# FINAL DEVELOPMENT PLAN SNB/KBNIR

## KHUSHKHERA-BHIWADI-NEEMRANA INVESTMENT REGION

Delhi – Mumbai Industrial Corridor Development Corporation Ltd.

**KUIPERCOMPAGNONS** / DHV / ECORYS / C&W

AUGUST 2014



KuiperCompagnons
Ruimtelijke Ordening, Stedenbouw, Architectuur, Landschap
City & Regional Planning, Urban Design, Architecture, Landscape

# Table of Contents


Preface ..... i

1 Introduction ..... 1-1

*1.1 Context ..... 1-1*

*1.2 Khushkhera Bhiwadi Neemrana Investment Region ..... 1-4*

*1.3 The Purpose ..... 1-4*

*1.4 The Approach ..... 1-4*

2 Development Strategy for KBNIR ..... 2-1

*2.1 Plan Objective ..... 2-1*

*2.2 Spatial Themes and Planning Principles ..... 2-2*

*2.3 Urban Structure ..... 2-5*

3 Elements of Development Plan for KBNIR ..... 3-1

*3.1 Plan Provision ..... 3-1*

*3.2 Planning Standards & Norms ..... 3-1*

*3.3 Base Map ..... 3-3*

*3.4 Generalised Existing Land Use Map ..... 3-5*

*3.5 Land Use Plan 2041 ..... 3-5*

3.5.1 Residential Use ..... 3-8
3.5.2 Commercial Use ..... 3-9
3.5.3 Industrial Use ..... 3-10
3.5.4 Recreational ..... 3-10
3.5.5 Public/ Semi-Public (Knowledge City / Government Offices) ..... 3-11
3.5.6 Transportation and Logistics ..... 3-11
3.5.7 Natural Features ..... 3-12
3.5.8 Special uses ..... 3-12
3.5.9 Agricultural Use Zone ..... 3-13
3.5.10 Public Utility Use Zone ..... 3-13
3.5.11 Cityscape ..... 3-13

*3.6 Urban Area Map ..... 3-15*

4 Development Promotion and Control Regulations for KBNIR ..... 4-1

*4.1 The Title and Extent ..... 4-1*

*4.2 Definitions ..... 4-1*

*4.3 Establishment of use zones and use premises ..... 4-2*

*4.4 Broad Land Use zones ..... 4-2*

*4.5 Sanction of Plans ..... 4-2*

*4.6 Location and boundaries of use zones ..... 4-2*

*4.7 Location and boundaries of use premises ..... 4-2*

*4.8 Sub-Division of use zones into use premises ..... 4-2*

*4.9 Permission of use premises in use zone ..... 4-2*

*4.10 Development works to be planned, designed, submitted and supervised by registered professionals ..... 4-3*

4.10.1 Licensed Architect/ Engineer ..... 4-3
4.10.2 Town Planner ..... 4-3
4.10.3 Structural Engineer ..... 4-3
4.10.4 Plumbing Engineer ..... 4-4

*4.11 Permitted & Permissible activities/ uses within Broad Land Use Classifications ..... 4-4*

4.11.1 Residential: Abadi Development Area Use Zone ..... 4-5
4.11.2 Residential Use Zone ..... 4-16
4.11.3 Commercial Use Zone ..... 4-28
4.11.4 Industrial Use Zone ..... 4-41
4.11.5 Development Control Regulations Industrial Use ..... 4-41
4.11.6 Recreational Use Zone ..... 4-52
4.11.7 Development Control Regulations Recreational area ..... 4-52
4.11.8 Tourism Use Zone ..... 4-58
4.11.9 Public/ Semi-public Use Zone (Knowledge City) ..... 4-65

4.11.10 Government Use Zone ....4-84
4.11.11 Permitted Use Premises in Transportation Use Zone ....4-84
4.11.12 Development Control Regulations Transportation and Logistics4-88
4.11.13 Hill and river conservation zone ....4-88
4.11.14 Permitted Use Premises in Highway Control Zone ....4-88
4.11.15 Permitted Use Premises in Hill and River Conservation Zone....4-88
4.11.16 Permitted Use Premises in Road side plantation corridor....4-88
4.11.17 Permitted Use Premises in Public Utilities....4-88
4.11.18 Public Utility Use Zone ....4-88
4.11.19 Permitted Use Premises in Agriculture use zone....4-88
4.11.20 Development Control Regulations Agricultural Use Zone ....4-89

*4.12 Parking Provisions....4-91*

*4.13 General Provisions ....4-92*
4.13.1 Distances from Railway Corridor ....4-92
4.13.2 Distances from Railway Corridor ....4-92
4.13.3 Distances from Oil/ Gas pipeline....4-92
4.13.4 Sub-Division/Layout of Land: ....4-93
4.13.5 Means of Access....4-94

*4.14 Mandatory Provisions....4-95*

*4.15 DSCR for ICT Master Plan....4-96*

5 Development Phasing for KBNIR ....5-1

*5.1 The Spatial Phasing Strategy ....5-2*

*5.2 Phase 1 (2021) ....5-2*

*5.3 Phase 2 (2031) ....5-2*

*5.4 Phase 3 (2041) ....5-3*

*5.5 Phase Wise Development of Road Infrastructure ....5-3*
5.5.1 Phase 1 (2021)....5-3
5.5.2 Phase 2 (2031)....5-4
5.5.3 Phase 3 (2041)....5-4

*5.6 Retaining flexibility ....5-5*

6 Infrastructure Plan....6-1

*6.1 Transport Infrastructure ....6-1*
6.1.1 Traffic Projections ....6-1
6.1.2 Development Strategy external links....6-3
6.1.3 Integrated transport strategy for the city....6-6

*6.2 Water Source & Conveyance Infrastructure ....6-20*
6.2.1 Water Demand....6-20
6.2.2 Existing Source & Its Status....6-20
6.2.3 Management of Ground Water Source – Aquifer Recharge....6-20
6.2.4 Available External Sources ....6-21
6.2.5 Analysis of Alternatives....6-22
6.2.6 Scheme for Preferred Option (Chambal) ....6-22

*6.3 Water Distribution System....6-24*
6.3.1 Peak Factor ....6-25
6.3.2 Pipe Design and Materials ....6-25
6.3.3 Distribution Aspect ....6-27
6.3.4 Network Design....6-27

*6.4 Sewerage System....6-32*
6.4.1 Design Periods....6-32
6.4.2 Projected Wastewater Flows ....6-32
6.4.3 Design Criteria....6-33
6.4.4 Design of Sewerage Network....6-41

*6.5 Recycled Water System....6-45*

*6.6 Storm Water Drainage System ....6-47*
6.6.1 Design Period ....6-47
6.6.2 Velocity in Storm Sewer ....6-47
6.6.3 Rainfall ....6-48
6.6.4 Peak Run off from the Catchments....6-48
6.6.5 Manholes ....6-48
6.6.6 Drop Arrangement ....6-49
6.6.7 Materials of Construction ....6-49
6.6.8 Proposed System ....6-50

*6.7 Solid Waste Management ....6-54*
6.7.1 Key Highlights of KBNIR....6-54

6.7.2 Waste Management Paradigm ....6-56
6.7.3 Load Estimates ....6-61
6.7.4 Service Levels ....6-63
6.7.5 Supporting Infrastructure ....6-66
6.7.6 Personnel Management and Occupational Health ....6-66
6.7.7 Institutional Strengthening and Capacity Building....6-67
6.7.8 Primary Collection and Transport System....6-69
6.7.9 Primary Collection and Secondary Storage....6-72
6.7.10 Street Sweeping and Drain Desilting....6-76
6.7.11 Transfer Stations ....6-78
6.7.12 Secondary Transport ....6-80
6.7.13 Horticulture Waste....6-82
6.7.14 Waste from Other Sources....6-83
6.7.15 Workshop....6-83
6.7.16 Treatment & Disposal of MSW in KBNIR....6-83
6.7.17 Recycling Centres ....6-96
6.7.18 Industrial Solid Waste Management....6-96
6.7.19 Institutional Arrangements ....6-97
6.7.20 Infrastructure and Services to be Offered ....6-97
6.7.21 Key Challenges ....6-98
6.7.22 Type of Service Providers....6-98
6.7.23 Investment and Operation Models of Relevance ....6-99
6.7.24 Suitable options ....6-100
6.7.25 Organisational Arrangements ....6-100
6.7.26 KBNIR Liability ....6-101
6.7.27 User Charges ....6-101

*6.8 Power....6-101*
6.8.1 Introduction ....6-101
6.8.2 Power Demand ....6-102
6.8.3 Power transmission and distribution ....6-104
6.8.4 Design and Planning of Power Transmission Network for KBNIR ...6-104
6.8.5 Power Sources....6-107

*6.9 Telecommunications....6-112*
6.9.1 Recognizing importance of ICT / telecommunications ....6-112
6.9.2 Broadband....6-113
6.9.3 Land based telephony....6-113
6.9.4 Mobile telephony....6-113
6.9.5 Below ground telecommunications structures....6-113
6.9.6 Above ground telecommunications structures ....6-113
6.9.7 Other considerations ....6-113

7 Block Cost Estimates....7-1

*7.1 Airport....7-2*
*7.2 Development of Bhiwadi- Neemrana Road Link....7-2*
*7.3 Development of Ajarka Railway Station ....7-2*
*7.4 Mass Transit Link to Nearest Cities....7-2*
*7.5 Water Source & Conveyance Infrastructure ....7-2*
*7.6 Site Development....7-2*
*7.7 Road Infrastructure....7-3*
*7.8 Water Distribution System....7-3*
*7.9 Sewerage System....7-4*
*7.10 Recycled Water System....7-4*
*7.11 Drainage System....7-4*
*7.12 Solid Waste Management ....7-4*
7.12.1 Capital Cost Estimates....7-5
*7.13 Power Generation & Transmission ....7-11*
*7.14 Landscaping & Plantation....7-11*

8 Broad Environmental & Social Assessment....8-1

*8.1 Screening of the Project....8-1*
*8.2 Environmental & Social Baseline ....8-1*
*8.3 Potential Impacts....8-2*
*8.4 Identified Mitigation Measures ....8-7*

9 Institutional & Regulatory Framework ....9-1

*9.1 Legal Framework ....9-1*

*9.2 Jodhpur Development Authority Act, 2009 (Model-1) ....9-2*
9.2.1 The Objective of the Act ....9-2
9.2.2 Jurisdiction ....9-2
9.2.3 Provisions under the Act ....9-2
9.2.4 The Organisational Structure of JDA ....9-3
9.2.5 Conclusion: ....9-4

*9.3 Rajasthan Urban Improvement Act, 1959 (Model-2) ....9-4*
9.3.1 Jurisdiction ....9-4
9.3.2 Provisions under the Act ....9-4
9.3.3 Conclusion ....9-5

*9.4 RIICO under Companies Act (Model -3) ....9-5*
9.4.1 The structure ....9-5
9.4.2 The objective & function ....9-6
9.4.3 Conclusion ....9-7

*9.5 Rajasthan Special Economic Zone Act ....9-7*

*9.6 Rajasthan Industrial Area Development Authority Act ....9-7*
9.6.1 Jurisdiction ....9-7
9.6.2 Provisions under the Act ....9-8
9.6.3 The Structure ....9-8
9.6.4 Conclusion ....9-9

*9.7 Rajasthan Municipalities Act, 2009 (Model -6) ....9-9*

*9.8 Comparing Prevailing Models ....9-10*

*9.9 Proposed Rajasthan Infrastructure Development Act ....9-11*

*9.10 Institutions Present in IR ....9-13*

*9.11 Dholera Special Investment Region Development Authority - A Case of Gujarat DMIC ....9-18*

*9.12 Key Takeaways & Analysis ....9-20*
9.12.1 Required Key Functions ....9-20
9.12.2 Classification of Activities over Project Life Cycle ....9-21
9.12.3 Assessing Activities by Agencies ....9-23

*9.13 The Rajasthan Special Investment Region Act ....9-25*

10 Land Procurement & Pricing Strategy ....10-1

*10.1 Land Procurement & Phasing strategy for IR ....10-1*

*10.2 Land Pricing Strategy ....10-2*

11 Economic Cost Benefit Analysis ....11-1

*11.1 Introduction ....11-1*
11.1.1 Investment costs ....11-1
11.1.2 Recurrent costs ....11-3
11.1.3 Revenue ....11-4
11.1.4 Results ....11-5
11.1.5 Development impact on the region ....11-7

**12 Marketing Strategy ....12-1**

*12.1 Vision and investment promotion objectives ....12-1*

*12.2 Activities with Comparative Advantage ....12-1*

*12.3 Investor Requirements ....12-1*

*12.4 Product development ....12-4*

*12.5 Investment Promotion ....12-4*

*12.6 Marketing the Investment region ....12-7*

*12.7 Models for Management of Investment Promotion ....12-7*
12.7.1 Model 1: Investment Promotion by the Public Sector (by in-house staff) 12-8
12.7.2 Model 2: Autonomous Public Investment Promotion Agency ....12-8
12.7.3 Model 3: Contractual Public-Private Partnership ....12-8
12.7.4 Model 4: Equity public-private partnership ....12-8
12.7.5 Model 5: Fully Private Development ....12-9
12.7.6 Comparative Summary ....12-9

## List of Tables

Table 3-1: Employment & Population provisions in DP -2041 ..... 3-1
Table 3-2: Planning Norms & Standards for KBNIR ..... 3-1
Table 3-3: The Extent of Land Uses in DP – 2041 ..... 3-8
Table 3-4: Proposed Residential Densities for KBNIR..... 3-8
Table 3-5: Land Reservation for DP Roads ..... 3-11
Table 3-6: Lengths of DP Roads ..... 3-12
Table 3-7: Land Reservation for Railway Network ..... 3-12
Table 4-1 : Development Control Regulation for Abadi development Area 4-8
Table 4-2: Permitted Use Premises in Abadi Development Area Use Zone4-9
Table 4-3: Permissible Use Premises in Abadi Development Area Use Zone4-15
Table 4-4: Development Control Regulations for Residential Area ..... 4-18
Table 4-5: Permitted Use Premises in Residential Use Zone..... 4-19
Table 4-6: Permissible Use Premises in Residential Use Zone ..... 4-26
Table 4-7: Development Control Regulations for Commercial Area..... 4-31
Table 4-8: Permitted Use Premises in Commercial Use Zone ..... 4-32
Table 4-9: Permissible Use Premises in Commercial Use Zone..... 4-38
Table 4-10: Development Control Regulations for Industrial Area..... 4-44
Table 4-11: Permitted Use Premises in Industrial Use Zone ..... 4-45
Table 4-12: Permissible Use Premises in Industrial Use Zone..... 4-49
Table 4-13: Permitted Use Premises in Recreation Use Zone..... 4-54
Table 4-14: Permitted Use Premises in Tourism Use Zone ..... 4-59
Table 4-15: Development Control Regulations for Public/ Semi-public (Knowledge City) 1..... 4-67
Table 4-16: Development Control Regulations for Public/ Semi-public (Knowledge City) 2..... 4-69
Table 4-17: Development Control Regulations for Public/ Semi-public (Knowledge City) 3..... 4-71
Table 4-18: Permitted Use Premises in Public/ Semi-Public Use Zone .... 4-72
Table 4-19: Development Control Regulations for governmental (Knowledge City) ..... 4-85
Table 4-20: Permitted Use Premises in Government Use Zone.....4-85
Table 4-21: Parking Provision Standards.....4-91
Table 4-22: Clearance With Respect To Power Line .....4-92
Table 4-23: Width of Pathway and Roads in Layouts for Other than Industrial Uses.....4-93
Table 4-24: Width of Roads in Industrial Layouts. .....4-94
Table 5-1: KBNIR Area Statement .....5-1
Table 5-2: Road Length per Phase (Km) .....5-5
Table 6-1: Per capita trip rate per day (PCTR).....6-1
Table 6-2: Assumptions regarding the distribution by mode of transport and occupancy.....6-1
Table 6-3: Traffic projections by category of traffic and mode of traffic in terms of number of trips per day, 2015- 2040.....6-2
Table 6-4: Projections of freight traffic in number of trips per day.....6-3
Table 6-5: Ground Elevations along alignment .....6-21
Table 6-6: Assumptions for Water Demand.....6-28
Table 6-7: Phase wise water demand .....6-28
Table 6-8: Capacity of Water Treatment Plant at KBNIR (MLD).....6-28
Table 6-9: Detail of capacity of UGR .....6-29
Table 6-10: Recommended design period for sewage components .....6-32
Table 6-11: Detail of wastewater generated in the project area.....6-33
Table 6-12: Recommended infiltration rate.....6-34
Table 6-13: Comparison of pipe material - gravity sewers .....6-37
Table 6-14: Comparison of pipe material - pumping/force mains.....6-38
Table 6-15: Bedding details.....6-40
Table 6-16: Capacity of STPs (MLD).....6-41
Table 6-17: Quality of water for ground water recharge.....6-42
Table 6-18: Recycled Water Availability.....6-45
Table 6-19: Design period for the drainage components .....6-47
Table 6-20: Rainy days and rainfall .....6-48
Table 6-21: Comparison of storm surface drains and piped system.....6-49
Table 6-22: Area Required for Recharge Pit (Acres) .....6-52
Table 6-23: Projected Population for the KBNIR.....6-55
Table 6-24 : Phase-Wise Distribution Of Population.....6-56

Table 6-25 : Classification of Streets and Sweeping Service Levels..... 6-57
Table 6-26: T & D Options for Different Waste Streams ..... 6-58
Table 6-27: Unit Waste Generation Rates..... 6-62
Table 6-28: Combined Unit Waste Generation Rates ..... 6-62
Table 6-29: Estimates of MSW Loads in KBNIR ..... 6-63
Table 6-30: Service Levels For Msw Management In KBNIR ..... 6-63
Table 6-31: Estimates of Litter Bins to be Installed Across KBNIR ..... 6-71
Table 6-32: Motorised Auto-Tipper Fleet for Primary Collection..... 6-72
Table 6-33: CWD and Wheely Bin Requirements for Secondary Storage 6-74
Table 6-34: Auto Tipper Requirements for Primary Collection Of Waste From Commercial And Institutional Sources..... 6-75
Table 6-35: Estimates of Road Sweeping And drain Cleaning Requirements ..... 6-76
Table 6-36: Phasing of Procurement of Street Sweeping Equipment and Implements..... 6-77
Table 6-37: Waste Transfer Stations in KBNIR ..... 6-78
Table 6-38: Estimates of Refuse Compactor Fleet for Lifting and Transporting Waste From CWDs ..... 6-80
Table 6-39: Estimates of Refuse Compactor Fleet for Long Haul Transport of Waste from Transfer Stations ..... 6-81
Table 6-40: Refuse Compactors for Transport of Brush..... 6-82
Table 6-41: Area Requirements for SLF..... 6-84
Table 6-42: Selection Criteria and Actions Suggested for Development of SWM SITE(S) in BNIR..... 6-87
Table 6-43: Estimates of MSW Loads in KBNIR ..... 6-92
Table 6-44: Key Process Parameters for Aerated Static Pile Composting 6-94
Table 6-45: Potential Service Providers For Msw Management ..... 6-98
Table 6-46: Options for Investment and Operations Model for MSW Management In KBNIR ..... 6-100
Table 6-47: Peak demand requirement and energy requirement ..... 6-102
Table 6-48: Demand Supply..... 6-102
Table 6-49: Power transmission infrastructure..... 6-102
Table 6-50: Peak demand (MW) and energy requirement (MU) for the investment region ..... 6-103
Table 6-51: Transmission capacity required in different phases in MVA6-105
Table 6-52: Number of substations required at different levels.....6-107
Table 6-53: Area Required for substations .....6-107
Table 6-54: 12th Plan Capacity Addition Conventional & Renewable Sources .....6-111
Table 7-1: Summary of Block Costs for KBNIR .....7-1
Table 7-2: Site Development Capital Costs .....7-3
Table 7-3: Road Infrastructure Capital Costs. .....7-3
Table 7-4: Capital Costs water distribution system for three alternatives. 7-3
Table 7-5: Capital Costs for Sewerage System .....7-4
Table 7-6: Block Cost Estimates for Recycled Water System .....7-4
Table 7-7: Block Cost Estimates for Capital Costs for Drainage System .....7-4
Table 7-8: Phase-Wise Capital Investment (First Time) For Msw Management In Kbnir (INR) .....7-6
Table 7-9: MSW Infrastructure Replacement Costs (INR Million).....7-8
Table 7-10: Combined Capex and Replacement Costs.....7-9
Table 7-11: Summary of cost estimates for Power Supply .....7-10
Table 7-12: Capital Cost for Landscaping and Plantation.....7-11
Table 8-1: Identified Potential Impacts & Mitigation Measures.....8-2
Table 8-2: Identified Impact Mitigation Measures .....8-7
Table 9-1: Comparative Analysis of Prevailing Models .....9-10
Table 9-2: Institutions, Structures and Objectives .....9-13
Table 9-3: Key Functions Required over Project Life Cycle .....9-21
Table 9-4: Prevailing Agencies & Desired Functions .....9-23
Table 10-1: Land Procurement Strategy .....10-1
Table 10-2: Proposed Land Pricing Mechanism .....10-3
Table 11-1: Assumptions with respect to costs for land acquisition (prices of 2013) .....11-1
Table 11-2: Capital investment in infrastructure in Rs crore in prices of 2013 .....11-2
Table 11-3: Capital investment in infrastructure included in the economic appraisal of the IR in Rs crore in prices of 2013.....11-3
Table 11-4: Assumptions for estimating the costs of operation and management and for marketing expenses .....11-3

Table 11-5: Land use of the IR and its development ..... 11-4
Table 11-6: Percentage distribution of gross land use, saleable land and land values in prices of 2013 ..... 11-4
Table 11-7: Phasing of land sales (ha) ..... 11-5
Table 11-8: Cash flow of revenues and costs in Rs crore in prices of 2013 11-6
Table 11-9: Summary economic effects of the development of the IR to economic in 2040 (monetary values are in current prices)..... 11-7
Table 12-1: Locational Requirements for Electronic Components..... 12-2
Table 12-2: Locational Requirements for Automotive Components ..... 12-2
Table 12-3: Locational Requirements for Wearing Appearal..... 12-3
Table 12-4: Locational Requirements for Transport & Warehousing (Logistics)..... 12-3
Table 12-5: Key Marketing Steps..... 12-7
Table 12-6: Comparative Summary – Marketing Management Models.. 12-9

## List of Figures

Figure 1-1: Location KBNIR in DMIC ..... 1-1
Figure 1-2: Location of SNB UC in Study Region..... 1-2
Figure 1-3: Location of KBNIR in Study Region..... 1-2
Figure 1-4: Notified SNB UC Proposed Land Use Plan -2041..... 1-3
Figure 1-5: Mass study..... 1-5
Figure 1-6:: Mass study ..... 1-5
Figure 2-1: Spatial Components of KBNIR ..... 2-5
Figure 3-1: Base Map for KBNIR ..... 3-4
Figure 3-2: Generalised Existing Land Use Plan for KBNIR ..... 3-6
Figure 3-3: Proposed Land Use Plan for KBNIR 2041 ..... 3-7
Figure 3-4: Scheme of Central Spine & Three Centres ..... 3-10
Figure 3-5: scheme agriculture..... 3-13
Figure 3-6: Prescribed Building Heights for KBNIR..... 3-14
Figure 3-7: Mass study..... 3-14
Figure 3-8: Mass study..... 3-14
Figure 3-9: Mass study .....3-15
Figure 3-10: Mass study .....3-15
Figure 3-11: Urban Area Map for SNB Urban Complex.....3-16
Figure 4-1: Residential Area KBNIR .....4-7
Figure 4-2: Mass study .....4-29
Figure 4-3: Commercial Area KBNIR.....4-30
Figure 4-4: Mass study .....4-42
Figure 4-5 Industrial Area KBNIR.....4-43
Figure 4-6: Recreation.....4-52
Figure 4-7: Recreational Area KBNIR.....4-53
Figure 4-8: Mass study .....4-66
Figure 4-9: Public/ Semi-Public Area KBNIR .....4-67
Figure 4-10: Mass study .....4-89
Figure 4-11: Natural Features / Special Uses / Agriculture / Public Utilities / Transportation in KBNIR.....4-90
Figure 4-12: Location of Gas/ Oil Pipeline within RoW of Road.....4-93
Figure 4-13: Round off of Junction.....4-94
Figure 4-14 : example solar power on rooftops.....4-95
Figure 4-15 : example rainwater harvesting from rooftops.....4-95
Figure 5-1: KBNIR Phasing .....5-1
Figure 5-2: Phase -1.....5-2
Figure 5-3: Phase -2.....5-3
Figure 5-4: Phase – 3 .....5-3
Figure 5-5: Road Infrastructure in Phase 1.....5-4
Figure 5-6: Road Infrastructure in Phase 2.....5-4
Figure 5-7: Additional Road Infrastructure in Phase 2 (compared to Phase 1) .....5-5
Figure 5-8: Road Infrastructure in Phase – 3.....5-5
Figure 5-9: Additional Road Infrastructure in Phase 3 (compared to Phase 2) .....5-5
Figure 6-1: Regional Road Network .....6-3
Figure 6-2: Regional Rail Network.....6-6
Figure 6-3: Impression road network.....6-9
Figure 6-4: Impression road network.....6-9

Figure 6-5: Transport infrastructure in the KBNIR..... 6-10
Figure 6-6: Road section 100 m road (Road Link) ..... 6-11
Figure 6-7: Road section 80 m road ..... 6-12
Figure 6-8: Road section 60 m road ..... 6-13
Figure 6-9: Road section 45 m road ..... 6-13
Figure 6-10: Road section 30 m road ..... 6-14
Figure 6-11: Junction Typology..... 6-16
Figure 6-12: Example of street lighting with solar panals ..... 6-17
Figure 6-13: Junctions..... 6-18
Figure 6-14: Public Transportation..... 6-19
Figure 6-15: Freshwater Conveyance from Chambal -Tentative Alignment 6-21
Figure 6-16: Water Distribution Network..... 6-31
Figure 6-17: Flow diagram of Membrane Biological Reactor Method..... 6-43
Figure 6-18: Sewerage System for KBNIR..... 6-44
Figure 6-19: Recycled System for KBNIR ..... 6-46
Figure 6-20: Rainfall in mm..... 6-48
Figure 6-21: Drainage Network for KBNIR..... 6-53
Figure 6-22: Hierarchy Of Waste Management Options..... 6-60
Figure 6-23: Possible Types Of Litter Bins For Installation Across Kbnir . 6-71
Figure 6-24: Locations Of The Proposed MSW Transfer Stations ..... 6-79
Figure 6-25: Mass study ..... 6-85
Figure 6-26: Location Of Identified Sites for SLF ..... 6-86
Figure 6-27: Static Aerated Pile for Composting MSW ..... 6-94
Figure 6-28: Peak demand (MW) & energy requirement (MU) for the investment region ..... 6-104
Figure 6-29: Demand forecast in MVA in the investment region ..... 6-105
Figure 6-30: Highlevel design of one unit of Transmission and Distribution Network..... 6-108
Figure 6-31: Power Supply Network..... 6-109
Figure 6-32: Power supply locations of the investment region ..... 6-112
Figure 7-1: Phase-Wise Capital Investment For MSW Management In KBNIR ..... 7-5
Figure 7-2: Phase-Wise Replacement Costs For MSW Management In KBNIR .....7-5
Figure 9-1: Presents the summary of powers & functions of JDA .....9-3
Figure 9-2: Presents the summary of powers & functions of UIT.....9-5
Figure 9-3: Presents the summary of powers & functions of RIICO. .....9-7
Figure 9-4 : Presents the summary of powers & functions of Industrial Area Development Authority. .....9-8
Figure 9-5: Structure of DSIRDA .....9-19
Figure 9-6: Powers and Functions of DSIRDA.....9-20
Figure 10-1: Land Procurement Strategy .....10-2
Figure 10-2: Land Cost Components .....10-2

## List of Appendices

**Appendix-1:** Response to Comments

**Appendix-2:** Base Line Scenario

**Appendix-3:** Industrial Employment & Population Projections for KBNIR

**Appendix-4:** List of Villages in KBNIR

**Appendix-5:** Planning Norms & Facilities by Phase

**Appendix-6:** Details of Reservoirs

**Appendix-7:** Chambal Water Conveyance – Pipe Sizing Calculations

**Appendix-8:** Compost Plant & Sanitary Land Fill Size Sizing Calculations

**Appendix-9:** BoQ &Specs for Typical Proposed Master Plan Roads

**Appendix -10** BoQ & Specs for Water Supply, Sewerage and Recycled Water

**Appendix -11:** Water Balance Diagram for KBNIR

## List of Abbreviation

| | |
|---|---|
| **BIP** | Bureau of Investment Promotion, Rajasthan |
| **BOO** | Build Own & operate |
| **BOOT** | Build, Own, Operate & Transfer |
| **BRR** | Behror Ring Road |
| **BRTS** | Bus Rapid Transit System |
| **BTK** | Bhiwadi - Tapookara- Khuskhera |
| **CAGR** | Compounded Annual Growth Rate |
| **Capex** | Capital Expenditure |
| **CEA** | Central Electric Authority |
| **CGWB** | Central Ground Water Board |
| **CI** | Cast Iron |
| **CPHEEO** | Central Public Health & Environmental Engineering Organization |
| **CTP-NCR** | Chief Town Planner, NCR, TPD, GoR |
| **CWD** | Community Waste Depot |
| **DBO** | Design, Built & Operate |
| **DFC** | Dedicated Freight Corridor |
| **DI** | Ductile Iron |
| **DJB** | Delhi Jal Board |
| **DMIC** | Delhi Mumbai Industrial Corridor |
| **DMICDC** | Delhi Mumbai Industrial Corridor Development Corporation |
| **DP** | Development Plan |
| **ECS** | Equivalent Car Space |
| **FSI** | Floor Space Index |
| **GoI** | Government of India |
| **GoR** | Government of Rajasthan |
| **GRP** | Glass Fiber Reinforced Plastic |
| **GWh** | GegaWatt Hour |
| **Ha** | Hectare |
| **HDPE** | High Density Polyethylene |
| **I.S Code** | India Standards Code |
| **IA** | Industrial Area |
| **ICD** | Inland Container Depot |
| **INR** | India National Rupee |
| **IR** | Investment Region |
| **ISBT** | Inter State Bus Terminal |
| **IT/ ITES** | Information Technology/ Information Technology Enabled Services |
| **KBNIR** | Khuskhera - Bhiwadi - Neemrana Investment Region |
| **kg/cm2** | kilogram per center meter square |
| **KLD** | Kilo liters per day |
| **KV** | Kilowatt |
| **kWh/sq.m/a** | Kilo Watt Hour per square meter per annum |
| **LPCD** | Liter per capita per day |
| **m/mts** | Meter |
| **m/sec** | meter per second |
| **MCM** | Million Cubic Meter |
| **MDR** | Major District Road |
| **MLD** | Million Liters per day |
| **MM** | millimeter |
| **MMTS** | Multi Modal Transit Station |
| **MoCom** | Ministry of Commerce, GoI |
| **MoEF** | Ministry of Environment & Forest, GoI |
| **MoM** | Minutes of Meeting |
| **MoUD** | Ministry of Urban Development |
| **MRTS** | Mass Rapid Transit System |
| **MS** | Mild Steel |
| **MSW** | Municipal Solid Waste |

| | |
|---|---|
| **MT/CUM** | Metric Ton per cubic meter |
| **MT/d** | Metric Ton per day |
| **MU** | Million Unit |
| **MW** | Megawatt' |
| **NCR** | National Capital Region |
| **NH** | National Highway |
| **O&M** | Operation & Maintenance |
| **Opex** | Operation & Maintenance Expenditure |
| **OR** | Other Roads |
| **PPP** | Public Private Partnership |
| **PSC** | Pre-Stressed Concrete |
| **PSP** | Private Sector Participation |
| **RCC** | Reinforced Cement Concrete |
| **RFP** | Request for Proposal |
| **RIICO** | Rajasthan State Industrial Development and Investment Corporation |
| **RoW** | Right of Way |
| **RRTS** | Rapid Rail Transit System |
| **RSR-NCR** | Rajasthan Sub-Region of NCR |
| **RVPNL** | Rajasthan Vidyut Prasaran Nigam Limited |
| **SH** | State Highway |
| **SIR Authority** | Special Investment Region Authority |
| **SLF** | Sanitary Land Fill |
| **SNB UC** | Shahjahanpur - Neemrana - Behror Urban Complex |
| **SPS** | Sewage Pumping Station |
| **Sqkm** | Square Kilometer |
| **STP** | Sewage Treatment Plant |
| **SWM** | Solid Waste Management |
| **T&D** | Treatment & Disposal |
| **ToR** | Term of References |
| **TPD** | Town Planning Department, GoR |
| **TS** | Transfer Station |
| **UDH** | Urban Development & Housing Department, GoR |
| **UDPFI** | Urban Development Plan formulation & implementation guidelines |
| **UFW** | Unaccounted for Water |
| **ULB** | Urban Local Body |
| **USEPA** | United State Environmental Protection Agency |
| **WHO** | World Health Organisation |
| **WTP** | Water Treatment Plant |

# Preface

Cities are the mirrors of society, reflecting the state of culture, architecture, economy, social relations, the human values, nature, agriculture and above all the care for environment and climate.

In other words cities are the yardstick of the level of civilization.

We have to model smart, sensual, seductive, exuberant, brazen cities. On our travel to these cities we are spinning along new and unforeseen paths, thereby enhancing the discourse on nature, rural communities and the “image of the city”.

Cities must be based on analysis engulfing rationality and functionality, but also encompassing poetry. The logic of the sensuality and the sensuality of the logic is the best adagium; thus providing a synthesis on both procedural and symbolic levels and enhancing creative imaginations to the collective “public” space.

It is therefore our task to embed this “ideal city” in “ideal green fields” embracing the villages with their long history.

The paradigms have to be reshuffled, changed and instead of the usual contradictions between “urban” and “rural” there has to be a marriage of the two.

The village in the city and the city in a pastoral agrarian setting.
Villages are after all the first human settlements, giving home to the first inhabitants with memories and aspirations.

Every inch of land has to be valued - revaluated before transforming it to the future use. “Vibrant nature” is the fundament of a “vibrant culture”.



Arravali hills, the forest and the great heritage. Here was the cradle for the great epic of Mahabharata, birth place of Indian civilization.

Cities are not only sculpted with tangible materials, programs and economics. Cities are also formed by the intangibles, the narratives, the poetry, the social interactions and the human scale. “The People” are the most important ingredient for defining the chemistry of the “sculpting clay” of the cities.

Constantly we have to change our shape to absorb the needs, wishes and hopes of all the participants in order to design a city.

Cultural consciousness, historical awareness, imagination and philosophical approach are literally the virtual fundaments of the city.

Functionalism or an overdoses of rationalism can never achieve the spiritual, the soul of the city.

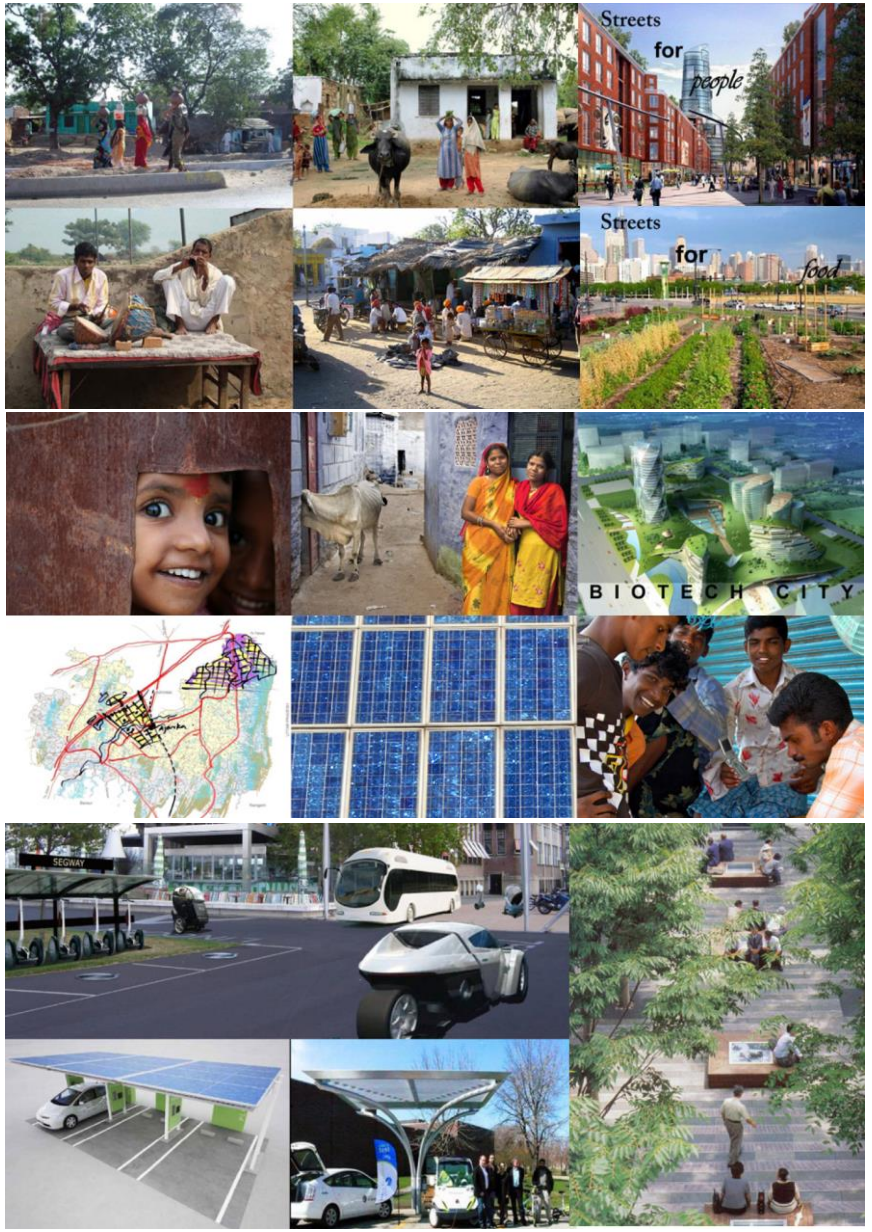
Nobody but the poet knows the rules of the grammar. Only when the poet overrules the rules a POEM is given birth to. Drawing lines for the FUTURE cannot be just based on the “measurable”. The “sociology” and the physiology of the city are as important.

At present we are in the middle of the “Environmental Age”.

It could be the highest stage of civilization.

For centuries exploiting the planet, it is time to stop this thoughtlessness and use information and knowledge to arrive at the level of WISDOM.

Sustainability, environmental, social, cultural and economical has to be the guiding “mantra”.
With the knowledge of today we cannot but embrace the principle of 3R’s (REDUCE RE-USE RECYCLE)



The major components for the delineation are the green fields for multi-cropping, water recharge to balance the subsoil water level, the proximity of the infra structure -especially public transport net- and the guarantee that “ecological sensitive zones” are not treaded upon.

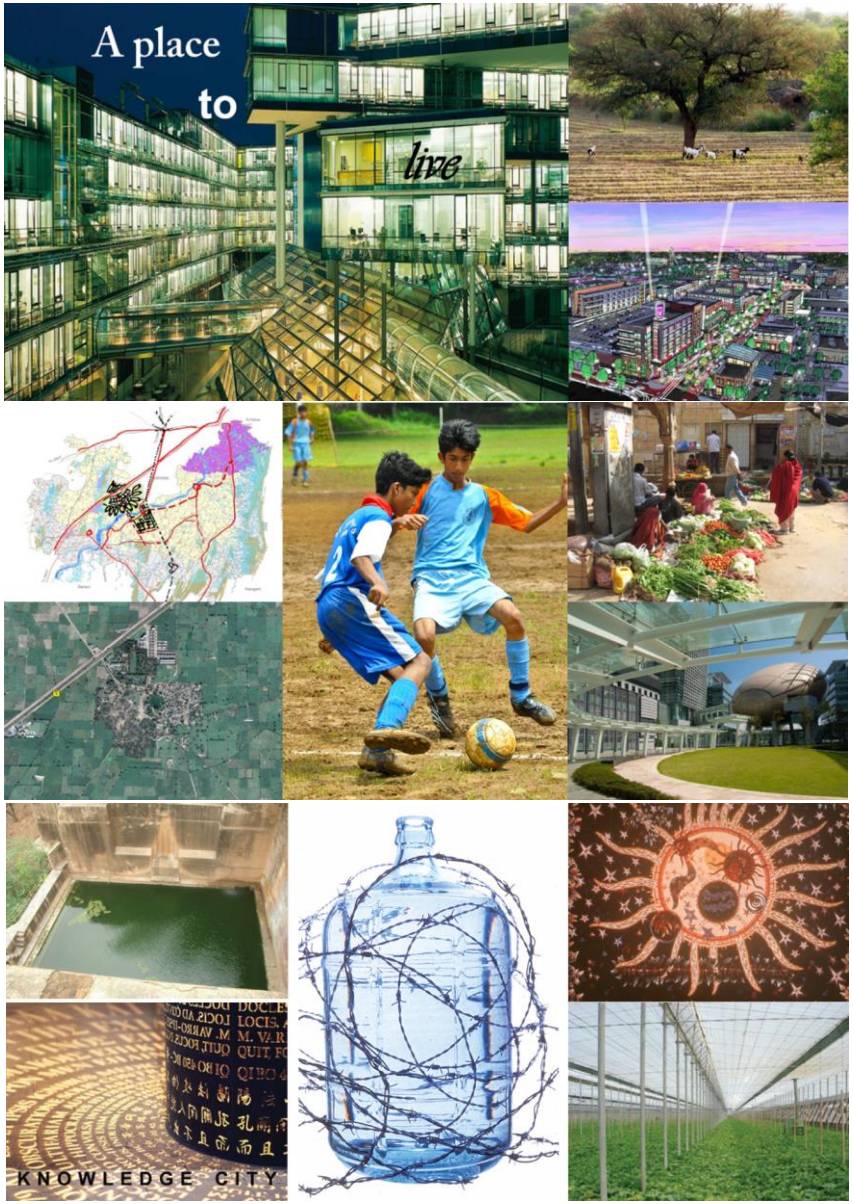
The location of the new city between NH8 and Ajarka railway station gives us the utmost opportunity to develop a city of approximately 50 km2 based upon a SMART concept, sustainable, green and intelligent.

All needed power can be generated by the sun. Solar energy on all scales can be harvested for all without any doubts. Imagine the first world metropolis with “zero carbon footprint”.

Rain harvesting, water recharge and creating ecological chains are the aspirations of this project. We have nicknamed the city as “SURYAPUR” to make us all the time aware of our goals. Public transport network, dedicated lanes for bicycles, tree lined shady footpaths leading to amenities on a walkable distance.

A city where the inhabitants when they switch on the light - there is light, when they open the tap - there is water.
A city where the people are secured of their daily needs, where else can we better project a SUNCITY than here in Rajasthan.
A city with gardens, parks and green agrarian belts respecting the multicropping green fields.

A city with herbal, spice, vegetable and fruit gardens, for research and for consumption in the garden restaurants. What a wonderful feeling plucking the vegetables, cooking and enjoying.



A city based on a holistic approach, integrating all the activities in an harmonious fashion, fulfilling the needs of both body and soul.
A city with layers of structures overlapping each other.

A lineage of activities in a very functional way. At the same time telling different stories through experiences, encounters and conversations.

A city where ordinary becomes extraordinary, full of imaginations, thus inspiring her inhabitants.

Imagine walking from home to work through lush green fields crossing through along village streets arriving at your work when green economy is in abundance.

The first Green City.
A city where water and energy are part of the basic planning structure, absolutely sustainable.

A city where the villages are part of the whole.
A city where traditions meet the modernity.
A city where dreams come true.
A city for all and by all.
A city where entrepreneurs are lining up to join hands.
A city where multiple opportunities for investments are available.
A city where food is being grown, traded, processed and consumed.
A city as a breeding place of creativity.
A city of inspirations and aspirations.
A city where children grow up with their heads in the clouds and feet on the ground.
A city with a tremendous sense of civic pride. A human city with care for each other.
A city to feel at home.
A bustling city, a city to admire, to remember and to converse over.



# 1 Introduction

## 1.1 Context

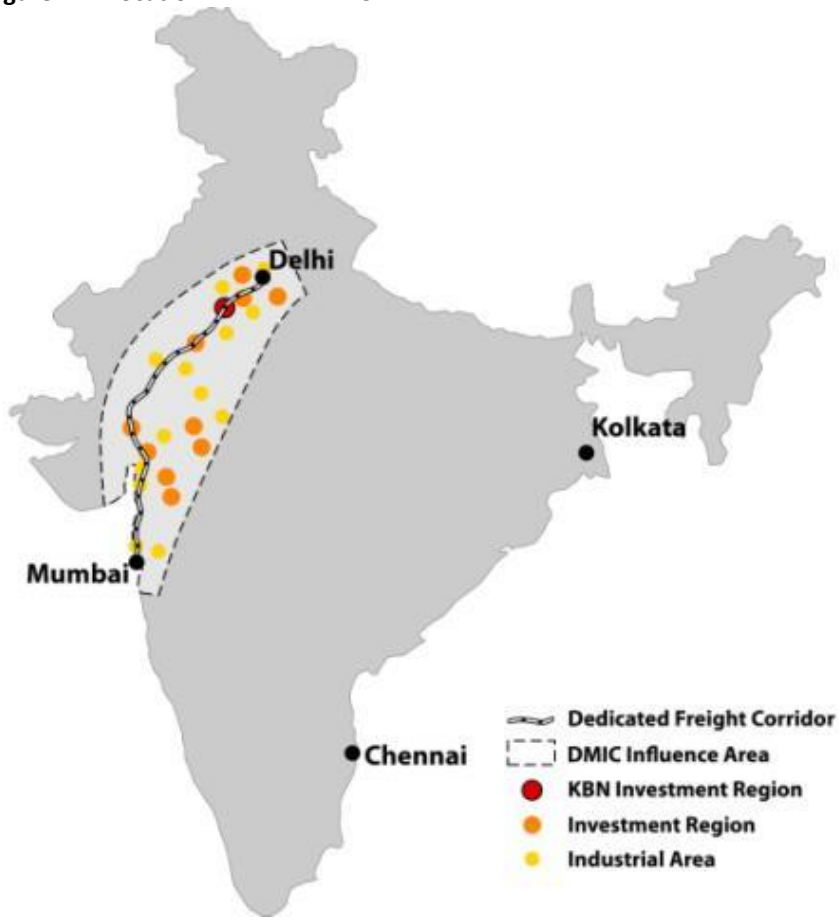
Since 2010 worldwide more people are living in urban areas than in rural areas. Cities offer the best opportunities on economic growth, prosperity and well-being. The growth of urban area challenges policymakers worldwide. In order to develop inclusive cities with a place for everyone, the issues of shelter, food, energy, waste, water, education and so on come to the forefront of the attention. Not only are these issues possible limiting conditions for future growth, they are at the same challenges for a sustainable urban growth and setting up green economies.

Government of India developed national policies to use the powers of urbanization, like the Golden Quadrilateral and the Delhi-Mumbai Industrial Corridor (DMIC), an initiative to create a linear zone of industrial development nodes along on a Dedicated Freight Corridor (DFC). Within the DMIC 11 Investment Regions are identified. This report covers one of these 11; for the Khushkhera-Bhiwadi-Neemrana Investment Region (KBNIR), a major new industrial hub to be located in Rajasthan.

The KBNIR is proposed as a major new industrial hub to be located about 110 kilometres (km) south of National Capital City - New Delhi, within the Rajasthan Sub-Region of National Capital Region. The KBNIR is the first investment region in Rajasthan under the proposed Delhi – Mumbai Industrial Corridor project (DMIC). **Figure 1-1** presents the location of KBNIR in DMIC.

It is the vision of Government of India (GoI) to develop an extended industrial corridor between Delhi and Mumbai; a band of 150 km on along the alignment of western Dedicated Freight Corridor (DFC) called Delhi – Mumbai Industrial Corridor (DMIC). This envisages assistance in promoting the industrial development with high quality physical and social infrastructure. The DMIC Development Corporation Limited (DMICDC; Special Purpose Vehicle) has been created under Ministry of Commerce (MoCom), GoI, to have a planned and coordinated development of DMIC region. The Bureau of Investment Promotion; Government of Rajasthan (GoR) is the nodal agency for DMIC project for state of Rajasthan.

**Figure 1-1: Location KBNIR in DMIC**



KuiperCompagnons Lead Consortium[1] (Consultant) has been given a mandate, by DMICDC, to undertake the "consultancy services for Preparation of Development Plan (DP) for Khushkhera – Bhiwadi – Neerana Investment Region (KBNIR) of Rajasthan sub-region of DMIC".

As per the Term of Reference (ToR) of assignment the Consultant has so far completed all activities/ tasks towards the Stage – 1 of Part-A of RFP leading towards preparation of draft DP for KBNIR (Stage-2 of Part A). Stage – 2 of Part A of RFP refers to preparation of draft DP along with the pre-feasibility assessment for five [5] projects and Master Planning for a Greenfield Integrated Township. The objective of ongoing report is to present the Final DP for KBNIR.

The Shahjahanpur Neemrana Behror Urban Complex (SNBUC) of Alwar district covers 555 sqkm of area; wherein Khuskhera Bhiwadi Neemrana Investment Region (KBNIR) covering 165 sqkm is subset. **Figure 1-2** and **Figure 1-3** presents location of SNBUC and KBNIR in study region respectively.

The Government of Rajasthan, in consultation with DMICDC, finalised the master plan for SNB UC 2041 and was notified on May 22, 2013. The notification of Master Plan for SNB UC 2041 was issued Urban Development and Housing Department, Rajasthan under prevailing legislative framework. **Figure 1-4** presents the notified proposed land use plan – 2041 for SNBUC (includes KBNIR).

KBNIR proposals are in line with the notified Master Plan for SNB UC 2041. The comments and suggestions received on draft DP, too has lead to amendments in this report. The response to various comments received on Draft DP is presented in **Appendix – 1**.

[1] Consortium includes KuiperCompagnons, Netherlands, as the lead member, with DHV Group, Ecorys and Cushman & Wakefield as consortium partners.

**Figure 1-2: Location of SNB UC in Study Region**

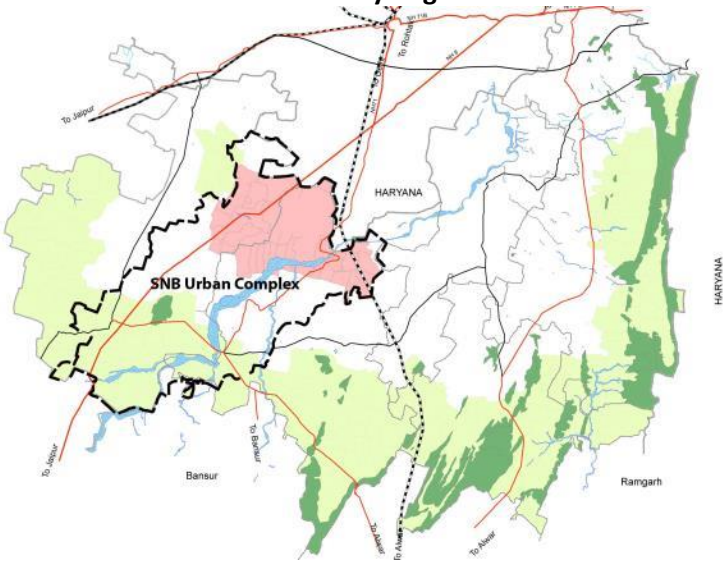



**Figure 1-3: Location of KBNIR in Study Region**

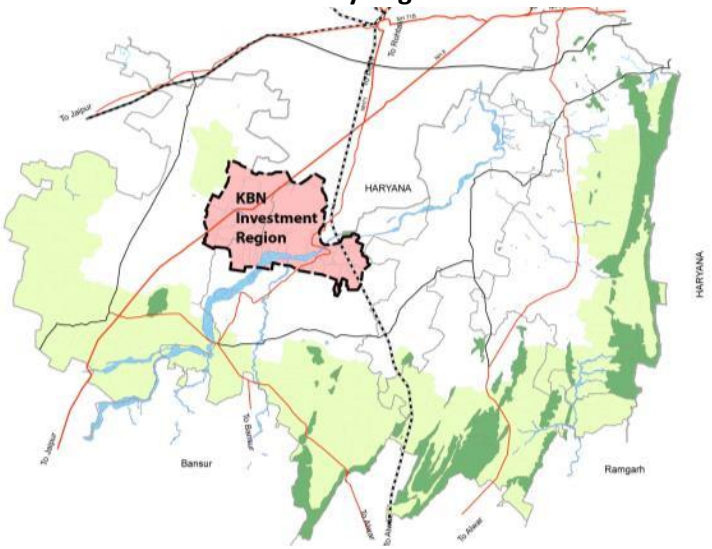
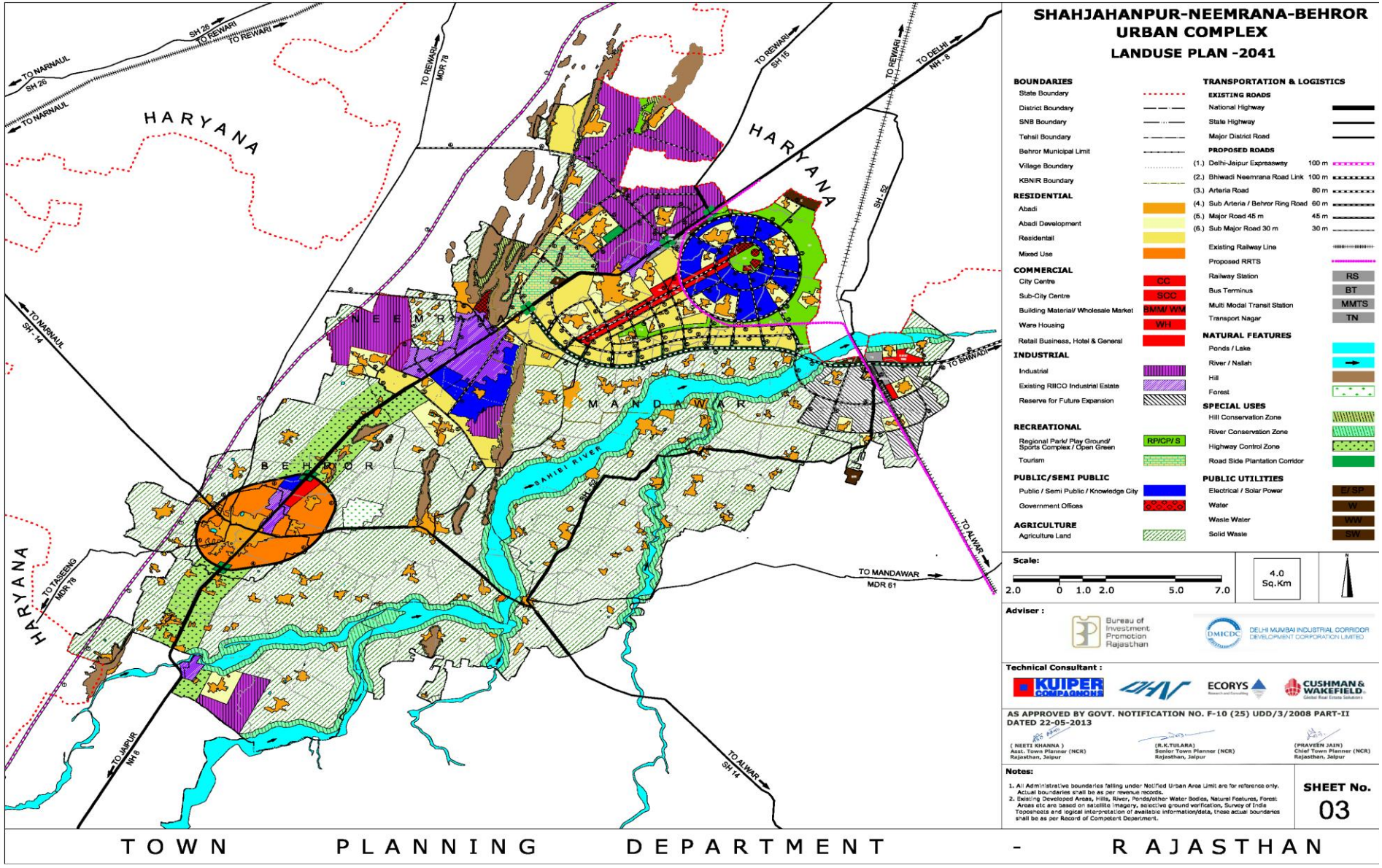


**Figure 1-4: Notified SNB UC Proposed Land Use Plan -2041**



## 1.2 Khushkhera Bhiwadi Neemrana Investment Region

Designate site for KBNIR is proposed as a new industrial hub within the SNB- UC. KBNIR is the natural expansion of Shahjahpur Industrial Area and Town. It is located in Alwar District of Rajasthan and borders Haryana. It admeasures 165.61 sqkm covering 42 villages of SNB UC. The base line scenario for KBNIR is presented in **Appendix -2.**

It is envisaged that the KBNIR would become an industrial centre, having direct connectivity with National & State Highways. The DP for the KBNIR allocates land for Industrial, knowledge/ researched based employment, commercial areas, residential, education and community services, recreational areas, open space and parks, environmental buffers, together with networks for transport and utility services.

The DP provides for the development of an integrated and self contained city with the potential to grow up to a target population of 13.7 million populations with required industrial areas. Refer **Appendix – 3** for details on industrial area demand estimates, population projections and site delineation.

The DP takes into account the DMIC objectives and goals and focuses on creating an enabling environment to promote local industries, enhance investment climate, improve quality of life, upgrade human skills, create world class infrastructure and attract global investments.

## 1.3 The Purpose

The purpose of DP for KBNIR is to provide a development guiding framework for next 30 years. DP intents to provide a broad development guidelines for all interested parties in the development & future of the KBNIR which may include Central Government, State Government, Public and Private agencies/ corporations and the existing industries & local inhabitants the designated area.

The DP comprises of a spatial plan, showing land use and infrastructure proposals for the whole of the SNB UC together with its development promotion/ control regulations.

The DP is essentially a strategic document, prescribing the land use plan for the KBNIR for next 30 years and shall be followed by detailed physical plans i.e zoning plans/ sector plans, industrial area plans, individual infrastructure/ utility plans, etc.

It is suggested that, for DP being a substantially a long term plan, DP shall be monitored, updated, and amended on a regular basis as circumstances change/ situation arises for it to remain valid for its horizon. It is proposed that the DP shall be reviewed once in 10 years from the date it is first published.

## 1.4 The Approach

The approach to prepare DP is in line with the overall scope. The DP has been prepare after analysing the results of a) market research and gap assessment study (target industries, industry sizing & potential, employment projections), b) are delineation exercise, c) population estimates, d) existing scenario (socio-economic, regulatory & topographic) of delineated KBNIR, e) planning standards and most importantly the Vision & Urban Planning Theme conceived by the consultant.

Various study reports, as mentioned below (conducted/ submitted by the Consultant towards preparation of DP may be referred for further details and are available with DMICDC, ILFS IDC & State Nodal Agency (BIP).

- Report on Site Selection / Area Delineation, Market Analysis, Gap Assessment for Investment Region, January 9, 2011.
- Techno-Economic Feasibility report with master plan and financial model of Aerotropolis, December 2011
- Techno-Economic Feasibility report on Knowledge City, December 2011.
- Techno-Economic Feasibility report on Road Link connecting Bhiwadi & Neemrana, December 2011
- Concept Master Plan khushkhera-Bhiwadi-Neemrana Investment Region, March 20, 2012

Apart for above report, various decisions taken by GoR on various occasions as well as observations/ suggestion by DMICDC/ ILFS/ CTP-NCR, Town Planning Department, have influenced the preparation of development plan for KBNIR.




**Figure 1-5: Mass study**



**Figure 1-6:: Mass study**



# 2 Development Strategy for KBNIR

## 2.1 Plan Objective

The overall objectives for a successful development of KBNIR *New City* are set out in Concept Master Plan. These objectives, their reasoning and ways of implementation are addressed below.

**Create an attractive pioneering climate; a vibrant, innovative and creative atmosphere**
Initial investors and pioneers need to be attracted in an early phase to ignite and start up the entire development.

Therefore inspirational and responsible environments and buildings where people are motivated to work with passion are to be established. A strong Institutional & Governance Framework has to be provided and a marketing strategy has to be prepared to promote KBNIR.

**Create a robust, compact framework flexible for future developments**
The future can be uncertain from political, economical and social point of view. The development should be able to adopt to new situations.

A strong spatial structure and phase wised development will contribute to this. Development of a new phase should only be started when previous phase is completed.

**Reduce, reuse, and recycling of water**
Water is scarce in the region and therefore the available water should be used in the most efficient way.

Only water efficient industries are allowed within the KBNIR and rain harvesting from all buildings should be promoted. The (urban, industrial and agricultural) water demand should be minimized, and used water should be recycled.

**Create a Knowledge based society**
Increasingly knowledge and innovation are seen as key equities. Market analysis and water scarcity promote the creation of a knowledge based society. Therefore a Knowledge City is promoted and the focus in on High Tech Industries and High Tech Agriculture.

**Use renewable energy**
The use of renewable energy will contribute to a clean and healthy sustainable environment and can be an impulse to local industries.

Solar energy will be harvested on all buildings, and solar plants will be in the utility zone and in the 500 m buffer along NH8. Other renewable energy sources such as natural gas are encouraged.

**Create reliable energy supply**
Reliable access to energy is one of the major limiting factors for growth and development. Sustainable solutions such as locally harvested solar energy will be created.

**Create a competitive new city**
A competitive city has the ability to attract and keep new businesses, work force and visitors.

Land uses and functions are therefore based on comprehensive market analysis. There is excellent connectivity by road, rail and air, and a high quality living environment is created.

**Create a sustainable new city**
Only with a sustainable approach the development of KBNIR can meet present needs without compromising the ability of future generations to meet their needs.

Sustainability is an overall goal in the development of New City that will be implemented in all aspects (e.g. ecological, social, cultural and economic)

**Minimize negative social impact**
Communities are the heart of all settlements. A strong new development can be created based on the existing social structures, that therefore need to be preserved.

There is no relocation of existing population. Abadi Development Areas are created to maintain possibilities for autonomous development of the existing settlements. Job creation for existing farmers will take place by intensifying local food production for the new city.

**Use local food**
The use of local food will contribute to local agriculture economy and reduces transportation. A link can be made between local food production and processing, and high tech (agricultural) industries.

(High Tech) Agriculture zones will be created within KBNIR for local food production and a Agro Food Hub can facilitate regional farmers food production and trade.

**Create maximum connectivity, circulation and accessibility**
Good connectivity, circulation and accessibility by different modalities decreases transportation time to and within the city.
Excellent external connectivity by road, rail and air is created. Also frequent and fine maze Public Transport network, and an excellent internal accessibility by clear and functional road structure is created.

**Avoid waste**
To avoid major environmental impact, urban and industrial city waste should be decreased and re-used.
Separate waste collection is envisaged and an integrated solid waste management facility is promoted.

## 2.2 Spatial Themes and Planning Principles

The DP is based on the application of a set of spatial themes and planning principles that contribute to achieving the objectives as stated in the previous paragraph. These themes and principles are summarized and explained below.

**A Compact and Integrated City**
The necessity of compact urban development is for several reasons such as liveability, transport, sustainability and water scarcity. One of the key considerations in the New City is the availability of water. With regard to the limitations of water availability in the region and importance of agricultural land in the food production for the country, increase in the urbanizable area shall be avoided as far as possible and the urbanizable area shall be as limited as possible.

To stop ribbon development along roads steps should be taken in advance in the planning stage itself. This risk identified is reflected in the compact city approach. Sprawl and fragmentation should be avoided if possible. This is not good for image forming of a new and developing city, for the functioning of the city or for efficiency of development and efficient use of the city. A compact urban development area will reduce the risk of disjointed or stalled development.

A compact city will require less agricultural land to be turned over for development and the most fertile farmland areas have to be safeguarded from urbanization. A compact city is also more efficient, promoting walking and cycling to work for example. The compact city results in a higher urban density for this area and promotes a lively and vibrant urban character.

The advantage of planning and designing for a compact urban form is the wide range of benefits that can be achieved from a single solution. Well designed, urban centers with a compact urban form have been shown to:

Improve economic development by concentrating a wide variety of high value, knowledge intensive, and service orientated economic activity;

- Increase physical activity through creating more walkable environments. Studies have shown that walkable cities can help reduce obesity and provide other health benefits;
- Improve urban livability (including individual safety and reduced crime) through the careful design of public spaces. This includes designing safer street environments that are also community places;
- Build stronger "communities" with easier access to social services and facilities;
- Improve social cohesion and creativity within the community by providing good public spaces;
- Accommodate changing housing preferences e.g. providing a wider variety of housing types to accommodate demographic needs;
- Improve energy efficiency through easier access to alternative modes of travel (public transport, walking and cycling). Such modes also achieve other benefits including reduced household transport-related costs;
- Move goods and provide services more efficiently;
- Reduce greenhouse gas emissions, lower pollution levels and reduce noise;
- Optimize national, state and local government investment in transport and other infrastructure (including social infrastructure such as schools).

**Integration of existing population**

Key to *The New City* is that no existing villages may be destroyed either wholly or partially to make way for new development whether that be roads, infrastructure or new built developments. The existing villages will be embedded within the new developments and be retained and regenerated to become vital and vibrant elements in the new urban and rural structures.

**Key Objectives are:**

- Upgrade the quality of infrastructure in the villages to stimulate economic growth, and connect the villages to the 'new' infrastructure;
- Integrate the villages into the new economy and provide access to new opportunities in education, employment and social / health care;
- Avoidance of unnecessary disruption to established communities both in physical terms (protection, retention of property) and in social terms (no displacement and fragmentation of communities);
- Allow villages to develop and grow through natural progression and self-help rather than through forced redevelopment and relocation.

The existing villages in *The New City* will be entirely adopted into the new urban structures and developments. Around these villages a landscape strip (Abadi Development area) is proposed that will function as a communal urban space where street markets, urban agriculture plots or for example pocket parks can be located. Where the new developments are more dense or perhaps (light) industrial uses this area can be seen as a buffer zone between the residential and non-residential areas.

Besides the existing village settlements, also existing roads are implemented in the new urban fabric. These existing roads are embedded in a green environment and connect the Abadi areas. They create direct connections between the Abadi's for walking, biking and public transport.

**Integration of land use**

In the Development Plan is aimed at a development of the new city in which different activities such as living, working, facilities, leisure, sports and recreation are in each other vicinity. This integration of land uses will result in minimizing travel distances within the city, and maximizing a vibrant and lively character of the all parts of the city.

Especially integration of residential in other land uses is important to create a lively and vibrant city. Therefore residential is made possible in several other land uses.

Single use areas are avoided as much as possible to prevent desolated, unsafe areas coming into existence.

As part of this concept it is allowed in the Development Plan to have a maximum 30% of secondary land use within an area of dominant land use. Different land uses in each other's vicinity should however not have negative effects on each other.

**Accessibility of Industrial Zones**
A good accessibility is of special importance to the industrial zones within the KBNIR. Therefore these industrial zones are located in the direct vicinity of important road (NH8 and Road Link), and rail (Ajarka station) infrastructure. This allows industrial traffic to avoid residential, commercial and natural areas that are to be avoided to minimize negative traffic impact.

**Separation fast and slow traffic**
To avoid dangerous situations and to maximize a continuous traffic flow fast and slow traffic modes are separated. The fast traffic roads (National Highway 8 and Road Link) have therefore separated junctions to avoid conflicts and guarantee a free flow of passing traffic.

Also bike & pedestrian traffic are separated from motorized traffic to avoid conflicts and dangerous situations, and to promote sustainable manners of transport.

**Environmental protection**
The ecologically sensitive areas (Arravalli Hills) are protected from development that might harm the ecological values in these areas. Also the Sahibi River bed is protected from development that could obstruct the water buffering capacity during monsoon.

**Robust landscape framework**
The urban framework and the landscape framework must be in balance to create a sustainable city. Therefore a robust framework of green spaces is to be planned that must be protected from other developments. (High-tech) Agriculture is located in the direct vicinity of the city to contribute to the cities landscape framework. Also the Abadi Development areas are made important part of the overall integration strategy of integrating green areas within the city.

**Use of trees**
The use of trees is very important in a city, especially with Rajasthan climate. Trees will create shade, a good micro climate, habitats for birds and small animals, and they have a positive impact on peoples well being and health. Overall it can be said that trees increase a pleasant living environment in the city.

For this purpose it is aimed to maintain all existing trees, and plant as many new trees as possible in the New City. In the streets sections many trees are implemented.

**Conservation of multi cropping areas**
In the delineation of the Development Plan the areas that are of the highest importance to agriculture (multi cropping agriculture) are protected from non-agriculture developments. Local food production is considered of high importance to the sustainable development of the new city.

**Creating own identity by spatial layout**
Many world cities are recognized by their spatial layout. The green avenues from New Delhi, the grid structure from Manhattan and the boulevards from Paris create a strong identity to these cities.

The circular iconic shape of the Knowledge City will contribute strongly to the future identity of New City.

**First step towards Solar City**
In the new city the use of solar power is maximized. The model project for Solar Power and Micro-Grid at Neemrana, can be considered the first step towards creating a full Solar City. Different locations have been assigned to the purpose of solar power generation (along NH8 and in Utility zone), and guidelines for solar power generation of rooftops of buildings have been incorporated in this report.

**Integrated Public Transport**
Public transport of different modes, from RRTS to riksja, is interconnected within the new city. Large distances are travelled fast by trains, and in hub stations people can change to busses, and finally to local door-to-door transport.

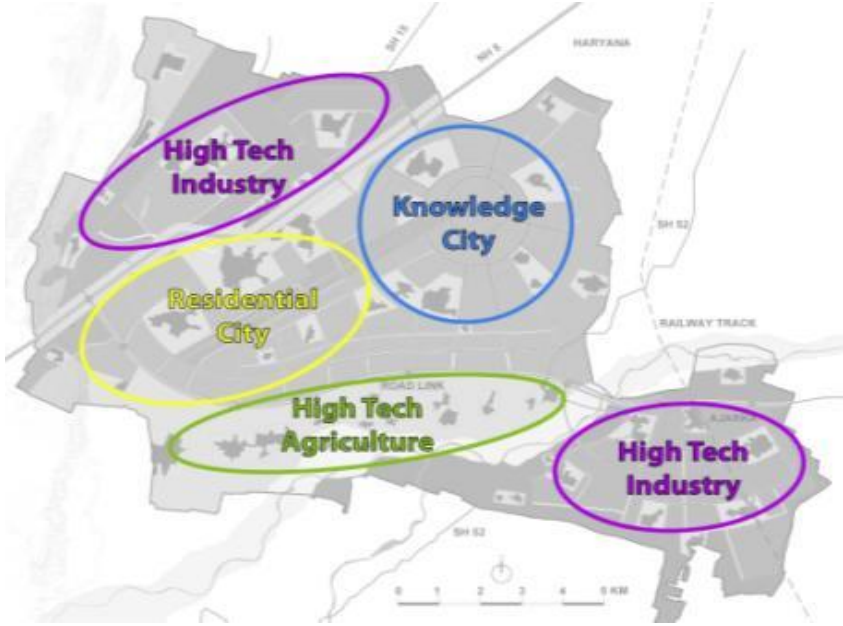
**Living near streets**
The commercial and working life largely concentrates on the sides of urban streets. Shops, offices and small businesses along streets create a vibrant urban character in the city. A lively atmosphere where people meet and interact. Therefore the main streets are used to create these lively public places where people work and shop. Gated communities are prevented.

**Phased development**
The development of the new city is planned in three phases. At each phase the city can function independent on the (possible) development of future phases. Therefore in every phase a mix of land uses is present to create a well-balanced city at each time.

## 2.3 Urban Structure

The Spatial Development Plan for the KBNIR is designed to accommodate and facilitate the expected (and perceived) developments for this investment region for the coming 30 years. The overall spatial strategy allocates land uses of different size to specific areas with the purpose of creating a strong base for the (phase wise) development of an attractive and competitive investment region supported by world class infrastructure.

**Figure 2-1: Spatial Components of KBNIR**



# 3 Elements of Development Plan for KBNIR

## 3.1 Plan Provision

The site for the Development of the KBNIR is a within the SNB UC urban complex and includes 42 villages. As per Census 2001, combined population of villages falling under KBNIR was 68,041persons. The list of villages falling within KBNIR is presented in **Appendix -4**.

DP provides for concentrated & planned urbanisation of KBNIR. The development of industries and other economic activities in the KBNIR is expected to create large number employments and support a very large population. It is anticipated that a high proportion of those employed in the KBNIR would live in KBNIR and the Development Plan has been designed to house a target population of ~1.4 million inhabitants. The key employment and demographic provisions of the Plan are summarised in **Table 3-1** and details of employment & Population projections are presented in **Appendix-3.**

**Table 3-1: Employment & Population provisions in DP -2041**

| Employment & Population provisions in DP -2041 | | | |
|---|---|---|---|
| Sl. No. | Phase 1 | Phase 2 | Phase 3 |
| Employment | 81100 | 186200 | 5,37,000 |
| Population | 254200 | 513200 | 13,80,000 |
| Dwelling Unit | 63550 | 128300 | 345000 |
| | | | |

Note: Figures are cumulative in nature and have been rounded up to nearest digit. Household Size = 4.

## 3.2 Planning Standards & Norms

An extensive range of community facilities would be required to meet the needs of the inhabitants of the KBNIR. KBNIR is planned as largely self sufficient & contained in terms of health, education, cultural, government, sports and open space facilities.

The planning norms that proposed for providing various facilities/ infrastructure has been borrowed from UDPFI guidelines issued by Ministry of Urban Development, Govt. of India. **Table 3.2** provides the planning norms/ standards that are to be used for providing facilities in KBNIR over next three decades. The details of facilities required in each phase are presented in **Appendix-5**.

**Table 3-2: Planning Norms & Standards for KBNIR**

| Planning Norms & Standards for KBNIR | | | |
|---|---|---|---|
| Sl. No. | Facilities/ Amenities | Population Threshold (UDPFI) per unit | Unit Area (Ha) |
| 1 | School Education Infrastructure | | |
| 1a | Crèche | 10,000 | 0.08 |
| 1b | Pre-Primary, Nursery School | 2,500 | 0.08 |
| 1c | Primary School | 5,000 | 0.4 |
| 1d | Senior Secondary | 7,500 | 1.6 |
| 1e | Integrated School without hostel facility | 100,000 | 3.5 |
| 1f | Integrated School with hostel facility | 100,000 | 4 |
| 1g | School for Handicapped/ Mentally Challenged | 45,000 | 1 |
| 2 | Higher & Technical Education | | |
| 2a | College | 100,000 | 6 |
| 2b | University Campus | 1,000,000 | 60 |

| Planning Norms & Standards for KBNIR | | | |
|---|---|---|---|
| **Sl. No.** | **Facilities/ Amenities** | **Population Threshold (UDPFI) per unit** | **Unit Area (Ha)** |
| 2c | Teaching Institutes | 1,000,000 | 4 |
| 2d | Technical Education Centre (ITI + Polytechnic) | 1,000,000 | 4 |
| 2e | Engineering Colleges | 600,000 | 6 |
| 3 | Health Care Facilities | | |
| 3a | Dispensary/ Health Centre | 15,000 | 0.1 |
| 3b | Nursing Homes, Child Welfare and Maternity Centre | 50,000 | 0.2 |
| 3c | Poly-Clinic with observation beds | 100,000 | 0.2 |
| 3d | Intermediate Hospital (Category B) | 100,000 | 0.6 |
| 3e | Intermediate Hospital (Category A) | 100000 | 2.7 |
| 3f | General Hospital | 250,000 | 4 |
| 4 | Sheltering Facilities | | |
| 4a | Old Age Home | 500,000 | 0.2 |
| 4b | Orphanage | 250,000 | 0.2 |
| 4c | Night Shelter | 100,000 | 0.1 |
| 4d | Working Women's Hostel | 250,000 | 0.1 |
| 5 | Security& Safety Infrastructure | | |
| 5a | Police Station | 90,000 | 1.5 |
| 5b | Police Post | 50,000 | 0.16 |
| 5c | District Office & Battalion | 1,000,000 | 4.8 |
| 5d | Police Line | 2,000,000 | 6 |
| 5e | District Jail | 1,000,000 | 10 |
| 5f | Civil Defence & Home Guards | 1,000,000 | 10 |
| 5g | Fire Station/ Sub-Fire Station | 200,000 | 1.5 |
| 6 | Telecommunication & Postal Infrastructure | | |
| 6a | Head Post office | one per city | 1 |
| 6b | Post Office | 50,000 | 0.3 |
| 6c | Telephone Exchange | 100,000 | |
| 7 | Socio-Cultural Facilities | | |
| 7a | Recreational Club (Type-1) | 15,000 | 0.2 |
| 7b | Recreational Club (Type-2) | 50,000 | 0.5 |
| 7c | Recreational Club (Type-3) | 100,000 | 1 |
| 7d | Music, Dance, Drama Centre | 50,000 | |
| 7e | Meditation & Spiritual Centre | 50,000 | |
| 7f | Socio-Cultural Centre | 500,000 | |
| 7g | Electric Crematorium | 250000 | 1 |
| 7h | Crematorium Ground | 250000 | 1 |
| 7i | Burial Ground | 250000 | 1 |
| 7j | Religious Building | 50,000 | 0.1 |
| 7k | Multipurpose Community Hall | 100,000 | 0.2 |
| 8 | Transportation Facilities | | |
| 8a | Bus Terminal | 2,50,000 | 1 |
| 8b | Inter State Bus Terminal | one for city | 4 |
| 8c | Bus Depot | 500,000 | 2 |
| 8d | Truck Terminal | 500,000 | 10 |
| 9 | Commercial & Shopping Facilities | | |
| 9a | Milk Booth | 5,000 | |
| 9b | Local Shopping/ Neighbourhood Centre | 10,000 | 2 |
| 9d | Community Centr/ Sub-Sector | 100,000 | 5 |
| 9e | Sector Centre | 250,000 | 8 |
| 9f | Sub-city Centre | 500,000 | 16 |
| 9g | Central Business District | 1,000,000 | 25 |

| Planning Norms & Standards for KBNIR | | | |
|---|---|---|---|
| **Sl. No.** | **Facilities/ Amenities** | **Population Threshold (UDPFI) per unit** | **Unit Area (Ha)** |
| 9h | Wholesale Market | 100,000 | 1 |
| 9i | LPG Godowns | 50,000 | 0.1 |
| 9j | Dhobi Ghat | 300,000 | 1 |
| 9k | Petrol Pump | 30,000 | 0.15 |
| 10 | Playground/ Parks/ Open Spaces/ Sports Centre | | |
| 10a | Community Park | 100,000 | 5 |
| 10b | Multipurpose Park | 100,000 | 2 |
| 10c | District Park | 250,000 | 25 |
| 10d | City Park | 1,000,000 | 20 |
| 10e | Community Sports Centre | 100,000 | 3 |
| 10f | Multipurpose ground | 500,000 | 4 |
| 10g | District Sports Centre | 500,000 | 10 |
| | | | |

## 3.3 Base Map

The base map presents the existing natural and manmade settings within the area of interest. The position, alignment, locations of natural features like Hills, Forests, River, Ponds/ Lakes, spot levels (as per SoI Toposheets) can be seen on base map. The man made features show in base map includes administrative boundaries (State, District, Tehsil, Village) Transportation Network (NH/ SH/ MDR/ Other Roads/ Railway Line) and existing built areas (village settlement areas, industrial areas, any other build mass).

The base map prepared for KBNIR is presented in**.**The base map covers an area 165 sqkm. As per census 2001, geographical areas for entire SNB UC shall be 161 sqkm respectively.

The Consultant has prepared the base map for the KBNIT using satellite imagery[2], SoI toposheets secondary information and village revenue maps as well as the site reconnaissance survey. Whereas for rest of SNB UC, the consultant has relied predominantly on SoI toposheets, information/ data provided by Office of CTP-NCR, Town Planning Department, GoR.

While, the Consultant is aware of the variations[3] for each village between the revenue information (as per Government Records) and base map for KBNIR (42 villages) based on satellite imagery and SoI Toposheets. It is therefore important to note here that:

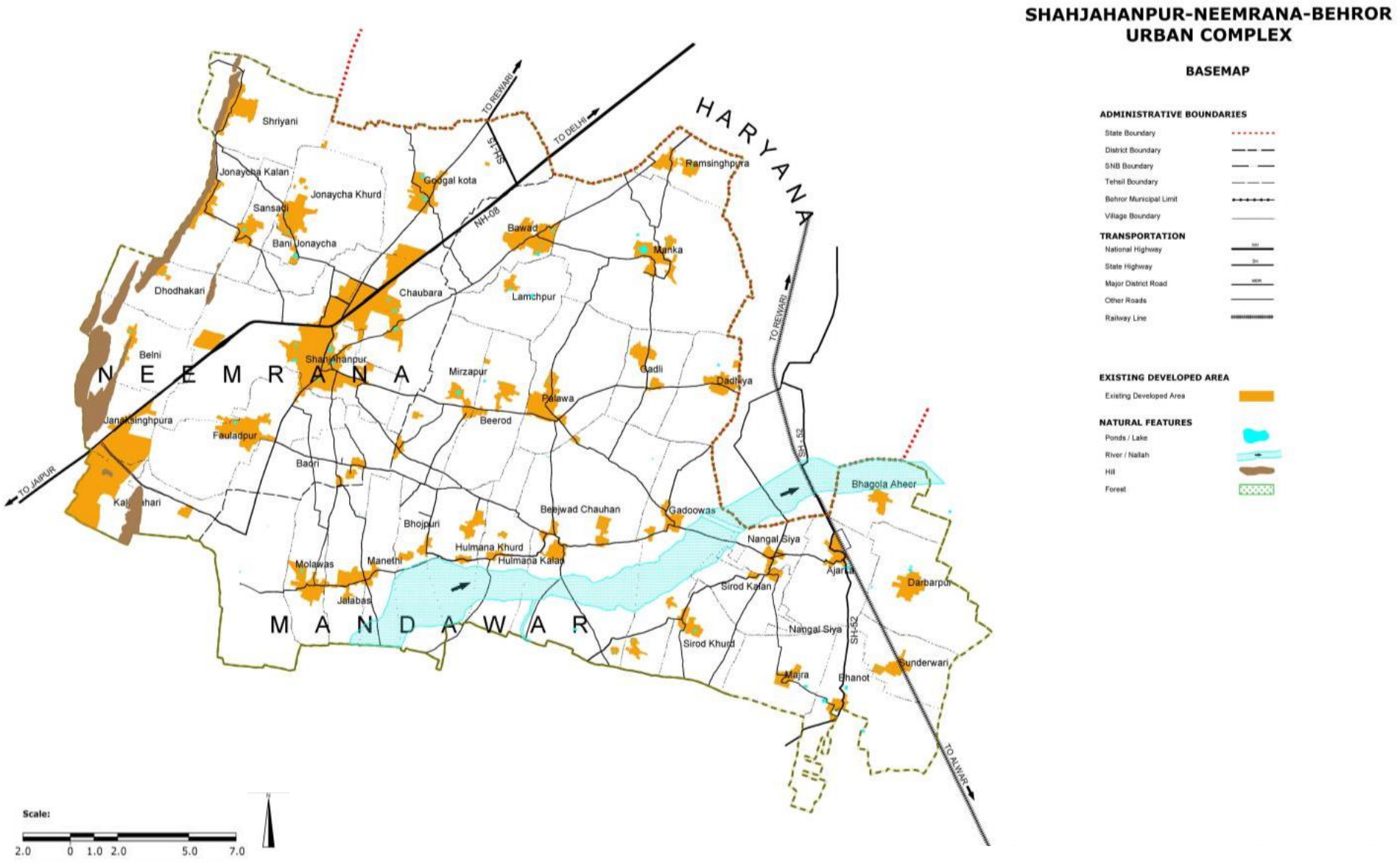
- The administrative boundaries (state, district, village, tehsil,) are for reference only and actual boundaries as per revenue records and demarcated on ground shall be considered.
- Extend of existing build areas, natural features (Hills, River, Ponds, forests, etc) area based on satellite imagery, SoI topoheets, and logical interpretation of available information/ data. Their actual boundaries shall be as per the records of competent authority or as per ground conditions, whichever is more.
- Several infrastructure facilities & utilities (such as High Tension Lines, Power sub-station, Gas Pipelines, etc) above & under the ground and are currently not mapped. Their position. Location, alignment shall be as per the ground conditions.

The Base Map for KBNIR -2012 is presented in **Figure 3-1** and separately in Sheet-1

[2] Provided by DMICDC Limited

[3] The reasons for variations and extend of area variations for 42 villages of KBNIR is presented in Appendix -4.

**Figure 3-1: Base Map for KBNIR**



## 3.4 Generalised Existing Land Use Map

The existing build area were given appropriate land uses as per the activities/ use performed within the premises to prepare generalised existing land use map. This was done based on inputs from Office of Town CTP-NCR, Planning Department and very few ground verification. The land uses are broadly categorised into following:

- **Abadi Area** (Existing village Settlements, Behor municipal areas, scattered developments but near to Abadi Areas interpreted as non-industrial activities other than scattered uses based on insight from Officials of Town Planning Department, GoR)
- **RIICO Industrial Estates** (Areas logically interpreted as Industrial Estimates using satellite imagery)
- **Other Industries** (Existing developed area logically interpreted as industries with inputs from Officials of Town Planning Department, GoR)
- **Mining Area** (Areas observed where mining activities were being performed or previously performed and is abandoned)
- **Other Scattered Uses** (Includes scattered uses other non-residential and non-industrial activities)
- **Natural Features** (This includes, Hills, Forests, River, Ponds/ Lakes, etc.)

The generalised existing land use map prepared for KBNIR is presented in **Figure 3-2** as well as Sheet 2.

## 3.5 Land Use Plan 2041

The proposed land use plan captures the essence of various land uses within KBNIR. The main objective is to ensure that the future proposals within the development area are in conformity with the prescribed land uses. These land uses are:

1. **Residential Zone** (Existing Abadi, Abadi Development Area & Residential Sectors)
2. **Commercial Zone** (City Centre, Sub-City Centre, General Commercial, Building Material Market, Wholesale/ Mandi, etc)
3. **Industrial Zone** (Micro, Small, Medium, Large scale industries of Green & Orange Categories. No red industries)
4. **Tourism Zone**
5. **Recreational** (Regional Park, Play Ground, Sports Complex, Road Green Buffer,etc)
6. **Public and Semi Public Zone** (Knowledge City, Government Offices, PSU & Semi-Govt Agencies offices, etc)
7. **Transport and Logistics Zone** (Transport Nagar, Logistics & Wharehousing, Railways Station/ Yard, Multimodal Passenger Terminal, ISBT, etc)
8. **Natural Features** (Ponds, river zone, hills and forests)
9. **Special Uses** (hill and river conservation zone, and Highway Control Zone Along NH8)
10. **Agriculture Zone**
11. **Public Utilities** (electric, solar, power, water and waste)

The Notified Masterplan for Shahjahanpur-Neemrana-Behror Urban Complex proposed Land Use Plan 2041 as shown on **Figure 3-3** as well as in **Sheet No.3** appended separately and**,** whereas the extent of various land uses proposed in DP is as given it **Table 3-3**.

**Figure 3-2: Generalised Existing Land Use Plan for KBNIR**

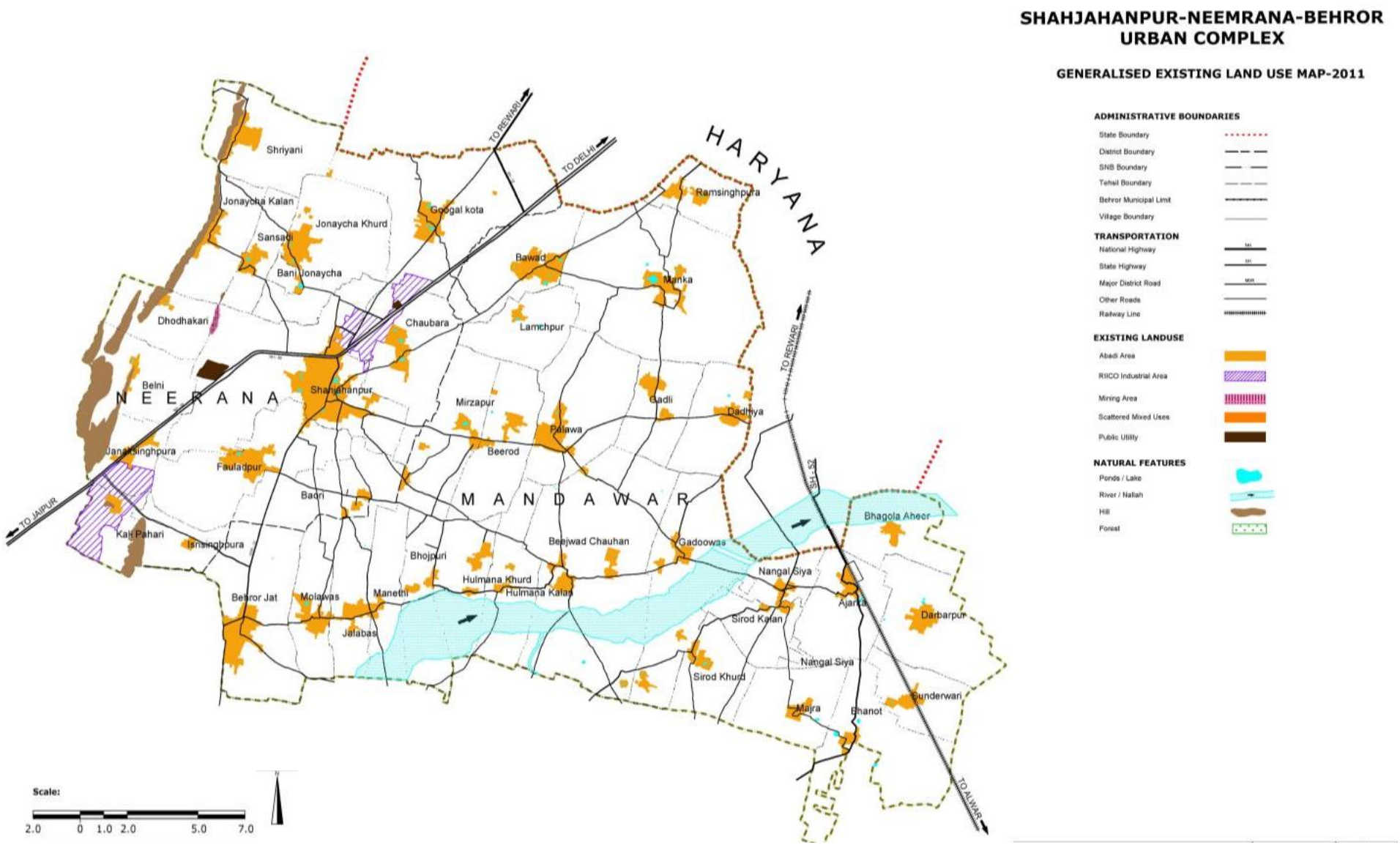


**Figure 3-3: Proposed Land Use Plan for KBNIR 2041**

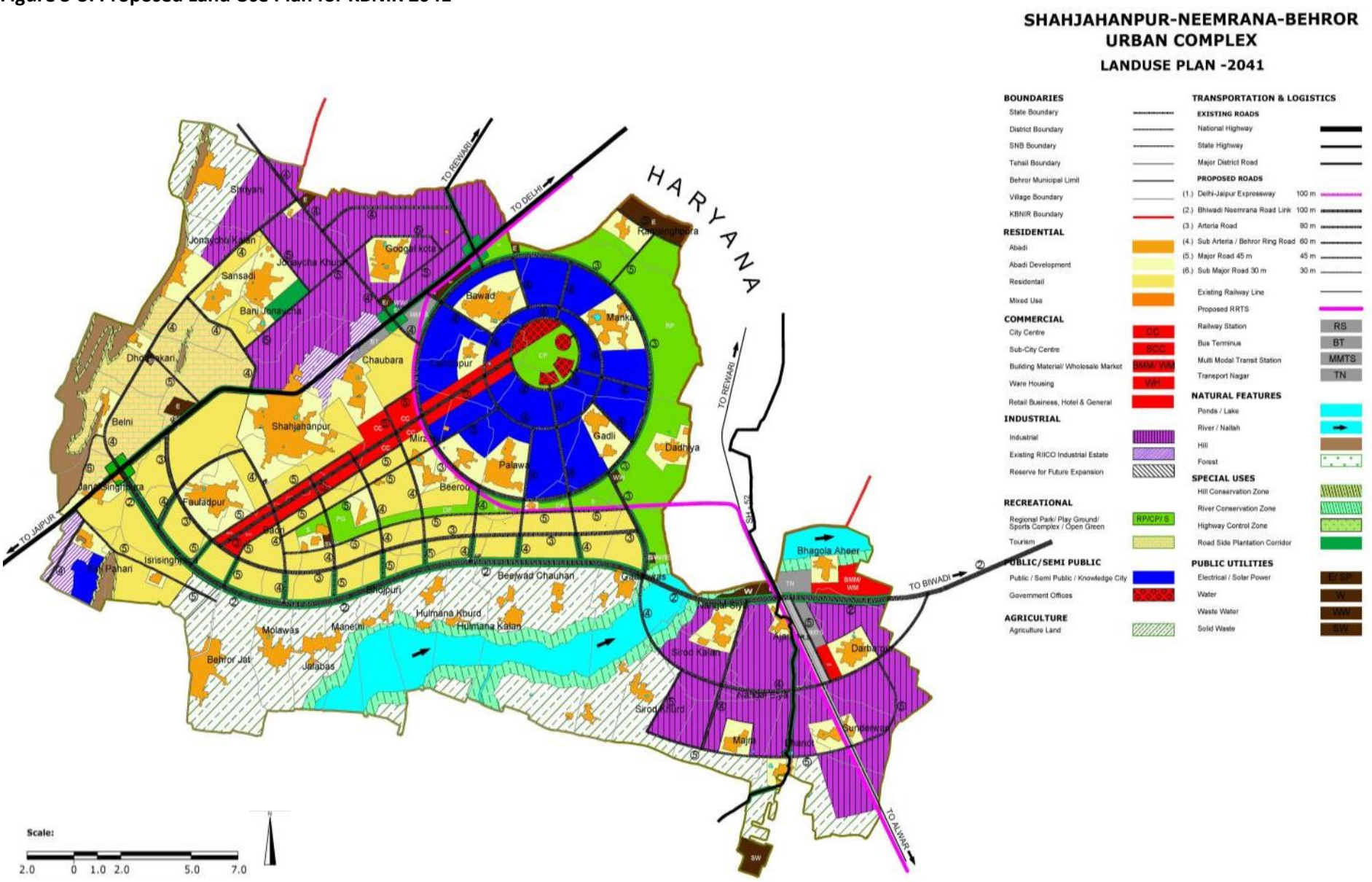


**Table 3-3: The Extent of Land Uses in DP – 2041**

| The Extent of Land Uses in DP – 2041 | | |
|---|---|---|
| **Broad Use Zones** | **Land Uses** | **Area ( Sq.km)** |
| **Residential Use Zone** | **Abadi** | 10.06 |
| | **Abadi Development Area** | 13.47 |
| | **Residential** | 20.64 |
| **Industrial Use Zone** | **Industry** | 25.34 |
| | **RICCO Industrial Area** | 1.81 |
| **Commercial Use Zone** | **Commercial** | 3.92 |
| **Tourism Use Zone** | **Tourism** | 6.31 |
| **Public/ Semi-Public Use Zone** | **PSP/ Knowledge City** | 11.94 |
| **Government Use Zone** | **Government** | 0.69 |
| **Public Utility Use Zone** | **Public Utility** | 1.94 |
| **Recreation Use Zone** | **Recreation** | 10.30 |
| **Open Spaces & Green Buffers** | **Road Green Buffer** | 4.03 |
| | **Open Green** | 0.35 |
| **Transportation Use Zone** | **Transportation** | 1.09 |
| | **Railway** | 0.63 |
| | **Master Plan Roads** | 12.96 |
| **Natural Features** | **Hills** | 2.85 |
| | **River** | 7.80 |
| | **Pond** | 0.12 |
| **Special Uses** | **Hill Conservation 50** | 1.25 |
| | **River Conservation** | 5.03 |
| **Agriculture Use Zone** | **Agriculture** | 23.11 |
| | **Total** | **165.61** |
| | | |

### 3.5.1 Residential Use

The residential land use comprises of the following components:

- Residential Area
- Abadi Area
- Abadi Development Area

The average gross density is 310 PPHA of Residential Use Zone and is designed to accommodate close to 3,45,000 dwelling units. In all 37 residential sectors apart from Abadi Development Area are proposed for development. **Table 3-4** presents the proposed residential densities for KBNIR.

**Table 3-4: Proposed Residential Densities for KBNIR**

| Proposed Residential Densities for KBNIR | | | |
|---|---|---|---|
| **Residential Use Zone** | **Area (ha)** | **Gross Density Assigned** | **Design Population** |
| **Residential Sectors** | 2078.62 | 450 | 935378 |
| **Abadi Development Area** | 1343.05 | 250 | 335764 |
| **Abadi Area** | 1016.47 | 110 | 111812 |
| **Total** | **4438.14** | **310** | **1382954** |
| | | | |

The village abadies falling within the urbanisable area are expected to accommodating little over 2 lacs population.

It is proposed that the aforesaid residential areas be developed by public and private sectors as well as on PPP mode. The residential areas are proposed to be developed on neighbourhood concept to by making provision of all community facilities and services within the sectors as per sector density.

It is the intention for the New City to be a livable city. Therefore it should be a pleasant place that offers good conditions for a mixed society where everyone is welcome and no one is excluded. Different urban forms are representing the variety of cultural backgrounds and accommodating all social classes. Functional mix is crucial. Main roads should be vibrant. Like successful cities as Paris and Jaipur these roads are aligned by shops and retail. At the same time the city should also offer places for relaxation. This is the reason why urban blocks are introduced. By their enclosure they provide places which are protected from street noise and city life. These are the perfect places for parks, playground and educational services like schools or kindergartens.

*Abadi and Abadi Development Areas*
The villages are located on strategic positions and they provide identification within the total development. Many of them are surrounded by the new residential or industrial land uses. Therefore it is crucial to maintain and embed these villages. Disturbance of their existing social and cultural network should be avoided.

### 3.5.2 Commercial Use

The commercial land use comprises of the following components:

- Retail Business, Hotel & General;
- City Centre
- Sub City Centre
- Building Material / Wholesale Market

Along the main roads of the New City commercial plinths will be the fundament of a lively city. To achieve a really vibrant city it should have a focal commercial point related to the major boulevard. As Paris is identifiable by the Champs Elysee, a central axis is introduced in the New City. Running between Fauladpur and the Civic Centre, a formal spine is designated. This spine is the main urban boulevard of the New City. This broad urban boulevard features a central median strip alongside which the main road runs. Between the main central roads and the parallel cycle / footpaths are two wide linear park strips. Flanked by formally planted street trees, these linear park strips are otherwise designed as simple areas of urban lawn that can be populated by people from the adjoining neighbourhoods and business districts for a range of uses and events.

In the proposed plan commercial use has been treated importantly and with intangible value, helping to keep social structure in shape in terms of economic stability, adequate income and mutual social contribution. The key objective of commercial provision is to create a hierarchy and network of commercial spaces to serve the varied needs of the communities.

The Central Commercial Spine connects the three main centers viz civic centre, central business district and sub city centre. The Central Spine and the three Centres forms the city core.

**Civic Centre**
The Civic Centre is located in green central area of the Knowledge City. The Civic Centre is allocated as primary location for Government related buildings. The Civic Centre also hosts public facilities such as libraries, theaters, art exhibitions and museums.

The green setting of the Civic Centre makes is possible to create a highly attractive urban park in which the (semi)public buildings can be located.

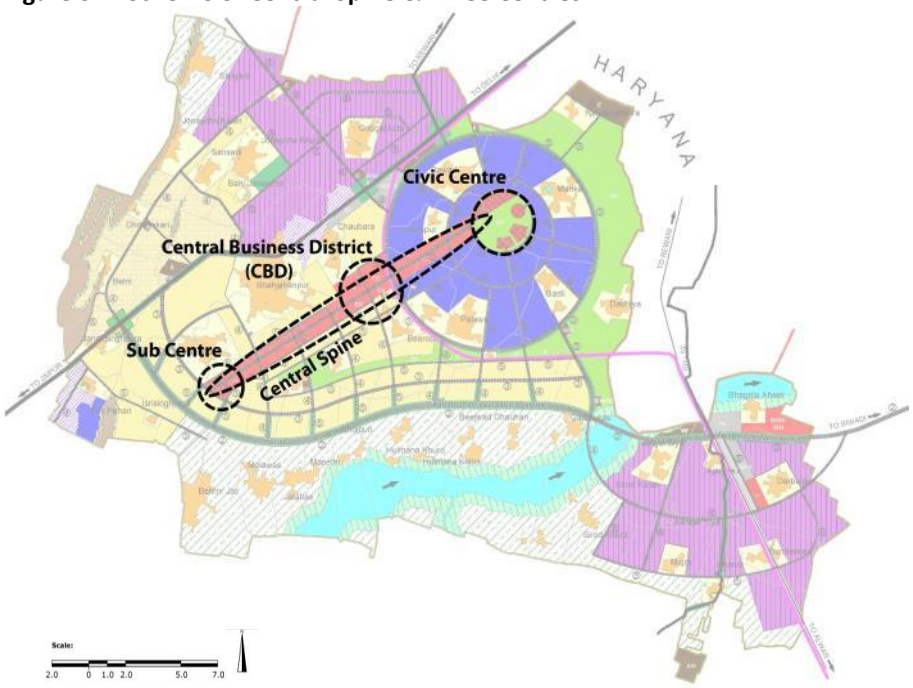
**Central Business District (CBD)**
The CBD is located in the centre of the overall development. Its main function is to create an attractive and competitive environment for corporate businesses and offices. Also commerce and retail uses, hotels and restaurants are located in the CBD facilitate its main use.

**Sub Centre**
The Sub Centre is located on the western side of the Central Spine. This Sub Centre hosts mostly commercial uses, supported by facilities for this part of the city.

**Central Spine**
The Central Spine is the vibrant main urban axis in the new city with mainly commercial use. Also residential use is integrated to create lively atmosphere, also after closing hours.

The main purpose of the Central Spine is to connect the three centres and the heart of the Knowledge City with the overall development. **Figure 3-4** presents the scheme of central spine & three centres within KBNIR

**Figure 3-4: Scheme of Central Spine & Three Centres**




### 3.5.3 Industrial Use

The industrial sector is projected to create employment opportunity for approximately 1,20,000 people and would require ~2500 hectares (~25 sq.km) new area for development of industries by 2041. This is in addition to the existing Shahjahanpur Industrial Area & Neemrana Industrial Area (development by RIICO).

The industrial land use comprises of the following components:

- Industrial Area IR
- RIICO Industrial Estate
- Mining Area

Although focused on settlements of various industries the industrial area should not be a desolate area during evening and nights. To avoid criminality the presence of people and a lively atmosphere is crucial. The best way to achieve this is to introduce residential zones in this area, concentrated on various sites related to main public areas.

### 3.5.4 Recreational

The recreational land use comprises of the following components:

- Regional Park, Play Ground / Sports Complex/ Road Buffer

A pleasant and attractive city offers possibilities for recreation, besides living and working. Green areas are designated for walking, sporting and other types of leisure for all ages. Recreation for all results in improved health and wellbeing for the community.

Open spaces, also known as ‘green spaces’, play an important role in cities not only as part of nature but also as basis for urban ecological processes to sustain a city’s landscape and character. The Open Spaces provided in DP aims to integrate the formal and informal open spaces and connects them to form a comprehensive park system.

- Tourism

In order to enhance tourism in the region and provide necessary business facilities within the KBNIR, a tourism zone for setting hotels, motels, resorts, golf course, multiplexes, exihibition/ convention centre, holiday homes, etc is proposed NH8 and Aravalli Hills.

### 3.5.5 Public/ Semi-Public (Knowledge City / Government Offices)

The Public/ Semi Public land use comprises of the following components:

- Knowledge City
- Government Offices

Like the residential and commercial areas, this area (Knowledge City / Government Offices) is a crucial part of the city. In fact its intent is the same: being a lively city. The public/ semi-public areas should therefore contribute to the vibrant city of the New City. All of the land uses have to be integrated as far as possible into one vibrant new city rather a series of separate clusters. The Knowledge City and Government Offices area have the ability to stimulate many different developments and at the same time helps these developments to integrate into the city. It is a catalyst for development. In the Knowledge City can be a transition from learning to doing, from education through research-and-development to production and distribution. From the outset the Knowledge City is placed at the core of our plans with the strong belief that this element should be a fully integrated element in the entire KBNIR.

### 3.5.6 Transportation and Logistics

DP – 2041 is based on multi-modal transport strategy covering both public and private transport. A good system of roads, logistic facilities, inter-modal connectivity and public transport systems matching the transport demand are proposed to be developed. Transportation area has been earmarked towards transport and logistics use zone to provide for roads, Multimodal Passenger Hub, ISBT, railway line/ yard, expansion of Ajarka Station and logistics facilities like, warehouses, Transport Nager, etc.

The transportation and logistics land use comprises of the following components:

- Highways
- Roads
- Railway line
- Railway station, ISBT, Multi Modal Transit Station, Transport Nagar, Warehousing

#### 3.5.6.1 Road Network

The DP road network derives its form existing & planned road network as well as the concept of designer. The DP is designed with a network of urban roads (Arterial and Sub-Arterial) plus a host of roads of regional and national importance (NH & SH) whose widths and ROWs have been standardized and as given in **Table 3-4.** The total length of urban roads within KBNIR is around **~227km**; includes NH8, SHs, Road Link (within KBNIR) and master plan roads. These roads are designed to cater to the anticipated requirements of the KBNIR and the surrounding region. The approximate lengths of DP roads are given in **Table 3-5**.

**Table 3-5: Land Reservation for DP Roads**

| Land Reservation for DP Roads | | |
|---|---|---|
| **Type** | **Right of Way** | **Green Buffer** |
| NH | 90 | 30 |
| SH | 60 | 30 |
| Road Link | 100 | 60 |
| Arterial Road | 80 | 0 |
| Sub-Arterial Road | 60 | 0 |
| Main Road | 45 | 0 |
| Sub-Main Road | 30 | 0 |
| | | |

Note: All dimensions are in meter. Green buffer to be on both sides of the RoW.

**Table 3-6: Lengths of DP Roads**

| Lengths of DP Roads | |
|---|---|
| **Category of Road** | **Road Length (KM)** |
| National Highway | 33.3 |
| Station Highway | 7.74 |
| Bhiwadi - Neemrana Road Link | 19 |
| 80m RoW | 38.6 |
| 60m RoW | 71.9 |
| 45m RoW | 55.2 |
| 30m RoW | 2.1 |
| **Total** | **227.84** |
| | |

### 3.5.6.2 Expressways

**Connection to Proposed Delhi Jaipur Expressway:**
It is understood that GoI is planning for Expressway between Delhi & Jaipur and the alignment is running parellal to NH8 on western side of KBNIR. It is therefore proposed that the said expressway be connected by extending road from NH8 to Ghelot Industrial Area.

**Road Link Expressway Category Road:**
An expressway category road between Bhiwadi & Neemrana is proposed by GoR under DMIC project. DP incorporates its alignment running through KBNIR area.

### 3.5.6.3 Railway

Currently two types of railway systems are prevailing in the SNB UC region – a) Indian Railways, and b) Proposed New Delhi – Alwar Regional Rapid Transit System. In addition, it is understood that the MRTS between Gurgaon & Bawal may get extended till Shahjahanpur. While the alignment of Indian railways, RRTS network is very much defined in DP, the MRTS alignment still remains to supper imposed on to DP. It is proposed that the MRTS network/ alignment be taken on the median/ along the NH8. Land reservation for existing & proposed railway networks within SNB UC is as given in **Table 3-6**.

**Table 3-7: Land Reservation for Railway Network**

| Land Reservation for Railway Network | | |
|---|---|---|
| **Sl.No.** | **Description** | **Land Reservation** |
| 1 | Indian Railway | 60 meter wide ROW |
| 2 | Proposed MRTS | Along NH8– to be completely elevated |
| 3 | Proposed RRTS | Along KBNIR Road Network & Indian Railway Network– to be completely elevated |
| | | |

### 3.5.7 Natural Features

The natural features land use comprises of the following components:

- Ponds, lake
- River
- Hill
- Forest

In general it can be said that these natural features are safeguarded from intrusion of urban development. Natural development is dominant in this land use.

### 3.5.8 Special uses

In order to protect as well as preserve two prominent natural features – Aravali & Sahibi River System from urbanisation, two natural conservation zones area proposed in DP 2041. This includes hill conservation zone and river conservation zone.

**Hill Conservation Zone:**
The minimum extent of hill conservation zone shall be is 50 meter from the foothills or as per revenue records, whichever is more on ground.

**River Conservation Zone:**
A 250 meter wide river conservation zone is proposed along the Sahibi & Sota nalla river system. The extent of river conservation zone for other rivulets/ natural drainage shall be 50 meter or the width of stream whichever is more.

**Preservation of Eco-zones declared by Ministry of Environment & Forest, GoI:**
The MoEF, GoI through its notification S.O. 319 (E) dated May 07, 1992 [http://envfor.nic.in/legis/eia/aravalli.html] has prohibited development process & operations in following lands (as per revenue records) of Alwar District of Rajasthan:

- Gair Mumkin Pahar
- Gair Mumkin Rada
- Gair Mumkin Behed
- Banjad Beed
- Rund

### 3.5.9 Agricultural Use Zone

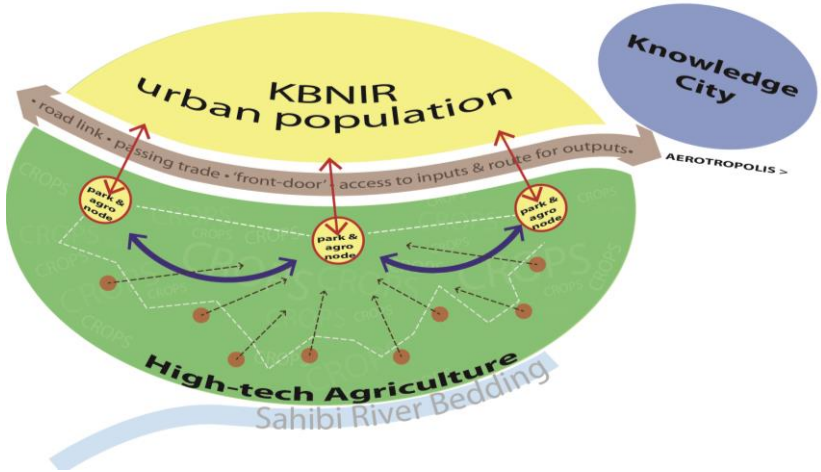
The Agricultural land use comprises of the following components:

- Agriculture land
- High Tech Agriculture land

In these areas existing agriculture will be maintained, protected and developed to secure a local food production for the New City.

High tech agriculture is aimed at the application of modern techniques to intensify the agricultural yields. This innovative agriculture is located south of the residential area, as can be seen in the **Figure 3-5**.The open green areas can be attractive for escaping the busy and hectic urban life.

**Figure 3-5: scheme agriculture**




### 3.5.10 Public Utility Use Zone

The public utility land use comprises of the following components:

- Electrical / Power
- Solar Power
- Water
- Waste Water
- Solid Waste

Dedicated areas for public utilities are reserved for power, water and waste management.

### 3.5.11 Cityscape

A cityscape is the urban equivalent of a landscape. In urban design the terms refer to the configuration of built forms and interstitial space. The DP has used “height of the build” – element of built form to define the

cityscape for KBNIR region. The height of the is guided by the land use typology & master planner's concept of cityscape for KBNIR.
Theme is to have tall structures along the central spine and core of knowledge city then followed by less taller structures depending on the use. **Figure 3-5** presents the prescribed average building heights for KBNIR.

The suggested city space in terms of average height of the building is classified as:

- G+14 structure (Max 53meters)
- G+10 structures (Max 35meters)
- G+4 structures (Max 24meters for Industries & 15 meters for Residential)
- G+2 structure (Max 10 meters for Abadi & Abadi Development Area)

Note above height are average height structures; special permission shall be taken from competent authority for heights beyond the suggested structures height. No special permission shall be required for buildings implementing solar power plant at rooftop to consume additional 10% FAR.

**Figure 3-6: Prescribed Building Heights for KBNIR**

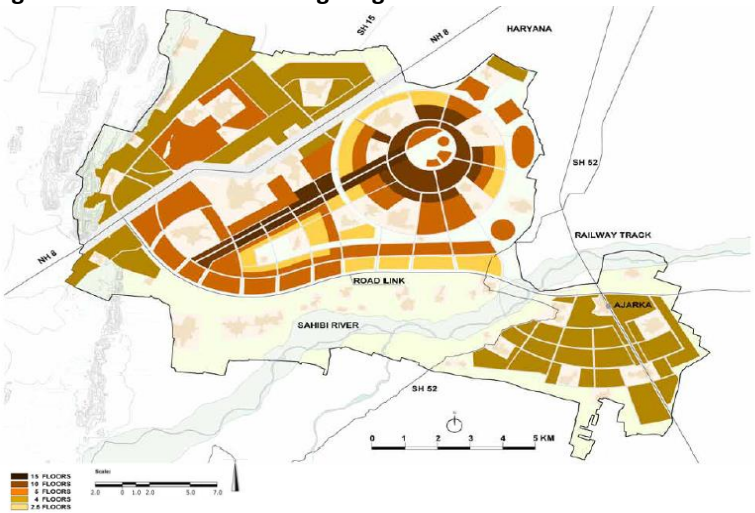



**Figure 3-7: Mass study**



**Figure 3-8: Mass study**



## 3.6 Urban Area Map

The urban area map depicts the extent of urbanisation within the notified limits for the designed period. Also, to define zones for preparing zonal/ sector level plans. **Figure 3-6** as well as **Sheet No. 4** appended separately presents the Urban Area Map for KBNIR (as per Notified SNB UC)

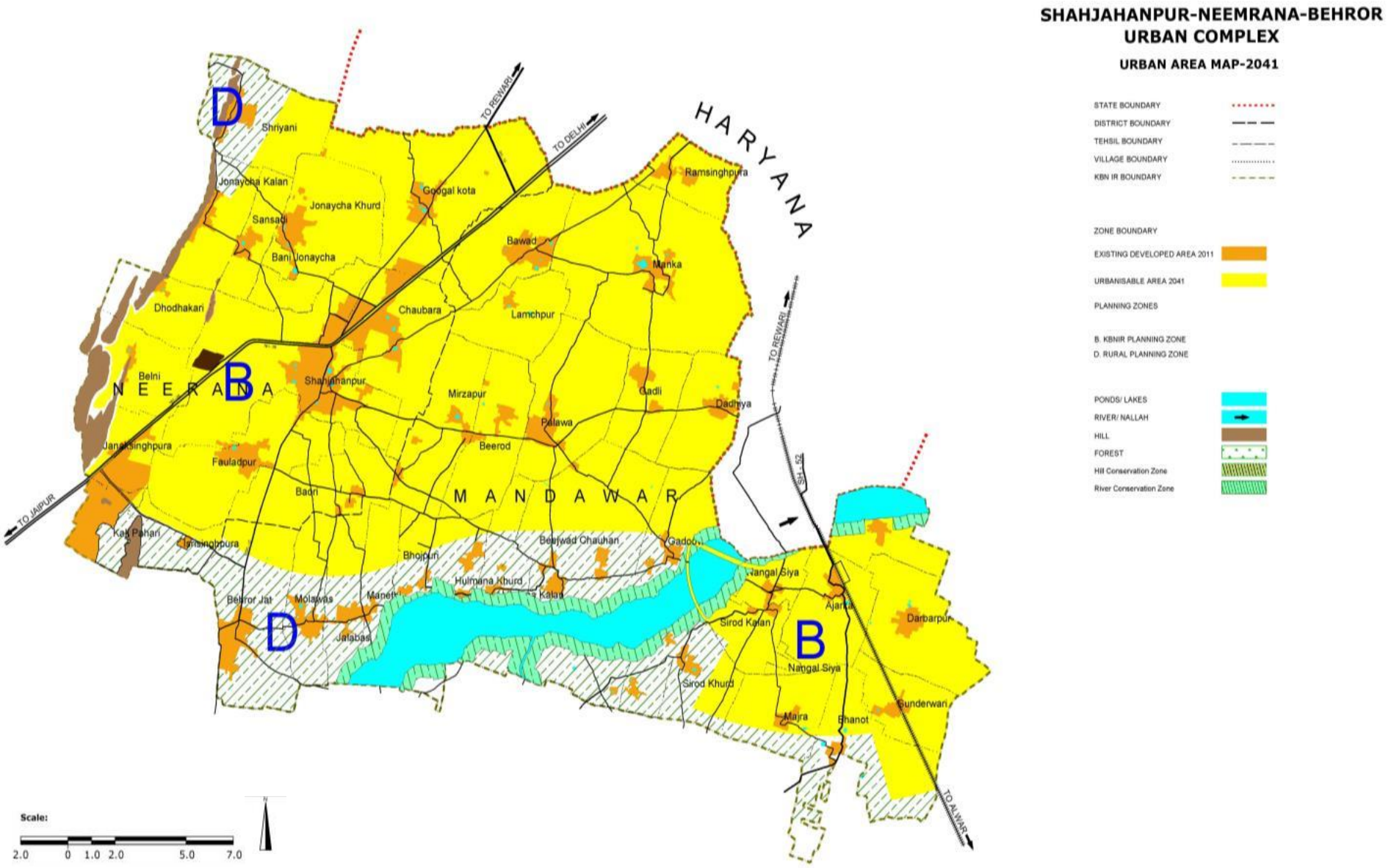
**Figure 3-10: Mass study**



**Figure 3-9: Mass study**



**Figure 3-11: Urban Area Map for SNB Urban Complex**



# 4 Development Promotion and Control Regulations for KBNIR

The notified Master Plan for SNB UC – 2041 provides for Development Promotion and control regulation applicable to entire SNB UC. This section of the report reproduces the applicable provisions for KBNIR in particular.

The entire KBNIR cannot be regulated by land use only. It has to be supplemented by zonal development plans and sector plans. The regulations as specified in the above mentioned plans shall be guiding and shall facilitate development within KBNIR.

The objective of the Development Promotion/ Control Regulations (DP&CR) of DP - 2041 is to promote and regulate development controls for building(s) within use premises in accordance with the development policies and land use proposals contained in the master plan-2041 for SNBUC. These regulations shall be effective in KBNIR.

The regulations shall act as a mechanism to grant permissions to (prospective developers/ builders/ end-users / plot owners etc.) for creation of infrastructure facilities for the city as also to implement the broad land use plan policies of the Master Plan-2041. These regulations will act as promotional as well as control the development to achieve the planned growth. The approval of land use shall be granted by the competent authority as per the provisions of these regulations. The permission of activities within the broad land use categories defined in Master Plan-2041 and regulations thereof shall be as per these Development Promotion/Control Regulations. It is a systematic

Development Promotion & Control Regulation to ascertain the use activity at two levels:

1. Conversion of use zones in to use premises.
2. Permission of use activities on use premises. The Development Promotion

## 4.1 The Title and Extent

These Regulations may be called the Development Promotion and Control Regulations KBNIR - 2041. These Regulations shall apply to the entire KBNIR.

## 4.2 Definitions

In these Regulations unless the context otherwise requires;

1. 'Land use plan' means the Master Plan 2041 indicating use zones
2. 'Zonal Development Plan' means a plan for one of the planning zones of the SNB Urban Complex containing detailed information regarding provision of social infrastructure, parks, open spaces, and Circulation System etc.
3. 'Local area / Sector plan' means the plan of a ward/subzone to be prepared and approved by the concerned local body/Authority.
4. 'Layout plan' means a plan indicating configuration and size of all use premises. Each use zone may have one or more than one layout plan depending upon the extensiveness of the area under the specific use zones and vice-versa.
5. 'Permitted use premises' means allowed use premises, without any condition.
6. 'Permissible use premises' means allowed use premises with certain conditions by the competent authority.

Words and expressions used in these regulations but not defined shall have the same meanings as assigned to them under the Rajasthan Urban Improvement Act 1959 and Regulations/byelaws framed by the competent authority and also under Master Plan-2041.

## 4.3 Establishment of use zones and use premises

The KBNIR is divided into broad land use zones as mentioned in section 5.3. Each land use zone category which shall be further sub-divided into required number of use premises with or without conditions in layout plans.

## 4.4 Broad Land Use zones

- Abadi & Abadi Development Area
- Residential
- Commercial
- Industrial
- Regional Park /Play Ground / Sports Complex / Open Green
- Tourism
- Public and Semi Public
- Government offices
- Transportation
- Hill & River Conservation Zone
- Road side plantation corridor
- Public Utilities
- Agricultural

Permitted and permissible use premises in these broad land use zones have been worked out in section 4.5 below.

## 4.5 Sanction of Plans

Layout Plans, Site Plans and Building plans shall be approved by the competent authority/ local bodies in their areas of jurisdiction.

## 4.6 Location and boundaries of use zones

Any one of the use zones may be located at one or more than one places as shown in the Land Use Plan. The boundaries of various pockets of use zones are defined in land Use Plan.

## 4.7 Location and boundaries of use premises

The location and boundaries of each use premises shall conform to as specified in the layout plan with reference to important bench mark like road, drain or other physical features. Any change in the location, boundaries and predominant use of use premises due to any reason and duly approved shall be incorporated in layout plan.

## 4.8 Sub-Division of use zones into use premises

The object of these development regulations is to guide the preparation of layout plans for various land use zones, and service plans corresponding to these layout plans for provision of physical infrastructure like water supply, sewerage drainage etc. shall conform to the prescribed norms.

## 4.9 Permission of use premises in use zone

Permission may be given as a part of approval of layout plan or where lay out is not available as a case of special permission by the competent authority. Notes:

1. The layout plan already approved by the Authority or any other local authority concerned in accordance with the law shall be deemed to have approved under these Development Promotion & Control Regulations of Master Plan-2041.
2. An area in respect of which there is no approved layout plan shall be governed by the provisions of the Development Plan, or Zonal Development Plan

3. The permission under these regulations shall be granted for the land use only, the Building permission shall have to be obtained by the plot owner/Developer etc. as per provisions and building parameters applicable.
4. The concerned authority shall form detailed rules, procedures, parameters, charges payable etc. for granting permission under these regulations.
5. In case of any doubt, dispute or discrepancy the decision of State Government shall be final.
6. In case of any discrepancy, the provisions of Township policy, Affordable policy, Building byelaws and other such policies/orders will prevail.
7. While approving the layout plan for a particular use zone, the competent authority may relax the minimum area and road width requirements for use premises. However, when use premise is permitted in a use zone as a standalone activity, the minimum area and road width requirement shall be adhered.
8. The Development Control Regulations can be amended / modified by the Government at any time. Any circulars /orders /regulations etc. issued by Government from time to time will be deemed to be part of these Development Control Regulations

## 4.10 Development works to be planned, designed, submitted and supervised by registered professionals

### 4.10.1 Licensed Architect/ Engineer

The plans, specifications and notifications referred to under these regulations shall be prepared and duly certified by the Registered Architect or Licensed Engineer having valid license from the Competent Authority.

The criteria for independent Architect/ Engineer to be a licensed Architect/ Engineer shall be as follows:

- Shall be registered Architect under Architects Act, 1972 with Council of Architecture;
- Shall be registered with Institute of Engineers possessing valid Engineering Degree;
- Shall have at least 5 years of continuous experience;
- Payment of required registration charges/ annual fees as prescribed by the Competent Authority

### 4.10.2 Town Planner

The layout plans or sub-division schemes for areas above 5 hectare, requiring infrastructure planning shall be prepared and duly signed by a licensed Town Planner. However this clause may not be applied to industrial units.

The criteria for getting license from Competent Authority to be a licensed Town Planner Include:

- Shall be registered Architect under Architects Act, 1972 with Council of Architecture;
- Shall be Registered with Institute of Town Planners, India
- Shall Possess valid degree in Urban & Regional Planning from reputed Planning Schools in India/ Abroad
- Have planned at least 5 layouts for an area more than 20 acres any wherein India
- Have planning at least 5 years of continuous experience
- Payment of required registration charges/ annual fees as prescribed by the Competent Authority

### 4.10.3 Structural Engineer

The plans showing structural details shall be prepared and duly signed by the Registered Structural Engineer. The plans showing structural details

shall be prepared & duly certified by Licensed Structural Engineer. In respect of structural stability of each development work, each owner shall notify the name & address of the licensed Structural Engineer in the prescribed form and the Structural Engineer shall convey his acceptance in the prescribed from. The Structural Engineer shall submit form of supervision as per prescribed form & on completion of the development, the Structural Engineer shall issue a certificate of stability of the structure, as per prescribed form.

The Qualification for getting licence from Competent Authority to be structural engineer for developments within notified area includes:

- Shall be registered with Institute of Engineers possessing valid Engineering Degree (Civil);
- Shall have at least 8 years of continuous experience in structural engineering;
- Payment of required registration charges/ annual fees as prescribed by the Competent Authority

#### 4.10.4 Plumbing Engineer

The Plans showing plumbing arrangements shall be prepared and duly signed by the Plumbing Engineer.

The Qualification for getting licence from Competent Authority to be Plumbing engineer for developments within notified area includes:

- Shall be registered with Institute of Engineers possessing valid Engineering Degree (Civil);
- Shall have at least 5 years of continuous experience in planning & executing plumbing works for buildings;
- Payment of required registration charges/ annual fees as prescribed by the Competent Authority

## 4.11 Permitted & Permissible activities/ uses within Broad Land Use Classifications

As described in the masterplan one of the ambitions is establish a balanced livable city with a coherent social life. People should be able to live a healthy life, go by bike to work or by electric bus and their children are able to play free at safe places. Landowners, private developers and inhabitants should know what can be expected. Justice and legal certainty will be the foundation of the development.To achieve so, it is crucial to set up regulations. The development plan determines the various land-uses of the area and regulations for development: coverage, density, set-backs and other crucial issues.

The control regulations lists which use is permitted or permissible. To establish a lively and lovable city a mix of uses is one of the keys for development. one of tools for this is to introduce diversity of uses and forms. The control regulations therefore enable different functions other than the main use. For instance in the residential area 70% at least should be housing (for example apartment buildings, one-family houses etcetera), maximum 30% of the area is allowed to establish other complementary uses (for instance local shopping centers, household industries, care facilities, nursery, primary and secondary schools etcetera)

The development of KBNIR is based on high ambitions regarding economic, ecological, physical and social sustainability. Only these ambitions will be reality when strict rules are applicable that enable proper conditions for a this city. The development of KBNIR is based on various studies that have resulted in a spatial program (see chapter 3: Elements of Development Plan for KBNIR). To establish this program the various built-up land use zones should follow additional control regulations and provisions about density (FAR).

Besides the spatial program that is needed to make the development feasible, one of the aims is to makes this city also liveable and lovable. For

the appearance of the physical form is important to provide the right conditions. Without these conditions the creation of such a city is not manageable. A lively, comfortable, readable additional some provisions for premises should be applied.

The urban form should enable flexibility of private development at one hand and at the other offer opportunities for public encounters, space for transportation, green and water. For this reason we determined he provisions for:

- Ground coverage % of plot area
- Max Building Height
- Minimum and maximum building length
- Minimum Setbacks (Front-Rear- Side)
- Building alignment
- Minimum % EWS housing ( for residential and abadi areas only)
- Minimum area for playground and green ( for residential and abadi areas only)

### 4.11.1 Residential: Abadi Development Area Use Zone

**Table 4-2 & Table 4-3** present permitted & permissible use premises within Abadi Development Area Use Zone **(figure 4-1).**

***Uses Permit Existing Villages***

To avoid disturbance the current use should be continued. '*To keep the existing, one should change'* will be the motto of these areas. Improvement in some cases will be necessary to keep the social structure. This will result in local urban transformations and in some cases to change of building use. These changes should always take in account the adjacent use and not hinder these.

***Uses Permitted Abadi Development Area***

Existing Abadies are integrated in the development plan. The rural character of them should be kept and revitalized by extension of the villages with residential use. To avoid conflicts with the new urban development also green (buffers) are part of the Abadi development area.

***Residential use***

The new housing development should also take in account the current massing and character of the abadies. Low rise residences and apartments are allowed Improvement of typologies is preferred and new typologies can be added. The existing road network should be kept and new roads should be connected with them.

***Other Use***

Other public use of buildings is allowed. These include nursery, primary and secondary schools, creches, small commercial centers, small shops and retail.

Part of the Abadi development area is green. as mentioned before. The area of green ( mixed or sector green) should cover at least 30 % of the total Abadi development area.

In this area also recreational use is allowed and the current landscape should be conserved as much as possible, including existing water ponds. Some areas can also be transformed to:

- Sector green. This green is hosting local recreation, such as walking and cycling routes, open air sport accommodation and other.
- Mixed green zones where recreational uses are mixed with local agriculture (food production for abadi residents), or woodland. It is allowed to establish small buildings related to these activities.)

The existing road network will be transformed to slow traffic routes and local access roads (to existing abadies).

Along existing roads new development is allowed. The use is mainly residential, but can also be commercial (small scale less than 200 m2, retail shops), or public/semipublic (health , community centers, schools, religious premises).

***Existing Villages***

The volumetric and spatial composition of the abadies should be sustained. Uncontrolled development should be avoided. Renewal of clusters of houses, neighborhoods or individual houses should be implemented taking in account current characteristics, massing of houses, streets or roads and building height.

Many of the new fringes of the abadi development area are adjacent to residential area, industrial area or Knowledge City. The fringe should be form a clear and identifiable edge.

***Development Control Regulations Abadi Development Zone***

**Table 5-1** shows the development control regulations for the Abadi development area. This is divided into buildings on the open area (A1), new roads in the development area for housing (A2), and along the existing roads (A3).

A1: All buildings should not exceed 2.5 floors.

A2: The area that is newly developed. The structure is related to the existing villages. Informal patterns enhance human scale;

A3: Within the area covering existing roads family housing and some retail, shops, public services (care, primary and secondary schools) are allowed. Playgrounds should be established within a realm of 250 m.

The current road width should not be exceeded. Bicycle routes should be designed and local car access should be allowed to the existing villages and new developments along the road.

***Architecture***

As mentioned before the architecture of buildings should be complementary to the existing styles of the villages. This means that modern housing is allowed, but its scale and materials should match with the existing buildings.

***Parking***

For each 100 m2 built-up area (plotted housing, apartments), 1 parking lot is required (see table 5-21 chapter 5.12). The parking provisions should not dominate the area. Integration with the landscape therefore should be established.

On ground parking facilities should be located on private land. If multi-stories housing is applied, it is preferred to establish parking facilities underground. In some cases multi-stories parking is allowed when it is not visible from public area (streets, roads, squares, parks, pocket parks and other) or main public buildings (schools, community centers, religious buildings). For instance, these can be designated inside buildings. Fencing facades by green is also allowed if the building is limited to 2 floors.

***Sustainable Features***

Getting the area urbanized will put a load on environment. For this compensation or limitation of the demand of energy should be achieved as well as efficient water treatment.

For all areas rainwater harvesting should be established. All rainwater that falls on any place at the site should be collected or penetrated in soil.
Use of energy should be limited or compensated by making use of rooftops, by covering them with solar panels. The percentage of rooftops that should be covered by these panels is given in **section 4.14.**

In the New City the existing villages or Abadies are integrated in the development. The existing road network will be transformed to slow traffic routes and local access roads (to existing abadies). These routes will pass through residential zones and should be integrated as public routes.

**Figure 4-1: Residential Area KBNIR**

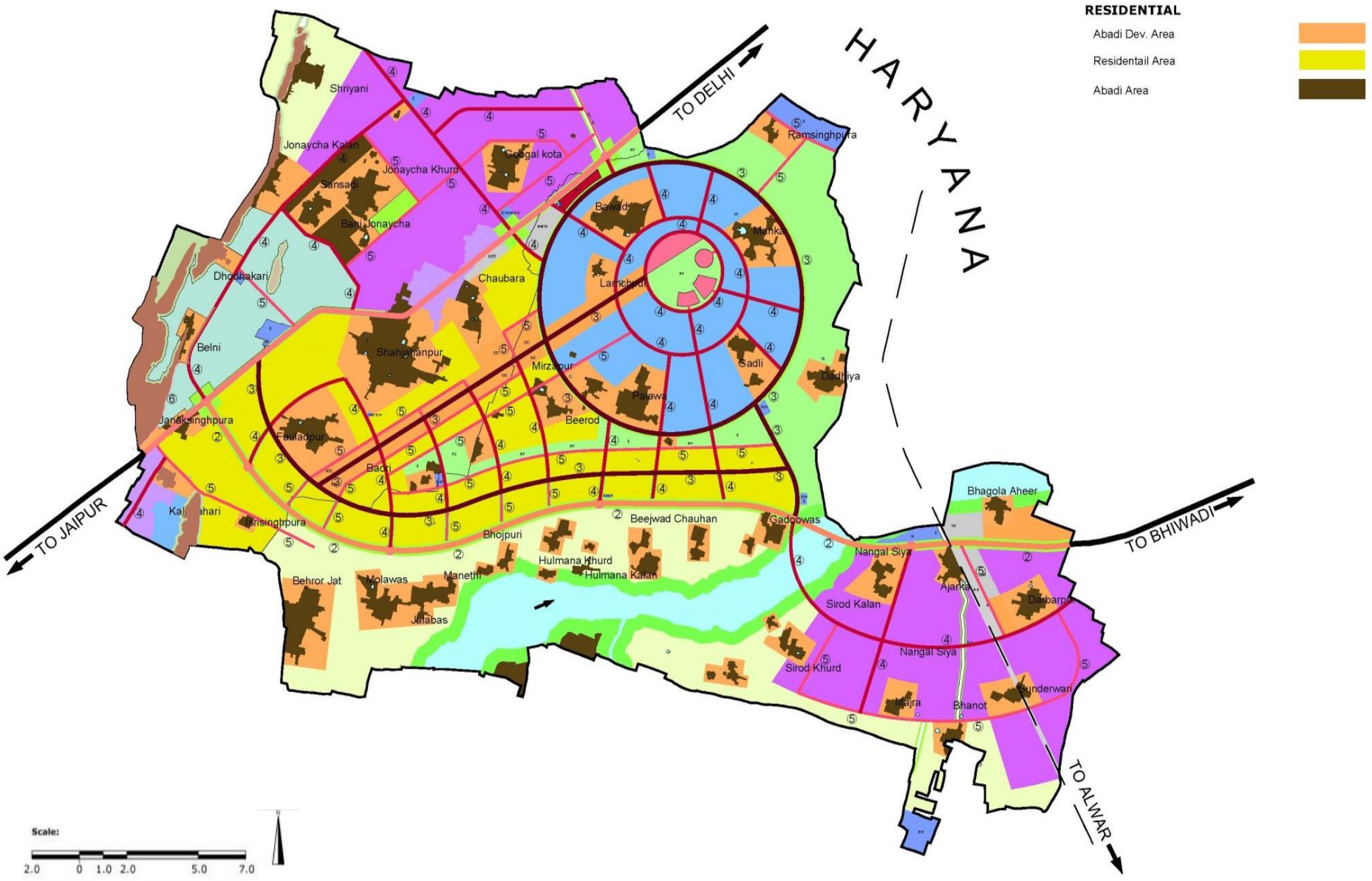


**Table 4-1 : Development Control Regulation for Abadi development Area**

| Development Control Regulation for Abadi development Area | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building lenght** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum % EWS housing** | **Minimum area for playground and green** | **Broad land-use classification** |
| **A.1** | Existing roads | 1.0 | 40 % | Equal to R/W | Max. 2/3 of plot length | **Up to 15m:** F: 3.0 m - R: 1/3 of ht - S: 1/3 of ht - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 20 % | free | 30% | | Agriculture, parks, leisure, recreational or sports facilities |
| **A.2** | From 18m | 1.0 | 40 % | Equal of R/W | Max. 2/3 of plot length | **Up to 15m:** F: 3.0 m - R: 1/3 of ht - S: 1/3 of ht - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 20 % | free | 30% | 15 % of site minimum 150 m2 | Villa/Bungalow; Row House Neighbourhood Retail; public facilities (Primary or secondary schools, care, Health Club; Swimming Pool , Day Care Centre), Utility Building |
| **A.3** | 10 or less | 1.0 | 50% | Equal to R/W | Max. 2/3 of plot length | **Up to 15m:** F: 3.0 m - R: 1/3 of ht - S: 1/3 of ht - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 20 % | free | 30% | 15 % of site minimum 100 m2 | Villa/Bungalow; Row House Neighbourhood Retail; public facilities (Primary or secondary schools, care, Health Club; Swimming Pool , Day Care Centre), Utility Building |

**Table 4-2: Permitted Use Premises in Abadi Development Area Use Zone**

| Permitted Use Premises in Abadi Development Area Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| 1 | Banks<br>ATMS | 0.075 | A. 18 mt & above<br>B. 12 mt & above | A premise for office to perform banking function and operations | Bank, Watch, & Ward Residence (upto 30 sq.m), Commercial, Office, and Canteen |
| 2 | Adult education centre | 0.02 | 12 mt & above | A premise having the facilities of formal education and training to adult with flexible timings. | Flexible use gives to a Primer school, Community centre or on such community buildings. |
| 3 | Anganwari | 0.02 | 12 mt & above | Anganwari as a space provision of residential housing / neighborhood level is a centre for provide service for children of six years age, pregnant woman , Feeding mother etc. under the integrated child development scheme ( ICBS) | Kitchen , Toilet and Hall |
| 4 | Banquet hall | 0.2 | 24 mt. & Above | A premises to hold small public gatherings, community functions, marriage etc. | Hall for public gatherings, marriages, cooking facilities and other logistic. |
| 5 | Bus Stop | As per requirement | | Road side shade for passenger awaiting city buses | Bus stop for every 500 to 750 mt. interval 30 to 40 mt. away from road crossing. |
| 6 | Community Centre/ Hall | 0.2 | On 24 mt. & above road | A premise having an enclosed space for various social and cultural activities of a residential area. | Community hall, Watch and ward residence (upto 30 sq.m), Soft drink and Snack stall. |
| 7 | Convenience Shopping Centre | 0.1 | On 18 mt. & above road | A group of shops not exceeding 50 in number in residential area serving a population of 5000 persons. | Retail, Repair and Personnel service shop, Restaurant, clinic. |
| 8 | Cycle rickshaw/cycle/ cart/ Auto/ Taxi stand | As per requirement | | | |
| 9 | Dairy Booth | As per requirement | Not in MDP Right of Way | Premises with basic facility for the supply of daily groceries to the local population. | Booth |
| 10 | Day Care & Crèche | 0.05 | 12mt & abvove | A premises having nursery facilities of infants during day time. The centre may be managed by an individual or an institution on commercial or non – commercial basis. | Crèche and day care center Watch & ward residence ( up to 30sqm) |
| 11 | Dharamshala | 0.05 | 18 mt. &above | A premises providing temporary accommodation for short duration on no-profit basis. | Dharamshala, Personnel service shop of barber & Launderer, Soft drink & Snack bar (upto 15 sqm). |
| 12 | Dispensary | 0.02 | 12 mt & above | A premises having facilities for medical advice and provision of medicines managed by public or | Dispensary, Soft drink & Snack stall. |

| Permitted Use Premises in Abadi Development Area Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| | | | | charitable institutions. | |
| 13 | Farm house/ environment friendly residence | 0.3 | 18 mt & above | A premise with low coverage, low height structure for residential use. | Farm house, Environment Friendly residence, Watch & ward Residence (up to 30 sqm). In case of village roads building line to be established at 30mt from the centre of the road. |
| 14 | Fire Post | As per requirement | | A premise with lesser degree of facilities or fire fighting. the post may be attached to specific premises with fire prone activities | Fire Post |
| 15 | Group Housing | 0.5 | 18 mt. & Above | A premises comprising of residential flats with basic amenities like Parking, Park, Convenience shops, Public utility etc. | Residential flat, Retail shop of confectionery, Grocery & General merchandise, Books & Stationary, Chemist, Barber, Swimming Pool, Play Area, Laundry, Tailor, Vegetable shop (on Ground floor with an area upto 20 sqm each). Crèche and day care centre, on ground floor with an area up ot 50 sqm & Gymnasium. |
| 16 | Guest House | 0.05 | 18 mt. & Above | A guest house is premises for housing the staff of Government, Semi-Government, Public undertaking and private limited company for short duration. | Guest house watch and wad residence (upto 30 sqm) personnel service shops of Barber, Launderer, Soft drink & Snack stall (upto 15 sqm). |
| 17 | Gymnasium | 0.05 | 12 mt & above Allowed in Group Housing | | |
| 18 | Health Centre | 0.2 | 18 mt & above | A premise having facilities for treatment of indoor and outdoor patients having up to 30 beds. The health centre may be managed by a public or a charitable institution on non-commercial basis. | Health Centre watch and ward residence (upto 30 sq.m), Chemist shop (upto 15 sq.m each) |
| 19 | Hostel | 0.05 | 18 mt & above | A premises in which rooms attached to 'institution' or otherwise are let out on a long term basis | |
| 20 | Library | 0.05 | 12 mt. & above | A premise having a large collection of books for reading and reference for general public or specific class. | Library, watch & ward Residence (up to 30 sqm), Canteen, Allowed in Exhibition and Art gallery, Auditorium, Commercial Complex, Convenient Shopping. |

| Permitted Use Premises in Abadi Development Area Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| 21 | Local shopping centre | 0.4 | 18 mt. & above | A group of shops not exceeding 75 numbers in residential area serving a population of 15,000 persons. | Retail, Repair and Personnel service shop, Informal sector unit, Commercial office, Cottage and Service industry, Clinical Laboratory, Clinic & Polyclinic, Restaurant, Soft drink & Snack stall, Post office and Bank extension counter, Nursing home and Guest house. |
| 22 | Medical Clinic | 0.02 | 12 mt & above | A premise with facilities for treatment of outdoor patients by a doctor. In Case of a polyclinic, it shall be managed by group of Doctors. | Clinic |
| 23 | Night Shelter | | 12 mt & above | A premises providing night accommodation to individuals without any charges or with token charges it may be run by local government of voluntary agencies | Night Shelter |
| 24 | Nursery & kinder garter school | 0.1 | 12 mt. & above | A premise with facilities for training and playing for children preparatory to the school. | Nursery and kindergarten school watch & ward residence (up to 30 sq.m). |
| 25 | Nursing Home | 0.1 | 12 mt. & above | A premise having medical facilities for indoor and outdoor patients having up to 30 beds. It shall be managed by a doctor or a group of doctors on commercial basis. | Nursing home, watch & ward Residence (upto 30 sqm each), Chemist shop (up to 15 sqm each). |
| 26 | Old Age Home/ care centre for physically/ mentally/ challenged/ working woman/ men hostel | 0.1 | 12 mt. & above | A premise with residential and related facilities for old age persons. | Old age home, Residence/flat for Caretaker and watch & ward. Personnel service shop, Dispensary, Club, Community hall. |
| 27 | Park | - | - | A premise used for recreational leisure activities. It may have on it related landscaping, Parking Facilities, Public toilet, Fencing etc. it will include synonyms like Lawn, Open space, Green, etc. | Park, Soft drink & Snack stall (on the park with & above 1.0 hectare area). |
| 28 | Plant Nursery | 0.05 | 12 mt. & above | It is a premise with facilities for rearing and sale of young plants. | Nursery, watch & ward Residence (upto 30 sqm). All structures shall be temporary nature. |
| 29 | Play ground | | | A premise used for outdoor games. It may have on it Landscaping, Parking facilities, Public toilet, etc | Play ground |

| Permitted Use Premises in Abadi Development Area Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| 30 | Plotted Housing | as per township policy | | A premises for one or more than one dwelling unit and may have on it one main building block and one accessory block for garage/garages and servant quarters. | Residences, Convenient Shops (5% of saleable area), Park (15% of total scheme), road width not less than 12mt. |
| 31 | Police Post | As per requirement | 12 mt. & above | A premise having facilities for a local police post of a temporary nature or on smaller scale as compared to a police station. | Police post, Essential staff housing. |
| 32 | Primary School | 0.2 | 18 mt. & above | A premise having educational and playing facilities for students up to v standard. | Primary school, Watch & ward residence (upto 30 sqm), Books and Stationery shop (up to 15 sqm), Soft drink & Snack stall. |
| 33 | Professional Offices | 0.05 | 12 mt. & above | | |
| 34 | Public utilities and building except services and storage yard | As per concerned Dept. norms | | (i) Overhead tank- A premises having an overhead tank for storage and supply of water to its neighbouring areas. It may or may not include a pump house.<br>(ii) Underground tank-A premises having an underground tank for storage and supply of water to its neighbouring areas. It may or may not include a pump house.<br>(iii) Oxidation pond- A premises having a tank used for the oxidation process for sewage and other waste. for the oxidation process for sewage and other waste.<br>(iv) Septic tank- A premises having an underground tank for collection of sewage and its consequent disposal.<br>(v) Sewage pumping station-A premises with a pumping station used for pumping sewage on to a higher gradient.<br>(vi) Public toilet and urinal-A premises having latrine and urinals for use of public. It may or may not include drinking water facility.<br>(vii) Electric sub – station – A premises having electrical installation and transformer for | Public utility premises-Overhead tank, Underground tank, Oxidation pond, Septic tank, Sewerage pumping station, Public toilet urinal, Electric substation, Solid waste collection centre, Dhobi ghat. |

| Permitted Use Premises in Abadi Development Area Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| | | | | distribution of power.<br>(viii) Solid waste collection centre- A premises used for collection of garbage for its onwards transportation to sanitary landfill/disposal. | |
| 35 | Religious Premises | 0.05 | 12 mt. & above | A premise dedicated to accommodations and service of god or other objects of religious nature. It may have different nomenclature in different religions like temple (all faiths), Mosque, Church, Gurudwara, Ashram. | (i) Temple, (ii) Mosque, (iii) Church, (iv) Gurudwara, (v) Synagogue, (vi) Ashram, (vii) Bathing tank, (viii) Dargah and (ix) Charitable dispensary and Library. |
| 36 | Residence cum work plot (Shop cum Residence) | As per scheme | 18 mt. & above | A premises providing residential accommodation for one family (one household) and its workspace restricted to ground floor. | Residence, ground floor area may be used as work-space for Retail shop, Household industry and Personnel service shop. |
| 37 | Residential Flat | 0.075 | 18 mt. & above | A residential accommodation for one family (one household) which may occur as a part of group housing or independently. | Residence, Professional activity |
| 38 | Retail shop | 9 sq.m | 12 mt & above | Shops like vegetable/ fruits/ flowers/ bakery/ kirana/dairy product/book and stationery /Photostat /fax /STD PCO /barber shop /laundry /sweet shops/ halwai/ chemist/ tailoring/ photogaphy/ garment/ cycke repair etc. which are of necessity to the residents. | Retail shop, Repair shop, Personal service shop. |
| 39 | School for Handicapped Children | 0.2 | 18 mt. & above | | |
| 40 | Secondary School | As per requirement of educational deptt. | 18 mt. & above | A premise having educational and playing facilities for students up to x standard. It shall include middle schools which are upto viii standard for the purpose of this code. | Secondary, Senior secondary and Integrated school, Watch & ward Residence (upto 30 sqm), Books & Stationery and Chemist shop (upto 15 sqm), Soft drink & Snack stall, Canteen, Bank extension counter, Auditorium, Indoor games hall, Swimming pool, Post Office Counter Facility. |

| Permitted Use Premises in Abadi Development Area Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| 41 | Senior Secondary School | As per requirement of educational deptt. | 18 mt. & above | A premise having educational and playing facilities for students up to xii standard. | Secondary, Senior secondary and Integrated school, Watch & ward residence (upto 30 sqm), Books & Stationery and Chemist shop (up to 15 sqm), Soft drink & Snack stall, Canteen, Bank extension counter, Auditorium, Indoor games hall, Swimming pool, Post office counter facility. |
| 42 | Social Welfare centre without Auditorium | 0.1 | 18 mt. & above | A premise with facilities for welfare and promotion of community development. | Social welfare centre, Watch & ward Residence (upto 30 sqm), Canteen, Exhibition – cum – sale counter. |
| 43 | Taxi and Auto Stand | As per requirement | | | |
| 44 | Township/Mini Township Schemes | as per township policy | 18 mt & above | Plotted development/Group Housing /Flats with Institutional/ Recreational / Office/ Tourism/ Commercial use as per norms | |
| 45 | Vocational training institute | 0.1 | 18 mt. & above | A premise with training facilities for short – term courses for discipline, preparatory to employment in certain profession and trade. It includes training cum work centre. | Vocational training institute, Watch &Ward Residence (up to 30sqm) Hostel, Books, & stationary ship (up to 15 sqm) Canteen, Library. |
| 46 | Water Pumping | As per PHED Norms | | | |
| 47 | Yoga Centre | 0.05 | 12 mt. & above | A premises having facilities for self attainment, achieving higher quality of mind and body, Spiritual and religious discourse etc. | Yoga centre, Meditation, Spiritual and Religious discourse centre- Yoga centre, Meditation, Spiritual and Religious discourse centre, Watch & ward residence (upto 30 sqm), Hostel, Soft drink & stall. |

**Table 4-3: Permissible Use Premises in Abadi Development Area Use Zone**

| Permissible Use Premises in Abadi Development Area Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in Meters)** | **Definitions** | **Use Premises** |
| 1 | Atta Chakki | 0.02 | 12 mtr & above | A premise with facilities for grinding of wheat & other cearles | |
| 2 | Bakeries and Confectionaries | 30 sq.m | 18 mt. & above | A premises having an eclectic own/Bhatti for making bakeries items & three marketing | |
| 3 | Household Industry | 30 sq m and above | 12 mt. & above | | |
| 4 | LPG/ PNG Gas Booking Office | 0.03 | 12 mt. & above | | |
| 5 | Motor Cycle repairing work shop garages | 45 sq.mt | 18 mt. & above | | |
| 6 | Multipurpose shop | | 12 mt. & above | | |
| 7 | Orphanage | 0.05 | 12 mt. & above | A premise with facilities for boarding of children who are bereaved of parents. It may or may not have educational facilities. | |
| 8 | Petrol & diesel Pump | As per norms | 24 mt. & above | A premise for sale of petroleum products to consumers. | Petrol pump, Soft drink & Snack Stall, Automobile repair shop. |
| 9 | Post office | As per requirement | 18 mtr & above | A premise with facilities for postal communication for use by the public | Post office, Post & telegraph office, Watch & ward residence (upto 30 sqm),Canteen |
| 10 | Printing Press | 0.02 | 12 mt. & above | A premise with facility of machinery for printing & publishing Books, etc. | Hall for providing press. Watch & ward, Toilet etc. |
| 11 | Restaurants | 0.05 | 18 mt. & above | A premises used for serving food items on commercial basis including cooking facilities. It may have covered or open or both for sitting arrangement. | Restaurants |
| 12 | Telephone Exchange | As per requirement | 18 mt & above | A premise having facilities for central operation of telephone system for a designated area | Telephone Exchange, Watch & ward residence (upto 30 sq.m ), Canteen |

### 4.11.2 Residential Use Zone

**Table 4-5 & Table 4-6** present permitted & permissible use premises within Residential Use Zone **(Figure 4-1)**.

***Uses Permitted***
The area is intended for residential use. The main focus is on housing (at least 70%), alternated with well-located, mixed-use clusters within appropriate walking distances.

The residential zone will have a diversity in neighbourhood typologies and dwellings. The main arteries will be primary mixed-use spines for employment, retail and leisure opportunities.

***Major Building Use***
Residential is mainly determined by all types of housing (from single family houses to multistoried apartment buildings). This area is intended to accommodate all social classes. It should not exclude new urban housing forms and typologies (for all age groups, young and old, and all kind of lifestyles, extended families, families single households, etc.).

***Other building use***
As part of the overall strategy, residential land use will also be incorporated in other land uses.

The residential area is including various common facilities such as educational services, local commercial (shopping centres along main roads) cultural (e.g. community centers) , care (health centres) and religious premises .

It is also allowed to establish household industry or small professional offices at home. The number of employees should not exceed 10. Along main roads it should also facilitate commercial services (small or medium scale shops, retail) to enhance the liveliness on street.

The presence of green is crucial to achieve a good quality of living. Green should be clustered an equally distributed to accommodate (small neighborhood) parks, playground and other leisure activities (for example open air sport grounds), small buildings related to these activities are allowed)

***Development Control Regulations Residential area***
The development control regulation for the residential zone is described in **Table 4-4 .**

This zone includes a further differentiation related to the road hierarchy. In general along roads of 80 m, 60 m and 45 m width, buildings of 6 floors including the ground floor are allowed at all locations no matter of the density of the zone.

***Architecture***
A lively city is not only determined by its functional lay-out, also the image is crucial. Repetition of architecture should be avoided. Buildings should enhance orientation. On special locations such as corners of blocks at main roads, parks or squares there is an exception to the rule; at these locations higher buildings are allowed up to 8 floors.

Commercial plinths of buildings will generate liveliness. Its continuity is essential for the visibility of different shops. To achieve a continuous streetscape the buildings should be aligned along 5 m set back lines of the main roads. To achieve a differentiated streetscape the buildings are not allowed to be longer than 100 m. This will also enhance orientation and localization of private addresses.

***Parking***

For each 100 m2 built-up area (plotted housing, apartments), 1 parking lot is required (**Table 4-21, Chapter 4.12**). The parking provisions should not dominate the area. Integration with the landscape therefore should be established.

It is preferred to establish parking facilities underground. Only multi-stories parking is allowed when it is not visible from public area (streets, roads, squares, parks, pocket parks and other) or main public buildings (schools, community centers, religious buildings). These can for example be designated inside buildings. Fencing facades by green is also allowed if the building is limited to 2 floors.

***Sustainable Features***

Getting the area urbanized will put a load on environment. For this compensation or limitation of the demand of energy should be achieved as well as efficient water treatment.

For all areas rainwater harvesting should be established. All rainwater that falls on any place at the site should be collected or penetrated in soil.

Use of energy should be limited or compensated by making use of rooftops, by covering them with solar panels. The percentage of rooftops that should be covered by these panels is given in **Chapter 4.14**.

In the New City the existing villages or Abadies are integrated in the development. The existing road network will be transformed to slow traffic routes and local access roads (to existing abadies). These routes will pass through residential zones and should be integrated as public routes.

**Table 4-4: Development Control Regulations for Residential Area**

| Development Control Regulations for Residential Area | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum/ Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum % EWS housing** | **Minimum area for playground and green** | **Broad land-use classification** |
| **R.1** | 100 or 80 or 60 | 1.5 | 40% | Equal to R/W Or Equal to R/W which is less | 30-100m Or 2/3 of plot length | **Up to 15m:** F: 4.5 m - R: 3 m - S: 3 m - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 100 % | All begin at the setback line | 30% | 15 % of site minimum 100 m2 1 playground per 25 ha. | Multi-storey apartment and clusters thereof;, restaurants, cafes, hotels, commercial centers, Mall, Petrol Pump, Hospitals, public services (post office, bank), police station, places of worship, Retail |
| **R.2** | Up to 18 | 1.5 | 40% | G+5 floors Or or Equal to R/W, within the max. allowed building height | 30-100m Or 2/3 of plot length | **Up to 15m:** F: 4.5 m - R: 3 m - S: 3 m - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 100 % | All begin at the setback line | 30% | 15 % of site minimum 100 m2 1 playground per 25 ha. | Multi-storey apartment and clusters thereof;, restaurants, cafes, hotels, commercial centers, Mall, Petrol Pump, Hospitals, public services (post office, bank), police station, places of worship, Retail, Public Facility/Infrastructure/ Utility Buildings |
| **R.3** | Less than 18 | 1.5 | 45% | G + 5 floors or Equal to R/W, within the max. allowed building height | 30-100m Or 2/3 of plot length | 4.5m – 3m - 3m | 100 % | All begin at the setback line | Not applied | 15 % of site minimum 100 m2 1 playground per 25 ha. | Multi-storey apartment and clusters thereof;, restaurants, cafes, hotels, commercial centers, Mall, Petrol Pump, Hospitals, public services (post office, bank), police station, places of worship, Retail, Public Facility/Infrastructure/ Utility Buildings Terraced/Row House; Villa/Bungalow; Housing for EWS; Night Shelter; primary and secondary schools ,Old-Age Home; Neighbourhood Retail/Service Shop, Café, |

| Development Control Regulations for Residential Area | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sr No | Road RoW (m) | Max FSI | Max Ground coverage % of plot area | Max Building Height | Minimum/ Maximum building length | Minimum Setbacks (Front- Rear- Side) | Maximum % Hard pavement front set back | Building alignment | Minimum % EWS housing | Minimum area for playground and green | Broad land-use classification |
| | | | | | | | | | | | Maternity Home, Nursing Home, Kindergarten, Day-care, Dispensary, Veterinary Clinic, Health-club, Place of Worship on Plot smaller than 1000 sq m, Community Hall, Health-Club, Swimming Pool, |

**Table 4-5: Permitted Use Premises in Residential Use Zone**

| Permitted Use Premises in Residential Use Zone | | | | | |
|---|---|---|---|---|---|
| Sl. No. | Activity | Minimum Area (Ha) | Road Width (in meter) | Definitions | Use Premises |
| 1 | Auditoriums | 0.5 | 24 mt. and above | A premises having an enclosed space to seat audience and stage for various performances like Concerts, Play, Recitals, Functions etc. | Museum, Exhibition centre and open air theatre, watch & ward residence (up to 30 sq.m), canteen. |
| 2 | A.Banks<br>B. ATMS | 0.075 | A. 24 mt & above<br>B. 12 mt & above | A premise for office to perform banking function and operations | Bank, Watch, & Ward Residence (upto 30 sq.m), Commercial, Office, and Canteen |
| 3 | Anganwari | 0.02 | 12 mt & above | Anganwari as a space provision of residential housing / neighbourhood level is a centre for provide service for children of six years age, pregnant woman , Feeding mother etc. under the integrated child development scheme ( ICBS) | Kitchen , Toilet and Hall |
| 4 | Adult education centre | 0.02 | 12 mt & above | A premises having the facilities of formal education and training to adult with flexible timings. | Flexible use gives to a Primer school, Community centre or on such community buildings. |
| 5 | Banquet Hall | 0.2 | 24 mt. & Above | A premises used for marriage and other social functions | Hall for public gatherings, marriages, cooking facilities and other logistics. |
| 6 | Boarding and Lodging house | 0.05 | 18 mt. & Above | "Boarding house" is a premises in which rooms are let out on a long term basis as compared to hotels; 'lodging house' is a premises used for lodging of less than 50 | Boarding house and lodging house watch and ward residence (upto 30 sq.m) personnel service shops of Barber, |

| Permitted Use Premises in Residential Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| | | | | persons | Launderer, Soft drink & Snack stall (upto 15 sq.m) |
| 7 | Botanical Garden | As per requirement | | A premises in the form of a garden with plantation for research and exhibition. | Zoological gardens, Bird sanctuary, watch & ward residence (up to 30sq.m.), Residential flat (for maintenance staff), Retail shop, and Restaurant. |
| 8 | Bus Stop | As per requirement | | Road side shade for passenger awaiting city buses | Bus stop for every 500 to 750 mt. interval and 100 mt. away from road crossing. |
| 9 | Community Centre | 0.2 | 24 mt. & above | A premise having an enclosed space for various social and cultural activities of a residential area. | Community hall, Watch and ward residence (upto 30 sq.m), Soft drink and Snack stall. |
| 10 | Convenience Shopping Centre | 0.1 | 18 mt. & above | A group of shops not exceeding 50 in number in residential area serving a population of 5000 persons. | Retail, Repair & Personnel service shop, Restaurant, clinic. |
| 11 | Cycle rickshaw/cycle/ cart stand | As per requirement | | | |
| 12 | Dairy Booth | As per requirement | | Premises with basic facility for the supply of daily groceries to the local population. | Booth |
| 13 | Day Care & Creche | 0.05 | 12mt & above | A premises having nursery facilities of infants during day time. The centre may be managed by an individual or an institution on commercial or non – commercial basis. | Crèche and day care center Watch & ward residence ( up to 30sq.m.) |
| 14 | Dharamshala | 0.05 | 18 mt. &above | A premises providing temporary accommodation for short duration on no-profit basis. | Dharamshala, Personnel service shop of barber & Launderer, Soft drink & Snack bar (upto 15 sq.m.). |
| 15 | Dispensary | 0.02 | 12 mt & above | Premises having facilities for medical advice and provision of medicines managed by public or charitable institutions. | Dispensary, Soft drink & Snack stall. |
| 16 | Exhibition and Art Gallery | 0.1 | 18 mt. & Above | A premises with facilities for exhibition and display of paintings, Sculptures, Murals, Ceramics, handicrafts or products of a specific | Library, watch and ward residence (upto 30 sq.m), Canteen, Exhibition and Art Gallery, Auditorium. |
| 17 | Farm house/ environment friendly residence | 0.3 | 18 mt & above | A premise with low coverage, low height structure for residential use. | Farm house, Environment Friendly residence, Watch & ward Residence (up to 30 sq.m.).In case of village roads building line to be established at 30mtr. from the centre of the road. |
| 18 | Fire Post | As per | | A premise with lesser degree of facilities or fire fighting. | Fire Post |

| Permitted Use Premises in Residential Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| | | requirement | | the post may be attached to specific premises with fire prone activities | |
| 19 | Fire Station | As per requirement | 18 mt. and above | A premise with facilities for fire fighting for a catchment area assigned to it. It may include residence of essential staff | Fire station, residential flat (for maintenance staff), hostel (for employees), and service workshop |
| 20 | Group Housing | 0.5 | 18 mt. & Above | A premises comprising of residential flats with basic amenities like Parking, Park, Convenience shops, Public utility etc. | Residential flat, Retail shop of confectionery, Grocery & General merchandise, Books & Stationary, Chemist, Barber, Swimming Pool, Play Area, Laundry, Tailor, Vegetable shop (on Ground floor with an area upto 20 sq.m. each). Crèche and day care centre, on ground floor with an area up ot 50 sq.m. & Gymnasium. |
| 21 | Guest House | 0.05 | 18 mt. & Above | A guest house is premises for housing the staff of Government, Semi-Government, Public undertaking and private limited company for short duration. | Guest house watch and wad residence (upto 30 sq.m.) personnel service shops of Barber, Launderer, Soft drink & Snack stall (upto 15 sq.m.). |
| 22 | Gymnasium | 0.05 | 12 mt & above | | |
| 23 | Health Centre | 0.2 | 18 mt & above | A premise having facilities for treatment of indoor and outdoor patients having up to 30 beds. The health centre may be managed by a public or a charitable institution on non-commercial basis. | Health Centre watch and ward residence (upto 30 sq.m), Chemist shop (upto 15 sq.m each) |
| 24 | Hostel | 0.05 | 18 mt & above | Premises in which rooms attached to 'institutions 'or otherwise are let out on a long term basis; | Hostel watch and ward residence (upto 30 sq.m), Personnel service shops of Barber, Launderer, Soft drink & Snack stall (upto 15 sq.m). |
| 25 | I.T unit in residential plot | 0.02 | 24 mt & above | A Premise in which I.T unit is being run. | I.T unit office watch and ward. |
| 26 | Integrated Residential Townships | As per township policy | As per township policy | As per Township Policy | |
| 27 | Integrated senior secondary school without hostel | As per norms of education deptt. | 24 mt & above | | |

| Permitted Use Premises in Residential Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| | facility | | | | |
| 28 | Library | 0.05 | 12 mt. & above | A premise having a large collection of books for reading and reference for general public or specific class. | Library, watch & ward Residence (up to 30 sq.m.), Canteen, Allowed in Exhibition and Art gallery, Auditorium, Commercial Complex, Convenient Shopping. |
| 29 | Local shopping centre | 0.4 | 24 mt. & above | A group of shops not exceeding 75 numbers in residential area serving a population of 15,000 persons. | Retail , Repair and Personnel service shop, Informal sector unit, Commercial office, Cottage and Service industry, Clinical Laboratory, Clinic & Polyclinic, Restaurant, Soft drink & Snack stall, Post office and Bank extension counter, Nursing home and Guest house. |
| 30 | Medical Clinic | 0.02 | 12 mt & above | A premise with facilities for treatment of outdoor patients by a doctor. In Case of a polyclinic, it shall be managed by group of Doctors. | Clinic |
| 31 | Nursery & kinder garter school | 0.1 | 12 mt. & above | A premise with facilities for training and playing for children preparatory to the school. | Nursery and kindergarten school watch & ward residence (up to 30 sq.m). |
| 32 | Nursing Home | 0.1 | 18 mt. & above | A premise having medical facilities for indoor and outdoor patients having up to 30 beds. It shall be managed by a doctor or a group of doctors on commercial basis. | Nursing home, watch & ward Residence (upto 30 sq.m. each), Chemist shop (up to 15 sq.m. each). |
| 33 | Old Age Home/care centre for physically/mentally/challenged/working woman/men hostel | 0.1 | 12 mt. & above | A premise with residential and related facilities for old age persons. | Old age home, Residence/flat for Caretaker and watch & ward. Personnel service shop, Dispensary, Club, Community hall. |
| 34 | Park | - | - | A premise used for recreational leisure activities. It may have on it related landscaping, Parking Facilities, Public toilet, Fencing etc. it will include synonyms like Lawn, Open space, Green, etc. | Park, Soft drink & Snack stall (on the park with & above 1.0 hectare area). |
| 35 | Plant Nursery | 0.05 | 12 mt. & above | It is a premise with facilities for rearing and sale of young plants. | Nursery, watch & ward Residence (upto 30 sq.m.). All structures shall be temporary in nature. |
| 36 | Plotted Housing | as per | as per township | A premises for one or more than one dwelling unit and | Residences, Convinent Shops (5% of |

| Permitted Use Premises in Residential Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| | | township policy | policy | may have on it one main building block and one accessory block for garage/garages and servant quarters. | saleable area), Park (15% of total scheme), road width not less than 12mt. |
| 37 | Police Post | As per requirement | 12 mt. & above | A premise having facilities for a local police post of a temporary nature or on smaller scale as compared to a police station. | Police post, Essential staff housing. |
| 38 | Primary School | 0.2 | 18 mt. & above | A premise having educational and playing facilities for students up to v standard. | Primary school, Watch & ward residence (upto 30 sq.m.), Books and Stationery shop (up to 15 sq.m.), Soft drink & Snack stall. |
| 39 | Professional Offices | 0.05 | 18 mt. & above | | |
| 40 | Public utilities and building except services and storage yard | As per concerned Dept. norms | | (i) Overhead tank- A premises having an overhead tank for storage and supply of water to its neighbouring areas. It may or may not include a pump house.<br>(ii) Underground tank-A premises having an underground tank for storage and supply of water to its neighboring areas. It may or may not include a pump house.<br>(iii) Oxidation pond- A premises having a tank used for the oxidation process for sewage and other waste. for the oxidation process for sewage and other waste.<br>(iv) Septic tank- A premises having an underground tank for collection of sewage and its consequent disposal.<br>(v) Sewage pumping station-A premises with a pumping station used for pumping sewage on to a higher gradient.<br>(vi) Public toilet and urinal-A premises having latrine and urinals for use of public. It may or may not include drinking water facility.<br>(vii) Electric sub – station – A premises having electrical installation and transformer for distribution of power.<br>(viii) Solid waste collection centre- A premises used for collection of garbage for its onwards transportation to sanitary landfill/disposal. | Public utility premises-Overhead tank, Underground tank, Oxidation pond, Septic tank, Sewerage pumping station, Public toilet urinal, Electric substation, Solid waste collection centre, Dhobi ghat. |

| Permitted Use Premises in Residential Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| 41 | Recreational Clubs | 0.2 | 18 mt. & above | A premise having facilities for recreational activities including indoor games | |
| 42 | Religious Premises | 0.05 | 18 mt. & above | A premise dedicated to accommodations and service of god or other objects of religious nature. It may have different nomenclature in different religions like temple (all faiths), Mosque, Church, Gurudwara, Ashram. | (i) Temple, (ii) Mosque, (iii) Church, (iv) Gurudwara, (v) Synagogue, (vi) Ashram, (vii) Bathing tank, (viii) Dargah and (ix) Charitable dispensary and Library. |
| 43 | Research and Development Centre | 0.1 | 18 mt. & above | A premise providing facilities for research and development for any specific field. | Research & Development centre, Watch & ward Residence (upto 30 sq.m.), Residential flat (for maintenance staff) Hostel, Canteen, Bank extension counter, Library, Post office extension facility. |
| 44 | Residence cum work plot (Shop cum Residence) | As per scheme | 18 mt. & above | A premises providing residential accommodation for one family (one household) and its workspace restricted to ground floor. | Residence, ground floor area may be used as work-space for Retail shop, Household industry and Personnel service shop. |
| 45 | Residential Flat | 0.075 | 18 mt. & above | A residential accommodation for one family (one household) which may occur as a part of group housing or independently. | Residence, Professional activity |
| 46 | School for Handicapped Children | 0.2 | 12 mt. & above | | |
| 47 | Secondary School | as per requirement of educational deptt | 18 mt. & above | A premise having educational and playing facilities for students up to x standard. It shall include middle schools which are upto viii standard for the purpose of this code. | Secondary, Senior secondary and Integrated school, Watch & ward Residence (upto 30 sq.m.), Books & Stationery and Chemist shop (upto 15 sq.m.), Soft drink & Snack stall, Canteen, Bank extension counter, Auditorium, Indoor games hall, Swimming pool, Post Office Counter Facility. |
| 48 | Senior Secondary School | as per requirement of educational deptt. | 18 mt. & above | A premise having educational and playing facilities for students up to xii standard. | Secondary, Senior secondary and Integrated school, Watch & ward residence (upto 30 sq.m.), Books & Stationery and Chemist shop (up to 15 sq.m.), Soft drink & Snack stall, Canteen, Bank extension |

| Permitted Use Premises in Residential Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| | | | | | counter, Auditorium, Indoor games hall, Swimming pool, Post office counter facility. |
| 49 | Social Welfare centre | 0.1 | 18 mt. & above | A premise with facilities for welfare and promotion of community development. | Social welfare centre, Watch & ward Residence (upto 30 sq.m.), Canteen, Exhibition – cum – sale counter. |
| 50 | Taxi and Auto Stand | As per requirement | 24 mt & above | | |
| 51 | Township/Mini Township Schemes | As per township policy | | Plotted development/Group Housing /Flats with Institutional/ Recreational / Office/ Tourism/ Commercial use as per norms | |
| 52 | Traffic and Police control room | As per requirement | | A premises of temporary structure having facilities for the managing of traffic and low and order related issues. | Temporary traffic and Police control room |
| 53 | Water Pumping | As per PHED Norms | | In Facility Area | |
| 54 | Weekly Market | 1 | 24 mt. & above | An area used once in a week by a group of informal establishments in the form of a market. These markets shift from one area to another on different days of the week. | Weekly market, Informal sector trade, Soft drink & Snack stall (all structures will be either temporary or mobile, only for one day in a week). |
| 55 | Yoga Centre | 0.05 | 12 mt. & above | A premises having facilities for self attainment, achieving higher quality of mind and body, Spiritual and religious discourse etc. | Yoga centre, Meditation, Spiritual and Religious discourse centre- Yoga centre, Meditation, Spiritual and Religious discourse centre, Watch & ward residence (upto 30 sq.m.), Hostel, Soft drink & stall. |

**Table 4-6: Permissible Use Premises in Residential Use Zone**

| Permissible Use Premises in Residential Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in Meters)** | **Definitions** | **Use Premises** |
| 1 | Atta Chakki | 0.02 | 12 mtr & above | A premise with facilities for grinding of wheat & other cereals | |
| 2 | Bakeries and Confectionaries | 30 sq.m | 18 mt. & above | Premises having an eclectic own/Bhatti for making Bakeries item & three marketing. | |
| 3 | Burial Grounds/ Cremation site | The site for Burial grounds/ Cremation site shall be indentified at such locations which are not in proximities to residential areas. | | It is a premise with facilities for burying of dead bodies. | Burial ground, Cremation ground, Cemetery and electric crematorium- burial ground, Cremation ground, Cemetery and electric crematorium, Retail shops of wood, Flowers and related materials, Watch & ward Residence (up to 30 sq.m.) |
| 4 | Bus Terminal | As per requirement | 30 mt. & above | A premise used by a public transport agency or any other such agency for parking maintenance and repair of buses. This may or may not include a workshop | Bus depot, workshop, watch & ward residence (up to 30 Sq.m), soft drink & snack stall, administrative office. |
| 5 | Children Traffic Park | As per requirement | 18 mt. & above | A premise in the form of park with facilities for introducing and educating children about traffic & signaling. | Children traffic park, Watch & ward residence (upto 30 sq.m.), Soft drink & Snack stall, Museum, Auditorium. |
| 6 | Cinema Hall | 0.25 | 30 mt. & above | A premise with facilities for projection of movies | Cinema, Watch & ward residence (upto 30sqm), |
| 7 | Clinical laboratory | 0.02 | 18 mt. & above | A premise with facilities for carrying out various tests for confirmation of symptoms of a disease. | Clinical laboratory, Soft drink & Snack stall. |
| 8 | Household Industry | 30 sqm & above | 12 mt. & above | | |
| 9 | LPG/ PNG Gas Booking Office | 0.03 | 18 mt. & above | In convenient shopping centre. | |
| 10 | Motor Cycle repairing work shop garages | 45 sq.mt | 24 mt & above | In convenient shopping centre. | |
| 11 | Multipurpose shop | | 12 mt. & above | In convenient shopping centre. | |
| 12 | Municipal state and central govt. office | As per requirement | 18 mt. & above | | |
| 13 | Multiplex | 0.25 | 30 mt. & above | and stills with a covered space to seat audience | Administrative office, Soft drink & Snack |

| Permissible Use Premises in Residential Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in Meters)** | **Definitions** | **Use Premises** |
| | | | | | stall, Museum, Auditorium. |
| 14 | Museum | 0.2 | 24 mt. & above | A premise with facilities for storage and exhibition of objects illustrating antiques, Natural History, Art, etc. | Museum, Exhibition centre and Art gallery, Auditorium and Open air theatre- Museum, Exhibition centre and Art gallery, Auditorium and open air theatre, Watch & ward residence (up to 30 sq.m.), Canteen. |
| 15 | Music Dance and Drama Training Centre | 0.1 | 18 mt. & above | A premises having facilities for imparting training and coaching for Music, Dances and Dramatics. | Museum, Exhibition centre and Art gallery, Auditorium and Open air theatre- Museum, Exhibition centre and Art gallery, Auditorium and open air theatre, Watch & ward residence (up to 30 sq.m.), Canteen. |
| 16 | Open air theatre | 0.2 | 24 mt. & above | A premises having facilities for audience seating and a stage for performance and is open to sky. | Open air theatre, Watch & ward residence (up to 30 sq.m.), Canteen. |
| 17 | Orphanage | 0.05 | 12 mt. & above | A premise with facilities for boarding of children who are bereaved of parents. It may or may not have educational facilities. | Boarding house, school, watch and ward (up to 30 sq.m.) |
| 18 | Petrol and diesel Pump | as per norms | 24 mt. & above | A premise for sale of petroleum products to consumers. | Petrol pump, Soft drink & Snack Stall, Automobile repair shop. |
| 19 | Post office | As per requirement | | A premise with facilities for postal communication for use by the public | Post office, Post & telegraph office, Watch & ward residence ( upto 30 sq.m ),Canteen |
| 20 | Printing Press | 0.02 | 18 mt. & above | A premise with facility of machinery for printing & publishing Books, etc. | Hall for providing press. Watch & ward, Toilet etc. |
| 21 | Restaurants | 0.05 | 18 mt. & above | A premises used for serving food items on commercial basis including cooking facilities. It may have covered or open or both for sitting arrangement. | Restaurants |
| 22 | Socio-cultural institute | 0.1 | 18 mt. & above | A premise with facilities for activities of socio- cultural nature run by a public, voluntary or individual on primary non-commercial basis. | Social and cultural institute watch & ward residence (up to 30 sqm) soft drink & stall, restaurant, bank extension counter facility, canteen, auditorium, library, music, drama training centre, museum, exhibition and art gallery. |
| 23 | Telephone Exchange | As per requirement | | A premise having facilities for central operation of telephone system for a designated area | Telephone Exchange, Watch & ward residence (upto 30 sq.m ), Canteen |

### 4.11.3 Commercial Use Zone

**Table 4-8 & Table 4-9** present permitted & permissible use premises within Commercial Use Zone (**Figure 4-2**)

In the proposed plan commercial use has been treated importantly and with intangible value, helping to keep social structure in shape in terms of economic stability, adequate income and mutual social contribution. The key objective of commercial provision is to create a hierarchy and network of commercial spaces to serve the varied needs of the communities.

Different types of commercial centres are strategically located and developed in tandem with the proposed residential and institutional demand.

The main focus of commercial/ financial activity shall focus in City Centre and the two Sub-City Centres. The CBD will be developed as a world class business district in the Heart of City with public transport connectivity. In addition, wholesale market is also proposed in the DP-2041.

***Permit Uses***

As most of successful cities a main boulevard provides good orientation and is a spin off for various commercial, cultural and administrative functions. The New City will identify itself by this boulevard and it should be a vibrant corridor in a lively city. Along main roads various commercial functions will be accommodated in plinths of buildings. These will be accompanied by apartments on the upper floors. The continuity of this principle will be extended through the commercial area. The difference is that upper floors of this area not only lodge housing, but also offices.

At least 70% of the floor area is allowed to commercial (shopping malls, small shops), hospitality ( hotels, restaurants) and administrative (banks,) , The other 30% is meant for residential use (apartments), public (civic centres, cinemas, museum).), medical (hospital, health centres, clinics)
The spine is accessible for cars and public transport.

Because of its length (7 km) halfway at the intersection of the ring road of the Knowledge City a commercial centre is preferred be established. This part will be the most vibrant part of the city. The Centre should host not only commercial functions such as shopping malls or gallerias, restaurants, food courts and cafes, but cultural functions as well, such as the main theatre, music hall, museums, galleries. These functions will also be accompanied by apartments and hotels.
Adjacent to this zone city green should be integrated., a recognizable monumental park with specific importance on city scale for various public leisure activities

***Development Control Regulations Commercial area***

Vibrancy will be guaranteed at one hand by active plinths related to the public realm and by a high concentration of buildings as well. This part of the city is should be the activity spine of The New City. For this, all buildings within the area are allowed up to 15 floors and all plinths should provide commercial use.

As showed in **Table 4-7** a setback of 5 m is required to achieve continuity and optimal accessibility of building fronts along all roads of the commercial area. To achieve a differentiated streetscape the size of buildings size should be within a scope of 30 m to 100 m.
Special attention is to be given to the public realm; enough space for pedestrians, nice paving materials and the creation shade by trees.

***Architecture***

A lively city is not only determined by its functional lay-out, also the image is crucial. Repetition of architecture should be avoided. A mix of residential and office buildings is preferred. Buildings should enhance orientation. Variation of architecture is promoted.

Commercial plinths of building will generate liveliness. Its continuity is essential for the visibility of different shops. To achieve continuous streetscape buildings should be aligned along 5 m set back lines of main roads. To achieve a differentiated streetscape buildings longer than 100 m are not allowed. This will enhance orientation and localization of private addresses.

***Parking***

It is preferred to establish parking facilities underground. Only multi-stories parking is allowed when it is not visible from public areas such as streets, roads, squares, parks, pocket parks. For instance, these can be designated inside buildings. Fencing facades by green is also allowed if the building is limited to 2 floors. The amount of parking space is given in **Table 4-21, Chapter 4.12**

***Sustainable Features***

Getting the area urbanized will put a load on environment. For this compensation or limitation of the demand of energy should be achieved as well as efficient water treatment.

For all areas rainwater harvesting should be established. All rainwater that falls on any place at the site should be collected or penetrated in soil.

Larger surfaces for instance rooftops of shopping malls should be covered by green to avoid evaporation of rainwater, and cool buildings.

Use of energy should be limited or compensated by making use of rooftops, by covering them with solar panels. The percentage of rooftops that should be covered by these panels is given in **Chapter 4.14.**

**Figure 4-2: Mass study**

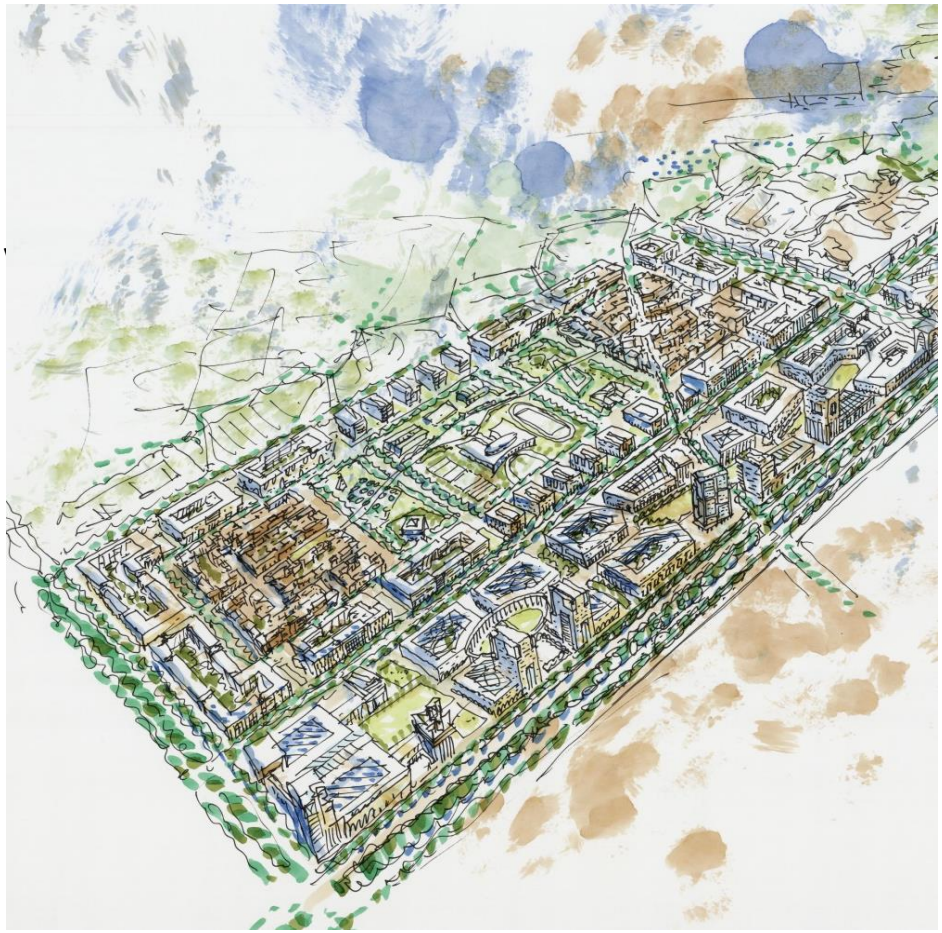


**Figure 4-3: Commercial Area KBNIR**

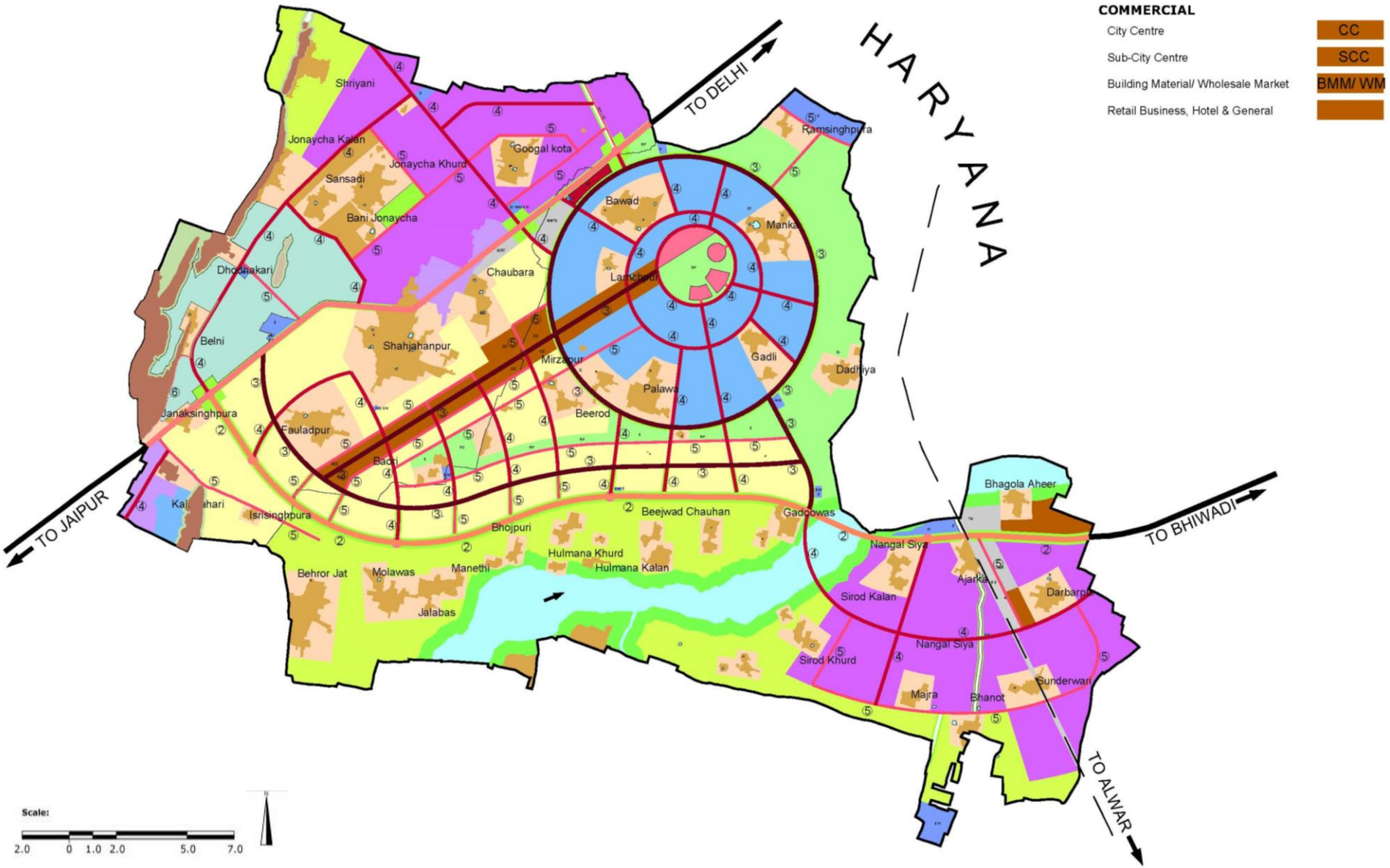


**Table 4-7: Development Control Regulations for Commercial Area**

| Development Control Regulations for Commercial Area | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum/ Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum % green** | **Broad land-use classification** |
| **C.1** | 80 or 60 | 2.0 | 70% | G+14 floors or Equal to R/W, within the max. allowed building height | 30-100m Or 2/3 of plot length | **Up to 15m:** F: 4.5 m - R: 3 m - S: 3 m - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 100 % | All begin at the setback line | 5% of area | Commercial plinth, Office Complex, integrated Parking; Retail Mall, Cinema Hall; Commercial Complex, Other Retail; Public/ Govt Institutional Buildings, Training Centre; Art Gallery Convention and Exhibition Centre; Hospital, Sports Complex; Auditorium; Integrated Museum; Residential Multistorey Apartments; Serviced Apartments, and all uses given below |
| **C.2** | 45 to 18 | 2.0 | 60% | G+14 floors or Equal to R/W, within the max. allowed building height | 30-100m Or 2/3 of plot length | **Up to 15m:** F: 4.5 m - R: 3 m - S: 3 m - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 100 % | All begin at the setback line | 10% of area | Office Complex, integrated Parking; Retail Mall, Cinema Hall; Commercial Complex, Other Retail; Public/ Govt Institutional Buildings, Training Centre; Art Gallery; Diagnostic/Radiology Centre; Hospital; Health/Welfare Centre; Place of Worship larger than 1000sqm; Public Facility/Infrastructure/ Utility Buildings; Petrol Pump |
| **C.3** | Less than 18 | 2.0 | 50% | G+14 floors or Equal to R/W, within the max. allowed building height | 30-100m Or 2/3 of plot length | 4.5m – 3m - 3m | 100 % | All begin at the setback line | 15% of area | Neighbourhood Retail Shop; Community Hall; Health Club; Dispensary; Place of Worship M smaller than 1000sqm; |

**Table 4-8: Permitted Use Premises in Commercial Use Zone**

| Permitted Use Premises in Commercial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width in Meters** | **Definitions** | **Use Premises** |
| 1 | Auditoriums | 0.5 | 24 mt. and above | A premises having an enclosed space to seat audience and stage for various performances like Concerts, Play, Recitals, Functions etc. | Museum, Exhibition centre & Art gallery, Auditorium and open air theatre, Watch & ward Residence)(up to 30 sq.m, canteen) |
| 2 | Auto/Thela/Rickshaw stand | As per requirement | 24 mt. & above | A premise providing space for parking of Auto/Rickshaw with or without parking fee. | |
| 3 | Bakeries & confectionaries | 30 sq. mtr | 18 mt. & above | A premises having an eclectic own/Bhatti for making Bakeries items & three marketing. | |
| 4 | Bank | 0.075 | 18 mt. & above | A premise used for office to perform banking function and operation. | Bank watch & ward residence (up to 30 qm. M. ) Commercial office and Canteen. |
| 5 | Banquet Hall | 0.2 | 18 mt. & above | A premises to hold small public gathering community functions, marriage etc. | Hall for public gatherings, marriages, cooking facilities and other logistics. |
| 6 | Bus Stop | As per requirement | | Road side shade for passenger awaiting city buses | Bus stop for every 500 to 750 mt. interval 30 to 40 mt. away from the road crossing. |
| 7 | Boarding house & lodging house | 0.05 | 18 mt. & above | Boarding house is a premises in which rooms are let out on a long term basis as compared to hotels: Lodging house is a premises used for lodging of less than 50 persons | Boarding house & lodging house, watch and wad residence (Upto 30sq .m) Personnel service shops of barber, Launderer and soft drink & snack stall (Upto 15 sq.m) |
| 8 | Bus Terminal | As per requirement | 30 mt. & above | A premises used by public transport agency to park the buses for short duration to serve the population . It may include the related facilities for passengers | Bus depot, workshop, watch & ward residence (up to 30 sq. m) soft drink snack stall administrative office. |
| 9 | Cinema | 0.25 | 30 mt. & above | A premise with facilities for projection of movies and stills with a covered space to seat audience | Cinema, watch & ward residence (Upto 30 sq.m). Administrative office ,soft drink & snack stall, Museum, Auditorium |
| 10 | Commercial office | 0.05 | 24 mtr & above | A premises used for offices of profit making organisation | Commercial office, retail & personnel Service shop, Restaurant, bank, Post & Telegraph office |

| Permitted Use Premises in Commercial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width in Meters** | **Definitions** | **Use Premises** |
| 11 | Community centre | 0.2 | 18 mt. & above | A premise having an enclosed space for various social & cultural activities. | Community hall, watch & ward residence (up to 30 sq. m) soft drink, snack stall. |
| 12 | Convention centre | City level as per requirement | 30 mt & above | A premise having all facilities for International / National conferences, Meetings, Symposium etc. | Internal national convention centre watch & ward residence (up to 30 sq. m.), Restaurant, Bank, Post and Telegraph office, Library, Exhibitions centre, Golf course, ATM |
| 13 | Dharamshala | 0.05 | 18 mt. &above | A premises providing temporary accommodation for short duration on no-profit basis. | Dharamshala, Personnel service shop of barber & Launderer, Soft drink & Snack bar (upto 15 sq.m.). |
| 14 | Fire Post | As per requirement | 18 mt & above | A premise with lesser degree of facilities or fire fighting. the post may be attached to specific premis es with fire prone activities | Fire Post |
| 15 | Fire Station | As per requirement | 40 mt. and above | A premise with facilities for fire fighting for a catchment area assigned to it. It may include residence of essential staff | Fire station, residential flat (for maintenance staff), hostel (for employees), and service workshop |
| 16 | Gas Booking Office | 0.03 | 18 mtr & above | | |
| 17 | Go downs & ware housing (Non-Inflammable) | 0.15 | 18 mt & above | | |
| 18 | Govt./ Institutional Office | As per requirement | 18 mt & above | A premises used for the office of union /State Government | Central government, State government, local government & Public undertaking office. Watch & ward residence (upto Sq m) retail shop, Chemist, Books and Stationery, Consumer store ( upto to 20 sq.m each on ground floor), canteen, bank Extension Counter , Post office Extension Counter. |
| 19 | Group Housing | 0.5 | (18 mt. & above) | A premises comprising of residential flats with basic amenities like parking, park, convenience shops, public utility etc. | Residential flat, retail shop of confectionery, grocery & general merchandise, books & stationary, chemist, baber, swimming pool, play area, laundry, tailor, vegetable shop (on ground floor with an area upto 20 sqm. each). Crèche and day care centre, on ground floor with an area up |

| Permitted Use Premises in Commercial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width in Meters** | **Definitions** | **Use Premises** |
| | | | | | to 50 sq.m & gymnasium. |
| 20 | Guest houses | 0.05 | 18 mt & above | A guest house is premises for housing the staff of Government, Semi Government, Public Under taking and private limited company for short duration; 'Boarding house' is a premises in which rooms are let out on a long term basis as compared to hotels 'Lodging house' is a premises used for lodging of less than 50 persons | Hostel, Guest house, boarding house and Lodging house, watch and ward residence (Upto 30 sq.m). Personnel service shops of barber, launderer , Soft drink & Snack stall ( upto 15 sq.m) |
| 21 | Health centre Upto 30 beds | 0.2 | 18 mt & above | A premise having facilities for treatment of indoor and outdoor patients having upto 30 beds. The health centre may be managed by public or a charitable institution on non-commercial basis. It Includes family welfare centre. | Health Centre Watch & ward residence ( upto 30 sq.m each), chemist shop ( upto 15 sq.m each) |
| 22 | Hotels | 0.075 | 24 mt & above | A premises used for lodging of 15 persons or more on payment with or without meals | Hotel, Retail & Personnel service shops & Commercial office restricted to 5% of the total floor area, Restaurant |
| 23 | I.T unit | 0.02 | 24 mt & above | A Premise in which I.T unit is being run. | I.T unit office watch and ward. |
| 24 | Library | 0.05 | 12 mt & above | A premise having a large collection of books for reading and reference for general public or specific class. | Library, watch & ward residence ( upto 30 sq.m each). Canteen, Exhibition and art gallery, Auditorium |
| 25 | Medical Clinic | 0.02 | 12 mt & above | A premise with facilities for treatment of outdoor patients by a doctor. In Case of a polyclinic, it shall be managed by group of Doctors. | Clinic |
| 26 | Motor Driving School | 0.1 | 24 mt & above | A premise having facilities for training of driving automobiles | Motor Driving Training Centre, Watch & ward residence ( upto 30 sq.m ), Soft drink & Snack stall |
| 27 | Multiplex | 0.25 | 30 mt. & above | A premise with facilities for projection of movies and stills with a covered space to seat audience. | Cinema, Watch & ward residence (upto 30 sq.m.), Administrative office, Soft drink & Snack stall, Museum, Auditorium. |

| Permitted Use Premises in Commercial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width in Meters** | **Definitions** | **Use Premises** |
| 28 | Night Shelter | | 18 mt & above | A premises providing night accommodation to individuals without any charges or with token charges it may be run by local government of voluntary agencies | Night Shelter |
| 29 | Nursing Home | 0.1 | 18 mt & above | A premise having facilities for indoor and outdoor patients having upto 30 beds. it shall be managed by a doctor or a group of doctors on commercial basis | Nursing Home, Watch & ward residence ( upto 30 sq.m ), Chemist shop (upto 15 sq.m each ) |
| 30 | Park/ Open Space | - | - | A premise used for recreational leisure activities. It may have on it related Landscaping, Parking facilities, public toilet, Fencing, etc. It will include synonyms like lawn, open space, green, etc | Park, Soft Drink & Snack Stall ( on the park with & above 1.0 hectare area). |
| 31 | Parking | As per requirement | As per requirement | A premises used for parking of vehicles. The public parking lots may be run on commercial or non-commercial basis | Parking |
| 32 | Petrol and Diesel pumps | As per norms | 24 mtr & above | A premise for sale of petroleum products to consumers. Exclude servicing of automobiles | Petrol pump, Soft Drink & Snack Stall, ATM, office for Petrol Pump |
| 33 | Police Station/ Police Post | As per requirement | 12 mtr & above | A premise having facilities for the offices of local police station. | Police Station, Essential staff housing,. Police post, Essential staff housing |
| 34 | Post office | As per requirement | 18 mtr & above | A premise with facilities for postal communication for use by the public | Post office, Post & telegraph office, Watch & ward residence ( upto 30 sq.m ),Canteen |
| 35 | Public utilities and building except services and storage yard | As per concerned Dept. norms | | (i) Overhead tank- A premises having an overhead tank for storage and supply of water to its neighbouring areas. It may or may not include a pump house.<br>(ii) Underground tank-A premises having an underground tank for storage and supply of water to its neighboring areas. It may or may not include a pump house. | Public utility premises- Overhead tank, Underground tank, Oxidation pond, Septic tank, Sewerage pumping station, Public toilet urinal, Electric substation, Solid waste collection centre, Dhobi ghat. |

| Permitted Use Premises in Commercial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width in Meters** | **Definitions** | **Use Premises** |
| | | | | (iii) Oxidation pond- A premises having a tank used for the oxidation process for sewage and other waste. for the oxidation process for sewage and other waste.<br>(iv) Septic tank- A premises having an underground tank for collection of sewage and its consequent disposal.<br>(v) Sewage pumping station-A premises with a pumping station used for pumping sewage on to a higher gradient.<br>(vi) Public toilet and urinal-A premises having latrine and urinals for use of public. It may or may not include drinking water facility.<br>(vii) Electric sub – station – A premises having electrical installation and transformer for distribution of power.<br>(viii) Solid waste collection centre- A premises used for collection of garbage for its onwards transportation to sanitary landfill/disposal. | |
| 36 | Research and Development | 0.1 | 18 mtr & above | A premise providing facilities for research and development for any specific field | Research and Development, Watch & ward residence (upto 30 sq.m), Residential flat ( for maintenance staff ) hostel, canteen, Bank extension counter, Library , Post office extension facility |
| 37 | Restaurants | 0.05 | 18 mt & above | A premise used for serving food items on commercial basis including cooking facilities. It may have covered or open or bath for sitting arrangement | Restaurants |

| Permitted Use Premises in Commercial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width in Meters** | **Definitions** | **Use Premises** |
| 38 | Retail Shops | 3 mtr X 3 mtr | 12 mt & above | A premise for sale of commodities directly to consumer with necessary storage | Retail shop, Repair shop, Personnel service shop. |
| 39 | Road/rail/air / transport booking office | 30 sq. mtr per counter | 18 mt & above | A premise for ticket booking facilities for Road/rail/air / transportation | Booking office |
| 40 | Service Center & Service Industry | 0.05 | 24 mt & above | A premise essentially having repair shops for automobiles, electrical appliances, building material, etc. to provide essential services to neighboring residential areas | Retail, Repair & personnel service shop, Cottage industry, Gas Godown, commercial office. |
| 41 | Stock Exchange / Financial Institution | 0.1 | 18 mt & above | A premise having facilities for stock trading and financial activities | Stock Trading, Foreign exchange & Trading activities banking facilities, brokers offices |
| 42 | Technical Training Institute | 0.1 | 18 mtr & above | A premise with facilities for training in discipline of technical nature. It Includes technical school and industrial training institute ,etc. | Technical training center, residential flat (for maintenance staff), Books & stationary shop, Chemist shop (Upto 15 sq.m each), Canteen, Bank Extension counter, Auditorium, Post Office counter facility |
| 43 | Telephone Exchange | As per requirement | 18 mtr & above | A premise having facilities for central operation of telephone system for a designated area | Telephone Exchange, Watch & ward residence (upto 30 sq.m ), Canteen |
| 44 | Weekly Market | 1 | 24 mt & above | An area used once in a week by a group of informal establishments in the form of a market. These Markets shift from one area to another on different days of the week. Informal unit: retail/Service unit, stationary or mobile working without roof including small khokhas on road side. | Weekly Market, Informal sector trade, Soft Drink & Snack Stall ( all structures will be either temporary or mobile , only for one day in a week) |
| 45 | Whole Sale Trade | 0.02 | 18 mt & above | A premise for Whole sale trade is a premise from where goods and commodities are sold and delivered to retailers. Such premises include storage and godown and loading and unloading facilities | Whole sale shop, godown & storage, commercial office (Restricted to 25% of the total floor area). Notes: (I) Park, Parking, Public Conveniences, Public utility are permitted in all premises wherever needed. |

| Permitted Use Premises in Commercial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width in Meters** | **Definitions** | **Use Premises** |
| | | | | | (II) In case of clubbing of premises, uses of all the premises clubbed are allowed<br>(III) In case of doubt, the permissibility of use premises/use activity shall be decided by the concerned committee of the Jaipur Development Authority constituted under section 10 of the act.<br>(IV) A structure which can be shifted from one palce to another or removed as eh case may be shall be considered as temporary structure |
| 46 | Work place/ Offices | 0.1 | 18 mt & above | A premises used for offices of profit making organisation | Commercial offices, retail & Personnel service shop, Restaurant, Bank, Post & Telegraph office. |

**Table 4-9: Permissible Use Premises in Commercial Use Zone**

| Permissible Use Premises in Commercial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in Meters)** | **Definitions** | **Use Premises** |
| 1 | Bus Terminal | As per requirement | 30 mt. & above | A premises used by a public transport agency for parking maintenance and repair of Buses. This may or may not include a workshop. | Bus depot, workshop, watch & ward Residence (up to 30sqm) soft drink Snack stall Administrative office. |
| 2 | Children's Traffic Park | As per requirement | 18 mt. & above | A premises in the form of park with facilities for introducing and educating children about traffic and signaling. | Children Traffic park, watch & ward Residence (up to 30 sq.mt. soft drink Snack stall , Museum, Auditorium. |
| 3 | Coal/Wood/ Timber Yard | 0.1 | 24 mt. & above | Open space for storage & trading of Coal/Wood/Timber. | Trading & facilities for storage of Coal /Wood /Timber watch & ward Flat up to 30sq.m. |
| 4 | Cold storage / chilling plant | 0.1 | 30 mt. & above | A premises where perishable commodities stored in covered space using mechanical and electrical devices to maintain the required temperature, etc.. | Cold storage, Watch & ward residence (up to 30 sq.m.), Caretaker office. |
| 5 | Community Centre | 0.2 | 24 mt. & above | A premise having an enclosed space for various social | Community hall, Watch & Ward Residence |

| Permissible Use Premises in Commercial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in Meters)** | **Definitions** | **Use Premises** |
| | | | | & cultural activities of a residential area. | (up to 30 sq. m.) soft drink Snack stall. |
| 6 | Cultural Information Centre | 0.25 | 24 mt. & above | A premises with facilities for cultural and information services for an institution, state and country. | Cultural and Information centre Watch & Ward Residence (up to 30 sq. m.) Hostel, Canteen, Bank extension counter facility. Auditorium (up to 500 v sitting capacity) Library, Exhibition and Art Gallery. |
| 7 | Day Care & Creche | 0.05 | 12mt & above | A premises having nursery facilities of infants during day time. The centre may be managed by an individual or an institution on commercial or non – commercial basis. The Centre can be part of Large Office Building Complex or stand alone. | Crèche and day care center Watch & ward residence ( up to 30sq.m.) |
| 8 | Dispensary | 0.02 | 12 mt & above | A premise having facilities for medical advice and provision of medicines managed by public or charitable institutions. | Dispensary, Soft drink & Snack stall. |
| 9 | Exhibition centre and Art Gallery | 0.1 | 18 mt. & above | Premises with facilities for exhibition and display of paintings, Sculpture, Murals, ceramics, Handicrafts or products of a specific class. | Exhibition centre and Art Gallery Watch & Ward Residence ( up to 30 sq. m.) Canteen |
| 10 | Gas Installation & gas works | 0.05 | 18 mt. & above | A premises with facilities of storage for Gas cylinder and Gas welding work | |
| 11 | Health centre | 0.2 | 24 mt. & above | A premise having facilities for treatment of indoor and outdoor patients having up to 30 beds. The health centre may be managed by a public or a charitable institution on non-commercial basis. | Health centre watch and ward residence (upto 30 sq.m), chemist shop (upto 15 sq.m each) |
| 12 | Hotel | 0.075 | 24 mt. & above | A premises in which rooms attached to Institutions or otherwise are let out on a long term basis. | Hotel, Commercial office, Retail & Personal service shop, Restricted 5% of the total floor area, Restaurant |
| 13 | Junk Yard | 0.05 | 18 mt. & above | A premises for covered and semi- covered or open storage including sale & purchase of waste goods, Commodities and Materials. | Junk Yard, Watch & Ward residence , Sales office |
| 14 | Motor garage and workshop | 0.05 | 24 mt. & above | Premises for servicing and repair of automobiles. | Workshop, Watch & Ward residence ( up to 30 sq. m. ) soft drink Snack stall Administrative office. |
| 15 | Open air theatre | 0.2 | 24 mt. & above | A premises having facilities for audience seating and a | Open air theatre, Watch & Ward residence |

| Permissible Use Premises in Commercial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in Meters)** | **Definitions** | **Use Premises** |
| | | | | stage for performance and is open to sky. | (up to 30 sqm) |
| 16 | Plant nursery | 0.05 | 12 mt. & above | It is a premise with facilities for rearing and sale of young plants. | Nursery, Watch & Ward residence ( up to 30 sq. m. ) |
| 17 | Religious Building | 0.05 | 18 mt. & above | Premises dedicated to accommodations and service of god or other objects of religious nature. It may have different nomenclature in different religions like temple (all faiths), mosque, church, gurudwara, Ashram. | (i)Temple ( ii) Mosque ( iii) Church (iv)Gurudwara (v) Synagogue , (vi) Ashram ( vii) Bathing tank , ( viii) Dargah and ( ix) Charitable dispensary and Library |
| 18 | Research & Development | 0.1 | 18 mt. & above | A premises providing facilities for research and development for any specific field. | Research & Development centre, Watch & Ward Residence (up to 30 sq.m.) Residence flat (for maintenance staff) Hostel Canteen, Bank extension, counter, Library, Post Office extension facilities. |
| 19 | Vocational training institute | 0.1 | 18 mt. & above | Premises with training facilities for short – term courses for discipline, preparatory to employment in certain profession and trade. It includes training cum work centre. | Vocational training institute, Watch & Ward Residence (up to 30sq.m.) Hostel, Books, & stationary ship (up to 15 sq. m.) Canteen, Library. |
| 20 | Voluntary health service | 0.05 | 18 mt. & above | Premises having medical facilities for treatment of outdoor patients and other like blood bank, etc. by voluntary institutions. This service may also take the form of temporary camp with charitable motive. | Voluntary health service, watch & ward residence (up to 30 sq.mt), administrative office, dispensary, canteen. |
| 21 | Ware Housing / storage godowns of perishable goods. | 0.1 | 24 mt. & above | A premise for storage godown and ware housing means premises for exclusive use of storage of goods and commodities in a manner as per the requirements of respective commodities. The premises includes the related loading and unloading facilities for the purpose of goods and commodities by road transport or rail transport as the case may be; | Storage, godown & ware housing, Watch & ward Residence (up to 30sqm), Wholesale outlet, administrative & Sales office. |

### 4.11.4 Industrial Use Zone

**Table 4-11 & Table 4-12** present permitted & permissible use premises within Industrial Use Zone **(Figure 4.3)**

***Permitted Uses***

In this part of the KBNIR a fully integrated city is proposed. This is possible with the switch towards High-tech industry that unlike traditional 'dirty' manufacturing industries, is cleaner and 'greener'. It is not only possible to place such industries within the mixed-city areas, it is also possible to place such activities within mixed-use buildings. Think of the new High-tech vertical factory in which R&D, production and assembly, conference and education and residential are combined into an integrated multi-level building.

The primary focus on High-tech Industries (and medium and light industries) means a mixed-use employment city, with an integration of live-work-study-innovate. But in this zone the industrial component is essential to the success of the city. In our plans we target high-tech industries that can benefit from a strong relationship with the Knowledge City. Following industries are allowed:

- High-tech industry Cluster

This cluster includes industries that have been classified by the CSO of India as knowledge based industries. They include; chemicals (NIC 24), metal products (NIC 28), machinery (NIC 29), office and accounting equipment (NIC 30), electrical equipment (NIC 31), televisions and radios (NIC 32), medical and optical goods (NIC 33), parts of motor vehicles and other transportation equipment (NIC 34 and 35).

- Light industry Cluster

These are largely consumer-oriented industries based on already (partially) processed inputs, including textiles and weaving (NIC 17 and 18), leather products and footwear (NIC 19), printing and publishing (NIC 22), furniture and miscellaneous industries (NIC 39) and 80 percent of logistics services (NIC 630).

- Medium Industry Cluster

Industries that are processing semi-fabricates, including wood products (NIC 20), paper products (NIC 21), rubber and plastic products (NIC 25), glass products and nonmetallic minerals (NIC 26), iron and steel, and non-ferrous metals and precious products (NIC 27).

To establish a lively city the industrial zone should incorporate some housing and commercial activities along main roads (such as retail, restaurants). These are preferred be concentrated adjacent to roads, public squares or parks. The residential concentrations (such as workers housing) should not be hindered by industrial buildings. Therefore types of industry should be adjusted to the residential locations.

Depending on the amount and type of dangerous substances various safety norms has to be applied. For each industry norms can be defined according to applicable regulations. Working on the further development and subdivision of sections of the area a detailed zoning of land-use and categories of industries should be prepared that enables housing on pronounced locations.

In this area various other uses are allowed such as wholesale, storage depots, research and development, hotels, nursing homes, crèches, religious premises, and restaurants.

### 4.11.5 Development Control Regulations Industrial Use

**Figure 4-3** presents the locations of industrial Use Zone within SNB UC. Building height of all buildings is allowed up to 4 floors.

***Architecture and Landscaping***

The architecture and typologies of buildings is variable. The scale of buildings should not dominate the streetscape. Integration with the landscape around the building is required. Planting should be a significant part of it. For each 200 m2 minimal one tree should be planted.

Most of the buildings are clustered in series of roughly 30 to 100 ha. Within the clusters of subdivided plots water catchment should be provided. These areas are green and left unpaved so water can penetrate soil.

***Parking***

Parking facilities should be established on private land. Only multi-stories parking is allowed when it is not visible from public areas such as streets, roads, squares, parks, pocket parks. For instance, these can be designated inside buildings. Fencing facades by green is also allowed if the building is limited to 2 floors. The amount of parking space is given in **Table 4-21, Chapter 4-12**.

In this area a collective truck lot can be established preferably in the vicinity of NH 8.

***Sustainable Features***

Getting the area urbanized will put a load on environment. For this compensation or limitation of the demand of energy should be achieved as well as efficient water treatment.

For all areas rainwater harvesting should be established. All rainwater that falls on any place at the site should be collected or penetrated in soil.
Use of energy should be limited or compensated by making use of rooftops, by covering them with solar panels**.** The percentage of rooftops that should be covered by these panels is given in **Chapter 4.14..**

**Figure 4-4: Mass study**



**Figure 4-5 Industrial Area KBNIR**

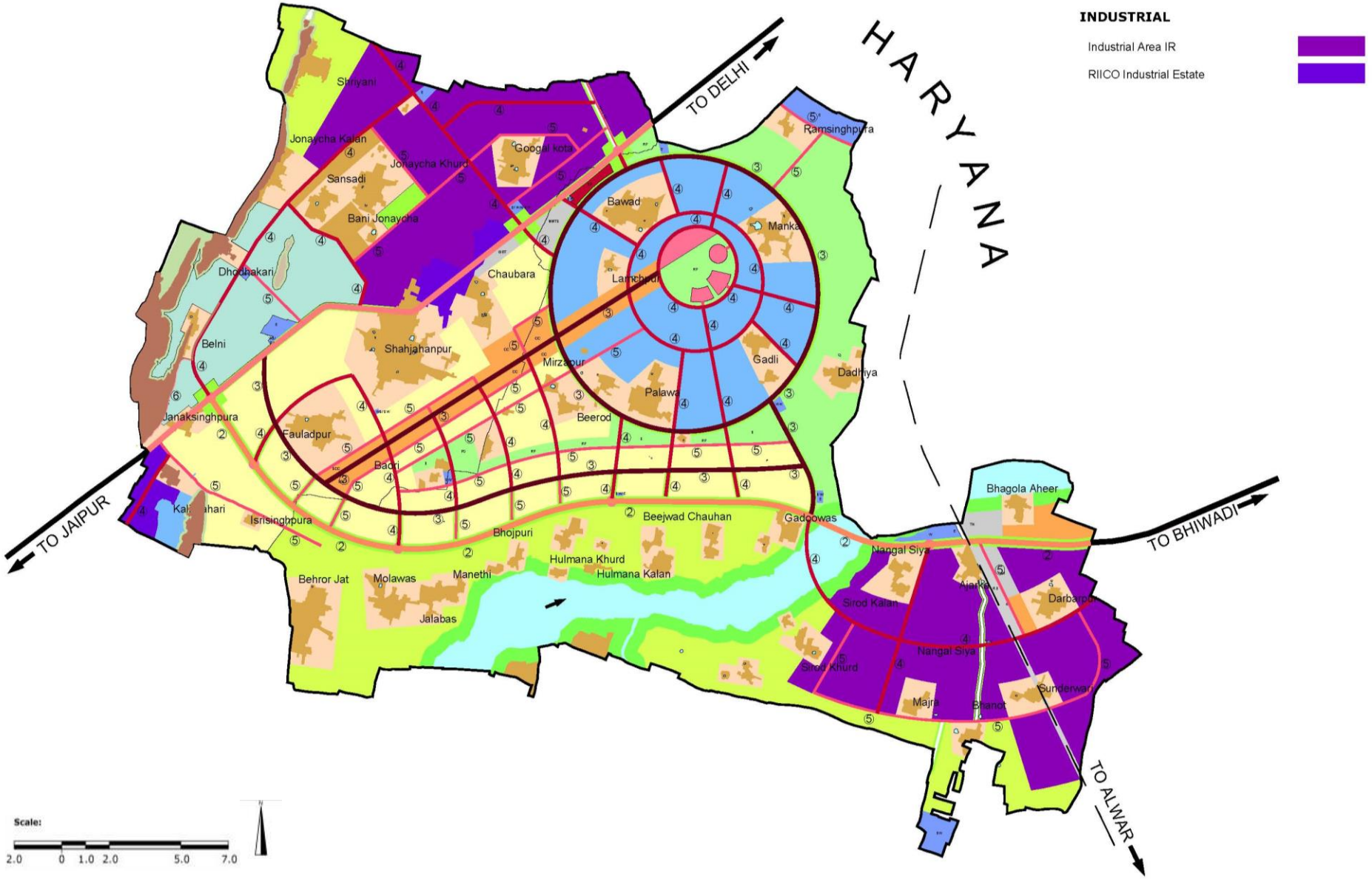


**Table 4-10: Development Control Regulations for Industrial Area**

| | Development Control Regulations for Industrial Area | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum % Green space** | **Broad land-use classification** |
| I.1 | 100 or 80 or 60 | 2.0 | 40% | Max. 30 m | 30-300m Or 2/3 of plot length | 15m – 9m – 9m | 20 % | free | 10 % of area | High-tech industry Cluster<br>This cluster includes industries that have been classified by the CSO of India as knowledge based industries. They include; chemicals (NIC 24), metal products (NIC 28), machinery (NIC 29), office and accounting equipment (NIC 30), electrical equipment (NIC 31), televisions and radios (NIC 32), medical and optical goods (NIC 33), parts of motor vehicles and other transportation equipment (NIC 34 and 35).<br><br>Light industry Cluster<br>These are largely consumer-oriented industries based on already (partially) processed inputs, including textiles and weaving (NIC 17 and 18), leather products and footwear (NIC 19), printing and publishing (NIC 22), furniture and miscellaneous industries (NIC 39) and 80 percent of logistics services (NIC 630).<br><br>Medium Industry Cluster<br>Industries that are processing semi-fabricates, including wood products (NIC 20), paper products (NIC 21), rubber and plastic products (NIC 25), glass products and nonmetallic minerals (NIC 26), iron and steel, and non-ferrous metals and precious products (NIC 27). |

| | Development Control Regulations for Industrial Area | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum % Green space** | **Broad land-use classification** |
| | | | | | | | | | | Optional:<br>Agrifood industry |
| I.2 | 45 to 18 | 2.0 | 40% | Max. 18 m | 30-300m<br>Or<br>2/3 of plot length | 15m – 9m – 9m | 20 % | free | 10 % of area | Same as As I.1 plus row housing, apartments, residential services (schools, neighbourhood commercial centres) hotels |
| I.3 | Less than 18 | 2.0 | 40% | Equal to R/W | 30-300m<br>Or<br>2/3 of plot length | 15m – 9m - 9m | 20 % | free | 10 % of area | Same as As I.1 plus row housing, apartments, residential services (schools, neighbourhood commercial centres) hotels |

**Table 4-11: Permitted Use Premises in Industrial Use Zone**

| Permitted Use Premises in Industrial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| In industrial use, Manufacturing, service, and light industry, extensive and heavy industry, special industrial areas and warehousing etc would be allowed within the Industrial estates/ use. In industrial use zone the buildings and shall normally be used for identified and associated permitted and permissible use/activities, on an application.premises | | | | | |
| 1 | Auditorium | 0.5 | 24 mt. & above | A premises having an enclosed space to seat audience and stage for various performances like concerts, Play, Recitals, Functions, etc. | Museum, Exhibition centre and Art gallery, Auditorium and Open air theatre, Watch & ward residence (up to 30 sq.m.), Canteen. |
| 2 | Boarding and Lodging house | 0.05 | 18 mt. & above | Boarding house is a premises in which rooms are let out on a long term basis as compared to hotels; Lodging house is a premises used for lodging of less than 50 persons. | Boarding house and lodging house, watch and wad residence (upto 30 sq.m.) Personnel service shops of Barber, Launderer, Soft drink & Snack stall (up to 15 sq.m.) |

| Permitted Use Premises in Industrial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 3 | Bus Depot and Workshop | As per requirement | 30 mt. & above | A premises used by a public transport agency or any other such agency for parking maintenance and repair of buses this may or may not include a workshop. | Bus depot, Workshop, Watch & ward Residence (up to 30 sq.m.) Soft drink & Snack stall, Administrative office. |
| 4 | Bus Terminal | As per requirement | 30 mt. & above | A premises used by public transport agency to park the buses for short duration to serve the population. It may include the related facilities for passengers. | Bus terminal, Soft drink & Snack stall, Administrative office, Other offices. |
| 5 | Cinema | 0.25 | 30 mt. & above | A premise with facilities for projection of movies and stills with a covered space to seat audience | cinema, watch & ward residence (upto 30 sq.m), admisnistration office, soft drink & snack stall, museum, audiotorium |
| 6 | Coal/ Timber/ Wood Yard | 0.1 | 24 mtr. & above | open space for storage & trading of Coal/Wood/ Timber. | Trading & facilities for storage of Coal/ Wood/ Timber watch & ward up to 30Sq.m |
| 7 | Cold Storage and Ice factory | 0.1 | 30 mt. & above | A premises where perishable commodities are stored in covered space using mechanical and electrical devices to maintain the required temperature, etc. | Cold storage, Watch & ward residence (up to 30 sq.m.), Caretaker office. |
| 8 | Commercial Complex | 0.1 | 24 mt. & above | A premise having training facilities for Stenography, Correspondence, Record keeping, etc. | Commercial and Secretarial training centre, Watch & ward Residence (up to 30 sq.m.), Canteen. |
| 9 | Day Care & Creche | 0.05 | 12mt & abvove | A premises having nursery facilities of infants during day time. The centre may be managed by an individual or an institution on commercial or non – commercial basis. | Crèche and day care center Watch & ward residence ( up to 30sq.m.) |
| 10 | Dispensary | 0.02 | 12 mt. & above | A premise having facilities for medical advice and provision of medicines managed by public or charitable institutions. | Dispensary, Soft drink & Snack stall. |
| 11 | Fire Post | As per requirement | | A premise with lesser degree of facilities or fire fighting. the post may be attached to specific premis es with fire prone activities | Fire Post |
| 12 | Fire Station | As per requirement | 18 mt & above | A premise with facilities for fire fighting for a catchment area assigned to it. It may include residence of essential staff | Fire station, residential flat (for maintenance staff), hostel (for employees), and service workshop |
| 13 | Gas godowns | As per norms of petroleum | 24 mt. & above | A premise where cylinders of cooking gas or other gas are stored. | Gas godown, Watch & ward residence (up to 30 sq.m.), Caretaker office. |
| 14 | Guest House | 0.05 | 18 mt. & above | A guest house is premises for housing the staff of Government, Semi-government, Public undertaking and Private limited | Guest house, Watch and wad Residence (up to 30 sq.m.) Personnel service shops of |

| Permitted Use Premises in Industrial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| | | | | company for short duration. | Barber, Launderer, Soft drink & Snack stall (up to 15 sq.m.) |
| 15 | Hostels | 0.05 | 18 mt. & above | Premises in which rooms attached to Institutions. Or otherwise are let out on a long term basis | Hostels watch and wad residence (up to 30 sq.m.) Personnel service shops of Barber, Launderer and Soft drink & Snack stall (up to 15 sq.m.) |
| 16 | Loading/ unloading spaces | As per requirement | | | |
| 17 | Nursing Home | 0.1 | 24 mt & above | Apremise having facilities for indoor and outdoor patients having upto 30 beds. It shall be managed by a doctor or a group of doctor on commercial basis | Nursing home, watch & ward residence (upto 30 sq m), chemical shop (upto 10 sq.m each) |
| 18 | Park | | | A premise used for recreational leisure activities. It may have on it related landscaping, parking facilities, public toilet, fencing etc. It will include synonyms like Lawn, Open space, Green, etc. | Park, Soft drink & Snack stall (on the park with & above 1.0 hectare area). |
| 19 | Parking | As per requirement | | A premises used for parking of vehicles. The public parking lots may be run on commercial or noncommercial basis. | Parking |
| 20 | Petrol and Diesel pump | As per norms | 24 mt & above | A premise for sale of petroleum products to consumers. | Petrol pump, Soft drink & Snack stall, Automobile repair shop. |
| 21 | Police Station/ Police Post | As per requirement | 24 mtr & above | A premise having facilities for the offices of local police station. | Police Station, Essential staff housing,. Police post, Essential staff housing |

| Permitted Use Premises in Industrial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 22 | Public Utilities | As per norms of concerned deptt. | | i) Overhead tank- a premises having an overhead tank for storage and supply of water to its neighbouring areas. It may or may not include a pump house.<br>ii) Underground tank- A premises having an underground tank for storage and supply of water to its neighbouring areas. Its may or may not include a pump house.<br>(iii) Oxidation pond- A premises having a tank used for the oxidation process for sewage and other waste.<br>(iv) Septic tank- A premises having an underground tank for collection of sewage and its consequent disposal.<br>(x) Sewage pumping station-A premises with a pumping station used for pumping sewage on to a higher gradient.<br>(xi) Public toilet and urinal-A premises having latrine and urinals for use of public. It may or may not include drinking water facility.<br>(xii) Electric sub-station – A premises having electrical installation and transformer for distribution of power.<br>(xiii) Solid waste collection centre - A premises used for collection of garbage for its onwards transportation to sanitary landfill/disposal.<br>(xiv) Dhobi Ghat- A premises used for cleaning and drying of clothes/linen by washer man. | Underground tank, Overhead tank, Oxidation pond, Septic tank, Sewage pumping station, Public toilet and Win ales electric substation, Solid waste collection centre, Dhobi ghat. |
| 23 | Restaurants | 0.05 | 24 mt & above | A premises used for serving food items on commercial basis including cooking facilities. It may have covered or open or both for sitting arrangement. | Restaurant |
| 24 | Storage and depot on non-perishable and non-inflammable commodities and incidental use | 0.1 | 18 mt & above | A premise for storage, Godown and ware housing means a premises for exclusive use of storage of goods and commodities in a manner as per the requirements of respective commodities. The premises include the related loading and unloading facilities for the purpose of carriage of the goods and commodities by road transport or rail transport as the case may be. | Storage, Godown & Warehousing, watch & Ward residence (up to 30 sq.m.), Wholesale outlet, Administrative & Sales office. |
| 25 | Ware housing | 0.1 | 24 mt & above | | |
| 26 | Wholesale | 0.02 | 18 mt & | A premise for whole – sale trade is a premise from where goods | Wholesale shop, Godown & Storage, |

| Permitted Use Premises in Industrial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| | business establishment | | above | and commodities are sold and delivered to retailers. Such premises include storage and godown and loading and unloading facilities. | Commercial office (restricted to 25% of the total floor area) |
| 27 | Worker Housing | 0.2 | 18 mt & above | Housing specifically meant for Workers | Residential flats (not exceed 50sqmt area), allied facilities) |

**Table 4-12: Permissible Use Premises in Industrial Use Zone**

| Permissible Use Premises in Industrial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 1 | Auto/thela/ Rickshaw stand | As per requirement | 24 mt & above | Premises for Auto/Thela/Rickshaw for Parking the same during non committing time. | |
| 2 | Banks and Financial institutions | 0.075 | 18 mt & above | A premises for office to perform banking and financial institutions functions and operations | Bank, Office, Watch and ward residence up to 30 sq.m. |
| 4 | Exhibition Centre and Art Gallery | 0.1 | 18 mt & above | A premises with facilities for exhibition and display of paintings, sculptures, murals, ceramic, handicrafts or products of a specific class | Library, watch and ward residence (upto 30 sq.m), canteen, exhibition and art gallery, auditorium. |
| 5 | Flatted group industry | 0.1 | 18 mt & above | A premise having a group of small industrial units having upto 50 workers with non-hazardous performance. These units may even be located in multistoried building. | Cottage and small industries shall be permitted, provided such industries do not have excessive i) Vibrations ii) Solid or liquid water or iii) Movement or raw material/finished products. Watch and ward residence (up to 30 sq.m) |
| 6 | Govt./Semi-Govt private business. Establishment | 0.1 | 24 mt & above | | |
| 7 | Hospitals less than 100 beds | 0.5 | 24 mt & above | A premise providing medical facilities of general or specialised nature for treatment of indoor and outdoor patients. | Hospital, Residential flat (employees and service personnel), Institutional hostel, Medical college, Retail shop (confectionery, Grocery & General merchandise, Books and Stationery, Barber, Launderer, Vegetable). |

| Permissible Use Premises in Industrial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 24 | Hotels | 0.075 | 24 mt & above | A premises used for lodging of 15 persons or more on payment with or without meals | Hotel, Retail & Personnel service shops & Commercial office restricted to 5 % of the total floor area, Restaurant |
| 8 | Indoor stadium | 0.25 | 24 mt & above | A premises for indoor stadium with play area and spectator seating including related facilities for players. | Stadium, local government office (maintenance), watch & ward residence (up to 30 sq.m), residential flat (for maintenance staff) retail shop, restaurant. |
| 9 | Industry | As per deptt. Of industry norms | 18mt & above | A premises for an industrial unit within a group of such units for manufacturing of specific products like electronic goods, etc. | Light industrial unit, Administrative office, Sales outlet, Residential flat to the extent of 5% of the floor space or 80 sq.m whichever is less for watch & ward and Supervision. |
| 10 | Junk Yard | 0.05 | 18mt & above | A premise for covered, Semi-covered or Open storage including sale and Purchase of waste goods, Commodities and materials. | Junk yard, Watch & ward residence sales office. |
| 11 | Medical clinic | 0.02 | 12 mt & above | A premises with facilities for treatment of outdoor patients by a doctor. In case of a polyclinic, it shall be managed by group of doctors. | clinic |
| 12 | Motor garage and workshop | 0.05 | 24 mt & above | A premise for servicing and repair of automobiles | Workshop, Watch & ward residence (up to 30 sq.m.) Soft drink & Snack stall Administrative office. |
| 14 | Night Shelter | | 18 mt & above | A premises providing night accommodation to individuals without any charges or with token charges. It may be run by local government or voluntary agencies. | Night Shelter |
| 15 | Outdoor stadium | 2 | 24 mt & above | A premises for outdoor games with pavilion building and stadium structure to seat spectators including related facilities for players. | Stadium, local government office (maintenance), watch & ward residence (up to 30 sq.m), residential flat (for maintenance staff) retail shop, restaurant. |
| 17 | Religious Buildings | 0.05 | 18 mt. & above | A premise dedicated to accommodations and service of god or other objects of religious nature. It may have different nomenclature in different religions like Temple (all faiths), Mosque, Church, Gurudwara, Ashram. | (i) Temple, (ii) Mosque, (iii) Church, (iv) Gurudwara, (v) synagogue, (vi) Ashram, (vii) Bathing Tank, (viii) Dargah and (ix) Charitable Dispensary and Library |

| Permissible Use Premises in Industrial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 18 | Research and development centre | 0.1 | 18 mt & above | A premise providing facilities for research and development for any specific field. | Research and Development centre, With & ward residence (up to 30 sq.m.), Residential flat (for maintenance staff) Hostel, Canteen, Bank extension counter, Library, Post office extension facility. |
| 26 | Satellite and telecommunication centre | As per requirement | 18 mt. & above | Is a premises with facilities for research and development of satellite and telecommunication technology. | Satellite and telecommunication centre and Observatory & weather office , residential flat (for maintenance staff.), Canteen , Research laboratory. |
| 19 | Service Stations | 0.1 | 24 mt. & above | Premises essentially having repair shops for Automobiles, Electrical appliances, Building material, etc. to provide essential services to neighbouring residential areas. | Retail, Repair & Personnel Service shop, Cottage industry, Gas godown, Commercial office. |
| 20 | Sewage disposal works | As per the requirement of the concerned deptt. | | | |
| 27 | Telephone Exchange | As per requirement | 18 mt. & above | Is a premise having facilities for central operation of telephone system for a designed area. | Telephone Exchange, Watch & ward residence (up to 30 sq.m.), Canteen. |
| 21 | Vocational training institute | 0.1 | 18 mt & above | Premises with training facilities for short – term courses for discipline, preparatory to the employment in certain profession and trade. It includes training-cum-work centre. | Vocatinal training institute, watch & ward residence (up to 30 sq.m) hostel, books & stationary ship (up to 15 sq.m) canteen, library. |
| 22 | Wholesale business establishment | 0.02 | 18 mt & above | | |
| 23 | Workshops/garages | 0.05 | 24 mt & above | A premise for servicing and repair of automobiles. | Workshop, Watch & ward Residence (up to 30 sq.m.) Soft drink & Snack stall Administrative office. |

### 4.11.6 Recreational Use Zone

**Table 4-13** presents permitted uses premises within Recreational Use Zone. This area is a green lung of the city. It is crucial for the liveability of it. Its character therefore is green. Some (small) buildings are allowed. The main use (70 %) of this area is public park. Additional to this, recreational facilities are allowed (such as amusement park, open air theatre, playground, restaurant, sport accommodation, etcetera)

### 4.11.7 Development Control Regulations Recreational area

The allocation and distribution of open space as follows:

- Regional Parks
- Play Ground
- Sports Facilities
- Green buffer along DP roads.

Trees are the most visually obvious of the soft landscape elements and may be used to give structure, define views, offer shade or provide screening. How a tree fits into the street should be considered by the selection of type and species. Palm trees, for example, can offer high clear stems and are therefore suitable for the creation of structure where clear visibility is a primary function of the route.

Elsewhere shade casting trees may be chosen for their light canopy and dappled shade that can improve the quality of the pedestrian realm. Alternatively more bushy / multi-stemmed trees and shrubs can offer screening and create enclosure w
here desired.

Buildings are allowed but the percentage is limited to 5 %. The maximum size of the footprint of buildings is 100 m x 100 m and its height is maximum 2.5 floors. The characters of buildings should be related to the green. Facades should be treated as main facades for each side

**Figure 4-6: Recreation**



**Figure 4-7: Recreational Area KBNIR**

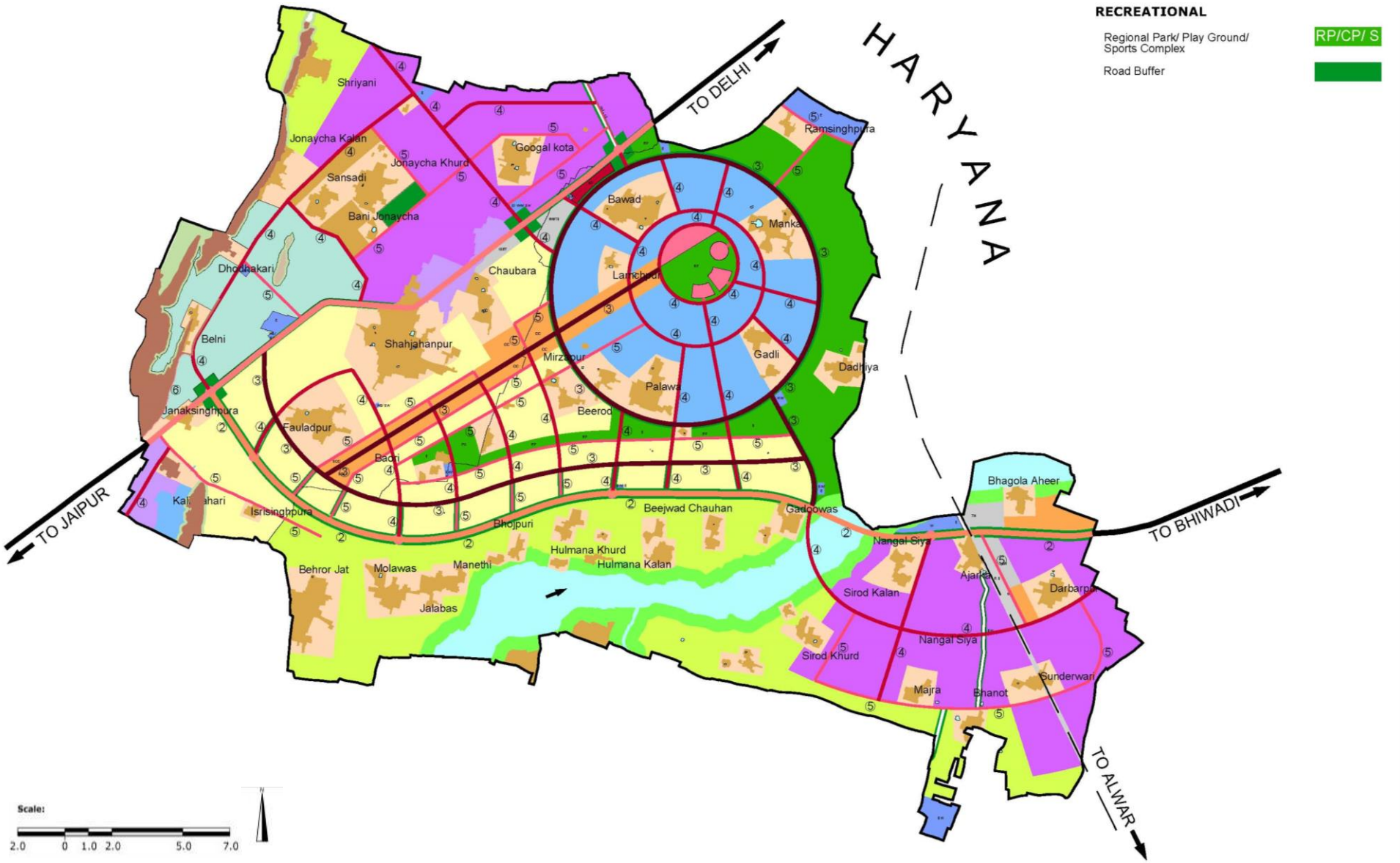


**Table 4-13: Permitted Use Premises in Recreation Use Zone**

| Permitted Use Premises in Recreation Use Zone | | | | | |
|---|---|---|---|---|---|
| **S.No** | **Activity** | **Minimum Area (ha)** | **Road Width (mtr)** | **Definitions** | **Use Premises** |
| 1 | Amusement Park | As per requirement of the concerned deptt. | | | |
| 2 | ATM | As per requirement | | | |
| 3 | Bird Sanctuary | As per requirement | | A Premises used in form of a large park or forest for preservation and breeding of birds with all related facilities. | Park, Forest, Watch & ward residence (up to 30 sq.m. each) Restaurant. |
| 4 | Botanical Garden | As per requirement | | A premise in the form of a garden with plantation for research and exhibition. | Garden, Research and Exhibition hall etc. |
| 5 | Bus terminal | As per requirement of the concerned deptt. | 30 mt & above | A premise for bus terminal | Bus terminal space, snacks booth, parking area. |
| 6 | Children Traffic Park | As per requirement | 18 mt & above | A premises in the form of a park with facilities for introducing and educating children about traffic and signaling. | Children traffic park, watch and ward residence (upto 30 sq.m), soft drink & snack stall, museum, auditorium. |
| 7 | District Park | | | | District Park, Theme park, Recreational Club, National Memorial, Open-air food court, Children Park, Orchard, Plant Nursery, Area for water harvesting, Archaeological Park, specialized Park, Amusement Park, Children Traffic Park, Sport activity, Playground, Amenity structures. Restaurant in a District Park having an area above 25 Ha. subject to following: a. Area of the restaurant plot shall not be more than 0.8 Ha. or 1% of the District Park, whichever is less. b.Restaurant plot shall have no physical segregation from the rest of the District Park area. c. The building shall be a single storey structure with max. FAR of 5 and height not more than 4m. without any residential facility and to harmonize with the surroundings. d. In case there is no parking lot in the vicinity, parking should be provided at a reasonable distance from the restaurants. Parking area should not from part of the restaurant complex /greens. 30% of the area shall be developed as |

| Permitted Use Premises in Recreation Use Zone | | | | | |
|---|---|---|---|---|---|
| **S.No** | **Activity** | **Minimum Area (ha)** | **Road Width (mtr)** | **Definitions** | **Use Premises** |
| | | | | | dense plantation. |
| 8 | city park | | | | Aqua Park/Water sport park, Arboretum, Botanical Garden, National Memorial (approved by Cabinet/Govt. of India), Amphitheatre, open Playground, Aquarium, other activities same as permitted in District Park. |
| 9 | Regional Park | | | | Ridge, Residential Flat (For watch & ward), Picnic Hut, Park, Shooting Range, Zoological Garden, Bird Sanctuary, Botanical Garden, Local Government office (Maintenance) , Open Air Theatre, Police Post, Fire Post, Orchard, Plant Nursery and Forest. |
| 10 | Sectoral Park | | | | Park, Children Park, Open air food court, playground etc. |
| 11 | Dairy Booth | As per requirement | | | |
| 12 | Local Govt. office for maintenance | As per requirement | | | |
| 13 | Fire Post | As per requirement | | A premise with lesser degree of facilities or fire With residential flat for staff. | Fire Post |
| 14 | Health centres for players and staff | 0.1 | 12 mt & above | | |
| 15 | Library | As per requirement | 12 mt & above | A premises having a large collection of books for resding and referance for general public or specific class | Library, watch & ward residence (up to 30 sq. m) canteen |
| 16 | Open air theatre | 0.2 | 24 mt. & above | A premises having facilities for audience seating and a stage for performance and is open to sky. | open Air Theatre, Watch & ward Residence (upto30sq.m.), Canteen. |
| 17 | Orchard | | | It is a premise with thick growth of fruit trees. It may also include garden with fruit trees. | Orchard, Watch & ward and Maintenance staff Residence (up to 30 sq. m.), all structures shall be temporary in nature. |
| 18 | Parks | | | A premise with facilities for welfare and promotion of community development. | Public meeting ground, public address podium, soft drink & snack stall. |
| 19 | Police post | As per requirement | 12 mt. & above | Premises having facilities for a local police post of a temporary nature or on smaller scale as compared to a police station. | Police Post, Essential staff housing. |

| Permitted Use Premises in Recreation Use Zone | | | | | |
|---|---|---|---|---|---|
| **S.No** | **Activity** | **Minimum Area (ha)** | **Road Width (mtr)** | **Definitions** | **Use Premises** |
| 20 | Picnic huts | | part of Parks | Premises for short duration stay for recreational or leisure purpose of a family, located within a tourist and/or recreational centre. | Picnic hut |
| 21 | Plant Nursery | 0.05 | 12 mt. above | It is a premise with facilities for rearing and sale of young plants. | |
| 22 | Play Ground | Premises used for outdoor games. It may have on it Landscaping, Parking facilities, Public toilet, etc. | | | Playground |
| 23 | Public Utilities | As per requirement of concerned deptt. | | (i) Overhead tank-A premises having a overhead tank for storage and supply of water to its neighbouring areas. It may or may not include a pump house.<br>(ii) Underground Tank-A premises having an underground tank for storage and supply of water to its neighbouring areas. It may or may not include a pump house.<br>(iii) Oxidation pond- A premises having a tank used for the oxidation process for sewage and other waste.<br>(v) Septic tank- A premises having an underground tank from collection of sewage and its consequent disposal.<br>(vi) Sewage pumping station-A premises with a pumping station uses for pumping sewage on to a higher gradient.<br>(vii) Public toilet and Urinal-A premises having latrine and urinals for use of public. It may or may not include drinking water facility.<br>(viii) Electric sub-station-A premises having electrical installation and transformer for distribution of power. | Overhead tank, Underground tank, Imitation pond, Septic tank, Sewerage pumping station, Public toilet urinal, Electric substation, Solid waste collection centre, Dhobi ghat. |

| Permitted Use Premises in Recreation Use Zone | | | | | |
|---|---|---|---|---|---|
| **S.No** | **Activity** | **Minimum Area (ha)** | **Road Width (mtr)** | **Definitions** | **Use Premises** |
| | | | | (ix) Solid waste collection centre- A premises used for collection of garbage for it's onwards transportation to sanitary landfill/disposal.<br>(x) Dhobi ghat- A premises used for cleaning and drying of clothes/linen by washer man. | |
| 24 | Recreational Club | 0.2 | 18 mt & above | A premises used for gathering of group of persons for social and recreational purposes with all facilities. | Recreational Club, Recreational Club, watch & ward Residence (upto 30sq.m.), Residential flat (for maintenance staff), Swimming pool, Indoor and Outdoor games facilities. |
| 25 | Regional Park | | | | Ridge, Residential Flat (For watch & ward), Picnic Hut, Park, Shooting Range, Zoological Garden, Bird Sanctuary, Botanical Garden, Local Government office (Maintenance) , Open Air Theatre, Police Post, Fire Post, Orchard, Plant Nursery and Forest. |
| 26 | Restaurant/Cafeteria | | As part of park | A premises used for serving food items on commercial basis including cooking facilities. It may have covered or open or both for sitting arrangement. | Restaurant |
| 27 | Shooting Range | 10 | 30mt | | |
| 28 | Special recreation | | | Premises having facilities for special recreation and Special education. | |
| 29 | Sport complex | As per requirement | 30 mt & above | | |
| 31 | Sports training centre | As per requirement | 30 mt & above | Premises with facilities for welfare and promotion of community development. | Sports Training Centre, Residential Flat (for Maintenance Staff), Retail shop (confectionery, grocery & general merchandise), Hostel, Bank, Post Office, canteen, Indoor and Outdoor Stadium, Swimming Pool, Play Ground. |
| 32 | Stadium (indoor) | As per requirement of concerned department | 30 mt & above | | |
| 33 | Stadium (outdoor) | As per requirement of | 30 mt & above | | |

| Permitted Use Premises in Recreation Use Zone | | | | | |
|---|---|---|---|---|---|
| **S.No** | **Activity** | **Minimum Area (ha)** | **Road Width (mtr)** | **Definitions** | **Use Premises** |
| | | concerned department | | | |
| 34 | Swimming pool | | 18 mt & above | A premise with related facilities facilities for swimming and spectators seating which shall vary with size, standard and purpose. | Swimming pool, watch & ward and maintenance staff residence, restaurent. |
| 35 | Trade Fair ground | As per requirement | 24 mt & above | | |
| 36 | Vending booth | As a part of park/stadium etc. | | | |
| 37 | Zoological Garden | As per requirement | As per require ment | A premises in the form of a garden or park or aquarium with a collection of animals, species and birds for exhibition and study. It shall include all related facilities. | Zoological garden, Bird sanctuary, Watch & ward Residence (up to 30 sq. m.), Residential flat (for maintenance Staff), Retail shop, Restaurant. |
| 38 | Golf Course | As per requirement | | | |

### 4.11.8 Tourism Use Zone

**Table 4-14** presents permitted uses premises within Tourism Use Zone.

The area is meant to cover various tourist activities. The major activities are holiday or leisure related (resorts, cottages, hotels/motels, theme parks etcetera). In general premises should be limited to 4 floors and a coverage of maximum 30%. Depending on the programming of the various activities, their themes and characterization building height and coverage can be adjusted

**Table 4-14: Permitted Use Premises in Tourism Use Zone**

| Permitted Use Premises in Tourism Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| 1 | Auditoriums | 0.5 | 24 mt. and above | A premises having an enclosed space to seat audience and stage for various performances like Concerts, Play, Recitals, Functions etc. | Auditorium, Watch & Ward Residence (upto 30 sq.m) |
| 2 | Bakeries and Confectionaries | 30 sq.m | 18 mt. & above | A premises having an eclectic own/Bhatti for making Bakeries items & three marketing | |
| 3 | A. Banks<br>B. ATMS | 0.075 | A. 18 mt & above<br>B. 12 mt & above | A premise for office to perform banking function and operations | Bank, Watch, & Ward Residence (upto 30 sq.m), Commercial, Office, and Canteen |
| 4 | Bird Sanctuary | As per requirement | | A Premises used in form of a large park or forest for preservation and breeding of birds with all related facilities. | Park, Forest, Watch & ward residence (up to 30 sq.m. each) Restaurant. |
| 5 | Botanical Garden | As per requirement | | A premises in the form of a garden with plantation for research and exhibition. | Zoological gardens, Bird sanctuary, watch & ward residence ( up to 30sq.m.), Residential flat (for maintenance staff), Retail shop, and Restaurant . |
| 6 | Bus Stop | As per requirement | | Road side shade for passenger awaiting city buses | Bus stop for every 500 to 750 mt. interval and 100 mt. away from road crossing. |
| 7 | Children Traffic Park | As per requirement | 18 mt. & above | A premise in the form of park with facilities for introducing and educating children about traffic and signaling. | Children traffic park, Watch & ward residence (upto 30 sq.m.), Soft drink & Snack stall, Museum, Auditorium. |
| 8 | Cinema Hall | 0.25 | 30 mt. & above | A premise with facilities for projection of movies and stills with a covered space to seat audience. | Cinema, Watch & ward residence (upto 30 sq.m.), Administrative office, Soft drink & Snack stall, Museum, Auditorium. |
| 9 | Commercial Complex | 0.1 | 24 mt. & above | A premise having training facilities for Stenography, Correspondence, Record keeping, etc. | Commercial and Secretarial training centre, Watch & ward Residence (up to 30 sq.m.), Canteen. |
| 10 | Community Centre | 0.2 | 24 mt. & above | A premise having an enclosed space for various social and cultural activities of a residential area. | Community hall, Watch and ward residence (upto 30 sq.m), Soft drink and Snack stall. |
| 11 | Convenience | 0.1 | 18 mt. & | A group of shops not exceeding 50 in number in | Retail, Repair and Personnel service shop, |

| Permitted Use Premises in Tourism Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| | Shopping Centre | | above | residential area serving a population of 5000 persons. | Restaurant, clinic. |
| 12 | Cycle rickshaw/cycle/ cart / Auto/ Taxi stand | As per requirement | | | |
| 13 | Exhibition and Art Gallery | 0.1 | 18 mt. & Above | A premises with facilities for exhibition and display of paintings, Sculptures, Murals, Ceramics, handicrafts or products of a specific | Library, watch and ward residence (upto 30 sq.m), Canteen, Exhibition and Art Gallery, Auditorium. |
| 14 | Farm house/ environment friendly residence | 0.3 | 18 mt & above | A premise with low coverage, low height structure for residential use. | Farm house, Environment, Friendly residence, Watch & ward Residence (up to 30 sq.m.) In case of village roads building line to be established at 30mtr.from the centre of the road. |
| 15 | Fire Station | As per requirement | 18 mt. and above | A premise with facilities for fire fighting for a catchment area assigned to it. It may include residence of essential staff | Fire station, residential flat (for maintenance staff), hostel (for employees), and service workshop |
| 16 | Government Offices (Tourism Related) | As per requirement | 24 mt & above | A premises used for the office of union /State Government | Central government, State government, local government & Public undertaking office. Watch & ward residence ( upto Sq. m). retail shop, Chemist, Books and Stationery, Consumer store ( upto to 20 sq.m each on ground floor), canteen, bank Extension Counter , Post office Extension Counter. |
| 17 | Group Housing | 0.5 | 18 mt & above | A premises comprising of residential flats with basic amenities like Parking, Park, Convenience shops, Public utility etc. | Residential flat, Retail shop of confectionery, Grocery & General merchandise, Books & Stationary, Chemist, Barber, Swimming Pool, Play Area, Laundry, Tailor, Vegetable shop (on Ground floor with an area upto 20 sq.m. each). Crèche and day care centre, on ground floor with an area up ot 50 sq.m. & Gymnasium. |
| 18 | Guest House | 0.05 | 18 mt. & Above | A guest house is premises for housing the staff of Government, Semi-Government, Public undertaking and private limited company for short duration. | Guest house watch and wad residence (upto 30 sq.m.) personnel service shops of Barber, Launderer, Soft drink & Snack stall (upto 15 sq.m.). |

| Permitted Use Premises in Tourism Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| 19 | Gymnasium | 0.05 | 12 mt & above | | |
| 20 | Health Centre | 0.2 | 24 mt & above | A premise having facilities for treatment of indoor and outdoor patients having up to 30 beds. The health centre may be managed by a public or a charitable institution on non-commercial basis. | Health Centre watch and ward residence (upto 30 sq.m), Chemist shop (upto 15 sq.m each) |
| 21 | Hotels | 0.075 | 24 mt & above | A premises used for lodging of 15 persons or more on payment with or without meals | Hotel, Retail & Personnel service shops & Commercial office restricted to 5 % of the total floor area,Restaurant |
| 22 | Local shopping centre | 0.4 | 24 mt. & above | A group of shops not exceeding 75 numbers in residential area serving a population of 15,000 persons. | Retail , Repair and Personnel service shop, Informal sector unit, Commercial office, Cottage and Service industry, Clinical Laboratory, Clinic & Polyclinic,Restaurant, Soft drink & Snack stall, Post office and Bank extension counter, Nursing home and Guest house. |
| 23 | Medical Clinic | 0.02 | 12 mt & above | A premise with facilities for treatment of outdoor patients by a doctor. In Case of a polyclinic, it shall be managed by group of Doctors. | Clinic |
| 24 | Motel/ Holiday cottage & Resort | 0.4 | 18 mt & above | A premise designed and operated especially to cater to the boarding,<br>Lodging, rest and recreation and related activities of travellers by road.(With standard FAR only) | Hotels are permitted with ground coverage 20% & standard FSI |
| 25 | Multiplex | 0.25 | 30 mt. & above | A premise with facilities for projection of movies and stills with a covered space to seat audience. | Cinema, Watch & ward residence (upto 30 sq.m.), Administrative office, Soft drink & Snack stall, Museum, Auditorium. |
| 26 | Museum | 0.2 | 24 mt. & above | A premise with facilities for storage and exhibition of objects illustrating antiques, Natural History, Art, etc. | Museum, Exhibition centre and Art gallery, Auditorium and Open air theatre- Museum, Exhibition centre and Art gallery, Auditorium and open air theatre, Watch & ward residence (up to 30 sq.m.), Canteen. |
| 27 | Music Dance and Drama Training | 0.1 | 18 mt. & above | A premises having facilities for imparting training and coaching for Music, Dances and Dramatics. | Museum, Exhibition centre and Art gallery, Auditorium & Open air theatre, Museum, Exhibition |

| Permitted Use Premises in Tourism Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| | Centre | | | | centre & Art gallery, Watch & ward residence (up to 30 sq.m.), Canteen. |
| 28 | Open air theatre | 0.2 | 24 mt. & above | A premises having facilities for audience seating and a stage for performance and is open to sky. | Open air theatre, Watch & ward residence (up to 30 sq.m.), Canteen. |
| 29 | Park | - | - | A premise used for recreational leisure activities. It may have on it related landscaping, Parking Facilities, Public toilet, Fencing etc. it will include synonyms like Lawn, Open space, Green, etc. | Park, Soft drink & Snack stall (on the park with & above 1.0 hectare area). |
| 30 | Petrol and diesel Pump | As per norms | 24 mt. & above | A premise for sale of petroleum products to consumers. | Petrol pump, Soft drink & Snack Stall, Automobile repair shop. |
| 31 | Planetarium | 0.2 | 24 | A premise with necessary facilities and equipment for studying planets. | Planetariums watch & ward residence (upto30sq.m.), and cafeteria. |
| 32 | Plant Nursery | 0.05 | 12 mt. & above | It is a premise with facilities for rearing and sale of young plants. | Nursery, watch & ward Residence (upto 30 sq.m.). All structures shall be temporary in nature. |
| 33 | Plotted Housing | As per township policy | As per township policy | A premises for one or more than one dwelling unit and may have on it one main building block and one accessory block for garage/garages and servant quarters. | Residences, Convinent Shops (5% of saleable area), Park (15% of total scheme), road width not less than 12mt. |
| 34 | Police Post | As per requirement | 12 mt. & above | A premise having facilities for a local police post of a temporary nature or on smaller scale as compared to a police station. | Police post, Essential staff housing. |
| 35 | Post office | As per requirement | 18 mtr & above | A premise with facilities for postal communication for use by the public | Post office, Post & telegraph office, Watch & ward residence ( upto 30 sq.m ),Canteen |
| 36 | Professional Offices | 0.05 | 18 mt. & above | | |

| Permitted Use Premises in Tourism Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| 37 | Public utilities and building except services and storage yard | As per concerned Dept. norms | | (i) Overhead tank- A premises having an overhead tank for storage and supply of water to its neighbouring areas. It may or may not include a pump house.<br>(ii) Underground tank-A premises having an underground tank for storage and supply of water to its neighbouring areas. It may or may not include a pump house.<br>(iii) Oxidation pond- A premises having a tank used for the oxidation process for sewage and other waste. for the oxidation process for sewage and other waste.<br>(iv) Septic tank- A premises having an underground tank for collection of sewage and its consequent disposal.<br>(v) Sewage pumping station-A premises with a pumping station used for pumping sewage on to a higher gradient.<br>(vi) Public toilet and urinal- A premises having latrine and urinals for use of public. It may or may not include drinking water facility.<br>(vii) Electric sub – station – A premises having electrical installation and transformer for distribution of power.<br>(viii) Solid waste collection centre- A premises used for collection of garbage for its onwards transportation to sanitary landfill/disposal. | Public utility premises- Overhead tank, Underground tank, Oxidation pond, Septic tank, Sewerage pumping station, Public toilet urinal, Electric substation, Solid waste collection centre, Dhobi ghat. |
| 38 | Recreational Clubs | 0.2 | 24 mt. & above | A premise having facilities for recreational activities including indoor games | |
| 39 | Religious Premises | 0.05 | 18 mt. & above | A premise dedicated to accommodations and service of god or other objects of religious nature. It may have different nomenclature in different religions like temple (all faiths), Mosque, Church, | (i) Temple, (ii) Mosque, (iii) Church, (iv) Gurudwara, (v) Synagogue, (vi) Ashram, (vii) Bathing tank, (viii) Dargah and (ix) Charitable dispensary and Library. |

| Permitted Use Premises in Tourism Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| | | | | Gurudwara, Ashram. | |
| 40 | Restaurants | 0.05 | 24 mt. & above | A premises used for serving food items on commercial basis including cooking facilities. It may have covered or open or both for sitting arrangement. | Restaurants |
| 41 | Road/rail/air / transport booking office | 30 sq. mtr per counter | 18 mt & above | A premise for ticket booking facilities for Road/rail/air / transportation | Booking office |
| 42 | Taxi and Auto Stand | As per requirement | 24 mt & above | | |
| 43 | Trade Fair Ground | As per requirement | 24 mtr. & above | | |
| 44 | Traffic and Police control room | As per requirement | | A premises of temporary structure having facilities for the managing of traffic and low and order related issues. | Temporary traffic and Police control room |
| 45 | Transit visitors camp | 0.1 | 30 mt. & above | | Hotel, Retail & Personnel service shops & Commercial office restricted to 5 % of the total floor area,Restaurant |
| 46 | Water Pumping | As per PHED Norms | | In Facility Area | |
| 47 | Work place/ Offices (Only for Tourism Related Activities) | 0.1 | 18 mt & above | A premises used for offices of profit making organisation | Commercial offices, retail & Personnel service shop , Restaurant, Bank, Post & Telegraph office. |

| Permitted Use Premises in Tourism Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| 48 | Yoga Centre | 0.05 | 12 mt. & above Allowed in Residential Flats, Group Housing & on Standalone Basis | A premises having facilities for self attainment, achieving higher quality of mind and body, Spiritual and religious discourse etc. | Yoga centre, Meditation, Spiritual and Religious discourse centre- Yoga centre, Meditation, Spiritual and Religious discourse centre, Watch & ward residence (upto 30 sq.m.), Hostel, Soft drink & stall. |

### 4.11.9 Public/ Semi-public Use Zone (Knowledge City)

**Table 4-18** presents permitted uses premises within Public/ Semi-Public Use Zone.

***Permit Uses***

All kinds of educational uses are allowed (e.g. high schools, other services and non-residential institutions such as universities, congress facilities (convention centers, conference hall, auditorium), cultural facilities (exhibition centers), sports centres, research and development centres, medical (hospitals , health centres), retail shops, schools (nursery, primary, secondary senior secondary) residential use (apartments, group housing) and religious premises

The primary focus in the Knowledge City is on education, research, development. The Knowledge City is the exclusive part of the Investment Region with dedicated space for Research and Development for IT, Health and Bio-Tech companies and so on. To get the required vibrant mix there is also a significant residential component. There will be green areas for parks, and larger open spaces for sports-science campuses. Throughout this part of the region there is also an integrated mixed-use for office and commercial purposes.

***Development Control Regulations***

The area is divided in 3 zones. These are determined by different building heights. The structure of ring roads of 60m should host commercial services. Some areas are adjacent to existing Abadies, these should be embedded in the structure. The same principle is followed as mentioned in earlier paragraph. Existing roads to these villages should also be integrated in the urban fabric.

Around the central area is a concentration of high buildings. From the centre, the zone decrease height to 6 floors and 2.5 floors.

Zone 1; along park continuous upto 25 floors, other upto 10, 20% of the area is allowed to establish 15 floors ;

Zone 2; upto 6 floors, 20 % allowed 15 floors;

Zone 3; along 60m and 40 m roads upto 5 floors, other 2.5 floors.

***Architecture***

A lively city is not only determined by its functional lay-out, also the image is crucial. Repetition of architecture should be avoided. Buildings should enhance orientation. Variation of architecture is promoted.

Commercial plinths of building will generate liveliness. Its continuity is essential for the visibility of different shops. To achieve continuous streetscape buildings should be aligned along 5m set back lines of main roads. To achieve a differentiated streetscape buildings longer than 100 m are not allowed. This also will enhance orientation and localization of private addresses.

***Parking***

According to the uses parking area should be provided. The amount of parking space is given in **Table 4.21, Chapter 4.12**. Parking facilities should be established on private land. Only multi-stories parking is allowed when it is not visible from public areas such as streets, roads, squares, parks, or pocket parks. For instance, these can be designated inside buildings. Fencing facades by green is also allowed if the building is limited to 2 floors.

***Sustainable Features***

Getting the area urbanized will put a load on environment. For this compensation or limitation of the demand of energy should be achieved as well as efficient water treatment. For all areas rainwater harvesting should be established. All rainwater that falls on any place at the site should be collected or penetrated in soil. Use of energy should be limited or compensated by making use of rooftops, by covering them with solar panels. The percentage of rooftops that should be covered by these panels is given in **Chapter 4.14**.

**Figure 4-8: Mass study**

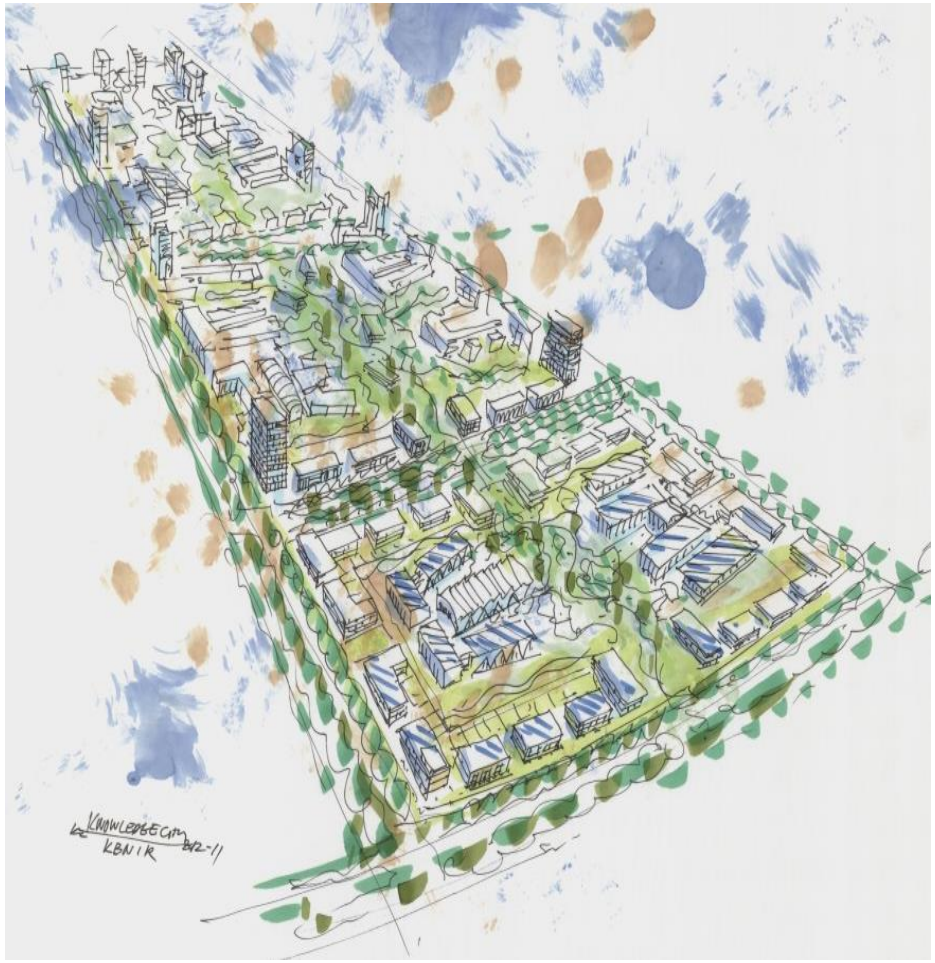


**Figure 4-9: Public/ Semi-Public Area KBNIR**

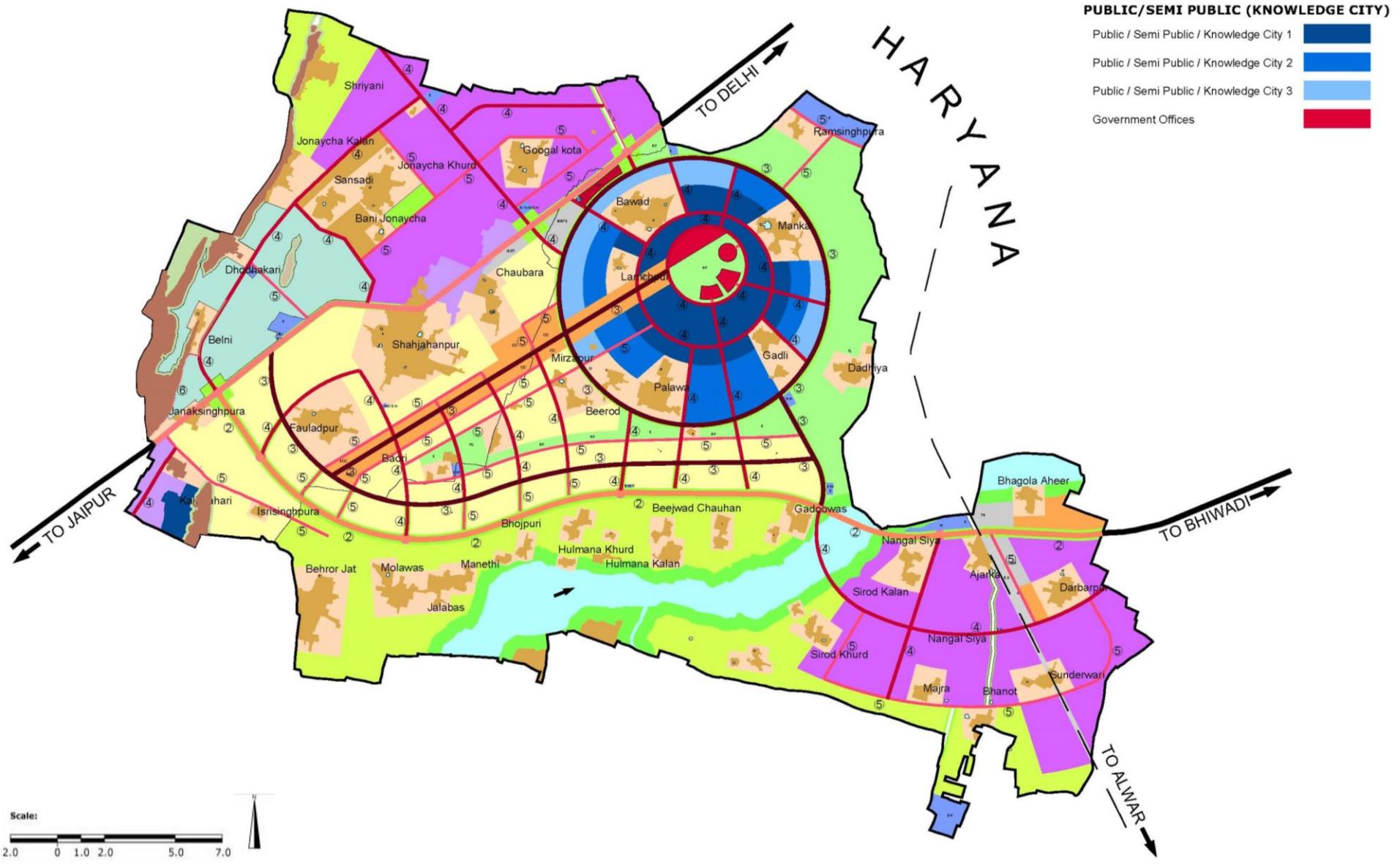


**Table 4-15: Development Control Regulations for Public/ Semi-public (Knowledge City) 1**

| Development Control Regulations for Public/ Semi-public (Knowledge City) 1 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum area for green** | **Broad land-use classification** |
| **K1.1** | 80 or 60 m along central green | 2.0 | 40 % | Equal to R/W | 30-100 Or 2/3 of the plot length | **Up to 15m:** F: 4.5 m - R: 3 m - S: 3 m - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants, Offices, governmental offices Apartments; Hostel, Hotels Library; Health Club; Public Facility/Infrastructure/ Utility Building, hospital |
| **K1. 2** | 80 or 60 | 2.0 | 40 % | Equal to R/W | 30-100 Or 2/3 of the plot length | **Up to 15m:** F: 4.5 m - R: 3 m - S: 3 m - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants, Offices, Apartments; Hostel, Hotels Library; Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building, hospital |
| **K1.3** | 45 to 18 | 2.0 | 40 % | Equal to R/W | 30-100 Or 2/3 of the plot length | **Up to 15m:** F: 4.5 m - R: 3 m - S: 3 m - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants, Offices, Apartments; Hostel, Hotels Library; Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building |

| Development Control Regulations for Public/ Semi-public (Knowledge City) 1 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum area for green** | **Broad land-use classification** |
| **K1.4** | Less than 18 | 2.0 | 45 % | Equal to R/W | 30-100 Or 2/3 of the plot length | **Up to 15m:** F: 4.5 m - R: 3 m - S: 3 m - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants, Offices, Apartments; Hostel, Hotels Library; Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building |

**Table 4-16: Development Control Regulations for Public/ Semi-public (Knowledge City) 2**

| Development Control Regulations for Public/ Semi-public (Knowledge City) 2 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum area for green** | **Broad land-use classification** |
| **K2. 1** | 80 or 60 Central park | 2.0 | 40 % | G + 4 floors, 20% G+14 floors, or Equal to R/W, within the max. allowed building height | 30-100 Or 2/3 of the plot length | **Up to 15m:** F: 4.5 m - R: 3 m - S: 3 m - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants, Offices, governmental offices Apartments; Hostel, Hotels Library; Health Club; Public Facility/Infrastructure/ Utility Building, hospital |

| Development Control Regulations for Public/ Semi-public (Knowledge City) 2 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum area for green** | **Broad land-use classification** |
| **K2.2** | 80 or 60 | 2.0 | 40 % | G + 4 floors, 20% G+14 floors, or Equal to R/W, within the max. allowed building height | 30-100 Or 2/3 of the plot length | **Up to 15m:** F: 4.5 m - R: 3 m - S: 3 m - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants, offices Apartments; Hostel, Hotels Library; Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building, hospital |
| **K2.3** | 45 to 18 | 2.0 | 40 % | G + 4 floors, 20% G+14 floors, or Equal to R/W, within the max. allowed building height | 30-100 Or 2/3 of the plot length | **Up to 15m:** F: 4.5 m - R: 3 m - S: 3 m - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants, offices Apartments; Hostel, Hotels Library; Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building |
| **K2.4** | Less than 18 | 2.0 | 45 % | G + 4 floors, 20% G+14 floors, or Equal to R/W, within the max. allowed building height | 30-100 Or 2/3 of the plot length | F: 4.5 m - R: 3 m - S: 3 m - | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants, offices Apartments; Hostel, Hotels Library; Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building |

**Table 4-17: Development Control Regulations for Public/ Semi-public (Knowledge City) 3**

| Development Control Regulations for Public/ Semi-public (Knowledge City) 3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum area for green** | **Broad land-use classification** |
| **K3. 1** | 80 or 60 | 0.7 | 40 % | G + 4 floors, or Equal to R/W, within the max. allowed building height | 30-100 Or 2/3 of the plot length | **Up to 15m:** F: 4.5 m - R: 3 m - S: 3 m - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 100 % | All begin at the setback line | 15 % of site minimum 100 m2 | University Campus; Hotel, café , restaurants, offices Apartments; Hostel, Hotels Library; Health Club; Public Facility/Infrastructure/ Utility Building, hospital |
| **K3.2** | 45 to 18 | 0.7 | 40 % | G + 4 floors, or Equal to R/W, within the max. allowed building height | 30-100 Or 2/3 of the plot length | **Up to 15m:** F: 4.5 m - R: 3 m - S: 3 m - **Above 15 m:** F: 9.0 m - R: 1/3 of ht - S: 1/3 of ht - | 100 % | All begin at the setback line | 15 % of site minimum 100 m2 | University Campus; Hotel, café , restaurants, offices Apartments; Hostel, Hotels Library; Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building, hospital |
| **K3.3** | Less than 18 | 0.7 | 45 % | G + 1.5 or Equal to R/W, within the max. allowed building height | 30-100 Or 2/3 of the plot length | F: 4.5 m - R: 3 m - S: 3 m - | 100 % | All begin at the setback line | 15 % of site minimum 100 m2 | University Campus; Hotel, café , restaurants, offices Apartments; Villa/Bungalow; Row House Hostel, Hotels Library; Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building |

**Table 4-18: Permitted Use Premises in Public/ Semi-Public Use Zone**

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 1 | Adult education centre | 0.02 | 12 mt. & above | A premises having the facilities of formal education and training to adult with flexible timings. | Flexible use gives to a Primer school, Community centre or on such community buildings. |
| 2 | Anganwari | 0.02 | 12 mt. & above | Anganwari as a space provision of residential housing / neighborhood level is a centre for provide service for children of six years age, pregnant woman , Feeding mother etc. under the integrated child development scheme ( ICBS) | Kitchen , Toilet and Hall |
| 3 | Auditorium | 0.5 | 24 mt. & above | A premises having an enclosed space to seat audience and stage for various performance like concerts ., play , Recitals, Functions, etc. | Museum, Exhibition centre and Art gallery,Auditorium and Open Air theatre, watch & ward residence ( up to 30sq.m.) , Canteen |
| 4 | Bank | 0.075 | 18 mt. & above | A premises for office to perform banking function and operations. | Bank , watch & ward residence ( up to 30 sq. m.), Commercial office , and Canteen. |
| 5 | Banquet hall | 0.2 | 24 mt. & above | A premises to hold small public gathering Community functions, Marriage etc. | Hall for public gatherings, Marriages, Cooking facilities and Other logistics. |
| 6 | Botanical Garden | As per requirement | | A premises in the form of a garden with plantation for research and exhibition. | Zoological gardens, Bird sanctuary, watch & ward residence ( up to 30sq.m.), Residential flat (for maintenance staff), Retail shop, and Restaurant . |
| 7 | Cinema | 0.25 | 30 mt. & above | A premise with facilities for projection of movies and stills with a covered space to seat audience | Cinema, watch & ward residence (Upto 30 sq.m). Administrative office ,soft drink & snack stall, Museum, Auditorium |
| 8 | Civil defence home ground | As per requirement | 24 mt. Above | A premises having facilities for office and other facilities or civilian organization for internal defence. | Civil defence and home guard, Residential flat for maintenance staff), Hostel , Play ground. |
| 9 | Clinic | 0.02 | 18 mt. & above | A premises having facilities for treatment of outdoor by a doctor. In case of a polyclinic, it shall be managed by a group of doctors. | Clinic |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 10 | Clinic Laboratory | 0.02 | 18 mt. & above | A premise with facilities for carrying out various tests for confirmation of symptoms of a disease. | Clinic Laboratory, Soft drink & Snack stall. |
| 11 | College 1. Medical college 2. Engg. College 3. General college | 1. As per norms of medical council of India 2. As per AICTE norms 3. AS UGC norms | 30 mt. & above | A premises having educational and playing facilities for students of under graduated and post graduated courses under a university. It includes all professional disciplines | School and College residential flat (for maintenance staff), Institutional hosted , Retail shops of 15 sq. m. each (Confectionery, Grocery, General merchandise, Books & Stationary, Chemist, barber, Launderer, Vegetable), Canteen, Bank extension counter, Auditorium, Indoor games hall, Swimming pool, Play ground, Post office counter facilities. |
| 12 | Commercial & Secretarial Training centre | 0.1 | 24 mt. & above | A premises having training facilities for Stenography , Correspondence , Record keeping etc. | Commercial & Secretarial Training centre watch & ward residence ( up to 30sq.m.), Canteen. |
| 13 | Conference hall / centre | 0.2 | 24 mt. & above | A premises having all facilities for a conference meeting, symposium, etc., where a number of different countries may also be participating. | Conference centre, watch & ward residence ( up to 30sq.m.) Residential flat( for maintenance staff) , Restaurant , Bank , Post & Telegraph office , Library , Exhibitions centre , |
| 14 | Convention centre | As per requirement | 30 mt. & above | A premises having all facilities for International / National conference ,Meetings , Symposium etc. | Internal National convention centre watch & ward residence (up to 30sq.m.) Restaurant, Bank, Post & Telegraph office, Library, Exhibitions centre , Golf course |
| 15 | Crèche and day care center | 0.05 | 12 mt. & above | A premises having nursery facilities of infants during day time. The centre may be managed by an individual or an institution on commercial or non – commercial basis. | Crèche and day care center Watch & ward residence ( up to 30sq.m.) |
| 16 | Cremation / Burial ground | The site for cremation ground shall be identified in locations which are not in | 18 mt.& above | A premise with facilities of performing last rites of dead bookies by burning. | Burial ground, Cremation ground , cemetery a Crematorium , Retail shops , wood, Flowers and related materials. Watch & ward Residence ( up to 20 sq. m.) |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| | | proximities to residential area. | | | |
| 17 | Cultural and Information centre | 0.25 | 18 mt. & above | A premises with facilities for cultural and information services for an institution, State and Country. | Cultural and Information centre watch & ward residence (up to 30sq.m.), Hostel, Canteen, Bank extension counter facility, Auditorium (up to 500 v seating capacity) library, Exhibition and Art gallery. |
| 18 | Cycle rickshaw/cycle/ cart stand | As per requirement | | | |
| 19 | Dharamshala | 0.05 | 18 mt. & above | A premises providing temporary accommodation for short duration on no- profit basis; | Dharamshala, Personal service shop of barber & Launderer, soft drink & snack bar( up to 15 sq. m.). |
| 20 | Disaster management centre | As per requirement | 24 mt. & above | A premises having facilities of training for emergency backup hospital facility training centre for disaster preparedness wireless communication etc. | Disaster management training centre, open ground for practice and relief camps communication centre, Hostels, Staff residence fire station. Watch and ward residence ( up to 30 sq.mt.) etc. |
| 21 | Dispensary | 0.02 | 12 mt. and above | A premises having facilities for medical advice and provision of medicines managed by public or charitable institutions. | Dispensary, Soft drink & Snack stall. |
| 22 | District Police office and Battalion | As per requirement | 24 mt. & above | A premises having facilities for the offices and paramilitary forces. | District police office and Civil defence & Home guard, Residential flat (for maintenance staff) Hostel, Play ground, Canteen, Bank extension counter. |
| 23 | Dobhi ghat, machine laundry public utility premises | Sites which have appropriate arrangement for water and drainage facilities and it shall be ensured that | | A premises use for cleaning and drawing of cloths and liner and PU. | Overhead, Underground tank for Oxidation pond , Septic tank, Sewerage, Pumping station , Public toilet and Urinal, Electric substation , Machine laundry. |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| | | the water bodies are not polluted as a result of such activities. | | | |
| 24 | Exhibition centre and Art gallery | 0.1 | 18 mt. & above | A premises with facilities for exhibition and display of paintings, Sculptures, Murals, Ceramic, Handicrafts or products of a specific class. | Museum, Exhibition centre and Art gallery, Auditorium and Open Air theatre, watch & ward residence ( up to 30sq.m. ) , Canteen |
| 25 | Fire post | As per requirement | | A premises with lesser degree of facilities or fire fighting. The post may be attached to specific premises with fire prone activities. | Fire post |
| 26 | Fire station | As per requirement | 18 mt. & above | A premises with facilities for fire fighting for a catchment area assigned to it. It may include residence of essential staff | Fire station, residential flat (for maintenance staff), hostel (for employees), and service workshop. |
| 27 | Fire training institute | As per requirement | 18 mt. & above | A premises having facilities of training for emergency uses in case of fire building collage etc. | Fire training centre hostels staff residence open practice grounds fire stations , watch and ward residence ( up to 30 sq.mt. ) etc. |
| 28 | Forensic science laboratory | As per requirement | 12 mt. & above | A premises containing facilities for application of medical knowledge to legal problems. | Forensic science laboratory |
| 29 | General and head post office with administrative office with. without delivery office | As per requirement | 24 mt. & above | A premises with facilities for postal and telecommunication to and from a no of post offices attached to it. | Head post office, General post office, watch & ward residence (up to 30 sq.m.), Canteen. |
| 30 | Guest House | 0.05 | 18mt. & above | A guest house is premises for housing the staff of Government , semi- Government public undertaking and private limited company for short duration; | Hostel , Guest House , Boarding house and loading house Watch & ward residence (up to 30 sq.m.) personal service shops of Barber, Launderer, Soft drink & Snack stall (up to 15sq.m.) |
| 31 | Government Offices | As per requirement | 24 mt & above | A premises used for the office of union /State Government | Central government, State government, local government & Public undertaking office. Watch & ward residence ( upto Sq. m). retail |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| | | | | | shop, Chemist, Books and Stationery, Consumer store ( upto to 20 sq.m each on ground floor), canteen, bank Extension Counter , Post office Extension Counter. |
| 32 | Hospital (i) 500 beds & above (ii) 201 to 500 beds (iii) 101 to 200 beds (iv) up to 100 7 beds | 6.00 4 – 6.00 1.00 – 2.50 (Area requirements may be relaxed looking to the non availability of Land ) | 30 mt. & above | A premises providing medical facilities of general or specialized nature for treatment of indoor and outdoor patients. | Hospital, Residential flat ( employees and service personal ) , institutional hostel , Medical college, Retail Shop (Confectionary , Grocery & general merchandise , Books and Stationary , Barber , Launderer, Vegetable). |
| 33 | Health Centre ( including family welfare centre) | 0.20 – 0.30 | 24 mt. & above | A premises having facilities for treatment of indoor and outdoor patients having up to 30 beds. The health centre may be managed by a public or a charitable institution on non – commercial basis. It includes family welfare centre. | Health centre, Nursing home, watch & ward residence ( up to 30 sq.m. each ), Chemist shop (up to 15 sq.m. each). |
| 34 | Health Centre | 0.2 | 24 mt. & above | A premise having facilities for treatment of indoor and outdoor patients having up to 30 beds. The health centre may be managed by a public or a charitable institution on non- commercial basis. It includes family welfare centre. | Health Centre, Nursing home , watch & ward residence ( up to 30 sq.m. each ), Chemist shop (up to 15 sq. m. each). |
| 35 | Hostel | 0.05 | 18 mt. & above | A premises in which rooms attached to ‘ Institutions’ or otherwise are let out on a long term basis; | Hostel , Guest House , Boarding house and Loading house , watch & ward residence( up to 30 sq.m.) personal service shops of Barber Launderer, Soft drink & Snack stall ( up to 15 sq. m.) |
| 36 | A. Integrated residential school with hostel facility<br>B. Integrated residential school with out hostel facility | As per norms of education deptt. | 24mt. & above | A premises having educational and playing facilities for student’s up to XII standard. It shall have boarding facilities for students and may have residence for faculty members. | School and College Residential flat (for maintenance staff), Institutional hosted , Retail shops of 15 sq. m. each (Confectionery, Grocery, General merchandise , Books & Stationary, Chemist, barber, Launderer, Vegetable), Canteen , Bank extension counter , Auditorium , Indoor games hall , |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| | | | | | Swimming pool , Play ground,, Post Office counter facility. |
| 37 | Indoor games stadium | 0.25 | 24 mt. & above | A premises for indoor stadium with play area and spectator seating including related facilities for players. | Stadium, Local Government office (maintenance), Watch & ward residence ( up to 30sq.m.), Residential Flat (for maintenance staff) Retail shop , Restaurant. |
| 38 | IT/ ITES Unit (engaged in research & development) | 0.02 & more | 18 mt & above | A Premise in which I.T unit is being run. | I.T unit office watch and ward. |
| 39 | Jail | As per requirement | 24 mt. & above | A premises having facilities for detention, confinement and reform of criminals under the law. | Jail |
| 40 | Library | 0.05 | 12 mt. & above | A premises having a large collection of books for reading and reference for general public or specific class. | Library, watch & ward residence (up to 30 sq.m.), Canteen, Exhibition and Art gallery, Auditorium. |
| 41 | Local Shopping Centre | 0.4 | 24 mt. & above | A group of shops not exceeding 75 numbers in residential area serving a population of 15,000 persons. | Retail , Repair and Personnel service shop, Informal sector unit, Commercial office, Cottage and Service industry, Clinical Laboratory, Clinic & Polyclinic,Restaurant, Soft drink & Snack stall, Post office and Bank extension counter, Nursing home and Guest house. |
| 42 | Motor driving school | 0.1 | 24 mt.& above | A premise having facilities for training of driving automobiles. | Motor driving training centre, Watch & ward residence ( up to 30sq.m.) , Soft drink & snack Stall. |
| 43 | Motor garage and workshop | 0.05 | 24 mt. & above | A premise for serving and repair of automobiles. | |
| 44 | Multiplex | 0.2 | 30 mt. & above | A premise with facilities for projection of movies and stills with a covered space to seat audience. | Cinema, Watch & ward residence (upto 30 sq.m.), Administrative office, Soft drink & Snack stall, Museum, Auditorium. |
| 45 | Multipurpose community hall | 0.2 | 24 mt. & above | A premises having an enclosed space for various social and cultural activities of a residential area. | Community hall, Watch & ward residence ( up to 30sq.m.), Soft drink & snack stall. |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 46 | Museum | 0.2 | 24 mt. & above | A premises with facilities for storage and exhibition of object illustrating antiques, Natural history , art , etc. | Museum, Exhibition centre and Art gallery, Auditorium and Open Air theatre, watch & ward residence ( up to 30sq.m. ) , Canteen |
| 47 | Music, Dance & Drama training centre | 0.1 | 18 mt. & above | A premises having facility for importing training and coaching music dance & dramatics. | Music, Dance & Drama training centre Watch & ward residence ( up to 30sq.m.), Canteen & Auditorium |
| 48 | Night shelter | | 18 mt. & above | A premises providing night accommodation to individuals without any charges or with taken charges. It may be run by local government or voluntary agencies. | Night shelter |
| 49 | Nursing home /Maternity home / Poly –clinic | 0.1 | 24 mt. & above | A premises having facilities for indoor and outdoor patients having up to 30 beds. It shall be managed by a doctor or a group of doctors. | Health centre, Nursing home , watch & ward residence ( up to 30 sq.m. each ), Chemist shop (up to 15 sq.m. each). |
| 50 | Observatory & Weather office | 0.1 | 18 mt. & above | Is a premise with facilities for research and development of data relating to weather and forecasting thereof. | Observatory & Weather office watch & ward Residence ( up to 30sq. m. ) |
| 51 | Old age home / care centre for physically / mentally / challenged/ working woman / men Hostel | 0.1 | 18 mt. & above | | |
| 52 | Open Air Theatre | 0.2 | 24 mt. & above | A premises having facilities for audience seating and a stage for performance and is open to sky. | Museum, Exhibition centre and Art gallery, Auditorium and Open Air theatre, watch & ward residence ( up to 30sq.m. ) , Canteen. |
| 53 | Orphanage | 0.05 | 12 mt. & above | A premises with facilities for boarding of children who are bereaved of parents. It may or may not have educational facilities. | Boardind house, school, watch and ward (up to 30 sq.m) |
| 54 | Outdoor games stadium | 2 | 24 mt. & above | A premises for outdoor games with pavilion building and stadium structure to seat spectators including related facilities for players. | Stadium, Local Government office (maintenance), Watch & ward residence ( up to 30sq.m.), Residential Flat (for maintenance staff) Retail shop , Restaurant. |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 55 | Planetarium | 0.2 | 24 mt. & above | A premises with necessary facilities and equipment for studying and Country. | Planetariums watch & ward residence ( up to 30sq.m. ) , and Canteen |
| 56 | Play Ground | | | A premises used for outdoor games. It may have on it landscaping , Parking facilities , Public toilet , etc. | Play Ground |
| 57 | Police line | As per requirement | 24 mt. & above | An area having facilities for work and residential accommodation of paramilitary forces. | Police line and Related facilities |
| 58 | Police post | As per requirement | 12 mt. & above | A premises having facilities for a local police post of a temporary nature or on smaller scale as compared to a police station. | Police post, Essential staff housing. |
| 59 | Police Station | As per requirement | 18 mt. & above | A premises having facilities for the offices of local police station. | Police station, Essential staff housing. |
| 60 | Police training institute / College ( include central security forces) | As per requirement | 30 mt. & above | A premises having facilities for training of paramilitary forces. | Training Institute residential flat (for maintenance staff ) Hostel, retail shops of area 20 sq. mt. each Confectionary , Grocery , Books & stationary, Chemist, Barber, Laundry, Vegetable, Canteen , Bank extension counter, Auditorium for Indoor & Outdoor games, Swimming pool, play ground post office, counter facility. |
| 61 | Post and telegraph office | As per requirement | 18 mt.& above | A premise with facilities for Postal and telecommunication for use by the public | Post office, Post & Tele graph office, Watch & ward residence ( up to 30 sq. m.) |
| 62 | Post office | As per requirement | 18 mt.& above | A premise with facilities of postal communication for use by the public | Post office , Post & Telegraph office , Watch & Ward residence ( up to 30 sq.m.), Canteen |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 63 | Public utility buildings | As per concerned deptt. norms. | | (i) Overhead tank – A premises having an overhead tank for storage and supply of water to its neighboring areas. It may or may not include a pump house.<br>(ii) Underground tank – a premises having an underground tank for storage and supply of water to its neighbouring areas. It's may or may not include a pump house. (ii) Oxidation pond – A premises having a tank used for the oxidation process for sewerage and other waste.<br>(iii) septic tank – A premises having an underground tank for<br>(iv) Sewerage pumping station – A premises with a pumping station used for pumping sewerage on to a higher gradient.<br>(v) Public toilet and urinal – A premises having latrine and urinals for use of public. It may or may not include drinking water facility.<br>(vi) Electric sub – station – A premises having electrical installation and transformer for distribution of power.<br>(vii) Solid waste collection centre – A premises used for collection of garbage for its onwards transportation to sanitary landfill / disposal.<br>(viii) Dhobi ghat- A premises used for cleaning and drying of cloths/ linen by washer man. | Public utility premises – overhead tank, Underground tank, oxidation pond , septic tank , Sewerage Pumping station ., Public toilet urinal , Electric substation, Solid waste collection centre, Dhobi ghat. |
| 64 | Recreational club | 0.2 | 18 mt. & above | A premises used for gathering of group of persons for social and recreational purpose with all facilities. | Recreational club, Recreational club Watch & ward residence (up to 30sq.m.), Residential flat (for maintenance staff ), Swimming pool . Indoor and Outdoor games facilities. |
| 65 | Radio and Television station | As per requirement | 24 mt. & above | Is a premise with facilities for recording, broadcast and transmission of news and other programs through the respective medium . It may include some hostel accommodation for guest artists, | Radio and Television station, watch & ward residence (up to 30sq. mtr), Hostel , Canteen , Library . |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| | | | | transmission facilities like towers. | |
| 66 | Reformatory | 0.05 | 18 mt. & above | A premises with facilities for behavioral reforms. | Reformatory and orphanage Residential Flat (for maintenance staff). Hostel, Personnel service (up to 20 sq.m.) |
| 67 | Religious / premises/building | 0.05 | 18 mt. & above | A premises dedicated to the service of the objects of religious nature it may have different nomenclature in different religions / faiths. | Temple, mosque, church, gurudwara etc. charitable dispensary, library. |
| 68 | Research & Development centre | 0.1 | 18 mt. & above | A premises providing facilities for research and development for any specific field. | Research & Development centre watch & ward residence ( up to 30 sq.m.) Residence flats of maintainer's staff, Hostel canteen, bank extension counter, Library, Post office, and Other facility. |
| 69 | Residential flat and residential plot – group housing ( for staff and employees) | As a part of the campus in public / semi – public use. | 24 mt. & above | Residential accommodation for one family ( one household ) which may occur as a part of group housing or independently .( for the use of staff & employees of the Public & Semi – Public use). | Residence , Professional activity ( as given in residential plot ( 1) |
| 70 | Restaurant | 0.5 | 18 mt. & above | Restaurant "Road transport booking office ' – A premises used for the offices of a road transport agency. | Restaurant |
| 71 | Retail and repair shop (convenient shopping) | 9 sq. mt. | 12 mt. & above | A premises equivalent of a retail shop , repair of household goods, Personal service shop electronic gadgets, Automobiles , Cycles, etc. | Retail shop , Repair shop , Personal service shop, Restaurant Clinic. |
| 72 | Road / Rail / Air ticket Booking & reservation office. | 25 sq. mt. per counter | 12 mt.& above | A premise used for the offices of a road transport agency. | Railway and road transport Booking office, storage. |
| 73 | Satellite and telecommunication centre | As per requirement | 18 mt. & above | Is a premises with facilities for research and development of satellite and telecommunication technology. | Satellite and telecommunication centre and Observatory & weather office , residential flat (for maintenance staff.), Canteen , Research laboratory. |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 74 | Schools<br>1. Nursery<br>2. Primary<br>3. Secondary<br>4. Senior Secondary | 0.05<br>(As per norms of education deptt.) | 12 mt.<br>18 mt.<br>18 mt.<br>18 mt. | · A premises having nursery facilities for infants during day time. The centre may be managed by an individual or an institution on commercial or non commercial basis.<br>A premises having educational and playing facilities for student's up to V standard.<br>A premises having educational and playing facilities for student's up to VIII standard.<br>A premises having educational and playing facilities for student's up to XII standard | School and College Residential flat (for maintenance staff), Institutional hosted , Retail shops of 15 sq. m. each (Confectionery, Grocery, General merchandise , Books & Stationary, Chemist, barber, Launderer, Vegetable), Canteen , Bank extension counter , Auditorium , Indoor games hall , Swimming pool , Play ground, Post Office counter facility. |
| 75 | Social and Cultural institute | 0.1 | 18 mt. & above | A premises with facilities for activities of socio – cultural nature run by a public, Voluntary or individual on primary non – commercial basis. | Social and Cultural institute watch & ward residence ( up to 30sq.m. ) Soft drink & Stall , Restaurant , , Bank extension counter facility, Canteen, Auditorium , Library, Music, drama training centre, Museum, Exhibition and Art gallery. |
| 76 | Social welfare centre | 0.1 | 18 mt. & above | A premises with training facilities for hotel management discipline it shall be ran by public / private body. It includes training come work centre. | Social welfare centre Watch & ward residence (up to 30sq.m.), Canteen, Exhibition – cum – sale counter. |
| 77 | Swimming pool | | 18 mt. & above | A premise with related facilities for swimming and spectators seating which shall vary with size, standard and purpose. | Swimming pool, Watch & ward and maintenance staff residence, Restaurant. |
| 78 | Telephone Exchange | As per requirement | 18 mt. & above | Is a premise having facilities for central operation of telephone system for a designed area. | Telephone Exchange, Watch & ward residence (up to 30 sq.m.), Canteen. |
| 79 | Trade Fair Ground | As per requirement | 24 mt. & above | | |
| 80 | Traffic and Police control room | As per requirement | | A premises of temporary structure having facilities for the managing of traffic and low and order related issues. | Temporary traffic and Police control room |
| 81 | Transmission tower / wireless station | As per requirement | 18 mt. & above | Is a premises used for installation of a tower for communication purpose. | Transmission tower, watch & ward residence (up to 30 sq.mt.) |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 82 | University | As per UGC norms | 45 mt. & above | A premises having an educational institution designed for instruction examination or both of students in many branches of advanced learning conferring degrees in various faculties , and often embodying colleges and similar institutions | Educational Institution Colleges Residential Flat (for maintenance staff) Institutional Hostel, Retail shops of area 20 sqm each (Confectionery, Grocery , General merchandise , Books & Stationary) Chemist, barber, launderer, vegetable, Residential , Library , Bank extension counter , Auditorium . Post office extension counter facility, Canteen, Indoor games hall. |
| 83 | Veterinary hospital for pet animals & birds | As per requirement | 30 mt. & above | A premises providing treatment for indoor and outdoor sick animals. | Veterinary hospital , residential flat (for employees and service personal ) , institutional hostel, Veterinary college ,Retail shop (Confectionery , Grocery , General merchandise , Books & Stationary , barber , Launderer ). |
| 84 | Veterinary Institute | As per norms | 24 mt. & above | A premises having educational and playing facilities for students of under graduate & post graduate courses along with research facilities under a university. | College , Residential flat ( for maintenance staff), Institutional hostel, Retail shops of area 20 sqm. each (Confectionery, Grocery) . |
| 85 | Voluntary health service | 0.05 | 18 mt. & above | A premises having medical facilities for treatment of outdoor patients and other like blood bank, etc. by voluntary institutions. This service may also take the form of temporary camp with charitable motive. | Voluntary health service, Watch & ward residence (up to 30 sq . mt. Administrative office,. Dispensary, Canteen. |
| 86 | Yoga Centre | 0.05 | 12 mt. & above | A premises having facilities for self attainment, Achieving higher quality of mind and body, Spiritual and religious discourse etc. | Yoga Centre & Meditation, Spiritual and religious discourse centre hall, Watch & ward residence ( up to 30sq.m.), Hostel , Soft drink & stall. |
| 87 | Zoological garden / Aquarium | As per requirement | | A premises in the form of a garden or park or aquarium with a collection of animals , species and birds for exhibition and study. It shall include all related facilities. | Zoological garden Watch & ward residence ( up to 30 sq.m.) Residential flat, Retail shop, Restaurant. |

### 4.11.10 Government Use Zone

**Table 4-20** presents permitted uses premises within Government Use Zone.

The center of the Knowledge City will host a variety of functions. This Civic centre is a vibrant and lively place where people meet and interact.
The area is situated in the heart of the Public/ semipublic area and is embedded in green/ park. It is meant to cover various governmental activities. These are for instance conference centers, government offices (town hall), communication centers, but also restaurants and museums are allowed.

***Development Control regulations***
The centre is a monumental place designated as park with a limited number of monumental buildings. The buildings will be lower than those along the outside of central ring. The maximum height is 5 floors including ground floor and the coverage is limited to 70%. **(Table 4-19).**

***Architecture***
To articulate the governmental status buildings should be recognisable by its architecture.. Surrounded by the monumental green central area of the Knowledge City the buildings are clustered have a direct relation with the green of the park. Set-backs from the main roads are at least 15m to articulate its positioning in the green..

### 4.11.11 Permitted Use Premises in Transportation Use Zone

Railway station, Bus terminus, Multi modal transit station & Transport nagar has been proposed in land use plan. While planning for these areas the related activities like godowns, petrol pump, police post, restaurant, retail shops, booking offices, workshops, post and telegraph, motor garage, medical clinics, bank, fire station, hotel, cinema hall, limited housing, guest house etc. can be provided in an integrated manner. However these activities shall not be permissible as individual activity.

***Permit Uses***
Main use of transportation area (besides transport) is green area. Additional to this, solar power can be generated. Partial commercial and office buildings can be established.

The area covering the expressway NH8 should provide rapid car transport from the New City to north and south. Adjacent to the road at both sides a green buffer has to be established. In this 30 m zone no permanent structures are allowed that might block future highway related development. Green zones and solar plants are adjacent to this zone.

Since this zone is the window from the cars on NH8 to the New City, a green buffer accompanies the road. It should express its ambitions being vibrant city, a pleasant living environment dealing with modern features on sustainability. Outside the 30 m reservation area, but within the 500 m buffer zone, a limited number of buildings are allowed. These buildings are accessed by a rear access road to avoid car traffic in the green buffer zone.

**Table 4-19: Development Control Regulations for governmental (Knowledge City)**

| Development Control Regulations for governmental (Knowledge City) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building lenght** | **Minimum Setbacks (Front-Rear-Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum area for green** | **Broad land-use classification** |
| **G** | 60 | 2.0 | 40 % | Equal to R/W | 300m | 15m – 9m – 9m | 50 % | free | 35 % of site | Governmental offices, civic centres, Conference, culture and expo centres, museum, restaurant, trade fair ground |

**Table 4-20: Permitted Use Premises in Government Use Zone**

| Permitted Use Premises in Government Use Zone | | | | | |
|---|---|---|---|---|---|
| **SlNo.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 1 | Auditorium | 0.5 | 24 mt. & above | A premises having an enclosed space to seat audience and stage for various performance like concerts ., play , Recitals, Functions, etc. | Museum, Exhibition centre and Art gallery,Auditorium and Open Air theatre, watch & ward residence ( up to 30sq.m.) , Canteen |
| 2 | Bank | 0.075 | 18mt. & above | A premises for office to perform banking function and operations. | Bank , watch & ward residence ( up to 30 sq. m.), Commercial office , and Canteen. |
| 3 | Bus Stop | As per requirement | | Road side shade for passenger awaiting city buses | Bus stop for every 500 to 750 mt. interval and 100 mt. away from road crossing. |
| 4 | Commercial & Secretarial Training centre | 0.1 | 24 mt. & above | A premises having training facilities for Stenography , Correspondence , Record keeping etc. | Commercial & Secretarial Training centre watch & ward residence ( up to 30sq.m.), Canteen. |
| 5 | Conference hall / centre | 0.2 | 24 mt. & above | A premises having all facilities for a conference meeting, symposium, etc., where a number of different countries may also be participating. | Conference centre, watch & ward residence ( up to 30sq.m.) Residential flat( for maintenance staff) , Restaurant , Bank , Post & Telegraph office , Library , Exhibitions centre , |

| Permitted Use Premises in Government Use Zone | | | | | |
|---|---|---|---|---|---|
| **SlNo.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 6 | Convention centre | As per requirement | 30 mt. & above | A premises having all facilities for International / National conference ,Meetings , Symposium etc. | Internal National convention centre watch & ward residence (up to 30sq.m.) Restaurant, Bank, Post & Telegraph office, Library, Exhibitions centre , Golf course |
| 7 | Crèche and day care center | 0.05 | 12 mt. & above | A premises having nursery facilities of infants during day time. The centre may be managed by an individual or an institution on commercial or non – commercial basis. | Crèche and day care center Watch & ward residence ( up to 30sq.m.) |
| 8 | Cultural and Information centre | 0.25 | 24 mt. & above | A premises with facilities for cultural and information services for an institution, State and Country. | Cultural and Information centre watch & ward residence (up to 30sq.m.), Hostel, Canteen, Bank extension counter facility, Auditorium (up to 500 v seating capacity) library, Exhibition and Art gallery. |
| 9 | Disaster management centre | As per requirement | 18 mt. & above | A premises having facilities of training for emergency backup hospital facility training centre for disaster preparedness wireless communication etc. | Disaster management training centre, open ground for practice and relief camps communication centre, Hostels, Staff residence fire station. Watch and ward residence ( up to 30 sq.mt.) etc. |
| 10 | Exhibition centre and Art gallery | 0.1 | 18 mt. & above | A premises with facilities for exhibition and display of paintings, Sculptures, Murals, Ceramic, Handicrafts or products of a specific class. | Museum, Exhibition centre and Art gallery, Auditorium and Open Air theatre, watch & ward residence ( up to 30sq.m. ) , Canteen |
| 11 | Fire training institute | As per requirement | 18 mt. & above | A premises having facilities of training for emergency uses in case of fire building collage etc. | Fire training centre hostels staff residence open practice grounds fire stations , watch and ward residence ( up to 30 sq.mt. ) etc. |
| 12 | General and head post office/telephone exchange | As per requirement | 24 mt. & above | A premises with facilities for postal & telecommunication to and from a no of post offices attached to it. | Head post office, General post office, watch & ward residence (up to 30 sq.m.), Canteen. |
| 13 | Government Offices | As per requirement | 18 mt & above | A premises used for the office of union /State Government | Central government, State government, local government & Public undertaking office. Watch & ward residence ( upto Sq. m). Retail shop, Chemist, Books and Stationery, Consumer store (upto to 20 sq.m |

| Permitted Use Premises in Government Use Zone | | | | | |
|---|---|---|---|---|---|
| **SlNo.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| | | | | | each on ground floor), canteen, bank Extension Counter , Post office Extension Counter. |
| 14 | Guest House | 0.05 | 18mt. & above | A guest house is premises for housing the staff of Government , semi- Government public undertaking and private limited company for short duration; | Hostel, Guest House, Boarding house and loading house Watch & ward residence (up to 30 sq.m.) Personal service shops of Barber, Launderer, and Soft drink & Snack stall (up to 15sq.m.) |
| 15 | Museum | 0.2 | 24 mt. & above | A premises with facilities for storage and exhibition of object illustrating antiques, Natural history , art , etc. | Museum, Exhibition centre and Art gallery, Auditorium and Open Air theatre, watch & ward residence ( up to 30sq.m. ) , Canteen |
| 16 | Observatory & Weather office | 0.1 | 18 mt. & above | Is a premise with facilities for research and development of data relating to weather and forecasting thereof. | Observatory & Weather office watch & ward Residence ( up to 30sq. m. ) |
| 17 | Police post | As per requirement | 12 mt. & above | A premises having facilities for a local police post of a temporary nature or on smaller scale as compared to a police station. | Police post, Essential staff housing. |
| 18 | Police office and Battalion | As per requirement | 18 mt. & above | A premises having facilities for the offices and paramilitary forces. | District police and civil defence & Home guard, Residential flat (for maintenance staff) Hostel, play ground, canteen, bank extension counter. |
| 19 | Restaurant | 0.5 | 24 mt. & above | Restaurant “Road transport booking office ‘ – A premises used for the offices of a road transport agency. | Restaurant |
| 20 | Satellite and telecommunication centre | As per requirement | 18 mt. & above | Is a premises with facilities for research and development of satellite and telecommunication technology. | Satellite and telecommunication centre and Observatory & weather office , residential flat (for maintenance staff.), Canteen , Research laboratory. |
| 21 | Trade Fair Ground | As per requirement | 24 mtr. & above | | |

### 4.11.12 Development Control Regulations Transportation and Logistics

Buildings are allowed to 6 floors. The coverage is limited to 10% of the area. The size of building ensembles is limited to 0.6 ha. The set back is 60 m.

**Figure 4-8** presents the proposals for Transport Sector.

### 4.11.13 Hill and river conservation zone

Besides existing buildings some small scale buildings are allowed for maintenance, tourist information/services up to 150 sqm, 1 floor.

### 4.11.14 Permitted Use Premises in Highway Control Zone

Highway control zone has been provided in the land use plan as per the provisions of National Capital Region Plan-2021. Activities in this zone can be permitted by Government as per the provisions of NCR Plan-2021.

### 4.11.15 Permitted Use Premises in Hill and River Conservation Zone

No urban activities shall be permissible in the Hill and River conservation zone. Only activities which are required for maintenance, protection and conservation of these areas, afforestation, agriculture, social forestry, agriculture can however be allowed by the Govt.

The natural conservation areas aim to preserve existing natural and ecological values, and to further strengthen these. No developments are allowed that conflict with this purpose, except for abadi expansion. **Figure 4-8** presents the proposals for Hill and River Conservation Zone.

No uses are allowed that might interfere with the ecological, natural and landscape features of this area.

### 4.11.16 Permitted Use Premises in Road side plantation corridor

In road side plantation corridor following activities are permitted

i. Approach/service roads
ii. Agriculture and horticulture
iii. Social forestry/plantations including afforestation
iv. Fuel filling stations with amenities like toilets, STD booths, small repair shop, small tea/soft, drink and snack bar
v. Toll Plaza, bus queue shelters, police booth, first aid centres and telephone booth

### 4.11.17 Permitted Use Premises in Public Utilities

The permission of use premises in the areas marked for public utilities use shall be governed by the specific function of the respective use.

DP provides adequate area for public utilities like water supply system, recycled waters system, sewerage system, drainage, solid waste disposal system, etc. Public utilities wherever not marked but found necessary can be provided in any of the land use zones of DP 2041 with prior approval. The location of Public utility zones in DP -2041 in **Figure 4-8.**

### 4.11.18 Public Utility Use Zone

Buildings are allowed serving public utilities. The size of the buildings is depending on their function. Large scale buildings be located on plots that enable planting or green zones around it.

### 4.11.19 Permitted Use Premises in Agriculture use zone

The area beyond the urbanisable limits within Notified SNB UC boundary has been reserved as agricultural zone. This zone however will not eliminate the essential building development within this area such as the extension of existing villages but contiguous to abadi area, required social

infrastructure and activities related to promotion of agriculture**. Figure 4-8** presents the agricultural use zone.

***Permit Uses***

Agricultural and high tech agriculture related land use such as horticulture are allowed. Agro food nodes are possible in this area, where communal facilities are made available for local farming.

Build structures are allowed if they support the agricultural use and not interfere with the landscape.

1) Agricultural, horticultural crops and cash crops
2) Dairy and poultry farming including milk chilling station and pasteurization plants
3) Social forestry/plantations including afforestation
4) Land drainage and irrigation by hydro-electric works and tube well for irrigation
5) Sanitary landfill, compost processing plant and other such activity sites with adequate protected belt.
6) Bus queue shelter and railway station
7) Airports with necessary buildings
8) Wireless Station
9) Grain godowns, storage spaces at site approved by competent authority
10) Weather station
11) Telephone and electric transmission lines and poles
12) Cremation and burial grounds
13) Fuel filling station
14) Power plant/sub-station/water works/treatment plants and other utility services
15) Storage godowns for inflamable petroleum products such as LPG, petrol, diesel, kerosene, aviation turbine fuel, light diesel oil and other petroleum products and lubricants with the approval of the competent authority
16) Farm houses
17) Afforestation specially on the wastelands and barren lands
18) Regional recreational uses such as, regional parks, wildlife sanctuary etc.
19) Cemeteries
20) Govt. sponsored social and public facilities.
21) Police, defence and paramilitary activities.

### 4.11.20 Development Control Regulations Agricultural Use Zone

Existing villages and existing roads are embedded in the landscape. Incidentally small buildings (footprint up to 300m2) are allowed to 2.5 floors for local owners of land. These buildings are for housing people and storage of agricultural equipment.

**Figure 4-10: Mass study**



**Figure 4-11: Natural Features / Special Uses / Agriculture / Public Utilities / Transportation in KBNIR**



## 4.12 Parking Provisions

The parking requirement of each land use and type of development is described here.For the developments with more than one land use, the parking requirement shall be calculated for the different uses within each development. The parking requirement for the developments is prescribed in terms of Equivalent Car Space (ECS) and its requirement shall be as per **Table 4-21** The minimum area for parking spaces shall be:

- In Open Area: 25 sqm
- In Covered Area; 30 sqm
- In Basement: 35 sqm

**Table 4-21: Parking Provision Standards**

| Parking Provision Standards | |
|---|---|
| **Land use/ Development Type** | **Minimum ECS requirement** |
| Residential | |
| Plotted Development / Detached / Semi- detached / Terrace House | 1 ECS per 100 sqm of Built up area |
| Multistorey Apartments / Group Housing/ Walkup Apartments | 2 ECS per 100 sqm of Built up area |
| Commercial | |
| Central Business District (CBD) | 3 ECS per 100 sqm of Built up area |
| Sub City Centre | 3 ECS per 100 sqm of Built up area |
| Neighbourhood Centre / convenient shopping | 2 ECS per 100 sqm of Built up area |
| Hotel | 3 ECS per 100 sqm of Built up area |
| Service Apartment | 2 ECS per 100 sqm of Built up area |
| Wholesale Market/ Service market | 3 ECS per 100 sqm of Built up area |

| Parking Provision Standards | |
|---|---|
| **Land use/ Development Type** | **Minimum ECS requirement** |
| Industry | |
| Light and Clean industry (Green Category) | 1.5 ECS per 100 sqm of Built up area<br>1 truck lot per 1000 sqm of Built up area |
| General Industry (Orange category) | 1ECS per 100 sqm of Built up area<br>1 truck lot per 1000 sqm of Built up area |
| Logistics | |
| High technology Business Park | 2 ECS per 100 sqm of Built up area |
| Public and Semi-public | |
| Primary Schools / Nursery Schools | 1.0 ECS per 100 sqm of Built up area |
| Universities / Colleges / Technical training institutions / Secondary schools | 1.5 ECS per 100 sqm of Built up area |
| School for Physically / Mentally challenged | 1.5 ECS per 100 sqm of Built up area |
| Hospitals/ Medical and other Health facilities | 2 ECS per 100 sqm of Built up area |
| Government Offices | 2 ECS per 100 sqm of Built up area |
| Multipurpose hall / banquet hall | 3 ECS per 100 sqm of Built up area |
| Community/ Recreation club / Museum/ Art Gallery/ Exhibition cum Convention centre | 2 ECS per 100 sqm of Built up area |
| Old Age homes/ Orphanage/ Religious buildings | 1.5 ECS per 100 sqm of Built up area |
| Open Space and recreation | |
| Amusement / theme parks | 3 ECS per 100 sqm of Built up area |
| Sports/ Recreation Facilities | 2 ECS per 100 sqm of Built up area |
| Golf Course | 1 ECS per 100 sqm of Built up area |
| | |

## 4.13 General Provisions

### 4.13.1 Distances from Railway Corridor

No new construction or reconstruction of an existing building shall be allowed within 30m from the railway boundary.

### 4.13.2 Distances from Railway Corridor

No portion of a building including any projection of building shall be erected or re-erected or any additions or alterations made to a building on a site within the distance quoted below in accordance with the Indian Electricity Rules in force from any overhead electric supply line.

**Table 4-22: Clearance With Respect To Power Line**

| Clearance With Respect To Power Line | | | | |
|---|---|---|---|---|
| **Voltage in the power line** | | **Vertical clearance in m.** | **Horizontal in m.** | **clearance** |
| (i) | Low and medium voltage lines and service lines. | 2.5 | 1.2 | |
| (ii) | High voltage including 33 kv lines up to and | 3.7 | 2.0 | |
| (iii) | High Voltage lines above 33 kv | 3.7+0.3 for every additional 33 kv or part thereof. | 2.0+0.3 for every additional 33 kv or part thereof. | |
| | | | | |

***Note:*** *The minimum clearance specified in the above clause shall be measured from maximum sag for vertical clearance and from maximum deflection due to wind pressure for horizontal clearance.*

### 4.13.3 Distances from Oil/ Gas pipeline

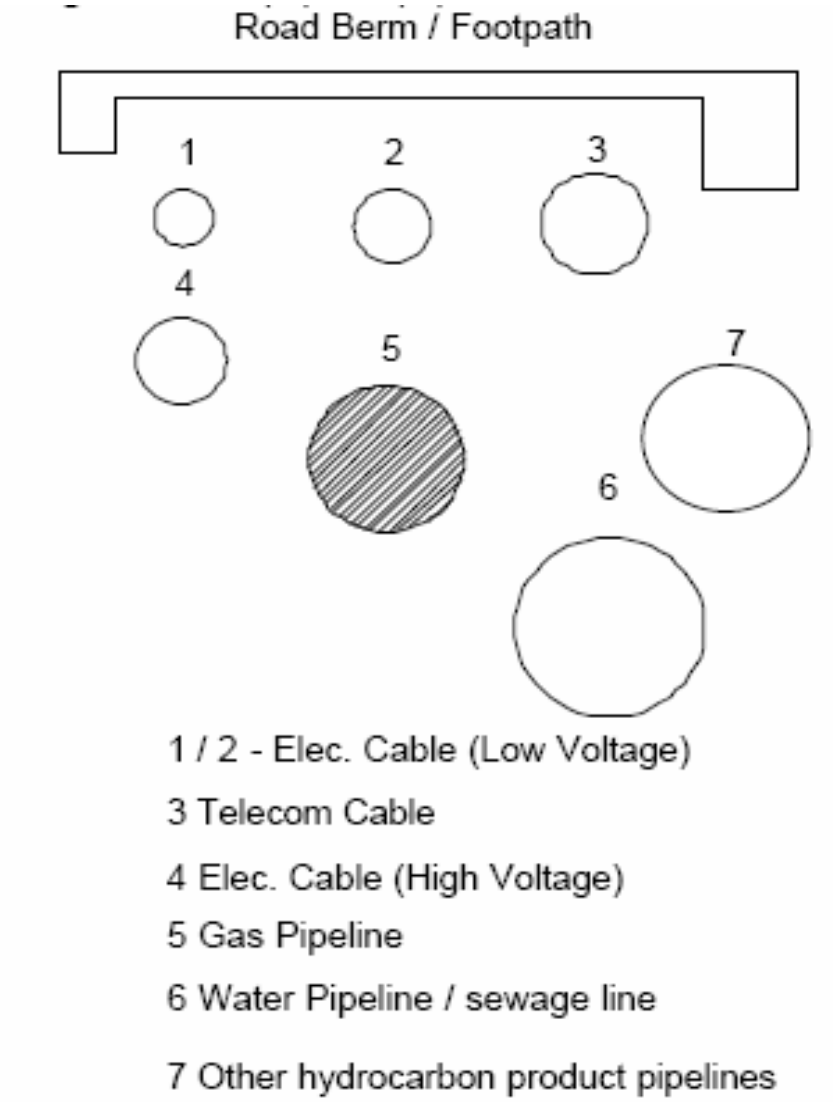
The safe distance of building from existing underground Gas/ Oil pipeline and to be planned City Gas Distribution Networks shall in accordance to regulations framed under the Petroleum and Natural Gas Regulatory Act, 2006 (19 of 2006), by Petroleum and Natural Gas Regulatory Boar.

The minimum safe distance, where the information on pipeline safe distance is not available, from the existing underground Oil or Gas pipeline shall be at least 12 meters to the building from the centre of pipeline on both sides of the pipeline.

No construction & plantation except for the following conditions shall be allowed within the safe distance:

- Pipeline related infrastructure;
- If the existing pipeline is within the RoW of Development Plan road;
- If the pipeline is planned to be laid down with the RoW of Development Plan roads. In this case, the pipeline shall be laid down as shown in following **Figure 4-22**

**Figure 4-12: Location of Gas/ Oil Pipeline within RoW of Road**




### 4.13.4 Sub-Division/Layout of Land:

Circumstances warranting preparation of a layout or sub-division:

- Proposals for sub-division/ amalgamation of lands or layouts of lands shall be submitted in the following cases:
  a) When more than one building is proposed to be constructed on any land, excepting for accessory buildings, the owner of the land shall submit proposal for proper layout of buildings or sub-division of his entire land.
  b) When the land under the proposal gets naturally sub-divided due to existing or proposed D.P. roads/ D.P. reservations or physical barriers.
  c) When development and redevelopment of any tract of land includes division and / or sub-division or amalgamation of plots for various land uses.
  d) When land under development admeasures 4000 sqm or more in a residential or commercial zone.
- Minimum widths of layout roads/streets/pathways shall be as given in the **Table 4-23 & 4-24**:

**Table 4-23: Width of Pathway and Roads in Layouts for Other than Industrial Uses**

| Width of Pathway and Roads in Layouts for Other than Industrial Uses | | |
|---|---|---|
| **Length of internal road/ Pathway (m)** | **Category** | **Minimum width in m.** |
| Upto 30 | Road with cul de-sac | 9.0 |
| Above 31 and upto 75 | Road | 12.0 |
| Above 76 and up to 300 | Road | 15.0 |
| Above 300 | Road | 18.0* |
| | | |

**Table 4-24: Width of Roads in Industrial Layouts.**

| Width of Roads in Industrial Layouts | | |
|---|---|---|
| **Sr. No.** | **Length in M** | **Industrial** |
| 1 | Upto 30 | 9 |
| 2 | 30-75 Mtrs. | 12 |
| 3 | 76-150 Mtrs. | 15* |
| 4 | 151-300 Mtrs. | 18* |
| 5 | Above 301 Mtrs. | 24* |
| | | |

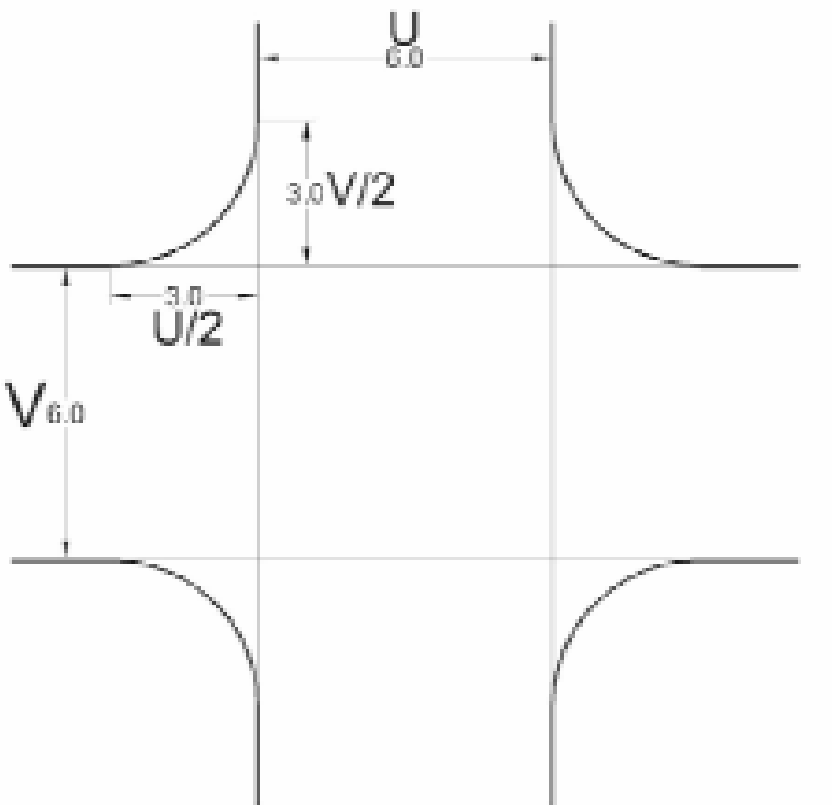
* Or more as may be required by authority as per importance of road
* The roads upto 9.0 width shall be end either by loop network or by cul-de sac within the layout only.

- Layout road shall be leveled and paved, sewered, drained, channeled, lighted, laid with water supply line and provided with trees for shade to the satisfaction of the Competent Authority.
- At junctions of layout roads the intersection shall be rounded off, with the tangent length from the point of inter-section to the curve being half the road width across the direction of the tangent as shown in **Figure 4-7**.

In any layout a cul-de-sac shall be permitted at the end of the internal road, having length upto 150 m. The dead end of such cul-de-sac shall be at a level equal to or higher than the main road level from where the cul-de-sac road takes off. The turning space, in each case, shall not be of less than 81sqm and no dimension shall be less than 9m.

The layout road proposed for development shall be clear of marginal open spaces of the adjoining existing structures.

**Figure 4-13: Round off of Junction**




### 4.13.5 Means of Access

Every plot shall be accessible through a paved public means of access like street/road or layout road. Plots which do not abut a public street/road or layout road shall be made accessible through a private means of access to which the plot owner has a legitimate right. No building shall be erected so as to deprive any other building of its means of access.

## 4.14 Mandatory Provisions

**Solar Power Panels at Rooftop**

All buildings (Commercial, institutional buildings, industrial buildings) having more than 10,000 sq.mt builtup area and residential building (Group Housing having 100 dwelling units & more and integrated townships with 10ha & more area) shall make provision for solar power plants at building rooftop covering 50% of clear rooftop area. **Figure 4-14** shows example of integration of Solar panels and architecture. While implementing solar power plants at building rooftop Guidelines on "Off-Grid and Decentralized Solar Applications & Rooftop and Other Small Solar Power Plants" issued by Ministry of Renewable Energy, Government of India, shall be followed.

The building implementing this provision shall be granted additional 10% FAR over and above the prescribed FAR for land use typology, while those building not implementing these provision, prescribed FAR shall be reduced by 10%.

Building plans for submitted to approval by the applicant to the competent authority shall clearly provide the details of rooftop solar power plant, on the basis of which Competent Authority shall grant additional FAR. The competent authority shall keep completion & functioning of rooftop solar power plant as a precondition while issuing the building completion certification.

**Rainwater Harvesting**

All buildings irrespective of their use type & size are mandated to have rooftop rainwater harvesting system designed and constructed in each building. The guidelines issues by GoR Rajasthan on Rainwater Harvesting shall be followed. In general design of rainwater harvesting system be designed to quantity of water from rooftop that can be collected **(Figure 5-9).** The formula to suggested by Central Ground Water Board to estimate quantity of water to be collect from rooftop area is a below:

Total quantity of water to be collected (cu.m.) = Roof Top Area (Sqm) x Average Monsoon Rainfall (m) x 0.8.

Note: The Average rainfall for SNBUC shall be considered as 550mm.

**Figure 4-14 : example solar power on rooftops**



**Figure 4-15 : example rainwater harvesting from rooftops**



## 4.15 DSCR for ICT Master Plan

**1. General Recommendations to influence General Development Control Regulations**

- Smart Khushkhera Bhiwadi Neemrana IR shall be based on converged network architecture. The ICT services would be available within a single 'service corridor' separate from all other public utilities (such as water, electricity, waste management, etc.)
- ICT and real estate systems are recommended to use common fiber infrastructure and containment systems.
- One competent authority to be constituted that will be responsible for approving network design (Outside and In-building) before and after execution. It is recommended that this authority should vest with a Special purpose vehicle such as KBNIR-SPV commissioned for Khushkhera Bhiwadi Neemrana IR.
- Utilities fit-out coordinator should be approved by KBNIR-RDA to provide oversight and initial approval for submitted fit-out designs.

**2. Recommendations for Public Utility Services Providers**

- Roads within Khushkhera Bhiwadi Neemrana IR shall allocate this space and dedicate it to accommodate the ducts depending on a given road type.
- Regulated Telecommunication Services (including and not limited to telephony, IPTV, Internet Access, etc.) are highly recommended to leverage the common FTTH Network for distribution and access within Khushkhera Bhiwadi Neemrana IR. All other Public Utility Services Providers shall leverage the same infrastructure for connectivity within their distribution networks. Examples of this include Smart Grid networks, leveraging IP network connection for management between water and waste pumping stations, etc.
- All of the Fiber Optic cabling system is recommended to be laid in underground ducts within the designated single 'service corridor'. Cable containments shall be filled no more than 40% of the capacity to meet the first 5 year demand and leave 60% for future growth.
- Man Holes (MH) will be provided for placing, pulling and splicing Fiber cables. Minimum clearance shall be maintained between MH/conduits and other utilities as per industry standards, TEC and BICSI guidelines.

**3. Recommendations for Service Providers adopting Smartgrid**

- Transmission and Distribution substations shall be connected to the Centralized Command & Control and the Data Center by Fiber Optic cables. They enable a series of automated services that allow utilities to monitor intelligent electronic devices (IEDs), gather sensor readings and manage assets.
- Every utility consumer such as residential, commercial and industrial will be connected to the Smart Grid through the Smart Khushkhera Bhiwadi Neemrana IR Network with an ability to monitor and manage energy consumption – and this could be positioned as an optional or mandatory Smart Service based on the prevailing regulations in the utility sector
- As a best practice, consumer privacy and data protection will be adopted as security measures all the way from homes/offices/industries to the data centers.

- Centralized Command Control center will be the central point of analysis of operational data. CCC will perform variety of functions ranging from grid monitoring to generation scheduling thus providing a real time view into supply-demand status

- Standards such as IEC61850 & IEEE1613 shall be adopted for Substation Automation.

**4. Recommendations for Passive Infrastructure Providers**

- All Mobile Cellular service providers shall be provided and will be required to share common telecom towers infrastructure (including equipment rooms next to the tower). Infrastructure for Mobile/Cellular network shall be owned and operated by designated entity of RIICO.

- Passive and Active equipment shall be capable of supporting the smart city services with enough capacity to handle all future requirements and applications.

- There will be a Service interconnection point (Service Exchange) where all Regulated Service Providers will connect to each other as well as the end-user network within Khushkhera Bhiwadi Neemrana IR (i.e. through the PIP).

- Passive Fiber infrastructure is recommended to be deployed at the same time as road(s) construction and be available in the same timeframe as utility services, i.e. electricity, water and sewerage.

- Similar to the services like electricity, water & Sewerage which are deployed on temporary basis when developing Green field areas, telecommunication (or ICT) infrastructure could be setup by individual developers according to their needs. For example VSAT links, point to point microwave links, 3G Wireless modems etc.

**5. Recommendations for Investors and Builders**

- Industry owners & Building developers/owners should be informed about the advantages of Smart Khushkhera Bhiwadi Neemrana IR Services and incentivized to adhere and construct according to recommendations within this document. These incentives may include Tax concessions, Carbon credits, subsidized energy pricing etc. Details of incentives will be elaborated in Stage-3 report of this project.

- Each building, lot, Industrial unit, detached and semi-detached house developer shall provide Handhold at the plot boundary and connect to Passive Infrastructure Provider (PIP) Manhole.

- Building developer shall provide Entrance Facility room at basement or ground floor of every multistoried building/Industrial unit.

- Building developer shall also provide at least one Main Telecom Room (MTR) at basement or ground floor of every multistoried building.

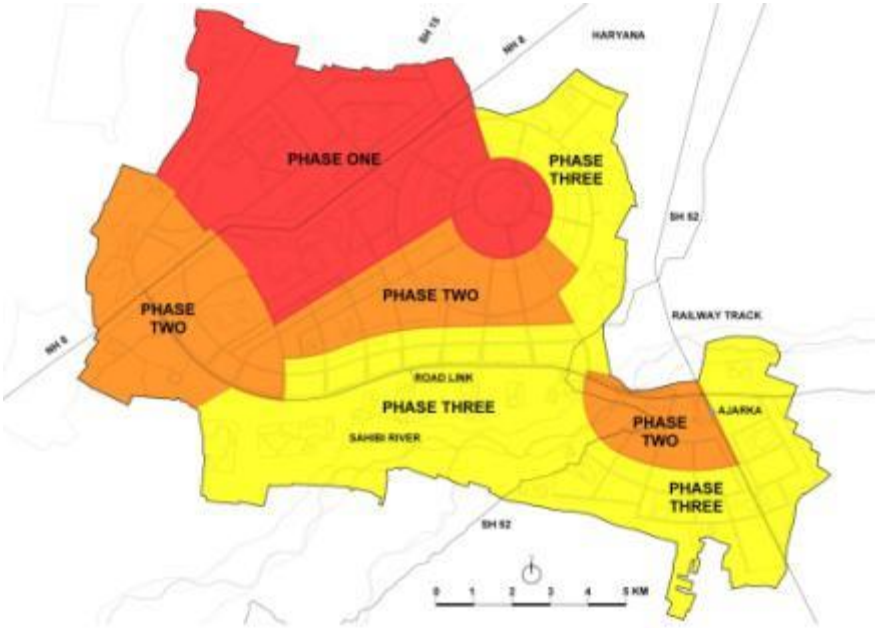
- MTR and EF Rooms both are recommended to have Access control system, CCTV Camera and Environment control system.

- Building Developer will provide a Consolidation Point (CP) in each office to provide all the Telecom Service offerings.

# 5 Development Phasing for KBNIR

The development of the New City is of such a large scale that the planning horizon is set at 2041. A phase wise development is necessary to make it able to adapt to unpredictable changes and maintain flexibility in the plan.

**Figure 5-1: KBNIR Phasing**




The land demand per phase has been calculated based on the expected industry demand. The land use break up for KBNIR phased development is presented in **Table 5-1.**

**Table 5-1: KBNIR Area Statement**

| KBNIR Area Statement | | | | | |
|---|---|---|---|---|---|
| **Broad Land Use Zones** | **Land Uses** | **Area (Sq.km)** | | | |
| | | **Phase 1** | **Phase 2** | **Phase 3** | **Total** |
| **Residential Use** | Abadi | 4.00 | 2.33 | 3.73 | **10.06** |
| | Abadi Development Area | 5.28 | 5.16 | 3.03 | **13.47** |
| | Residential | 4.02 | 10.17 | 6.45 | **20.64** |
| **Industrial Use** | Industry | 12.48 | 3.46 | 9.39 | **25.34** |
| | RIICO Area | 1.02 | 0.79 | 0.00 | **1.81** |
| **Commercial Use** | Commercial | 1.55 | 1.52 | 0.85 | **3.92** |
| **Tourism Use Zone** | Tourism | 2.87 | 3.44 | 0.00 | **6.31** |
| **Public/ Semi-Public Use Zone** | PSP/ Knowledge City | 4.77 | 3.96 | 3.20 | **11.94** |
| **Government Use** | Government | 0.69 | 0.00 | 0.00 | **0.69** |
| **Public Utility Use** | Public Utility | 0.29 | 0.46 | 1.19 | **1.94** |
| **Recreation Use** | Recreation | 1.22 | 2.00 | 7.09 | **10.30** |
| **Open Spaces & Green Buffers** | Road Green Buffer | 0.86 | 1.31 | 1.86 | **4.03** |
| | Open Green | 0.35 | 0.00 | 0.00 | **0.35** |
| **Transportation Use** | Transportation | 0.53 | 0.00 | 0.57 | **1.09** |
| | Railway | 0.00 | 0.07 | 0.56 | **0.63** |
| | Master Plan Roads | 4.39 | 4.77 | 3.80 | **12.96** |
| **Natural Features** | Hills | 0.62 | 2.23 | 0.00 | **2.85** |
| | River | 0.00 | 0.87 | 6.93 | **7.80** |
| | Pond | 0.05 | 0.02 | 0.05 | **0.12** |
| **Special Uses** | Hill Conservation | 0.34 | 0.91 | 0.00 | **1.25** |
| | River Conservation | 0.00 | 0.45 | 4.58 | **5.03** |
| **Agriculture Use** | Agriculture | 2.48 | 0.48 | 20.15 | **23.11** |
| **Grand Total** | | **47.80** | **44.38** | **73.42** | **165.61** |

## 5.1 The Spatial Phasing Strategy

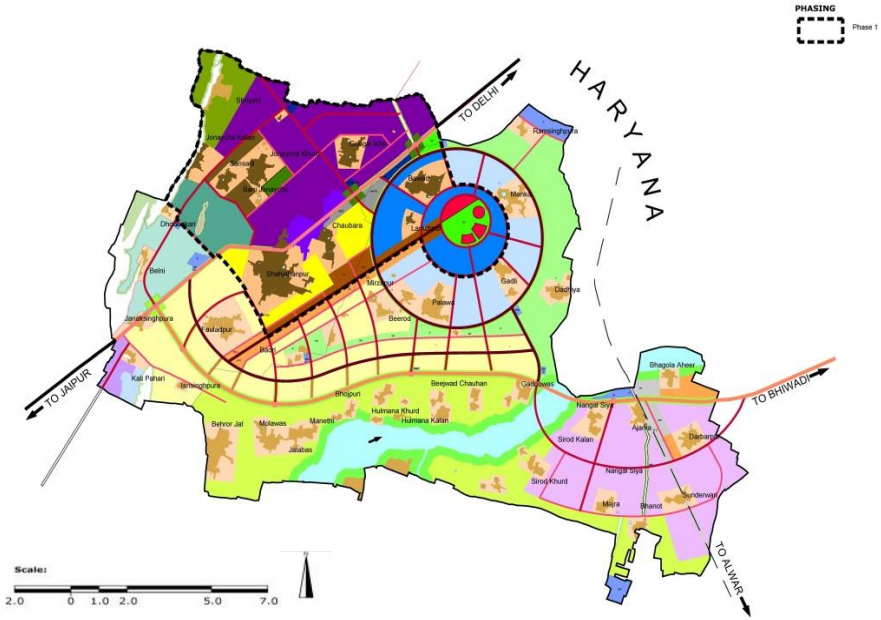
Phasing is done in a way that in each phase costs and benefits can be balanced. Every phase is an entity on its own. When a specific phase is finished, the New City is one integrated organic component, without any loose ends. Each phase can function, not depending on future phases to be developed. The phasing plan is developed with the following objectives:

- Availability of water;
- Each phase to be a self contained entity;
- establish a logical, identifiable framework with built-in flexibility to adapt to market changes;
- establish a basis from which necessary infrastructure can be realized efficiently and logically;
- consider the mix of clusters alongside catalyst developments, employment and education opportunities and the necessary supporting services and residential (including cultural and social) developments;
- identify and communicate investment requirements, development opportunities, infrastructure requirements and population predictions per phase;
- break the development into manageable blocks that can be planned, marketed and managed effectively;
- allow the developments to grow organically and in response to market conditions within a strong framework that gives the new urban area a recognizable identity and good urban quality.

## 5.2 Phase 1 (2021)

The first phase builds on the planned and on-going developments around Shajahanpur and along the NH8. Phase One also establishes the new city spine that runs parallel to NH8 into the heart of the Knowledge City. This spine, together with the first stages of the Knowledge City, establish a strong backbone for the *New City*. This phase benefits from close proximity to the NH8 and it can be established efficiently. By creating a main road connection parallel to the NH8, a core infrastructure can be realised that allows for maximum development potential in relation to start-up investments.

**Figure 5-2: Phase -1**



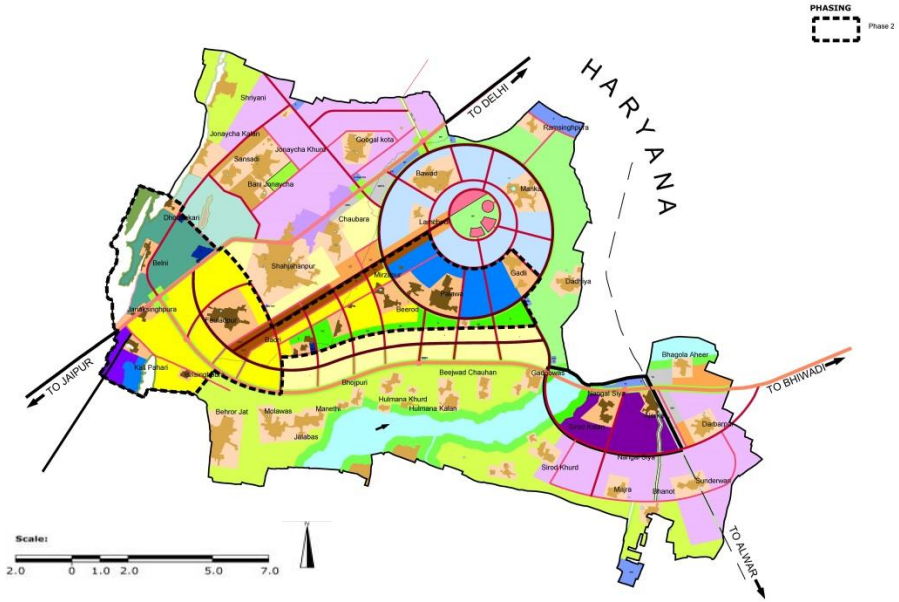

## 5.3 Phase 2 (2031)

The second phase is located on two separated sites: adjacent south of phase 1, and near Ajarka train station.

The section of phase 2 adjacent south to phase 1 consists of a logical expansion of the first phase. That part of phase 2 has maximum benefit from the vicinity of NH8 and the infrastructure that has been realized in phase 1.

The section of phase 2 west of Ajarka benefits from the existing train station (in combination with future RRTS alignment) in Ajarka in combination with the Road Link from NH8 to BTK Urban Complex / Aerotropolis. Phase 2 consists mainly of residential and industrial land uses.

**Figure 5-3: Phase -2**




## 5.4 Phase 3 (2041)

The third phase comprises residential, industrial and green zones (including agriculture, high tech agriculture and Sahibi areas), that are located in the south east of the New City. This ultimate phase completes the total *New City* development.

**Figure 5-4: Phase – 3**




## 5.5 Phase Wise Development of Road Infrastructure

### 5.5.1 Phase 1 (2021)

In the first phase the Road Link connecting KBNIR with the BTK Urban Complex / Aerotropolis location will be realized. The road infrastructure of the Phase 1 development area (pink) will be realized, together with three roads to connect Phase 2 with the Road Link (#1, #2 and (#3)).

The total length of Arterial Roads to be realized in Phase 1 is approximately 10,6 km (80m RoW) and 42,7 km (60m RoW), and the total length of Major Roads to be realized in Phase 1 is approximately 15,4 km. The length of the Local Streets to be realized in the first phase is depending on more detailed design plans.

**Figure 5-5: Road Infrastructure in Phase 1**

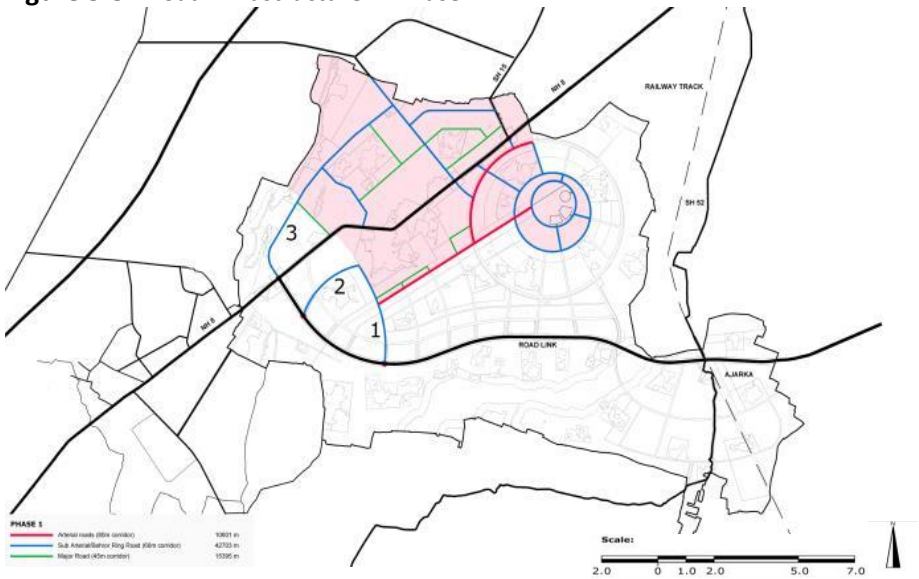
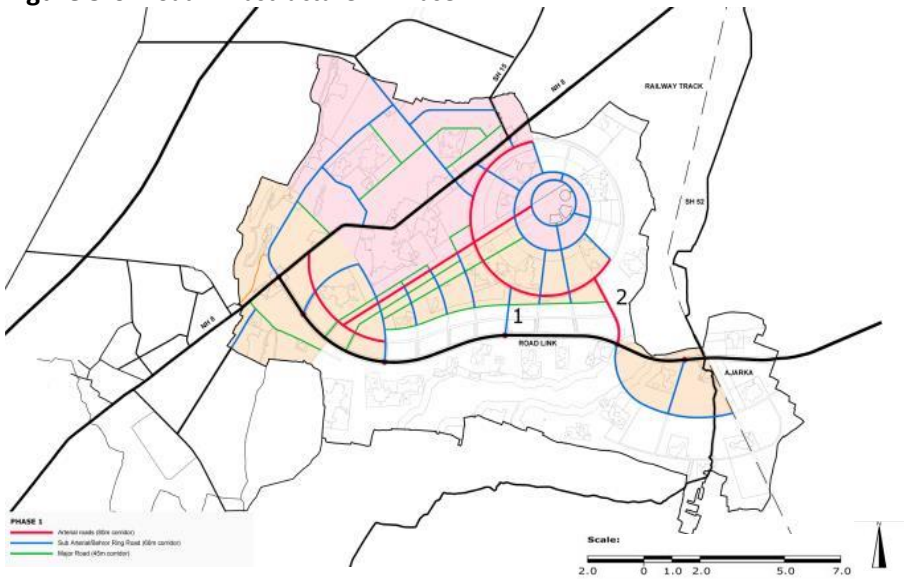



**Figure 5-6: Road Infrastructure in Phase 2**




### 5.5.2 Phase 2 (2031)

The second phase of development of the KBNIR will take place south of Phase 1 and in vicinity of Ajarka train station. The road infrastructure of the Phase 2 development area (light brown) will be realized, together with a road connection between Phase 2 and the Road Link (#1) and a road connection between both locations of Phase 2 (#2). The realization of the public rapid transport light rail track and upgrading of Ajarka train station are likely to take place in phase 2.

**Figure 5- 7** shows the additional road infrastructure that will be realized in Phase 2. The length of 80 m Arterial Roads to be realized in Phase 2 is approximately 14,1 km, the lengths of 60 m Arterial Roads is 19,1 km, the total length of Major Roads to be realized in Phase 2 is approximately 23,6 km, and the length f Sub Major Road is 2,1 km. The length of the Local Streets to be realized in the second phase shall depend on more detailed Plans.

### 5.5.3 Phase 3 (2041)

The third phase of the development comprises the south eastern part of the KBNIR (yellow). In this final ultimate phase the proposed road structure will be finalized (figure 5-8). Figure 5-9 shows the additional road infrastructure that will be realized in Phase 3. The total length of 80 m Arterial Roads to be realized in Phase 3 is approximately 13,9 km, the total length of 60 m Arterial Roads to be realized in Phase 3 is 10,1 km, and the total length of Major Roads to be realized in Phase 3 is approximately 16,2 km. The length of the Local Streets to be realized in the third phase is depending on more detailed Plans.

**Figure 5-7: Additional Road Infrastructure in Phase 2 (compared to Phase 1)**

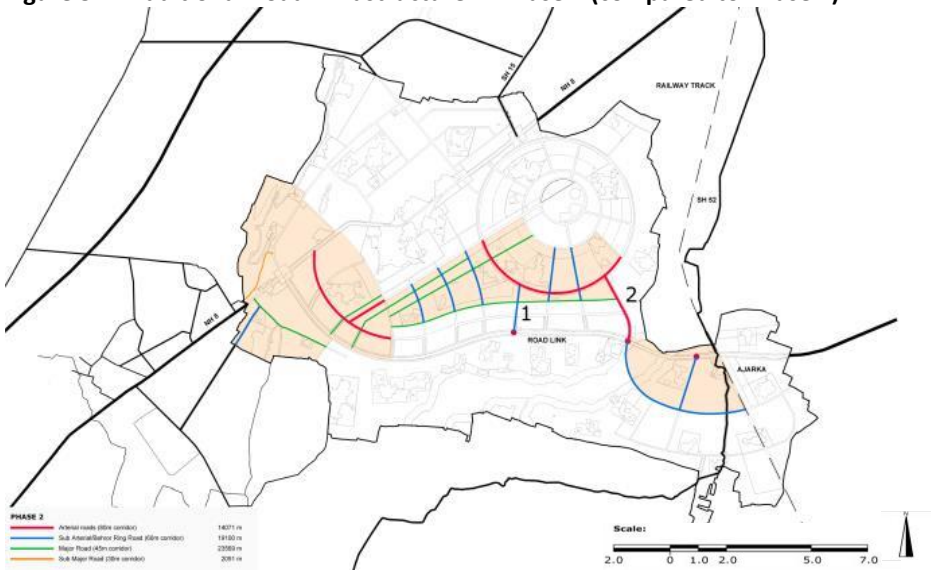



**Figure 5-8: Road Infrastructure in Phase – 3**

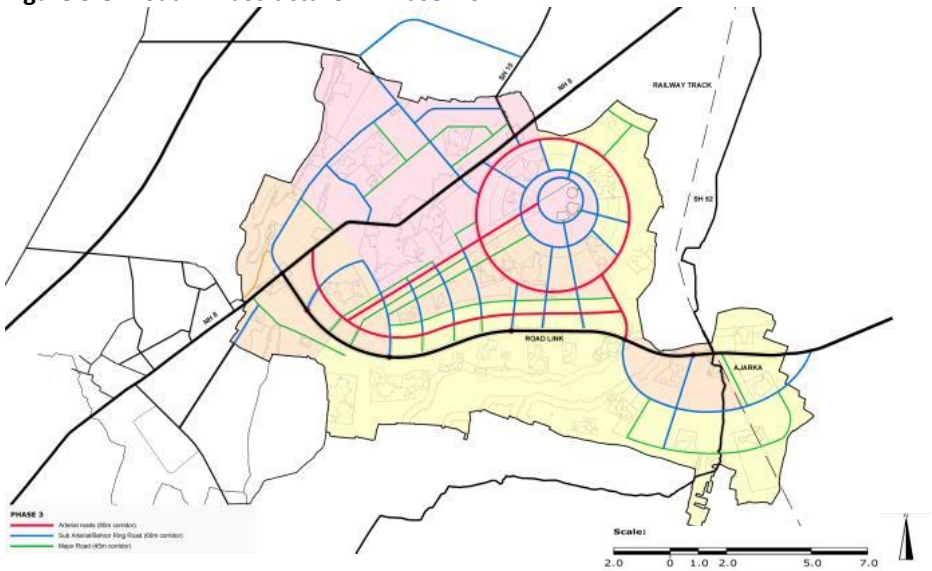



**Figure 5-9: Additional Road Infrastructure in Phase 3 (compared to Phase 2)**

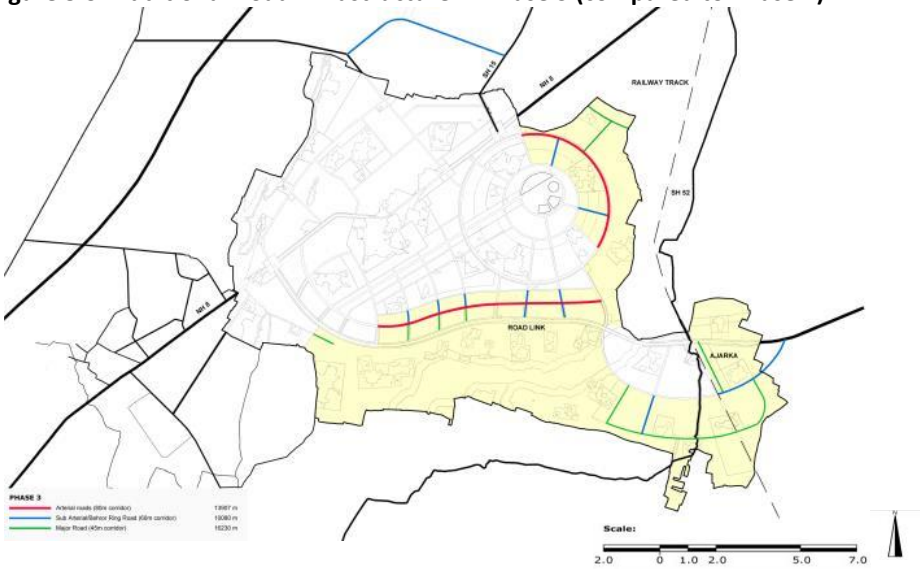



**Table 5-2: Road Length per Phase (Km)**

| Road Lelngth per Phase (Km) | | | |
|---|---|---|---|
| | **Phase 1** | **Phase 2** | **Phase 3** |
| Arterial Roads (80m) | 10.601 | 14.071 | 13.907 |
| Arterial Roads (60m) | 42.703 | 19.100 | 10.080 |
| Major Road (45m) | 15.395 | 23.569 | 16.230 |
| Sub Major Road (30m) | - | 2.051 | - |

Note: Road Link will be realized in phase 1 as separate entity

## 5.6 Retaining flexibility

The situation might occur that certain developers desire to develop large areas that cross the phase boundaries. A flexible approach towards these developments is proposed in case they result in self sustaining developments in case of infrastructure, and no additional infrastructure costs would be necessary

# 6 Infrastructure Plan

## 6.1 Transport Infrastructure

### 6.1.1 Traffic Projections

The proposed transport infrastructure has been based on projections of traffic over the 30 year plan horizon. These traffic projections are based on an analysis of current traffic patterns and the type of development that is taking place in urban areas in India. On the latter a recent study is available.[4]

Passenger transport projections by type of transport are based on estimates of the population, assumptions regarding the per capita trip rate, the distribution of trips by mode of transport and occupancy rates. The travel projections are made for three categories of transport: from the region to the surrounding cities, from the surrounding cities to the region and internal trips. The assumptions regarding the per capita trip rate are summarised in **Table 6-1**. The distribution of trips by mode of transport and the occupancy per unit are presented in **Table 6-2**. These estimates are based on the study on Traffic and Transportation Strategies and Policies and on traffic counts carried out in the region.

**Table 6-1: Per capita trip rate per day (PCTR)**

| Per capita trip rate per day (PCTR) | |
|---|---|
| **Direction of trip** | **Ratio** |
| Internal-external-internal | 0,02 |
| External-internal-external | 0,05 |
| Internal-internal | 1,0 |

[4] Ministry of Urban Development, Traffic and Transportation Strategies and Policies in Urban Areas in India, May 2008.

The trips from the IR to outside towns are assumed to be comparatively low because most residents in the region are expected to work in the region. The region is, however, expected to attract considerable traffic from outside the region, particularly the Delhi Metropolitan Region, but also from Jaipur and surrounding areas of people who will work in the region.

**Table 6-2: Assumptions regarding the distribution by mode of transport and occupancy**

| Assumptions regarding the distribution by mode of transport and occupancy | | | | |
|---|---|---|---|---|
| | **Public/ Private (%)** | **Type of transport** | **% Share** | **Persons/ unit** |
| External-internal and internal-external | | | | |
| Private | 70% | 2W | 30% | 1,2 |
| | | Car | 20% | 2 |
| | | Taxi | 10% | 1,5 |
| | | Sharing | 20% | 7 |
| | | Cycle | 20% | 1 |
| Public | 30% | Bus | 20% | 45 |
| | | Train | 80% | 250 |
| Internal-internal | | | | |
| Private | 45% | 2W | 10% | 1,2 |
| | | Car | 6% | 2 |
| | | Taxi | 20% | 1,5 |
| | | Sharing | 15% | 7 |
| | | Cycle | 12% | 1 |
| Public | 55% | Bus | 20% | 45 |
| | | Train | 80% | 250 |

The results of the traffic projections in terms of trips per day by mode of transport are presented in **Table 6-3**. The table starts out by presenting the number of persons making trips and the direction of these trips (internal-external-internal, external-internal-external and internal-internal). Applying the number of passengers, the number of trips made by each type of transport (2W, car, taxi, shared vehicle, cycle, bus and train) is projected and presented in the **Table 6-3**.

**Table 6-3: Traffic projections by category of traffic and mode of traffic in terms of number of trips per day, 2015- 2040**

| Traffic projections by category of traffic and mode of traffic in terms of number of trips per day, 2015- 2040 | | | | | | |
|---|---|---|---|---|---|---|
| | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| Population | 212000 | 254000 | 353000 | 513000 | 824000 | 1368000 |
| Trips (number of persons) | | | | | | |
| Internal-external-internal | 4240 | 5080 | 7060 | 10260 | 16480 | 27360 |
| External-internal-external | 10600 | 12700 | 17650 | 25650 | 41200 | 68400 |
| Internal-internal | 212000 | 254000 | 353000 | 513000 | 824000 | 1368000 |
| Internal-external | | | | | | |
| 2W | 742 | 889 | 1236 | 1796 | 2884 | 4788 |
| Car | 297 | 356 | 494 | 718 | 1154 | 1915 |
| Taxi | 198 | 237 | 329 | 479 | 769 | 1277 |
| Sharing | 85 | 102 | 141 | 205 | 330 | 547 |
| Cycle | 594 | 711 | 988 | 1436 | 2307 | 3830 |
| Bus | 6 | 7 | 9 | 14 | 22 | 36 |
| Train | 4 | 5 | 7 | 10 | 16 | 26 |
| External-internal | | | | | | |
| 2W | 1855 | 2223 | 3089 | 4489 | 7210 | 11970 |
| Car | 742 | 889 | 1236 | 1796 | 2884 | 4788 |
| Taxi | 495 | 593 | 824 | 1197 | 1923 | 3192 |
| Sharing | 212 | 254 | 353 | 513 | 824 | 1368 |
| Cycle | 1484 | 1778 | 2471 | 3591 | 5768 | 9576 |
| Bus | 14 | 17 | 24 | 34 | 55 | 91 |
| Train | 10 | 12 | 17 | 25 | 40 | 66 |
| Internal-internal | | | | | | |
| 2W | 7950 | 9525 | 13238 | 19238 | 30900 | 51300 |
| Car | 2862 | 3429 | 4766 | 6926 | 11124 | 18468 |
| Taxi | 12720 | 15240 | 21180 | 30780 | 49440 | 82080 |
| Sharing | 2044 | 2449 | 3404 | 4947 | 7946 | 13191 |
| Cycle | 11448 | 13716 | 19062 | 27702 | 44496 | 73872 |
| Bus | 518 | 621 | 863 | 1254 | 2014 | 3344 |
| Train | 373 | 447 | 621 | 903 | 1450 | 2408 |
| | | | | | | |

Separately projections of freight traffic have been prepared. These projections are based on assumptions regarding the area to be developed in the region, based on research conducted for other regions. The freight transport projections are presented in **Table 6-4**.

**Table 6-4: Projections of freight traffic in number of trips per day**

| Projections of freight traffic in number of trips per day | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Number of trips/ha | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| Area in ha | | 50 | 200 | 1,000 | 2,000 | 3,300 | 5,000 |
| LCVs | 2.34 | 117 | 468 | 2,340 | 4,680 | 7,722 | 11,700 |
| Trucks | 4 | 200 | 800 | 4,000 | 8,000 | 13,200 | 20,000 |

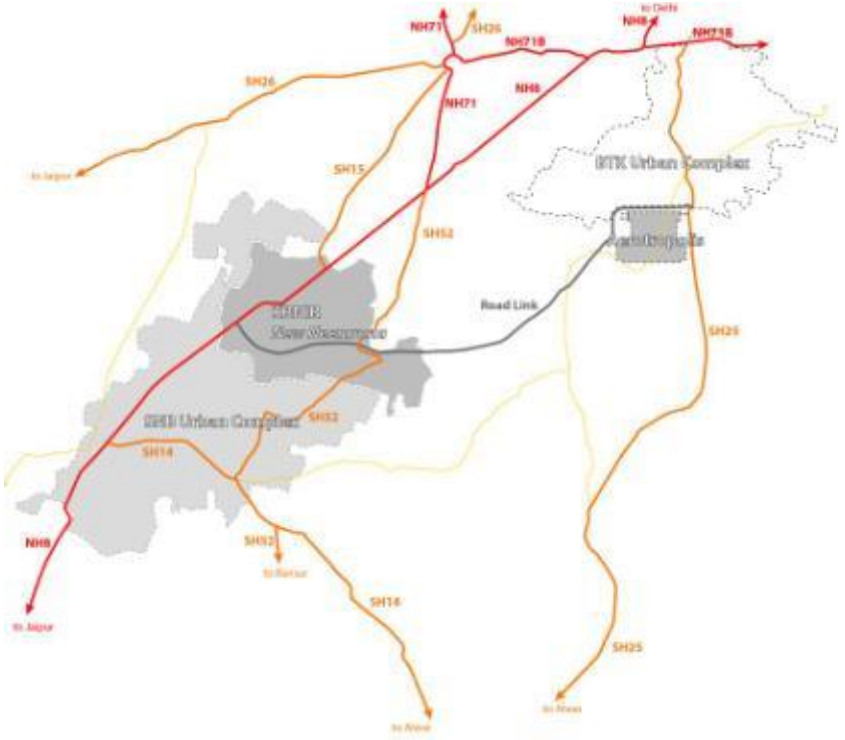
Based on the projections of internal-external-internal and in particular external-internal-external trips strengthening of external transport linkages is proposed. Also the internal road network and its dimensions are based on the trip forecasts. In designing the dimensions of the transport infrastructure, it has also been taken into account that the traffic, particularly within the region is subject to peak hours. Peak hour traffic may be as high as 10% of total daily traffic.

### 6.1.2 Development Strategy external links

#### 6.1.2.1 Road

The KBNIR is connected by several national state and district highways and roads to its surrounding regions.

**Figure 6-1: Regional Road Network**




**National Highways (NH):**

NH-8 has a very strong relevance in national context as it connects the Indian capital city of New Delhi with the Indian Financial capital city of Mumbai. The NH-8 passes through the State capitals of Gandhinagar and Jaipur, as well as important cities like Beawar, Ahmedabad, Surat and Vadodara. The total length of NH-8 is 1428 Kms and it forms part of the Golden Quadrilateral project undertaken by National Highways Authority of India. The length of NH-8 within the KBN region is over 32 Kms starting from the border of the states of Haryana and Rajasthan and ending south of Behror town.

The Master Plan for NCR (National Capital Region), 2021 has proposed a Highway Corridor Zone with a minimum width of 500 meters inclusive of green buffer on either side of the right of way along NH8 to enable the planned and regulated development along highway. It also states that excluding the green buffer, the landuse will be decided by the respective state governments depending upon the economic pressures, local situation and development potential of the area. The Master Plan expects the respective state governments to delineate and notify the Highway Corridor zone. It also recommends that while planning these zones, the state governments shall ensure segregation of highway traffic through proper green belts, service roads and controlled access to the highway. The Highway Corridor Zone is expected to be delineated based on the revenue village boundaries by the state government in the sub-regional plans for the state.

In addition to the NH-8, the other National Highway passing through the KBN region is NH-71B that connects Rewari (NH-8) and Palwal (NH-2) towns of Haryana. About 5Km of this highway passes through Bhiwadi town area in the state of Rajasthan. These two highways link this KBN region to several other national highways and thus, providing it a good connectivity at the regional as well as the national level. The NH-8 is already under upgradation to a 6-lane highway and the Draft Master Plan for BTK (Bhiwadi-Tapookara-Kushkera) Urban Complex for future widening of NH-71 by taking front setback on either side..

**State Highways (SH)**

Three State Highways also pass through the KBN region connecting different parts of the region with the district Headquarter at Alwar and other important towns/ tehsil headquarters in the district as well as other districts. Amongst the State Highways, the SH-25 acts as an important link connecting the BTK Urban Complex with the district Headquarter at Alwar. The Government of Rajasthan has already appointed a concessionaire for widening and strengthening of the SH-25 to a 4-lane road from Bhiwadi to Alwar over a length of about 70 Kms. The Concession Agreement has been signed for a period of 30 years on a BoT basis. The existing road width of the SH-25 varies between 30 to 45 m. The Draft Master Plan for BTK Urban Complex has defined the road width for the SH-25 at 60m with a 30m buffer on each side with an exception for a stretch from the junction of the NH-71B and the SH-25 upto Khijooriwas, which is proposed without buffer. The length of the SH-25 within the BTK Urban Complex is about 17.5 Kms.

**Major District Roads (MDR)**

There are three Major District Roads in the KBN region, MDR-61, MDR-61A and MDR-78. These have been developed to provide links between Tehsil Headquarters and the State Highways for various settlements and villages in the region. The MDR-61 and MDR-61A cater to the settlements on the eastern side of the NH-8 within the KBN Region. The MDR-61, with a total length of nearly 78 Kms, originates near the eastern boundary of the state and connects important settlements of Tapookara, Kotkasim, Mandawar and ends at the SH-14 near Sodawas.The MDR-61A provides connectivity of Tehsil Headquarter of Kishangarh Bas to the MDR-61 with a total length of about 13 Kms. The MDR-78 caters to the settlements on the western side of the NH-8 within the KBN region. It originates from a junction of the SH-26 (Haryana) near the state border in the north-western part and connects to the town of Behror and further links up to Gadoj.

**Development of new roads**

The draft Master Plan for the BTK Urban Complex has made provisions for an Expressway with a road width of 90m and a buffer of 30 m on each side along the southern periphery of the development area and a network of Arterial and Sub-Arterial Roads with a width of between 60 m and 45 m respectively. Similarly, the (de-notified) Master Plan for the SNB Urban Complex provides for bye-passes for three major settlements along the NH-8, the SH level six roads with a width of 45-60 m and having 4-6 lanes and thirteen major roads with a width of 45 m and having 4 lanes. The regional linkages proposed under the two Master Plans of BTK and SNB include the following:

- A NH Level road with 90 m Road width connecting the SNB Urban Complex with the BTK Urban Complex is proposed under the Master Plan for the SNB Urban Complex.
- RIICO has developed a road from Kasaula at the NH-8 in Haryana with a section of the road passing through Haryana to provide better access to its industrial estate at Khushkhera under the BTK Urban Complex.
- A bypass connecting the NH-8 and the NH-71B in the North through Haryana has also been proposed.

The DFC Corridor is proposed to pass through the Bhiwadi town area. The nearest DFC Junction for Bhiwadi area would be Rewari as per the existing proposals of DFC. The Draft Master Plan for the BTK Complex recognizes that efforts should be made to connect the BTK Complex with Rewari through a rail link running parallel to the DFC in the north to get the benefits of the DFC alignment passing through the middle of the city. Till the time this rail link is in place a 60 m wide road parallel to the DFC Corridor is proposed to connect the Bhiwadi Urban Complex with Rewari.

The regional road link proposed under the two Master Plans linking the Neemrana with the Bhiwadi area is critical especially in context of the proposed site for the Aerotropolis and the knowledge city within the KBN region. Considering the nature of developments proposed in the region, the road link needs to be designed with very high quality standards to address the future development potentials in the region.

In order to improve the regional road connectivity with Bhiwadi, the most industrialised area of Alwar District and Concor ICD, two links have been proposed to be development. Two road projects that are proposed to be developed include:

- Neemrana - Bhiwadi Expressway (Road Link); and
- NH8 - Concor ICD at Khatuwas on DFC

Neemarana - Bhwiadi expressway (Road Link) is a 48 km long and six lane high speed corridor connecting BTK Urban Complex (and proposed Aerotropolis site) with the KBNIR. Whereas the road link connecting NH8 (KBNIR) and Concor ICD at Khatuwas is four lane road.

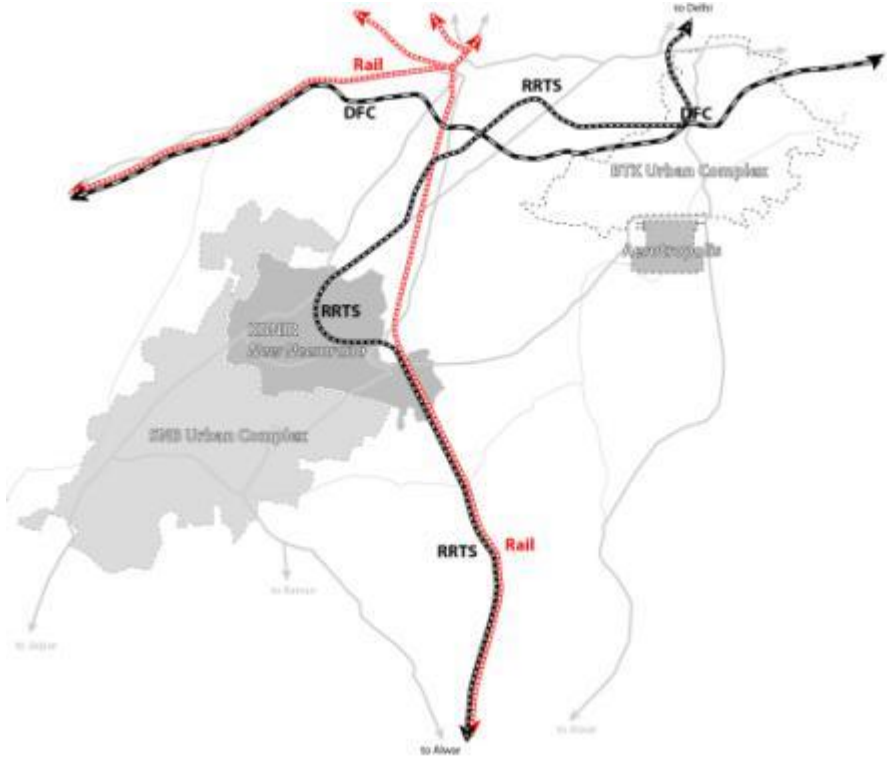
#### 6.1.2.2 Rail

The Rewari – Alwar Railway Line provides basic railway connectivity to the KBNIR. It is part of the railway link between New Delhi and Jaipur. This link is presently a broad gauge single track and is being upgraded to an electrified double track link. The Ajarka Station on this section falls within the KBNIR and would cater to the residents of IR. The station is presently a class c station according to the Indian Railway station classification standards and only a few passenger trains make a stop here. As the IR develops super-fast/ express Trains like Shatabhi will stop there. To facilitate such trains, Ajarka Station will need to be upgraded.

The newly proposed Dedicated Freight Corridor (DFC) runs north from the Development Plan area, and crosses BTK Urban Complex.

A Regional Rapid Transport System (RRTS) is proposed to provide fast rail connection between Delhi and its surroundings regions. The alignment of RRTS is integrated in the design of the New City.

**Figure 6-2: Regional Rail Network**




#### 6.1.2.3 Regional Rapid Transport System

The National Capital Planning Board (NCRPB), is currently undertaking a feasibility study for a rail based Regional Rapid Transit System between Delhi and Alwar. Its proposed alignment passes through the KBNIR. Also, a Mass Rapid Transit System (MRTS) is being planned by the Government of Haryana between Gurgaon and Bawal (close to the Rajasthan & KBNIR boundary). Furthermore, there is a potential to extend the Bawal leg of this MRTS to the KBNIR. The proposed MRTS is expected to terminate at Delhi Metro stations.

#### 6.1.2.4 Air

Till such time the proposed Aerotropolis near BTK becomes operational, the KBNIR will depend on the New Delhi International Airport which is approximately 95 km from the IR. Jaipur Airport is 150km away from the IR. It is estimated that by 2040 around 220,000 passengers per day would use the proposed Aerotropolis, including those residing within IR.

#### 6.1.2.5 Integrated Regional Passenger Hub

Given the developments envisaged for the KBNIR it is proposed to develop an Integrated Multi Modal Passenger Hub (MMPH) within the KBNIR. The proposed MMPH is envisaged having integrated terminals for interstate

### 6.1.3 Integrated transport strategy for the city

The key elements of the road transport infrastructure for the KBNIR are shown in **Figure 6-3**.

Buses, regional buses, city buses and a connection with the Delhi – Alwar RRTS station for inter modal passenger transfers. Apart from functions of intermodal passenger transfers, IPH would also provide office & commercial spaces for various government agencies and private companies involved in the development of the KBNIR.

The road transportation infrastructure in the KBNIR is divided in several categories:

| | | |
|---|---|---|
| NH8 | 90 m corridor | |
| Road Link | 100 m corridor | |
| Arterial Roads | 80 m RoW | 80 km/h |
| Arterial Roads | 60 m RoW | 80 km/h |
| Urban Collector Streets | 45 m RoW | 50 km/h |
| Local Streets | 30 m RoW | 30 km/h |

#### 6.1.3.1 Primary Roads

The Primary Road Network is developed with the following objectives:

- efficiency, effectiveness and safety of all users from different use groups, clusters etc.;
- logical, efficient and convenient access to, from and within the development;
- variety and choice in transport routes and modes (public and private);
- logical hierarchy in routes and distribution;
- ability to segregate heavy and non-heavy traffic where necessary, desirable in the future;
- consideration and minimization of impact of road type on environment (natural and built).

The primary road network is developed in consideration of the requirements of the Concept Master Plan, new urban area and the wider needs of connectivity in the region. The important road link connection from the south (via the station location at Ajarka) to the NH8 is a fundamental element. The necessary capacity of the road, the extent / length of road to be developed and the unlocking effect of the road link have been taken in consideration in locating this road. The unlocking effect is the amount of land that becomes available for development due to the presence of the new road link. With the proposed phasing strategy the costs of realizing the road link can be balanced with the amount of development. The proposal closely follows the suggestions put forward in the Concept Master Plan for the SNB complex prepared for the Town Planning Department Rajasthan in Jaipur. As in this plan, the Concept Master Plan for the KBNIR connects the road link with the NH8 via a series of arterial routes. The first and primary connection to be realized is the connection between Gadoowas and the NH8 via a circular road(s) around the new Knowledge City.

Along the NH8, the landscape design must perform two main functions. The first function is to provide an appropriate formal green spine that marks the entrance to the new developments and identifies this stretch of the NH8 as integral to the new developments. This is an important function in creating an appropriate setting that will be attractive to visitors and investors as well as those who will come to live, work and study in the area. The second function of the landscape alongside the NH8 is that of establishing a buffer between the busy, noisy main road, and the adjacent developments. The proposed buffer zone is 500m wide with the NH8 in the centre. The main roadway for the NH8 will require approximately 60m (including central median strip and service roads etcetera). This zone will be used for the collection of storm water runoff in wadis and swales as part of the rainwater harvesting and water recycling strategy. The zone can also be used as a solar power plant in which sculptural arrangements of solar panels form visually interesting forms whilst simultaneously generating electricity that can power the highway street lighting and possibly even electric busses etc. Such an element will form an impressive statement about the responsible, innovative and creative ambitions of the new urban area. Along the Road link to the South of the KBNIR, there is an extra strip of buffer planting that establishes a buffer offset between the busy link road and the new developments. This buffer may be supplemented by land sculpture (hills, dykes and bunds) using material excavated during the construction works elsewhere in the area.

#### 6.1.3.2 Arterial Roads

The arterial roads are meant to provide for the transport of large numbers of vehicles. They are characterized by high levels of traffic and higher speeds of up to 80km/h. Intersections are provided at a minimum spacing of 500m, there is little cross traffic, no parking permitted on these roads and the developments alongside the road cannot be accessed directly from the arterial road. Therefore we suggest the inclusion of parallel service roads that can facilitate limited local access for the plots immediately alongside the arterial roads and that also can accommodate limited, short-term on street parking. Alongside the service roads we propose main cycle ways and footpaths that allow these road corridors to function as primary

transport routes for all forms of traffic. The arterial roads define the largest subdivision of the new urban area and are closely linked to the phasing and development strategy.

These arterial roads are the main routes into, out of and through the new urban area. As such the design of these roads should establish the character of the development. The design places a generous central median that in the beginning can be simply a meadow strip and that later could contain a public transport route. The proposed service roads alongside the main arterial road will provide local access. Between the arterial road and service road a planted median strip is proposed that will contain storm drainage and a mix of native planting with blocks of ornamental planting close to the intersections. At the flanks of this road profile a double row of native, light canopy street trees is planned to form a green edge whilst also helping to create a pleasant, shady environment for walking and cycling. The sub-arterial roads feature a slightly smaller central median strip and no service roads but otherwise closely follow the landscape planting design concepts set out for the arterial roads.

Normally the arterial roads are 60 m RoW. However, the most important arterial roads are created with 80 m RoW to create extra dimensions for possible future public transport and a spacious green character.

#### 6.1.3.3 Urban collector streets

Urban collector streets circulate and distribute within the sub-clusters /neighbourhoods take the local destination traffic into and out of these areas. These roads are more intimate in character and have a narrower corridor that helps to visually reduce the speed of these roads. The roads have a design speed of 50km/h and intersections can be located with a minimum distance of 150m. As they are characterised by heavy levels of cross traffic, parking on these streets is not permitted however frontage access to the parcels is permitted although it remains subject to strict control.

#### 6.1.3.4 Local streets

Local streets provide access and circulation within the urban districts, neighbourhoods and developments. From these streets there is free frontage access and limited on-street parking is permitted. These streets have a design speed of 30km/h and the detailed design should reflect this low speed in the choice of materials, street elements and planting all of which should help to enhance the low speed character and improve pedestrian and cycle safety in particular.

The urban collector streets are smaller, more intimate streets and the landscape design should reflect a quieter, slower traffic environment. The trees may be less formally planted (groups and clusters rather that evenly spaces rows) and the trees may even be selected for their fruit or nut harvest. Whereas the arterial and sub-arterial streets should all apply a consistent palette of planting in order to establish an overall identity for the new urban area, the collector streets should enhance the individual characteristics of the clusters and city neighbourhoods through which they run.

#### 6.1.3.5 Existing roads

Existing roads that form the current direct connection between the Abadi areas are to be maintained. They function mainly as connections for slow traffic (e.g. pedestrians, bicycle, riskha) and for public transport.

#### 6.1.3.6 Primary non-vehicular network

Walkable cities offer many benefits in terms of health (mental and physical), vibrancy of streets, community engagement and business vitality. Creating excellent pedestrian systems requires attention for the quality of connections, the convenience of routes, scale, comfort and quality of spaces and streets and legibility of the routes. Achieving all of this requires an integrated approach where the pedestrian network is considered alongside the built structure and urban design guidance;

locations of landmark buildings, sightlines, active facades, active and passive surveillance etc. Pedestrian networks are designed with regard of all of the other transport networks in an area with special attention to potential conflicts, possible solutions and alternatives. Cycling is getting more important in urban transport and mobility. Cycling plays a significant role in reducing unnecessary short-distance car travel thereby greatly improving air quality. Many of the issues in planning cycle networks are the same as those facing pedestrian network. In addition to pedestrian networks, cycle networks require careful planning in terms of hierarchy of routes, provision of secure and sufficient cycle storage and the integration or separation of cycle and vehicle routes.

### 6.1.3.7 Design of roads and traffic segregation

**Figure 6-4 to 6-8-** shows the cross sections of the different types of roads.

Grade separators and traffic signals will be used at most of the junctions to control traffic. The signalized intersections are planned on intersections of arterial and sub arterial roads. Traffic segregation will be used on the basis of the road hierarchy and will involve fly overs

**Figure 6-3: Impression road network**



**Figure 6-4: Impression road network**



**Figure 6-5: Transport infrastructure in the KBNIR**

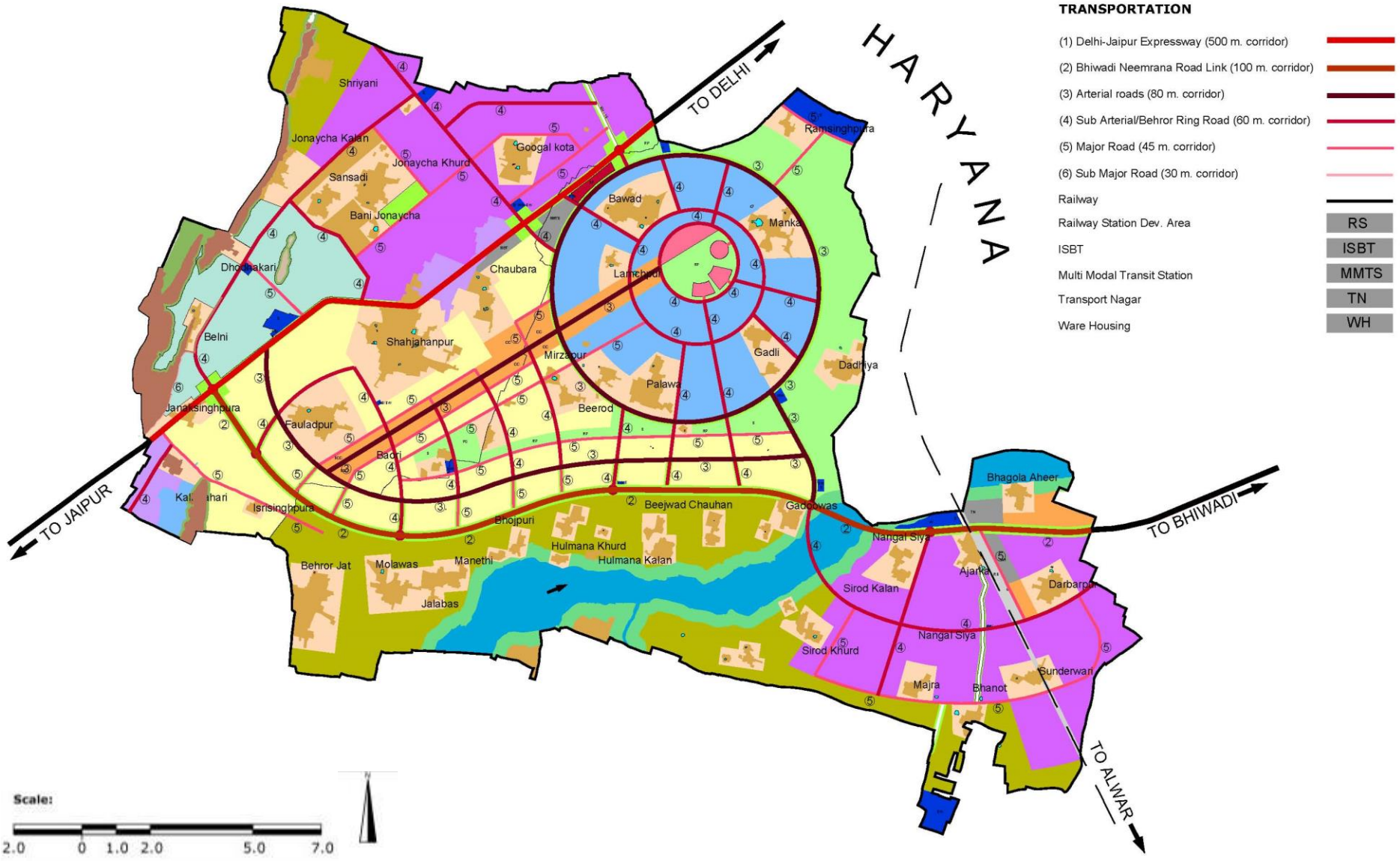


**Figure 6-6: Road section 100 m road (Road Link)**

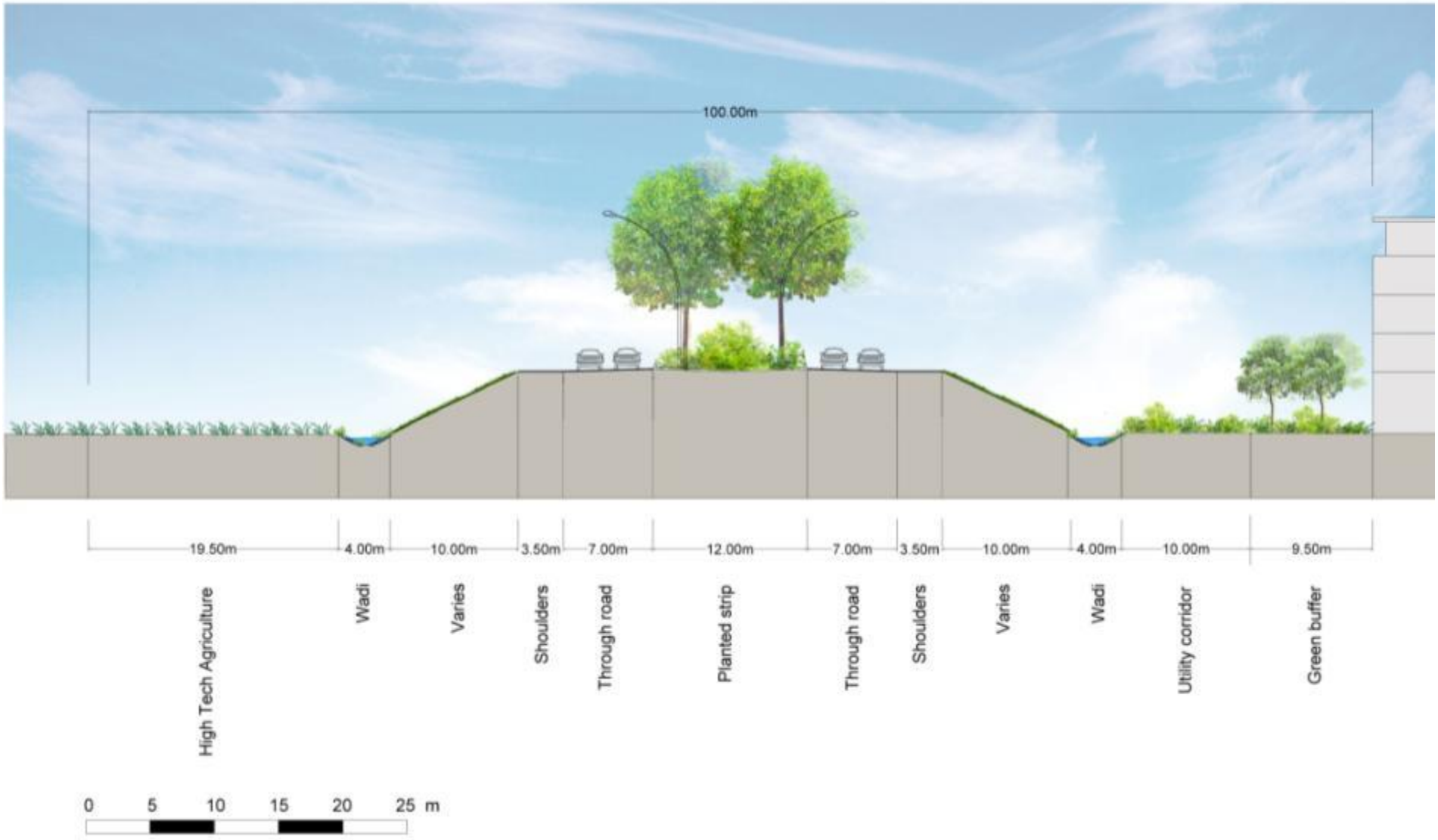


**Figure 6-7: Road section 80 m road**

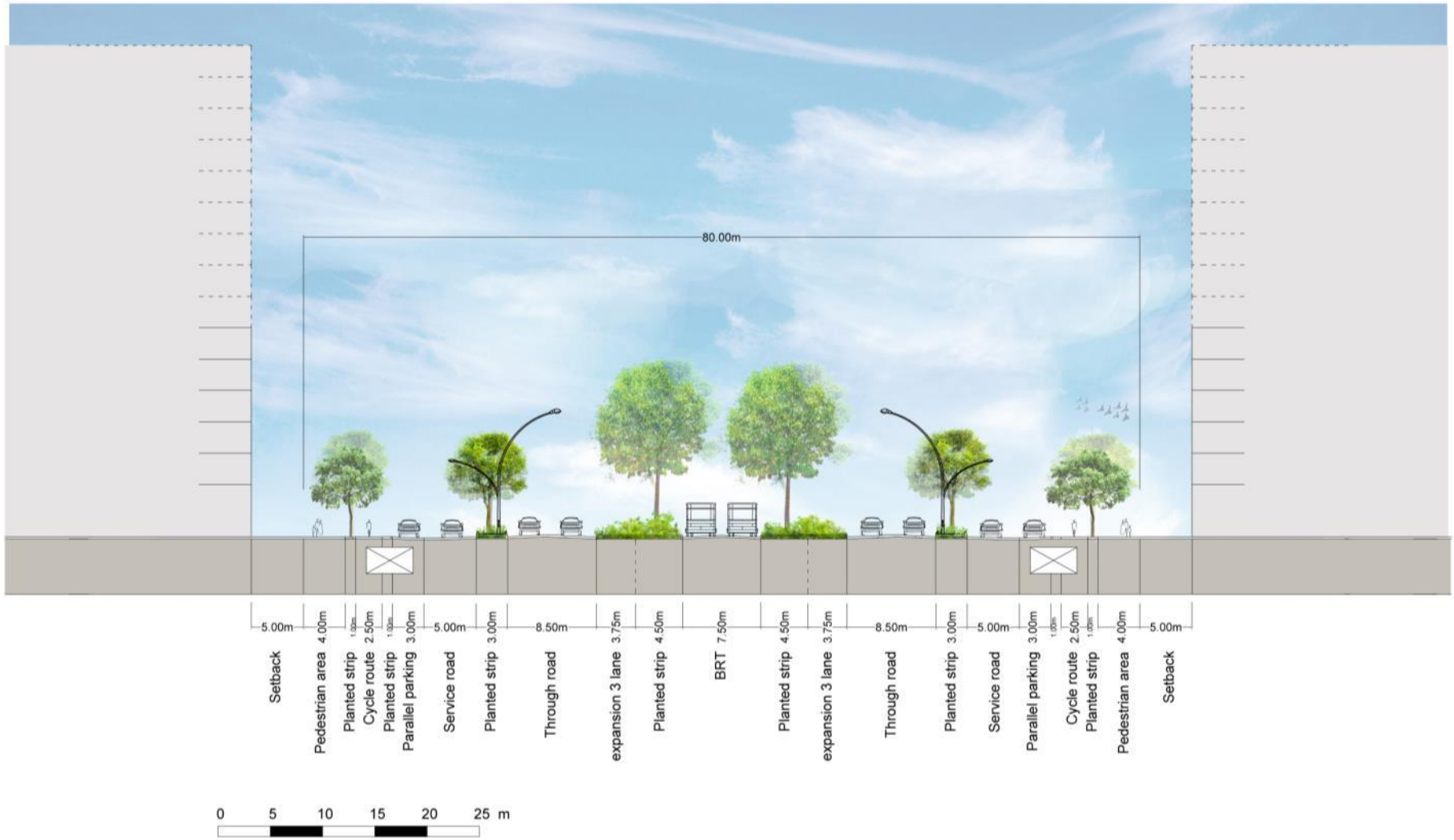


**Figure 6-8: Road section 60 m road**

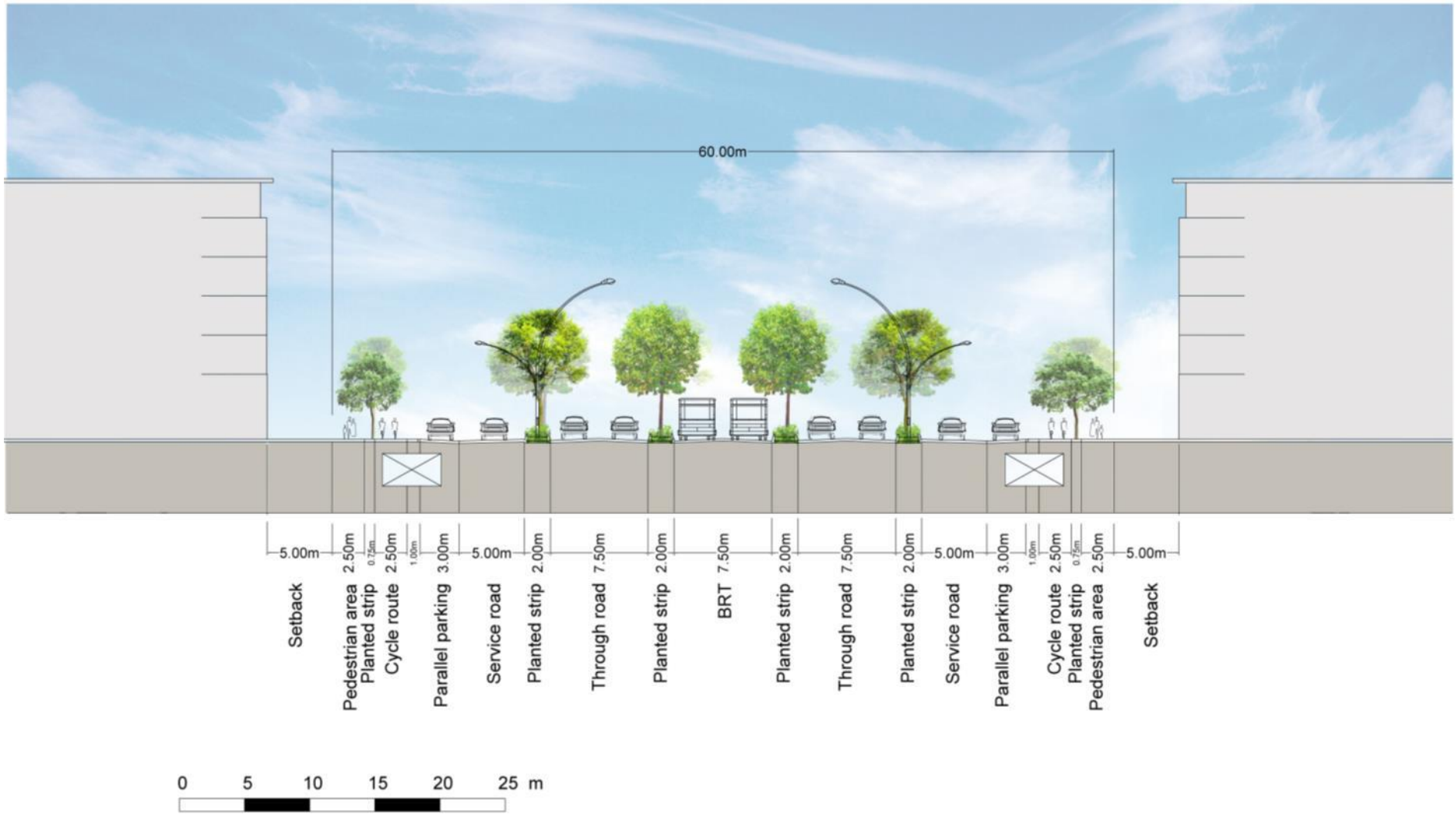


**Figure 6-9: Road section 45 m road**

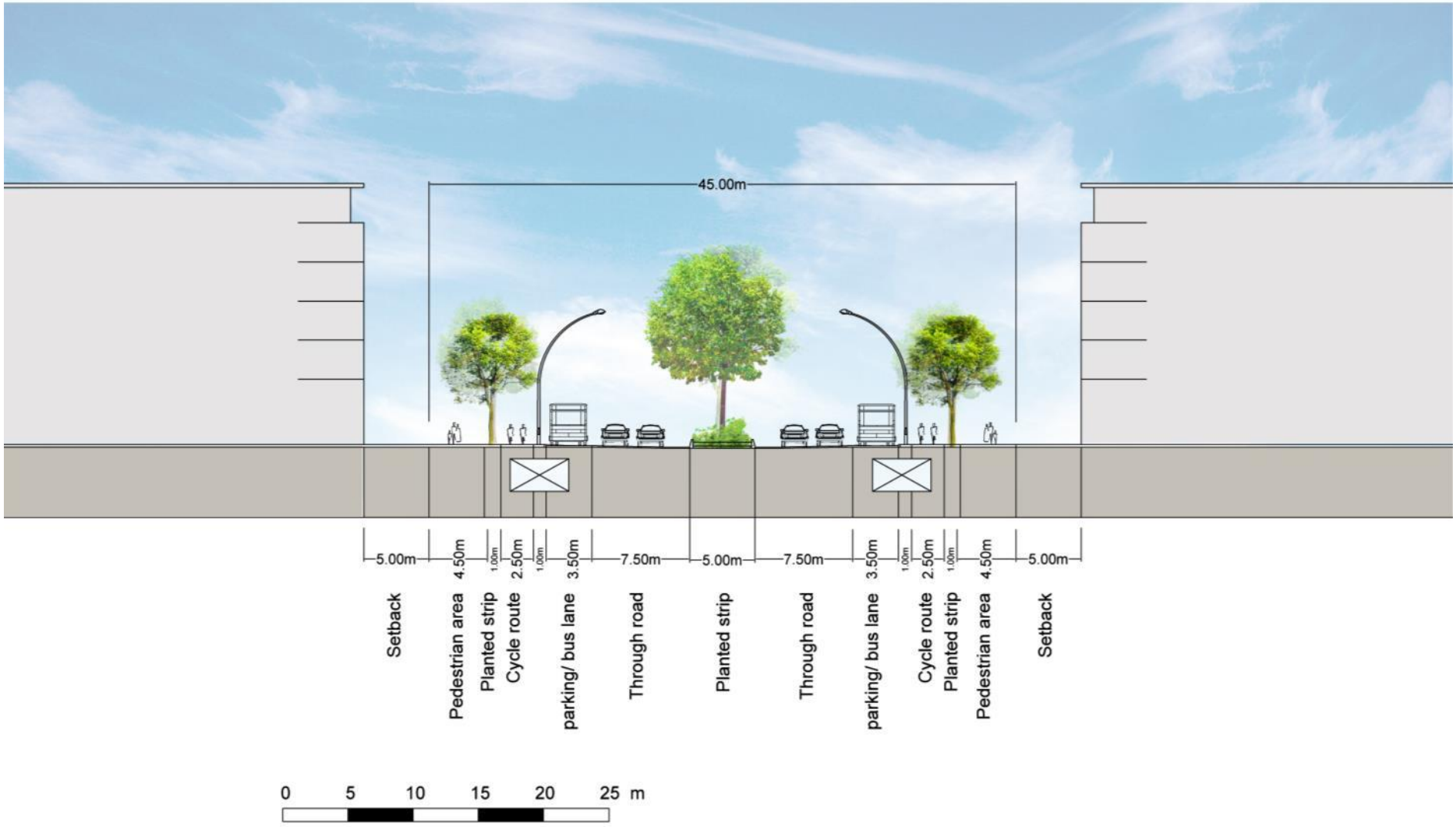
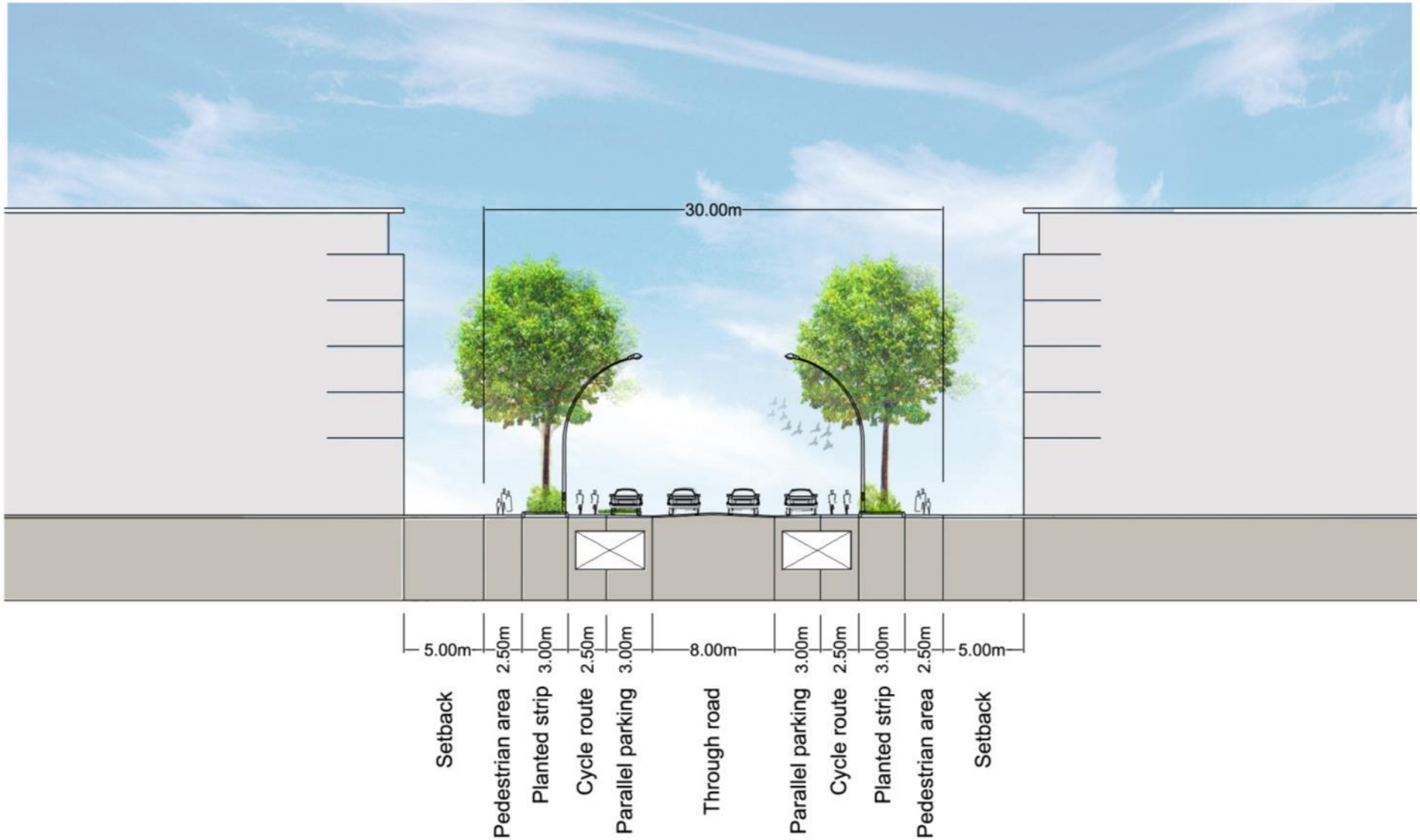


**Figure 6-10: Road section 30 m road**

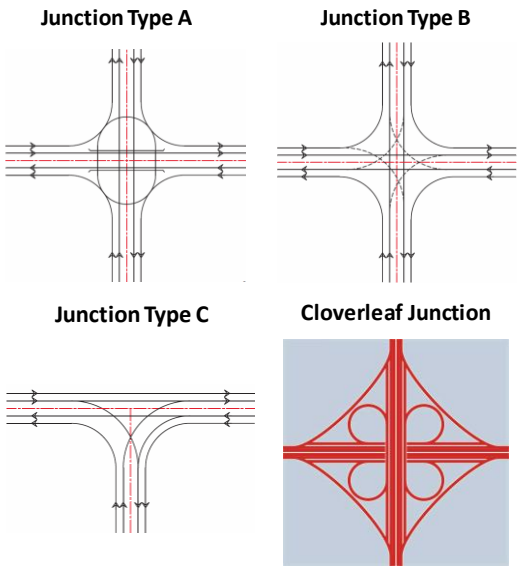


### 6.1.3.8 Flyovers / Bridges/ Junctions/ RoB / RuB

Within the New City the junctions with the NH8 and the Road Link will be on separate levels to avoid traffic congestions on these roads. Their primary use is to guarantee a smooth traffic flow, and therefore one-level junctions with traffic lights are to be avoided. Traffic junctions with other roads than NH8 or Road Link will be on one level controlled by traffic lights.

Exception to this rule is the junction between the central commercial spine and the outside ring road of the Knowledge City. This junction will be elevated since a high traffic demand is here expected and a spatial connection between the central spine and the Knowledge City may not be blocked by a large infrastructure junction. The following junctions are proposed. **Figure 6-9** presents the Junctions types whereas their locations are presented in **Figure 6-10**.

**Figure 6-11: Junction Typology**




### 6.1.3.9 Public Transport Network

Public transport plays an important role in the growth and functioning of a city. It provides the opportunity to structure the city and can be customised to serve specific needs. The main benefits of public transportation are:

- Its usage can lead to less car traffic, which increases safety for pedestrians and passengers, and creates safe neighbourhoods;
- reduces the level of air pollution, congestions, and the need for parking spaces;
- is resource efficient;
- efficient use of space;
- prevent urban sprawl (with accompanying car use);
- structures the city – attracts developments nearby;
- leads to dynamic, compact city centres;
- fast and quick movement through the city between hubs (intermodal transfer hubs);
- increases people's mobility (for those for whom car ownership is not possible, and cycling / walking too far).

The public transport plan is an outline of the possibilities contained within the design. This plan is a basic structure that illustrates potential routes and a hierarchy of public transport systems. The Public Transport plan recognizes that phasing, content and development will be led by the market and therefore the plan will grow structured and at times organically. The core of the public transport framework is illustrated alongside options for future expansion and alternative routes. The main high-volume high-level public transport system is a public rapid transit (light rail) system that runs from the train station at Ajarka (from Alwar). This light rail system runs along the median strip of the link road and arterial road and passes through the area before joining the NH8 and running through the buffer zone towards the Delhi/Rewari. This system will be supplemented by a local bus system. The bus system will use large buses on fixed routes and smaller buses on feeder routes. On very busy roads bus lanes may need to be introduced. In the the design of the road

infrastructure space is reserved for bus lanes. Buses and bus lanes will also act as a feeder system to the light rail system. Additional investments are needed in bus stops and a bus depot with maintenance facilities for the buses.

The layout of the public transport infrastructure, in particular the route of the light railway system and the main bus routes along arterial roads, is shown in **Figure 6-11**

#### 6.1.3.10 Street lighting

Good lighting of public areas is important to create safe living environments and to minimize (feelings of) unsafety and crime. It also can be used to improve orientation by using different lighting characteristics (e.g. color, intensity) for different categories of roads, spaces, neighborhoods etcetera.
A good street lighting van create pleasant (lighted) environments in the evenings, and therewith contribute to an attractive city.

Important aspects of a good street lighting are:

- Placement of enough lights to cover the public realm;
- Extra lights or intensity of light in areas with many people or that are vulnerable to crime;
- Adequate maintenance of street lights;
- Smart street lighting systems can be used to create a dynamic lighting system (e.g. dimming certain lights at night), and save energy (e.g. using PV-powered light poles).

**Figure 6-12: Example of street lighting with solar panals**



**Figure 6-13: Junctions**

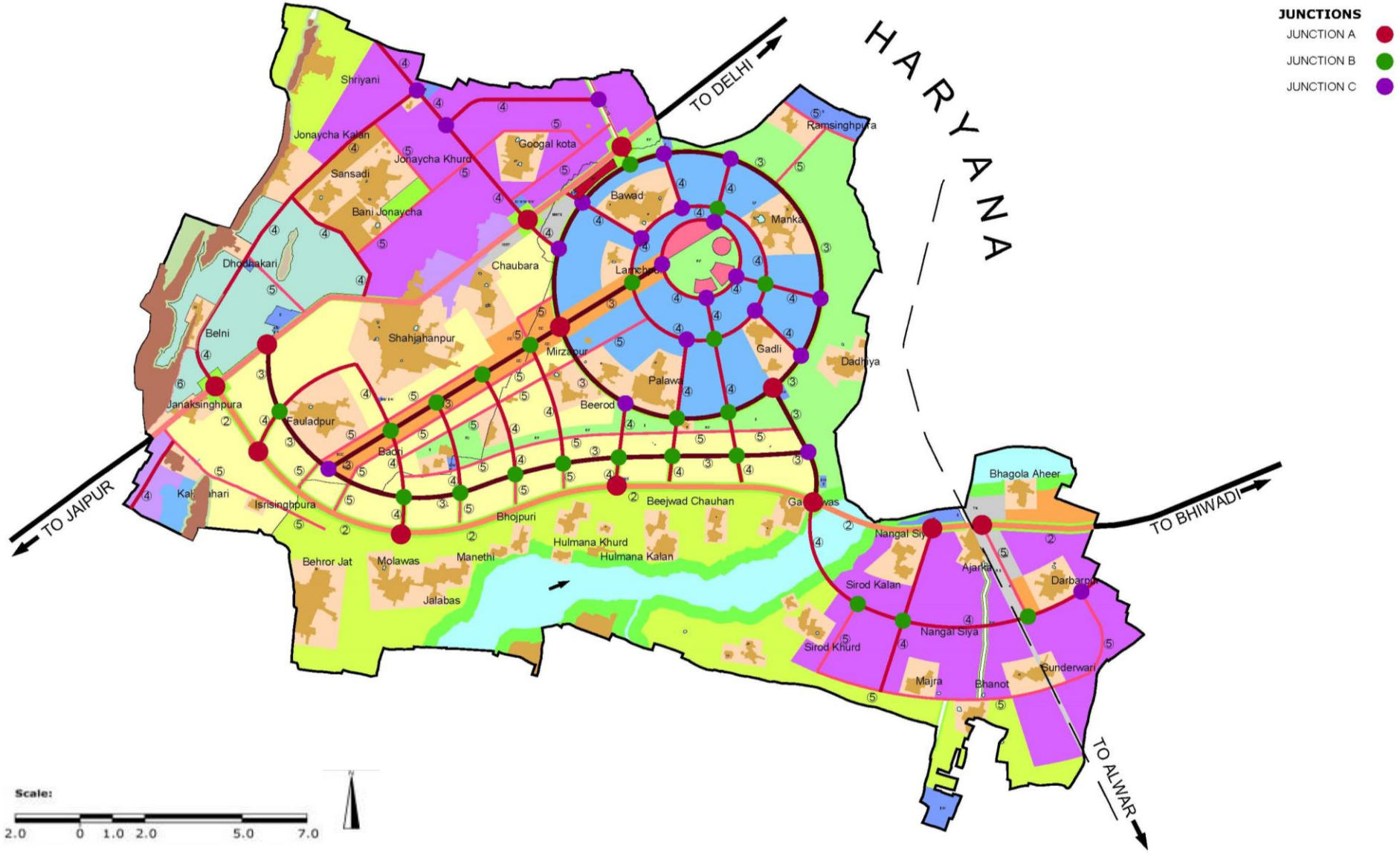
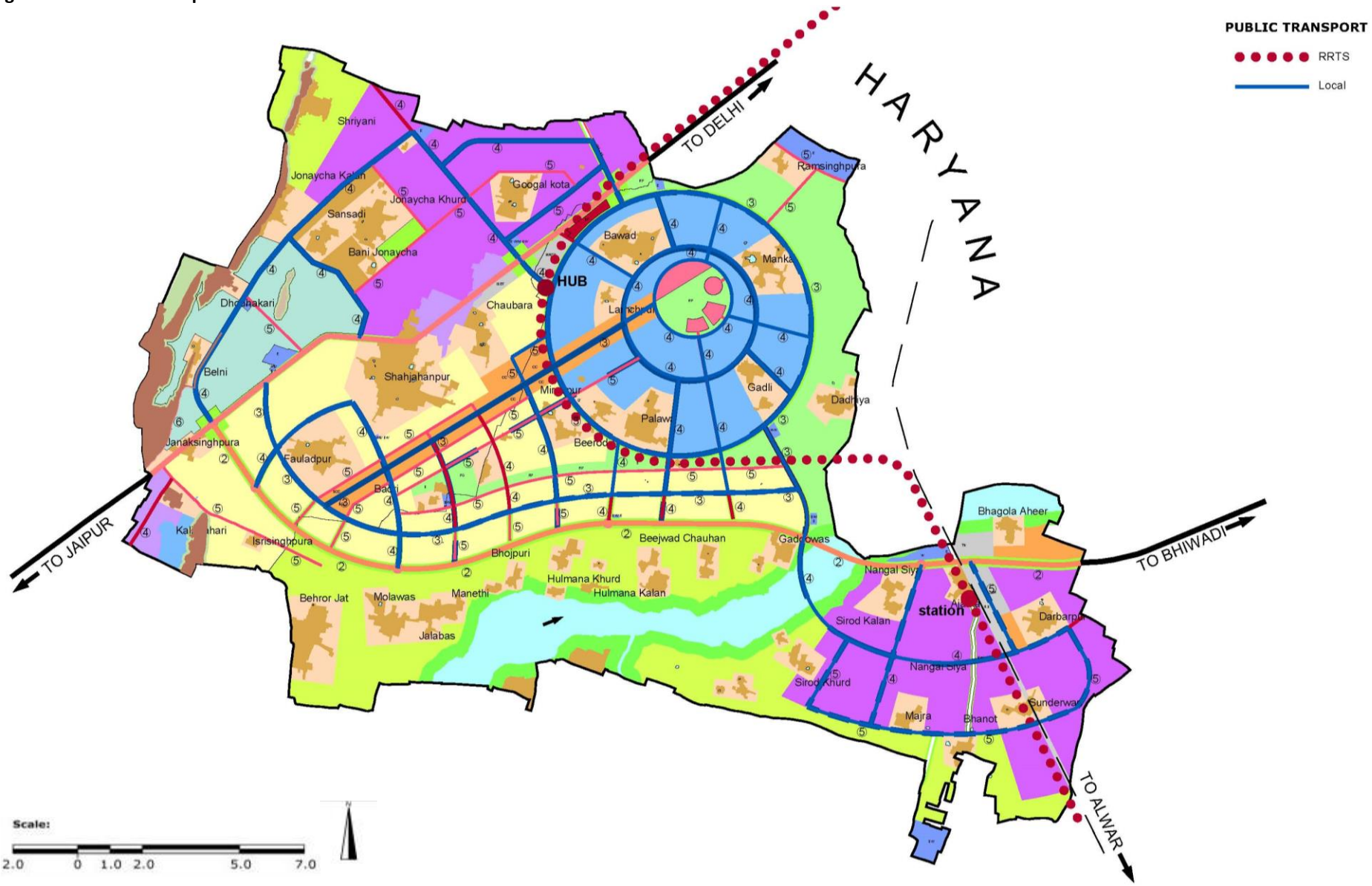


**Figure 6-14: Public Transportation**



## 6.2 Water Source & Conveyance Infrastructure

The ongoing section presents the water demand estimates for KBNIR, identification of potential sources and its selection.

### 6.2.1 Water Demand

As discussed earlier, the water demand for KBNIR is estimated at ~ 380 MLD by 2040 including the distribution and transmission losses. Of this Industrial process water is about 145 MLD. This is for the area of 165 Sq Km, population of 13.7lakhs and proposed industrial area of 26 sqkm. The existing annual water demand for irrigation is about 39 MCM (105MLD), which would decrease to about 4.5 MCM by 2041.

### 6.2.2 Existing Source & Its Status

At present, Ground Water is the only source for all forms of economic activities in the region. As per Central Ground Water Board (CGWB), the average annual ground water recharge in the region is just about **384 MCM.** The existing overdraft rate in the region is 1.63. CGWB has categorized the region as overexploited. If no interventions are made the overdraft rate may reach as high as 1.90 for this region by 2041.

For sustainable ground water development, net withdrawal of ground water shall be ZERO and ideally on the NEGATIVE net withdrawal. This means that the ground water levels are replenished over a period of time through supportive programs and interventions on Water Management.

In order to maintain the water balance in the region and improve the ground water aquifer situation, it is important to adopt multi-pronged strategy comprising of:

- Improved and efficient management of ground water source- Aquifer Recharge
- Importing water from external source

The improvement and efficient management of ground water needs sustained efforts over longer period are required. At the same time, it would fail to meet the demand from proposed/ existing economic activities. So, the external sources are must. In parallel aquifer recharge shall be channelized.

### 6.2.3 Management of Ground Water Source – Aquifer Recharge

The agricultural use accounts for nearly 90% of the total existing water demand, it is important to implement interventions for achieving efficiency in this major consumer of ground water source and with the mission approach nearly 40% of the water can be saved. In addition, it would be critical to implement the water harvesting measures and put in place systems for recycling the waste water. The suggested strategies for efficient management of ground water in the region include:

- Facilitating farmers for adopting drip and sprinkler based irrigation systems and also adopt low water consuming crops. Promoting the farmers to use water efficient agriculture techniques including use of green house.
- Revival of traditional Johads and other water harvesting systems as well as effective implementation of policy for water harvesting structures linked to all urban complexes.
- Recharging ground water through injection wells using treated waste water from domestic and industrial waste. The Aquifer Storage and Recharge system would be the most effective mechanism for minimizing the area requirements for storage as well as recycling of the waste water.
- Based on the above interventions and certain assumed efficiencies over a period, the water balance equations have been worked out and the interventions proposed above can result in achieving almost zero withdrawal situations in next two decades which further pursued through a mission approach could probably be achieved in one decade also. However, considering the long term sustainability of the aquifer and risks associated with effective implementation of interventions, it

is recommended that possibilities of getting water from external water source are also explored and a dependable source of water supply is extended to the region to supplement the ground water.

### 6.2.4 Available External Sources

The potential water sources considered for KBNIR include Fresh water from Chambal and Treated Wastewater from DJB.

#### 6.2.4.1 Fresh Water from Chambal

Chambal is one of the potential sources for getting water for the region, where the water levels during lean period are so low that the levels go below the desired 10 m depth levels for the Crocodile Sanctuary. The WRD of the Government of Rajasthan has indicated that it would be possible to draw surplus rain water from Chambal only during 3 months of monsoon and stored, which would require an reservoir area of about 50 Sq Km. The nearest point for drawing water from Chambal river is about 300 Km. Following figure shows the alignment of the routing the pipeline.

The elevation at the project area is 280 m and elevation the river is 120 m but the highest elevation is 403 m near Behror. The alignment passes through dholpur, bharatpur, Alwar, Behror to reach the project area. Figure 6-13 presents the tentative alignment for freshwater conveyance from Chambal River, while **Table 6-5** presents the elevation at various locations.

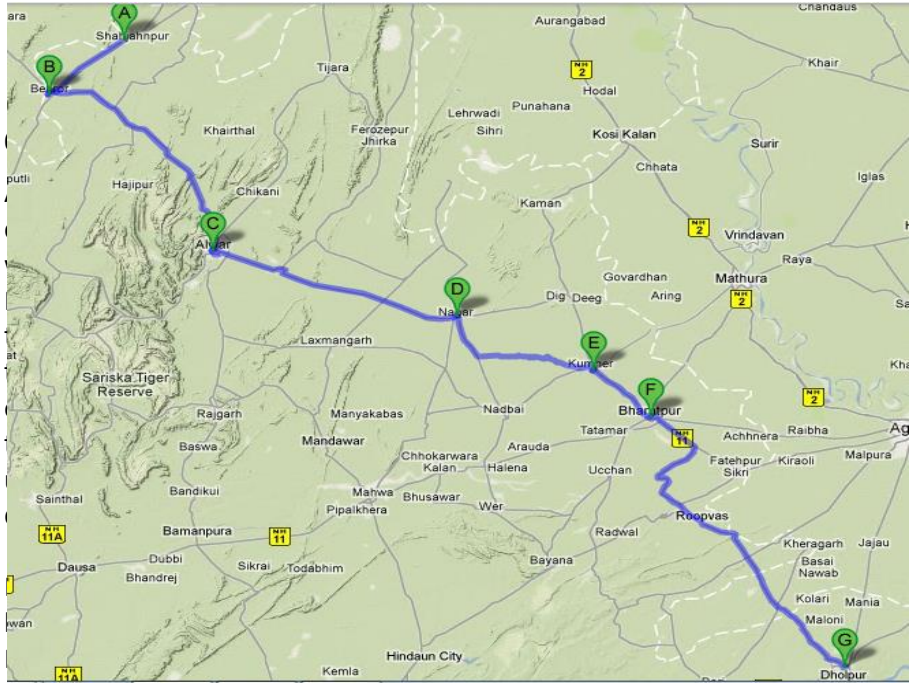
**Table 6-5: Ground Elevations along alignment**

| Ground Elevations along alignment | |
|---|---|
| **Place** | **Elevation** |
| Dholpur (Near River) | 120 m |
| Dholpur | 176 m |
| Bharatpur | 175 m |
| Kumher | 179 m |
| Nagar | 211 m |

| Ground Elevations along alignment | |
|---|---|
| **Place** | **Elevation** |
| Alwar | 285 m |
| Behror | 321 m |
| Shahjahanpur | 288 m |
| | |

A maximum level difference in the alignment is about 283 m, which would require multistage stage pumping. In addition, for getting water to the region, the pipe line would pass through several water scarce villages and towns with this region falling at the tail end.

**Figure 6-15: Freshwater Conveyance from Chambal -Tentative Alignment**



### 6.2.5 Analysis of Alternatives

The ground water alone would not be able the water demand for KBNIR on standalone basis for horizon period. The consultant in its earlier report presented three schemes of water sourcing – 1) Combination of Freshwater from Chambal, Treated Water from DJB and Ground Water), 2) Treated water from DJB and Ground Water, and 3) ground water alone (if no external source is available) and are briefly described hereunder.

**Option 1 (Freshwater from Chambal, Treated Water from DJB & Ground Water)**
In this option, it is said that fresh water requirement for the project shall be fulfilled by the Chambel water. The fresh water requirement of 300 MLD can be 100 % fulfilled by the river water during Monsoons. During Non Monsoon period, only 50% of the water can be fulfilled rest 50 % shall be fulfilled by ground water.

In order to reduce the dependency both on the ground and Chambel water, it is proposed to fulfill the industrial water requirement of 140 MLD (160 MLD including transmission losses) from the treated sewage from the Okhla STP.

**Option 2(Treated water from DJB & Ground Water)**
In this option, it is assumed that the fresh water requirement of 300 MLD shall be fulfilled by Ground water and the treated sewage from Okhla STP shall be used for fulfilling the industrial process water demand.

**Option 3 (Only Ground Water)**
In this option, it is assumed that the entire demand for the project shall be fulfilled by the ground water due to non-availability of external sources. However, it would mean over extraction of ground water and darkening the zone further.

The Consultant earlier opined that option 2 is the most practical one following reasons:

- The flows of Chambal River during non-monsoon period go well below the environmental sustainability limits, in-fact endangering the Crocodile Sanctuary. The presence of Crocodile sanctuary is the major hurdle in getting environmental clearances. The population along the alignment of water starved region of Alwar district would also demand water share in Chambal scheme.
- Complete Dependency on ground water is not feasible and sustainable over long run.
- Delhi Jal Board has agreed to share 40-50mgd (180-225mld) of treated water from Okhla Treatment Plant.

### 6.2.6 Scheme for Preferred Option (Chambal)

The Consultant is given to understand, that DJB treated water may not be available for KBNIR and that sourcing of water from Chambal River is preferred option of GoR.

This has led to narrowing the choice of source of water for KBNIR – i.e. Chambal River. PHED, GoR is conducting a feasibility study to fulfil the water requirement of Alwar district which also includes DMIDC area. GoR shared the report on “Source Feasibility Report for Providing Drinking Water to Alwar District includes proposed DMIC area”, from Chambal River” with the Consultant and directed it to consider it while making proposals for KBNIR on sourcing of water. It was informed to the Consultant during the meeting with PHED official on May 08, 2014, that the study includes the water requirement for several villages and towns apart from KBNIR falling enroute the conveyance system being formulated by PHED.

It may be note that the scheme presented by the Consultant shall be only for KBNIR at a broad conceptual level and would require further

investigations, studies and decisions by GoR to finalise the scheme for KBNIR for sourcing water from Chambal.

The, Addl, CE, PHED, Alwar (NCR) during meeting held on May 08, 2014 informed the Consultant that PHED is working on comprehensive scheme which shall include water requirement of several villages/ small towns enroute pipeline route and KBNIR. Hence the conveyance & storage system would be common. It is therefore, the proposal of PHED shall be considered as the basis for future design of water conveyance and storage for KBNIR. Also, the cost estimates associated for development of water conveyance and storage system shall be as per the costs derived by PHED for KBNIR.

Broad scheme concept for KBNIR is as following.

- It is proposed to pump water from Chambel River during monsoon period from source of point at Dholpur to storage reservoirs.
- The water shall be stored intermittently in reservoirs. The reservoirs can be existing reservoirs (to be selected from list of reservoirs) as suggested by WRD (list presented in **Appendix 6)** and artificial reservoirs. The suitability of reservoir for storage of water for KBNIR shall be done based on detailed studies and investigations while formulating the detailed project report.
- Water stored in these reservoirs, shall be used to supply water to KBNIR throughout the year.

The Consultant, having assessed the scheme and discussed the concept scheme with WRD & PHED during May 07 & May 08, 2014 meetings, is of the view that water for KBNIR shall be stored in large size reservoirs and these reservoirs shall preferably located along the pipeline route.

The scheme concept proposed for KBNIR is as following:

**Water Sourcing & Storage**

- The water required for KBNIR for year 2041 is 87.965Mcum/ year. This estimate is based on assumptions that only potable water requirement (241 MLD including losses) of KBNIR is sourced from River Chambal.
- It is proposed that water pumped from Chambal River (at Dholpur) shall be captured and immediately stored in string of reservoirs.

  NOTE: Earlier, the Consultant has suggested three reservoirs – namely Siliserh, ]aisamand, Deoti, for the purpose of water storage with capacity enhancement through deepening and construction of embankment. However, as per the WRD letter dated April 11, 2014 and received by Consultant on April 30, 2014, has communicated that water from Jaisamand, Deoti and Siliseth may not available for KBNIR due to prior commitments. Further, during the meeting with SE, WRD, held on May 07, 2014, the Consultant was informed that submergence area of these tanks is mostly privately owned and therefore deepening of these reservoirs may not be possible as it would entail acquiring land which is extremely difficult. It was then suggested by SE, that Bhuchara Dam (with capacity of 16.36 MCM), Raipur Patan (9.17 MCM) & Chitoli (24.38 MCM), totaling to 49.91 MCM as well as several other reservoirs (list presented in **Appendix 6**) shall be considered as potential storage reservoir for KBNIR. In addition to this, artificial reservoirs shall also be considered.

  The Consultant is of the opinion that all potential reservoirs (proposed earlier by Consultant, suggested by WRD and creation of artificial reservoirs) shall be studied for the purpose of storing water for KBNIR.

- It is proposed that further investigations/ studies shall be carried out by GoR to select the most feasible reservoirs for storing water for KBNIR from list of reservoirs presented in **Appendix 6** as well as possibility of creating artificial reservoirs. It may be noted that the cumulative capacity of selected reservoirs' shall be 87.965Mcum/ year by 2041.

- It is suggested that master reservoir (the biggest tank/dam among the selected reservoir) be developed and the other reservoirs (smaller tanks) are connected to master reservoirs.
- The master reservoir shall be filled up first followed by other tanks assuring the continuous water follow at uniform rate to KBNIR from Master Reservoir.
- The further investigations (like soil investigations, hydro-geological investigations, geo-technical etc,) on feasibility capacity argumentation of identified tanks and/ or creating artificial reservoir for storing water for KBNIR. The Consultant proposes that augmentation be done through deepening of tanks for higher evapotranspiration rate and land requirement.
- It is also suggested that to provide slope protection shall be established all along the banks of tanks to protect the slope and maintain the water quality.

**Raising Mains from Dholpur to KBNIR (Near Ajarka)**

- It is proposed to pump water from Chambel River during monsoon period from source of point at Dholpur to storage reservoirs.
- As per report of PHED, the fresh water requirement including transmission losses can be 100 % fulfilled by the river water during Monsoons and during Non Monsoon period, water stored in the tanks shall be supplied.
- While the demand at KBNIR for fresh water (raw water) is ~240 MLD and hence the water storage and conveyance system shall be designed for 240 MLD. With transmission losses the amount of water to reach at WTP at KBNIR shall be 230MLD.
- The water from Chambal (at Dholpur) shall be pumped through conveyance system (carrying water for KBNIR Only) to selected reservoirs[5].
- It is suggested that an Intake structure shall be created at selected tanks and to pump the water at uniform rate throughout the year. Water from smaller tanks shall be brought to larger Tank and from there a rising main shall be laid to transport water from larger tank to KBNIR (at Ajarka).
- The conveyance system shall designed to include following items:
    - UGT & Pumphouse at Dholpur
    - Rising main Pipe Line From Dholpur to Master Reservoir/ tank
    - Rising main pipe line from Master Reservoir to Smaller Tanks
    - Rising main Pipe Line from smaller tanks to master reservoir/ tank
    - UGT & Pump house at smaller tanks
    - UGT and Pump house at Master Reservoir
    - Rising Main Pipeline from master reservoir tank to Ajarka (KBNIR).
- Water Treatment Plant with capacity 230 MLD shall be developed at Ajarka. It is suggested to develop WTP in a phased manner and its development be done along with the enhancement of storage capacity.

## 6.3 Water Distribution System

In the region, except for Industrial Areas operated by RIICO, there is no existing water supply system. A new scheme of water transmission and distribution scheme is proposed for the KBNIR. Various design parameters needs to be finalized before designing the distribution network. These parameters needs are discussed below.

[5] Reservoirs to be selected from the list of reservoirs presented in Appendix 6 based on further investigations (like soil investigations, hydro-geological investigations, geo-technical etc,) on feasibility capacity argumentation of identified tanks for storing water for KBNIR

### 6.3.1 Peak Factor

Though the water supply system will receive flow throughout the day, there will be some duration in which maximum demand will be generated. Following Peak factors for domestic flow have been adopted for sizing the network, as per guidelines given in the CPHEEO Manual:

| Contributing Population | Peak Factor |
|---|---|
| Up to 50,000 | 3.00 |
| From 50,000 to 2,00,000 | 2.50 |
| Above 2,00,000 | 2.0 |

Peak factor shall be adopted based on the contributory population load on each pipe.

### 6.3.2 Pipe Design and Materials

Pipes of different materials are used in water supply systems. Broadly two categories of pipelines are generally required in water supply systems:

- Trunk Mains/ Transmission Mains between Water Treatment Plants and Service Reservoirs.
- Local Distribution Lines downstream of Service Reservoirs

Transfer Mains under the project includes Clear Water Mains from Water Treatment Plant to proposed/existing UGRs or OHRs. A number of pipe materials are available for water conveyance application, such as Cast Iron (CI), Ductile Iron (DI), Mild Steel (MS), High Density Polyethylene (HDPE), Asbestos Cement (AC), Glass Fibre Reinforced Plastics (GRP), Spirally Welded Steel (SWS), Prestressed Concrete (PSC) and Reinforced Concrete Cylinder Pressure Pipes (RCCP).

However, only CI, DI, HDPE are considered for further evaluation, since the other pipes are normally available in higher diameter range used for municipal applications. These pipes have been compared on various parameters to evaluate their usefulness for conveyance of clear water. The main parameters which have been discussed are available sizes and lengths, applicable IS codes, weight, flexibility, available working pressure ratings, tensile strength, impact strength, ease of tapping and repair, general availability in India.

**High Density Polyethylene (HDPE)**

HDPE pipes are available in sizes upto 630 mm OD but upto 315 mm OD they are commonly used. The material is light, has very good impact strength flexibility and corrosion resistance. The jointing can be done by butt welding, insert jointing or by flange jointing. This is satisfactory but requires skilled manpower; HDPE pipes are tough and resilient and conform to the topography of land when laid above ground or in trenches. They can bend to some extent thus reducing use of specials like bends, elbows etc., thereby reducing installation cost. HDPE pipes are easy to carry and install because of their lightness. The pipe has a very high C-value. The bending material has to be free from sharp edges. Fine sand or screened excavated material is ideal. It is the costliest material as compared to other pipes available in its range.

**Cast Iron (CI)**

It is available in sizes of 80mm-100mm suitable for local and trunk distribution mains though the commonly used range is 100 mm-1000mm. It is widely used in the water supply systems in India because of its longer life. There are examples of cast iron mains in which continue to give service even after a century of use though with reduced carrying capacity. CI pipes can be used in soils and waters of slightly aggressive charactive. It would e preferable to have inside mortar lining of this material. This will also improve its C-value. Adequately trained manpower is available in India for laying and jointing of CI piles. Locating underground CI pipes is easy with a pipe locator. Old worn out CI pipes have salvage value

**Ductile Iron (DI)**

Ductile Iron, also called nodular iron or spherical graphite iron has superior mechanical characteristics. Ductile iron differs from cast iron by its greater tensile strength and by its significant proof stress and elongation after yield. For protection from corrosion inside and outside linings are provided. Cement mortar lining with a seal coat of asphalted material is typically applied. Polyethylene internal linings and epoxy coatings and linings are also used for special applications. Laying and joining techniques are similar to CI. The pipe has high impact strength due to its ductility. Thus it has the durability of CI and the ductile strength of MS. However it needs proper bedding and backfilling for sizes 700mm and above due to it's this wall design. Pipes are easily available upto a size of 1000 mm.

Considering the ease of taking connections, durability, cost economics, availability, it has been recommended to adopt DI, K7 pipes for water supply scheme.

**Pipe Roughness Coefficient**

It is proposed that the DI pipes shall be used for the transmission as well as distribution system. As per CPHEEO Manual 1999, a 'C' value of 140 has been recommended. For the proposed network, which may be of DI, a 'C' value of 140 has been considered for design.

**Valves and Fittings**

For operation and maintenance of any supply system, a minimum number of valves are necessary. Provision for sluice valves, butterfly valves, air valves and scour valves for proper operation and maintenance and to maintain emergency supplies haves been made at the time of detailed designs.

**Sluice Valves**

Ideally, in a continuous supply system every branch should have a sluice valve to enable control of flow or for isolation of the line.

For equitable supply it is absolutely necessary to have controls, without which the hydraulically better placed reservoirs would draw more water depriving the others. The valves need to be controlled so that the reservoirs draw only the allocated quantity considering the supply from the existing water sources.

It is recommended undertake leak detection work on a large and on continuous basis in future to contain leakage losses; the system should have adequate number of valves to isolate the pockets.

**Air Release Valves**

Air release valves of standard make shall be proposed in the rising mains to protect the line from negative pressure and overloads due to the trapping of the air.

**Scour Valves/ Drain Valves**

Drain valves standard make shall be proposed in the rising mains and distribution system at lower points in the line to drain silt and water from the line, whenever required. Drawing no FVPL/STD/WS/02 shows detail of scour valve.

**Metering & Metering**

To avoid wastage and use of water judiciously all the connections shall be metered. The water tariff shall be framed on tapering principle such that the water charges increase with increase in its' consumption. The tariff shall be such that at least maintenance in-charge should be able to recover

the maintenance cost. Hence it is must to provide metering for giving connections. Moreover meter will be required at various locations within the distribution system to control and regulate the flow of water. Metering also helps to keep the leakages and thefts under control.

**Water Auditing**

It is beyond doubt that the measurement of flow in water supply system is of prime importance to control wastage and monitor system performance to generate more revenue. The point of measurement and suitable type of water meter at right place is as crucial as the policy of metered or un-metered system.

It is proposed to install bulk flow meters at critical points in the water supply system. The flow meters shall be installed on all clear water mains for measuring the quantity of water flowing to each zone or command area.

### 6.3.3 Distribution Aspect

**Minimum Pipe Size**

The minimum pipe size for distribution network is 100mm as per CPHEEO manual for population less than 50,000. However 80mm pipe size shall be considered as minimum for the distribution network design under this project as no further expansion is contemplated and it is a relatively small system.

**Duration of Supply**

Pre requisites for fixing duration of supply, i.e continuous supply for 24 hrs per day or intermittent supply, with adequate residual head are: availability of sufficient quantity of water, type of development and an efficient pipe network for distribution of water. The development is an integrated township with industries, commercial units, institutional development. and the water requirement in the industries, commercial and institutional will be only during the working hours. Hence, it is recommended that the water supply for project area will be planned for intermittent supply of 24 hours per day.

**Pressure Requirement**

The development shall comprise of the mostly high rise building. Hence, it is proposed to supply water to the underground tank of the buildings and from their UGT it shall be pumped to respective overhead tanks. The distribution network shall be designed to distribute water to consumers at a minimum residual of pressure 7 m at ferrule at all locations in the project area.

### 6.3.4 Network Design

A complete, effective and economical water supply system for transmission of underground water to individual households has been proposed for the proposed township. After studying the terrain, land use, and phasing pattern following are the main observations which influence the design of water distribution network.

- The KBNIR is divided into two parts by the NH 8.
- Major land uses within the KBNIR are of three categories viz. residential, knowledge city, and industrial.
- The railway line divides the Industrial area (near Ajaraka) into two regions
- Development Phasing for KBNIR
- It is assumed that irrigation water shall be fulfilled by individual tube wells and shall not be supplied from the water distribution system.

Considering all the above parameters the entire project area is divided into three zones aligned with the development phasing. The assumptions for water demand and phase wise water demand for different uses is presented in ***Table 6-6 & 6-7.***

**Table 6-6: Assumptions for Water Demand**

| Assumptions for Water Demand | | | | | |
|---|---|---|---|---|---|
| **Description** | **Phase 1** | **Phase 2** | **Phase 3** | **Total** | **Norms Adopted** |
| Residential Population | 254178 | 258957 | 855094 | 1368229 | 135 lpcd |
| Student Population | 30500 | 54873 | 92573 | 177946 | 45 lpcd |
| Industrial Area | 1248 | 346 | 939 | 2534 | 45000 ltr/ha/day |
| Industrial Employment | 56180 | 15580 | 42251 | 114011 | 45 lpcd |
| Tourism Employment | 12911 | 15471 | 0 | 28382 | 45 lpcd |
| Government | 3092 | 0 | 0 | 3092 | 45 lpcd |
| | | | | | |

**Table 6-7: Phase wise water demand**

| Description | Phase 1 | Phase 2 | Phase 3 | Total |
|---|---|---|---|---|
| Residential Population | 34.31 | 34.96 | 115.44 | 184.71 |
| Student Population | 1.37 | 2.47 | 4.17 | 8.01 |
| Industrial Area | 56.18 | 16.44 | 42.25 | 114.87 |
| Industrial Employment | 2.74 | 0.86 | 1.90 | 5.50 |
| Tourism Employment | 0.58 | 0.70 | 0.00 | 1.28 |
| Government | 0.14 | 0.00 | 0.00 | 0.14 |
| ***Sub-Total*** | ***95.32*** | ***55.43*** | ***163.76*** | **314.50** |
| Add 15% for losses | 14.30 | 8.31 | 24.56 | 47.18 |
| ***Total Demand at KBNIR*** | ***109.62*** | ***63.74*** | ***188.32*** | ***361.68*** |
| Add Transmission Losses (5%) | 5.48 | 3.19 | 9.42 | 18.08 |
| ***Total Water Demand for KBNIR at Source*** | ***115.10*** | ***66.93*** | ***197.73*** | ***379.76*** |
| | | | | |

The laying of the network shall be executed as per the phasing pattern and in modules. There would be four basic components of the water supply system, water treatment, Clear Water Reservoirs, Distribution Centers and Distribution Network. **Figure 6-16** presents the distribution system network for KBNIR.

### 6.3.4.1 Water Treatment

#### a) Water Quality

The water quality requirements of various users of the development will be different due to the difference in their nature of activity. The type of water treatment process to be adopted will depend on the raw water quality. The water received from the Chambal River shall be tested to determine the quality and treatment method shall thus be determined. The type of water treatment process to be adopted will entirely depend on the raw water quality.

#### b) Water Treatment Plant

It is proposed to have single water treatment plant at Ajarka on banks of Sahibi River. The size of WTP shall be 230MLD by 2040. It is proposed to be developed in phased manner and the capacity of each module is presented in ***Table 6-8***.

**Table 6-8: Capacity of Water Treatment Plant at KBNIR (MLD)**

| Capacity of Water Treatment Plant at KBNIR (MLD) | | |
|---|---|---|
| **Sr. No.** | **Phase** | **Capacity of WTP** |
| 1 | Phase I | 45 |
| 2 | Phase II | 45 |
| 3 | Phase III | 140 |
| | Total | 230 |
| | | |

#### 6.3.4.2 Clear Water Reservoirs and Distribution centers

Water from the after treatment shall be pumped & stored in underground tanks. Water from the underground tank shall be pumped to the overhead tank. One UGR shall be provided for each zone to assist in water distribution of each zone. The capacity of UGR is proposed for eight hours storage. **Table 6-9** gives the detail of capacity of UGR zone wise. The locations of UGR are presented in **Figure 6-16**.

**Table 6-9: Detail of capacity of UGR**

| Detail of capacity of UGR | | |
|---|---|---|
| **Sr. No.** | **Description** | **Capacity of UGT in ML** |
| 1 | Phase I | 15 |
| 2 | Phase II | 15 |
| 3 | Phase III | 47 |
| | Total | 77 |
| | | |

#### 6.3.4.3 Distribution system

The design of the water supply conveyance network would be performed by the selection of appropriate size depending on the ground slope so as to connect the succeeding node to convey the water while meeting the requisite hydraulic parameters. Identification of suitable size of pipe form an important part in the conveyance network design. An assessment is to be made to select each available commercial diameter for links to meet the designed parameter, i.e. velocity, pressure, flow rate etc.

The data required to design the network are pipe lengths, diameters, nodal demands, ground levels of the nodes, other design constraints such as peak factor, minimum and maximum allowable velocities. Manning's coefficient, nodal demand, ground elevations, number of nodes, links etc.

The design process is initiated by the preparation of a dynamic model of the network in AutoCAD. This model incorporates both spatial and non spatial data in the form of a network topology i.e., a combination of points and lines depicting pipes and manholes along with a backend database of attribute information which includes ID's, pipe lengths, formation levels etc. This GIS model is so dynamic that it can be integrated with any known software with GIS capability.

The base data model preparation was done based on water demand loading calculations done on each node in a meticulous manner. The individual loading has been uniformly distributed depending on the kind of landuse, population.

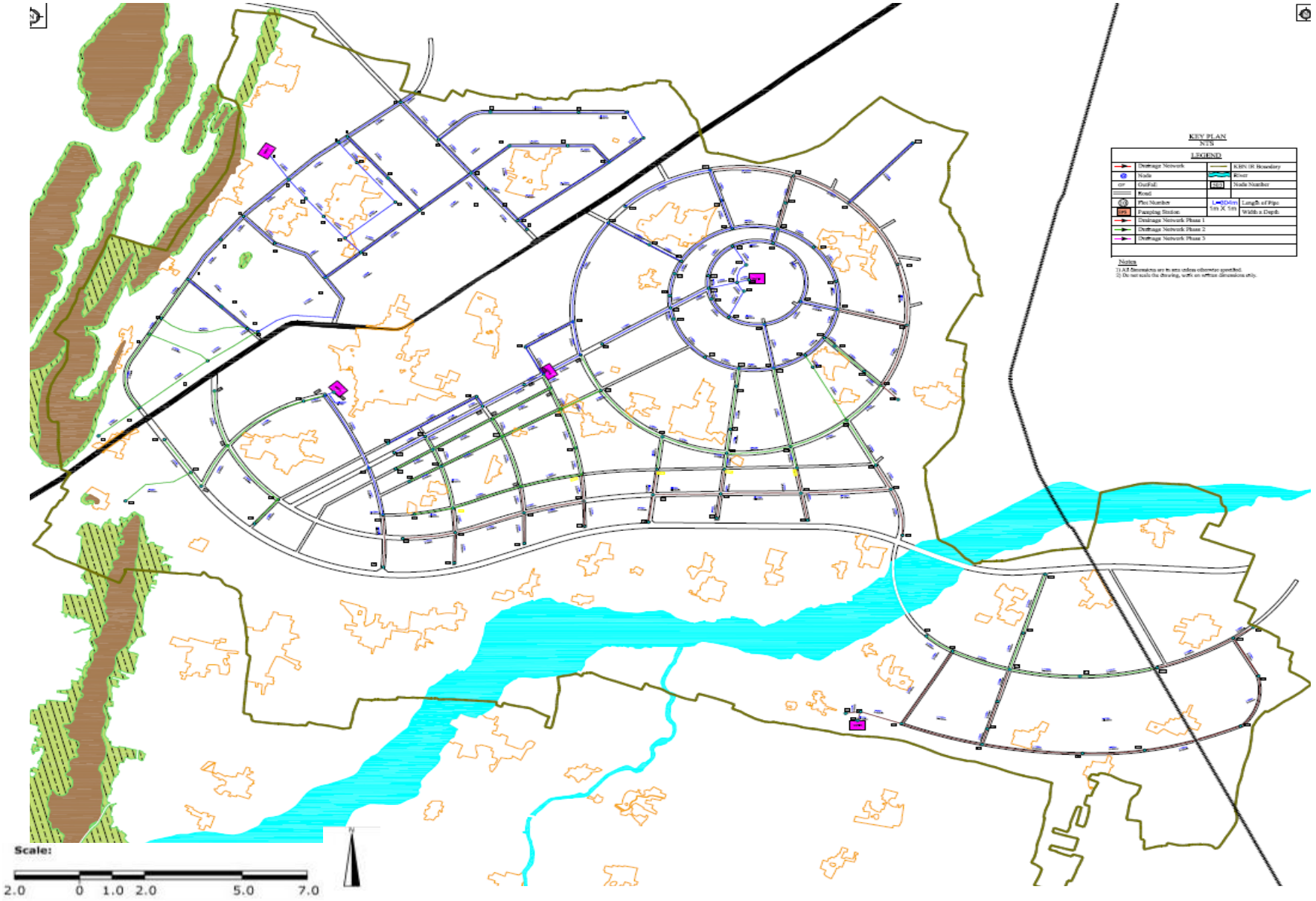
The preparation of base information depicting the feature, class data of demand node and pipe lengths acts as a primary data source for the next stage of design process, which is to interlink this base data with the design software. The base data once imported in the modeling software is analyzed for the flows and the corresponding diameters and the pressure heads are calculated.

The water modeling software is an extremely powerful program for the design and analysis of gravity flow and pressure flow through pipe networks and pumping stations. It enables the construction of a graphical representation of a pipe network containing information such as pipe data, pump data, loading etc.

The distribution network is calculated using the built-in numerical model, which utilizes both the direct step and standard step gradually varied flow methods. Flow calculations are valid for both surcharged and varied flow situations, including hydraulic jumps, backwater, and drawdown curves.

The design philosophy in the present scenario has been to optimize the respective pipe sections for velocity and pressure keeping the respective design constraints. **Figure 6-16** presents the distribution network for KBNIR.

**Figure 6-16: Water Distribution Network**



## 6.4 Sewerage System

This section deals with the design parameters & design of the sewerage scheme for KBNIR. The design criteria for the design of sewerage scheme have been framed as per the guidelines prescribed by the Ministry of Urban Development, Government of India and the relevant I. S. codes.

The design criteria to be followed for design of sewage collection, transportation and treatment system for the project are based on the recommendations laid down in the CPHEEO Manual of Sewerage and Sewage Treatment issued by Ministry of Urban Development, Government of India and as per provisions laid down in the relevant I.S. codes and Consultants' past experience in related field. The various design considerations and norms are described below.

### 6.4.1 Design Periods

The various sewerage project components will be designed to meet design periods as given in **Table 6-10**.

**Table 6-10: Recommended design period for sewage components**

| Recommended design period for sewage components | | | |
|---|---|---|---|
| **S. No** | **Component** | **Recommended Design Period (in years)** | **Remarks/ Clarification** |
| 1. | Sewer Network (Gravity Collection System) | 30 | The system will be designed for the prospective population of 30 years, as its replacement is not possible during its use. |
| 2. | Pumping Stations (Civil Works) | 30 | Duplicating machinery within the Pumping Station would be easier/ cost of Civil Works would be economical if executed once for full design period. |
| 3. | Pumping Machinery | 15 | Life of Pumping Machinery is considered as 15 years as per practice/ guidelines. |
| 4. | Conveyance System | 30 | Provision will be kept for the entire design period, as its' phasing/ replacement is not possible during its use. |
| 5. | Sewage Treatment Plant | 30 | The plant will be designed in modules for immediate stage and ultimate phase. |
| 6. | Effluent Disposal System | 30 | Provision of design capacities in the initial stage is economical. |
| 7. | Land Acquisition | 30 | Land requirement will be worked out for the ultimate stage. |
| | | | |

### 6.4.2 Projected Wastewater Flows

The drainage pattern of the entire 165 sq km area slopes towards south east. Though there are various physical barriers which divide the entire area into various zones. The project is also planned in phases. Attempt has been made to follow the existing drainage pattern of the area

Considering all these factors the entire project is divided into six drainage zones clubbed into three phases of development. The zone I slopes towards the National Highway No. 8. The area to the west of the NH-8 ie Zone II, III and IV, is relatively flat and having mild slope towards south. The Zone V and VI slopes towards the Sahibi River.

Based on the zoning pattern the and the per capita wastewater generation norm adopted the total wastewater generated shall be 265 MLD. **Table 6-11** gives the detail of Zone wise and land use wise waste water generated.

**Table 6-11: Detail of wastewater generated in the project area**

| Detail of wastewater generated in the project area | | | | |
|---|---|---|---|---|
| **Description** | **Phase 1** | **Phase 2** | **Phase 3** | **Total** |
| Residential Area | 31.31 | 31.19 | 97.20 | 159.71 |
| Industrial Area | 28.09 | 8.22 | 21.13 | 57.44 |
| **Total** | **59.40** | **39.41** | **118.33** | **217.14** |
| | | | | |

### 6.4.3 Design Criteria

**Per Capita Sewage Flow**

CPHEEO Manual on Sewerage and Sewage Treatment recommends a sewage generation of 80 - 90% of water supply for domestic supplies. For industries water some amount of water shall be used for process and only a part shall contribute to sewage. It is assumed that only 60 % shall contribute to sewage.

**Peak Factor**

Peak factor, i.e. the ratio of maximum to average hourly flow depends on the water use habit of the population of the project area and the contributing population. The quantity of water used in a day varies during the hours of the day due to habits of people.

Though the sewerage system will receive flow throughout the day, there will be some duration in which maximum sewage will be generated. Peak factors for domestic flow as per guidelines given in the CPHEEO Manual are furnished below:

| Contributing Population | Peak Factor |
|---|---|
| Up to 20,000 | 3.00 |
| From 20,000 to 50,000 | 2.50 |
| 50,000 – 750,000 | 2.25 |
| Above 750,000 | 2.00 |

Since the population is above 7, 50, 000 peak of 2 is applicable. Although peak in the scheme shall be based on contributory population.

**Infiltration**

The infiltration in to sewerage system shall be considered during flow estimation. Estimation of the flow in sanitary sewer includes flows due to infiltration of water through the joints of pipes and through manholes. The quantity is contingent on the workmanship in laying of sewers and the depth of ground water table in the area. Sewers are designed for the peak discharges and provision for ground water infiltration is to be made for worst condition and conservative design. With better standards of workmanship and availability of watertight joints for pipes, these values may be kept at minimum.

During most periods in the year, no ground infiltration is expected due to the absence of rains. Furthermore, due to the use of better pipe materials and construction techniques, the infiltration will be minimal. Provision for infiltration shall be made in the designs of sewer network in the scheme as per recommendations of CPHEEO manual, which are as under (**Table 6-12**).

**Table 6-12: Recommended infiltration rate**

| Recommended infiltration rate | | |
|---|---|---|
| **Norm** | **Minimum** | **Maximum** |
| Litres/ha/day | 5,000 | 50,000 |
| Litres/km of sewer/day | 500 | 5,000 |
| Litres/day/manhole | 250 | 500 |

The infiltration into sewer may occur through pipes, pipe joints, and manholes. With improved construction practices, the rate of infiltration will tend to be on the minimum, rather than on the maximum. The water table in project area is relatively low. Thus, for the purpose of this study, an infiltration rate of 3% of the Per capita sewage flow as suggested by CPHEEO has been adopted in the design.

**Gravity Sewage Collection System**

The various components of the proposed network are given below.

Sanitary Sewer Lines

Sewers are provided to convey wastewater from one location to another under gravity and therefore are normally laid deep enough to receive incoming flows from the contributing areas. Sewers must resist erosion and corrosion and its structural strength must be sufficient to withstand the backfill, impact, and live loads satisfactorily. The size and slope of sewer must be adequate for the flow to be carried and sufficient to prevent deposition of solids. Ease and economy of maintenance, safety to the personnel and the public, during its life as well as during construction period must be given due consideration.

In the design of sewerage system, the important decisions to be taken are location, size, slope, and depth of sewer, material of sewer lines and appurtenances to be added such as manholes, junctions, vent pipes and other structures to minimize turbulence, save head loss and prevent deposits and obnoxious gases.

The aim of design is not only to make the sewer system functional, but also to build the system at low competitive cost.

Generally, the total available energy is utilized to maintain proper flow velocities in the sewers with minimum head loss. Hence, the sewerage system design is limited on one hand by hydraulic losses, which must be within the available limit, and on the other on maintaining self-cleansing velocities in sewers. Many a time, it is difficult to meet both the conditions simultaneously due to wide variation in rate of flow.

Where differences in elevations are insufficient to permit gravity flow, pumping may be required. The cost of construction, operation and maintenance of pumping stations are compared with the cost of construction and maintenance of gravity sewers. Apart from the cost considerations, the consequences of mechanical and electrical failures at pumping stations may also be considered, which may necessitate a gravity system even at a higher cost. In the current context, requirement of an intermediate SPS is not expected because of availability of sufficient natural ground slopes.

The sewerage system layout involves the following steps:

- Selection of an outlet or disposal point
- Location and alignment of Trunk and Main Sewers and laterals
- Location of Pumping Stations
- Location of sewage treatment plant

In general, the sewers will slope in the same direction as the roads, drains or natural ground surface and will be connected to trunk sewers. The discharge point may be a treatment plant, a pumping station, a watercourse, a trunk or an intercepting sewer. In this case, disposal point will be a treatment plant.

Minimum Size of Sewer Line

Minimum diameter for public sewer shall not be less than 200 mm (internal) except for sharply falling gradients. A minimum sewer size of 200 mm, is therefore proposed to be adopted as per CPHEEO norms.

Capacity of Sewer

All sewers will be designed to flow up to a maximum depth of 0.80 times (i.e. 80 %) the internal diameter of sewer at ultimate peak flow (As per the CPHEEO Sewerage Manual) in order to ensure proper ventilation in sewers. However, such provision will be simultaneously checked for self-cleansing velocity in present peak flow condition

Velocity in Sewer

It is required to maintain minimum velocity through the sewer to ensure that suspended solids do not deposit and cause choking. Hence, it is mandatory to maintain "self-cleansing velocity" in sewer lines. As per Govt. of India stipulations:

The minimum self-cleansing velocity required is 0.6 m/sec at present peak flow to prevent 0.09 mm sand particles of sp. gr. 2.65 from settling.

The maximum scouring velocity is limited to less than 3.0 m/sec to safeguard the sewer against abrasion and erosion by sand and other gritty material and also against possible sulphide corrosion (as a result of release of hydrogen sulphide gas due to turbulence).

At certain stretches, viz. the tail ends of laterals, branches and even on the main sewer, minimum velocity for design flow is likely to be less than minimum self-cleansing velocity. At certain stretches, where velocity corresponding to peak flow condition is high, manholes and sewers will be flushed out during peak flow in removing silt, which got deposited during minimum flow period, especially during night hours. Adopting lower values of velocities through lesser gradients will help in avoiding deep excavations for sewer laying. In developing a particular sewer collection network, this point shall be given due consideration prior to design of sewers.

Sewer Transition

Sewer transition is defined as an event or point at which there is change in diameter of sewer or its alignment, junction of two or more sewer lines, etc. These changes can occur singly or as combination of two or more factors. The preparation of hydraulic design of sewers has to take into account the changes in hydraulic profile of sewers due to such transitions. Usually diameter of the sewer increases progressively.

Hydraulic Design Formula

(a) Gravity Flow

For open channel flow, Manning's formula is used for designing slope and diameter of the sewer line to carry the design flow at stated velocity, which is expressed as:

Manning's formula:

$V = 1/n \times R^{2/3} \times S^{1/2}$

For circular conduits, the above equation is represented by,

$V = 1/n \times 3.968 \times 10^{-3} \times D^{2/3} \times S^{1/2}$

And

$Q = 3.118 \times 10^{-6} \times D^{8/3} \times 1/n \times S^{1/2}$

Where,

Q = Discharge in lps
S = Slope of hydraulic gradient
D = Internal diameter of the pipe in mm
R = Hydraulic radius in m
V = Velocity in m/s
n = Manning's coefficient of roughness

HYDRAULIC PROPERTIES OF CIRCULAR SECTIONS FOR MANNING'S FORMULA

| Constant (n) | | | Variable (n) | | |
|---|---|---|---|---|---|
| d/D | v/V | q/Q | $n_d/n$ | v/V | q/Q |
| 1.0 | 1.000 | 1.000 | 1.00 | 1.000 | 1.000 |
| 0.9 | 1.124 | 1.066 | 1.07 | 1.056 | 1.020 |
| 0.8 | 1.140 | 0.968 | 1.14 | 1.003 | 0.890 |
| 0.7 | 1.120 | 0.838 | 1.18 | 0.952 | 0.712 |
| 0.6 | 1.072 | 0.671 | 1.21 | 0.890 | 0.557 |
| 0.5 | 1.000 | 0.500 | 1.24 | 0.810 | 0.405 |
| 0.4 | 0.902 | 0.337 | 1.27 | 0.713 | 0.266 |
| 0.3 | 0.776 | 0.196 | 1.28 | 0.605 | 0.153 |
| 0.2 | 0.615 | 0.088 | 1.27 | 0.486 | 0.070 |
| 0.1 | 0.401 | 0.021 | 1.22 | 0.329 | 0.017 |

Where,

D = Full Depth of flow (internal dia)
V = Velocity at full depth
n = Manning's coefficient at full depth
Q = Discharge at full depth
d = Actual depth of flow
v = Velocity at depth 'd'
$n_d$ = Manning's coefficient at depth 'd'
q = Discharge at depth 'd'

The value of Manning's co-efficient ('n' value) for uPVC / HDPE pipe is 0.011, for DI pipe (cement mortar lined) is 0.011, for RCC pipe is 0.011 (for rubber gasket jointed pipes) and for stoneware pipe is 0.012.

b)Pressure Flow

Hazen-Williams Formula is used for closed conduits and pressure flow (e.g. pumping main). The same has been discussed earlier in the section on water supply.

Manholes

Sewer transitions occur wherever conduits of different characteristics are connected. The difference may be in flow, size, grade and alignment, material of conduit, with a combination of one or all characteristics. Manholes have been located at all such transitions with CI/PVC footrest for access.

The size of the access cover should be of 560 mm clear opening. Since the manholes are to be located on roads with trucks plying on them, Steel fibre reinforced concrete covers (SFRC) of heavy duty HD-35 designation and conforming to IS: 12592 have been proposed.

For straight sections, the interval at manholes on sewers, which are to be cleaned manually and cannot be entered for cleaning or inspection, the maximum distance between manholes should be kept at 30 m. However, for economical consideration a manhole spacing of 50 m C/C shall be provided for all trunk sewers having diameter more than 600 mm.

Drop Arrangement

Drop arrangements are normally provided where the difference in inverts of an incoming sewer and receiving manhole exceeds 0.6 m. The crowns of the sewers are always kept continuous and suitable drop at the manhole is provided. The drop arrangement consists of a pipe that guides the incoming sewage to the level of main sewer in the manhole. The diameter of the backdrop pipe should be at least same as the incoming pipe diameter. Drop arrangements provided in manhole have the following functions:

To convey incoming sewage to the bottom of the manhole without splashing,

To avoid the scouring action of sewage falling from a height on the cement concrete floor of manhole,

Safety of the personnel who enter the manhole

Materials of Pipeline

The pipe material to be adopted is selected through a techno-economic comparison of the available materials and based on the following factors as well as the Life Cycle Analysis:

- Type of flow (Gravity / Pumping)
- Characteristics of flow
- Avaliability of sizes
- Soil conditions and bedding requirements
- Strength
- Jointing Methods
- Durability

- Cost

Based on the above factors, different types of pipe materials used for sewer are as follows:

- For Gravity Sewer
- Stoneware pipes;
- HDPE pipes;
- Spun RCC pipes and
- PVC pipes

HDPE and Stoneware (SW) pipes shall be utilized for sizes from 150 to 300 mm diameter in gravity collection systems for depths up to 3.00 m.

Spun RCC pipes used in gravity collection systems for depths greater than 3.00 m and for diameters greater than 300 mm. These pipes are easily available in diameters from 200 mm to 3,000 mm in general and are economic for sixes above 300 mm dia when compared to SW pipes. Stoneware pipes are proposed for sewers of 150 to 300 mm diameter in general. RCC Spun pipes are proposed for sewers of > 300 mm diameter in general. HDPE pipes are proposed for sewers of 150 to 300 mm diameter in a small pilot area in zone 3 (in wards 27, 28 and 29). A comparison of gravity sewers is indicated in the **Table 6-13**.

**Table 6-13: Comparison of pipe material - gravity sewers**

| Comparison of pipe material - gravity sewers | | | | |
|---|---|---|---|---|
| No. | Parameters | Gravity Sewer | | |
| | | Stoneware | RCC &Spun RCC | PVC Pipes |
| 1 | Available sizes (mm) | 100-300 | NP 2: 200-1000, NP 3 & NP 4; 200-1000 | 90 OD to 315 OD |
| 2 | Length (m) | 0.6 | 2.5 | 3m, 6m |
| 3 | Applicable IS | 651-1971 | 458; 783; 3597 | 3076: 1985 |
| | | 4127 | | |
| 4 | Weight | Medium | Medium-Heavy | Light flexible |
| 5 | Flexibility | Rigid | Rigid | |
| 6 | Tensile strength | - | 2.5 N / mm2 | |
| 7 | Impact strength | Fair | Good | Fair |
| 8 | C-value of pipe material | 100 –120 | 120-150 | |
| 9 | Manning coefficient of roughness | 0.012 | 0.013 | 0.011 |
| 10 | Corrosion Resistance | Good corrosion resistant | Good corrosion resistant | Very Good corrosion resistance |
| 11 | Jointing Methods | S/S jointed with yarn and cement mortar. | S/S with rubber rings conforming to type IS / cement mortar | Bell and plain ends jointed with solvent cement or push on joint with rubber ring |
| 12 | General Availability | Easily available in India | Easily available in India | Not being used for sewer lines in India. But widely used worldwide. |
| 13 | Availability of Plant & Skilled Manpower | Easily Available | Easily Available | Easily available |

| Comparison of pipe material - gravity sewers | | | | |
|---|---|---|---|---|
| **No.** | **Parameters** | **Gravity Sewer** | | |
| | | **Stoneware** | **RCC &Spun RCC** | **PVC Pipes** |
| | for Manufacturing Laying and Maintenance | | | |
| 14 | Corrosion Control Techniques | Glazing is done to the exposed surface | Manufactured with sulphate resistant cement. Sacrificial coating with high alumina cement if necessary | Pipes are corrosion resistant |
| 15 | Jointing Materials | Tarred Yarn and cement mortar | Tarred Yarn and cement mortar | Rubber rings, solvent cement |
| 16 | Special Bedding requirement | Granular/ Concrete | Granular/ Concrete | Granular/ Concrete |
| 17 | Laying speed | Fair | Good | Very fast |
| 18 | Pipe Performance Experience | Good | Very Good | Largely used in Australia since 1975 |
| 19 | Recommendation | Yes up to 3.50m depth | Suitable for all depths | Yes up to 200 mm diameter for house sewer connections and laterals |
| | | | | |

For Pumping Mains

Cast Iron, Ductile Iron, Pre-Stressed Concrete and Glass Fibre Reinforced Plastic (GRP) Pipes are to be considered for pumping mains and crossing of river channels, roads, and railways at shallow depth. The brief characteristics of CI, DI, PSC and MS Pipes are given below.

Cast Iron Pipes

CI pipes are easily available in class LA, A and B and size from 100 mm up to 750 mm diameter. However, considering corrosion effects due to sulphide, CI are not preferred.

Ductile Iron Pipes

DI pipes are preferred because of better strength properties and surge withstanding capacity of DI pipes. DI pipes with internal cement lining and bituminous coating are preferable than CI pipes for pumping mains for sizes up to 500mm.

PSC Pipes: PSC pipes are proposed for pumping mains of diameters above 500 mm and less than 1000 m.

GRP Pipes: GRP Pipes are proposed for pumping mains of diameters greater than 1,000 mm.

A comparison of pipe materials for pump mains is indicated in the **Table 6-14**.

**Table 6-14: Comparison of pipe material - pumping/force mains**

| Comparison of pipe material - pumping/force mains | | | | | |
|---|---|---|---|---|---|
| **No.** | **Parameters** | **Pumping Main Material** | | | |
| | | **Cast Iron** | **Ductile Iron** | **GRP** | **HDPE** |
| 1 | Available sizes (mm) | 100 - 1,000 mm | 100 –1,000 mm | 200 – 1500mm | 20 -1,000 mm |
| 2 | Length (m) | 5.50 | 6.00 m | 6.0 to 12.0m | 6m – 12 m |

| Comparison of pipe material - pumping/force mains | | | | | |
|---|---|---|---|---|---|
| No. | Parameters | Pumping Main Material | | | |
| | | Cast Iron | Ductile Iron | GRP | HDPE |
| 3 | Applicable IS for Manufacture, Laying and Jointing, fittings etc | 1536,1537, 1538, 6263,7181, 3114 | 3589; 5822 | | 4984 |
| 4 | Weight | Heavy | Medium | Light | Very light |
| 5 | Flexibility | Rigid | Medium | Flexible | Flexible |
| 6 | Available Working Pressure range Kg/m2 | 6-12 class LA, A, B | As required | Upto 10ksc | 2.5 – 16 kg/cm2 |
| 7 | Tensile strength Kgf/mm2 | 15 | 40 | | |
| 8 | Impact strength | Good | Very Good | Good | Good |
| 9 | C-value of pipe material | 100 | 140 | 150 | 150 |
| 10 | Corrosion Resistance | Low in corrosive soils & water | Good with internal lining & outside coating | Good | Very Good |
| 11 | Jointing Methods | Spigot & sockets joint with rubber ring / flanged joint | Spigot & sockets joint with rubber ring / flanged joint | S/S with push on joint with rubber ring | Butt welding using parent material |
| 12 | General Availability | Freely Available in India | Limited Availability in India | Now available in India | Widely mfd. In India |
| 13 | Availability of Tools & Plant and Skilled Manpower for Laying and Maintenance | Freely Available | Easily Available | Available | Available – requires initial training of personnel |
| 14 | Availability of Corrosion Control Techniques | Mortar lining on the inner surface required for corrosive wastewater | Cement Mortar lining on the inner surface for corrosion resistance | Corrosion resistant | Corrosion resistant |
| 15 | Laying speed | Fast | Fast | Fast | Fast |
| 16 | Pipe Performance & Experience | Very good | Good with Cement or Glass-lining | Limited experience in India | Good; Repairs are difficult. |
| 17 | Recommendation | Not recommended | Yes (for sizes up to 500 mm) | Yes (for sizes greater than 750 mm) | Yes (for sizes up to 1000 mm) |
| | | | | | |

The following pipes have been considered in the design of pumping mains:
Gravity pipes – RCC NP3 s/s pipes have been recommended.

For pumping main in Treatment plant HDPE pipe is recommended.

Laying & Jointing of Gravity Sewers/ Pressure Mains

DI sewer pipes of push-on joint are proposed to be utilized. The sewer lines will be laid and jointed in accordance with standard norms of manufacturer and requirements of relevant standards codes. Sewers will be encased in concrete where the required cover is not available. Special protection to

sewer lines will be provided at locations of road crossing, drain/ nalla crossings, crossings near potable water lines etc.

Minimum Cover and Maximum Depth of Sewer

The gravity sewer lines and pressure mains will be laid with minimum earth cover of 1.2 m above the top of the sewer in order to protect the pipes from bearing loads. Depth of excavation increases the cost of lying of sewer lines substantially and also makes future maintenance difficult. Hence, efforts shall be made to optimize the design of collection system with regard to maximum depth of sewer and this shall be restricted to 6.0 m for all proposed lines.

Type of Bedding

The type of bedding provided for pipes will be selected from three types of bedding namely, type "B" i.e. shaped bottom or compacted granular bedding with carefully compacted backfill, type "Ab" i.e. concrete cradle-plain concrete with carefully tamped backfill and "Ac" i.e. concrete cradle RCC with 0.4 % reinforcement. They are described as:

Special compact granular bedding

The pipe shall be bedded in compacted granular material placed on a fresh trench bottom of the granular bedding shall have minimum thickness of one fourth the outside diameter of pipe but not less than 10 cm and shall extend halfway up the pipe barrel at the sides.

Concrete Cradles

The pipe be bedded in a monolith cradle of plain or reinforce concrete 1:2:4 as specified having minimum thickness of one fourth the outside diameter of the pipe but not less than 10 cm and shall extend halfway up the pipe barrel at the sides and then slopping upward tangential to the top surfaces of the pipe, the coarse aggregate if the cement concrete 1:2:4 shall be of stone chips or gravel 20 mm down.

Concrete Encasement

The pipe shall be bedded in monolith layer of plain or reinforced cement concrete 1:2:4. The coarse aggregate shall be stone chips or/gravel 20 mm down.

The following bedding below the sewers is provided depending on the load factor obtained during the design (**Table 6-15**). These are as per the CPHEEO manual.

**Table 6-15: Bedding details**

| Bedding details | | |
|---|---|---|
| **Load Factor** | **Class** | **Bedding Details** |
| 0 | C | Flat bottom trench |
| 1.1 | C | Shaped bottom or compacted granular bedding with lightly compacted backfill |
| 1.5 | B | Shaped bottom or compacted granular bedding with carefully compacted backfill |
| 1.9 | Aa | Concrete cradle – plain concrete and lightly tamped backfill |
| 2.2 | Ab | Concrete cradle – plain concrete and carefully tamped backfill |
| 2.8 | Ac | Concrete cradle – RCC 0.4% |
| 3.4 | Ad | Concrete cradle – RCC 1.0% |
| | | |

The location of the above types of bedding and any other types should be decided on site conditions such as type of soil and its extent of water contents, super imposed load etc. Immediately after excavation construction of bedding should be taken up. It should be ensured that trench is not water logged. The soil under the bedding shall be well compacted and stabilized.

### 6.4.4 Design of Sewerage Network

The sewerage system network under the project area essentially comprises of conveyance systems like trunk mains, branch mains, rising mains etc., collection systems like lifting stations, natural disposal systems like ponds, disposal systems like main disposal stations and STP. The Project area covers 165 Sq Km and is divided into 6 zones. The proposed system involves designing of new sewer network, pumping stations (if any). The primary proposal is of setting up 6-Sewage Treatment Plant at 6-locations, within project limits.
The criteria adopted for demarcation of sewerage Zones within the project area are as follows:

- Topography of the area
- Land use
- Physical natural features like river
- Man-made features like NH-4, railways etc

#### 6.4.4.1 Sewage Treatment & Disposal

At present, sewage treatment facilities are not available in the entire project Area. The area within the project area is rural in nature. These villages are presently not served by sewerage network system.

Suitable treatment technology has been worked out in terms of treatment efficiencies, land requirement, approximate capital costs, power requirements and operation and maintenance costs.

The Proposed capacity of STPs in each phase shall be designed taking into account the entire residential and industrial loads based on the population projection till 2040. The details of phasewise proposed STPs is given in **Table 6-16**.

**Table 6-16: Capacity of STPs (MLD)**

| Capacity of STPs (MLD) | | | |
|---|---|---|---|
| **Description** | **Phase 1** | **Phase 2** | **Phase 3** |
| STP Capacity | 31.31 | 31.19 | 97.20 |
| CETP Capacity | 28.09 | 8.22 | 21.13 |
| Total | 59.40 | 39.41 | 118.33 |
| | | | |

**Wastewater Quality**

It is mandatory to ascertain the quality of sewage/ wastewater expected to reach the inlet of proposed STP. The range of values for the different parameters is ascertained by taking the sample from the existing terminal pumping station. Thus, after the analysis of sample, parameters are suitably adopted for preliminary process design and basic unit sizing of the STP. The quality of effluent for the industrial area shall depend upon the type of industries coming up in the area.

**Treatment Standards**

The treated sewage has to meet following discharge standards and guide lines under Environment (Protection/Third Amendments Rules, 1993 issued by the Central Government. The treated water shall be used to recharge the ground water. Hence the treated water needs to be treated so that the water does not pollute the ground water aquifers. In India, there are no guidelines for treated water quality for ground water recharge. USEPA prescribes the quality of water for ground water recharge, which is given in **Table 6-17.**

**Table 6-17: Quality of water for ground water recharge**

| Quality of water for ground water recharge | | |
|---|---|---|
| **Sr. No.** | **Description** | **Value** |
| 1 | pH | 6.5-8.5, |
| 2 | Turbidity | < 2NTU |
| 3 | faecal coliforms | nil / 100ml |
| 4 | Residual chlorine | 1 mg/l |
| 5 | other parameters | as portable standards. |
| | | |

The quality of effluent for the industrial area shall depend upon the type of industries coming up in the area. Since the type of the industries cannot be decided at this stage of the project. Hence, CETP shall be set based on the type of the industries coming up. Residential, commercial and institutional area shall have typically the same quality of wastewater. This quality of treated waste water for the residential area is achievable by MBR treatment process.

**Membrane Biological Reactor Treatment Method (MBR)**

Micro and ultra filtration membranes submerged in aeration tank totally remove sludge in suspension from the activated sludge liquid. This system is single packaged modular unit which consists of housing, aeration diffuser; permeate water manifold and membrane elements. The membrane element consists of flat sheet polyvinylidene fluoride membranes sandwiching a vertical support panel. Flat sheet membranes with pore size of 0.1-micron meter filter feed sewage including activated sludge. All particles with sizes more than 0.1-micron meter are removed effectively using this membrane. The air bubbles supplied from the bottom of the membrane elements continuously scour off activated sludge accumulated on the membrane surface. Air bubbles are used for the biological reaction to decompose organic matter present in the raw sewage.

Sewage from sewer is passed through screen and then pumped out to an equalization tank to have homogeneous character (**Figure 6-17**). A course bubble aeration grid is provided to mix the contents of sewage in equalization tank. From equalization tank it flows to aeration tank. In aeration tank, MLSS in the range of 12,000 to 15,000 mg/l is maintained to ensure complete removal of organic matter in sewage. Air from blower is supplied to supply oxygen to bacteria and for scouring of membranes.

As membranes are in operation continuously, clogging of membranes takes place due to organic and inorganic substances. Cleaning of membranes with sodium hypo chloride and citric acid is required to be done once in two to three months.

**Advantages**

- Less area is required; it is about 0.33 to 0.5 times the space over a conventional system.
- Low operating costs.
- No dependence on sludge recirculation
- Excess sludge production is very low and it is fully digested
- Operating power consumption cost is 0.3 kWh /cum for filtration.
- Very efficient in removal of total Coliform; of the order of 99.999 %.
- Near-drinking water quality is achieved
- Option of removal of N and P is available

**Disadvantages**

- High initial capital cost.
- Periodical cleaning of membranes with chemicals to prevent clogging of membranes. Membranes also require replacement every 4-5 years.

**Figure 6-17: Flow diagram of Membrane Biological Reactor Method**

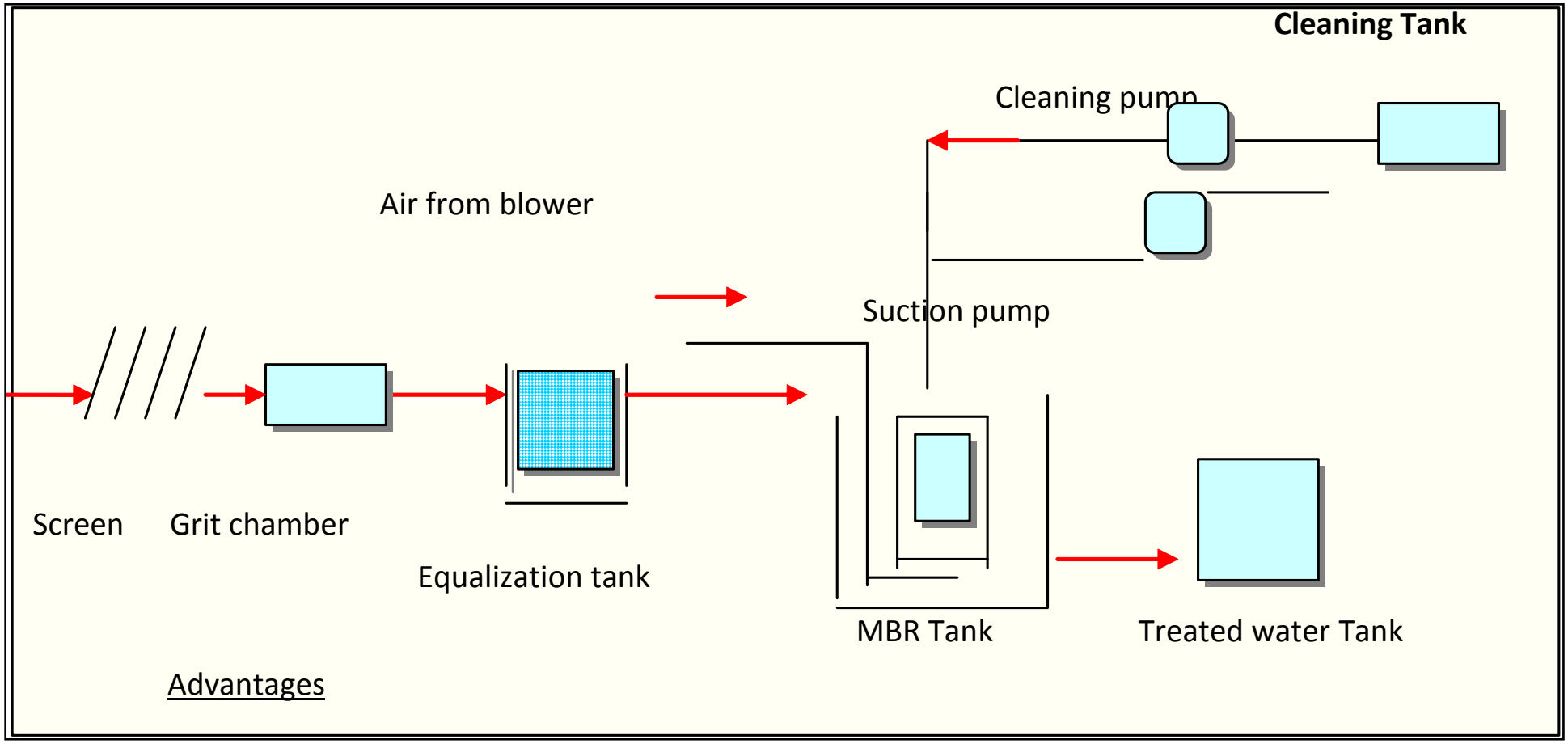
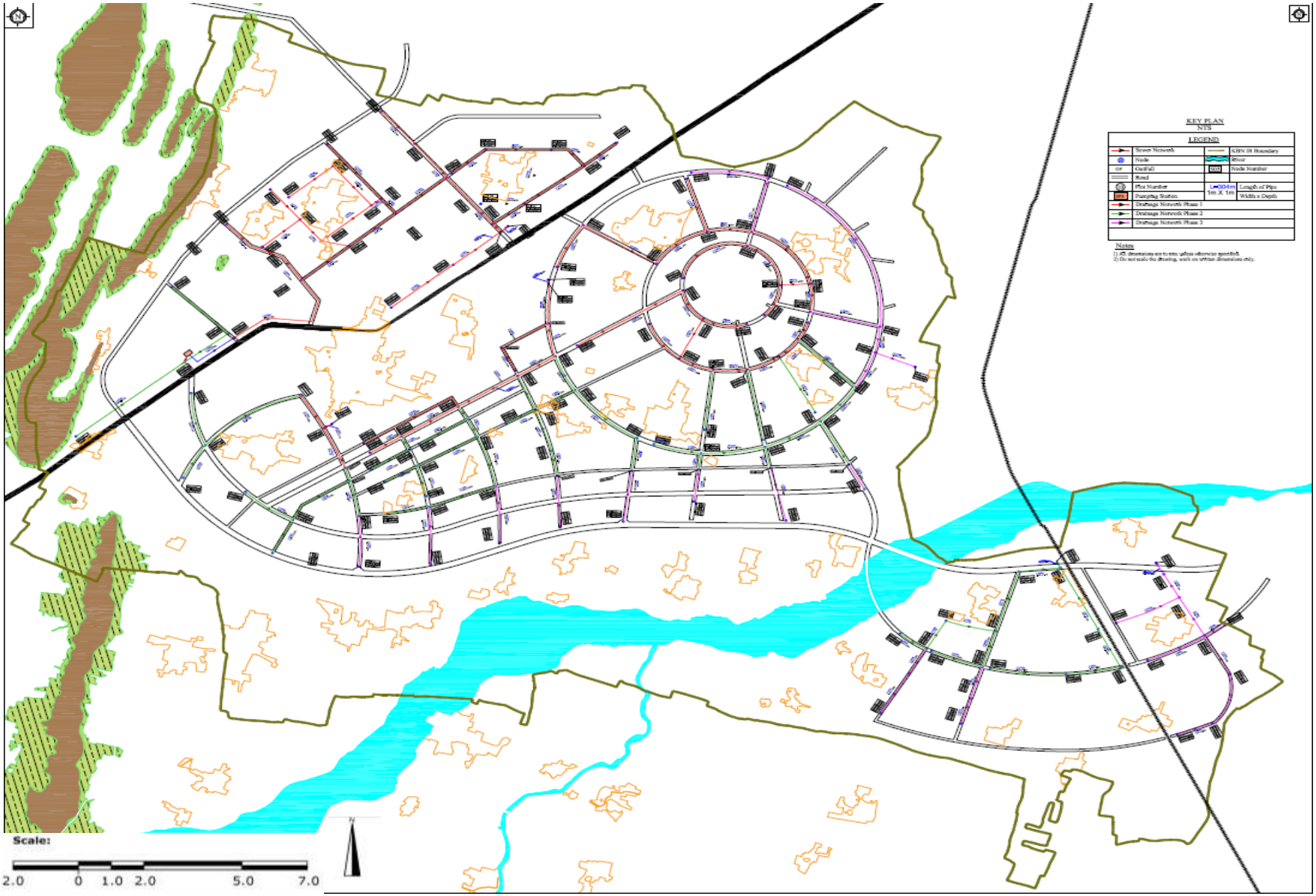


**Figure 6-18: Sewerage System for KBNIR**



## 6.5 Recycled Water System

A good & safely operated waste water treatment plant with tertiary treatment systems more or less will guarantee that the treated / recovered water is 100 % safe - in fact at times it is even better than the naturally recycled water available in the water bodies. Further, where time is at premium, quality can be ensured in the treatment plant but not so in nature - where there are no operational controls. In order to conserve water and to use it judiciously, it is proposed to recycle the treated wastewater for non portable uses. Hence, it is proposed to use the treated wastewater for Industrial purpose

### 6.5.1 Planning and Design of Recycling Water Supply System

Design methodology of the recycled water system shall be similar to that of water supply system. Treated water from STP shall be pumped through the distribution system to the end user. Water shall be used for non potable uses and Industrial applications. **Table 6-18** shows the detail of recycled water availability for each phase and availability.

**Table 6-18: Recycled Water Availability**

| Recycled Water Availability | | | | |
|---|---|---|---|---|
| **Description** | **Phase 1** | **Phase 2** | **Phase 3** | **Total** |
| Generation Estimates | 47.52 | 35.47 | 106.50 | 189.49 |
| | | | | |

### 6.5.2 Recycled Water Supply System – Design Criteria

Design criteria for recycled water shall be similar to that of water supply network except for following parameters.

**Minimum Pipe Size**

This pipe size shall be considered as minimum for the distribution network design under this project as no further expansion is contemplated and it is a small system. 100 mm diameter pipes shall be considered as minimum pipe diameter.

**Pipe Material**

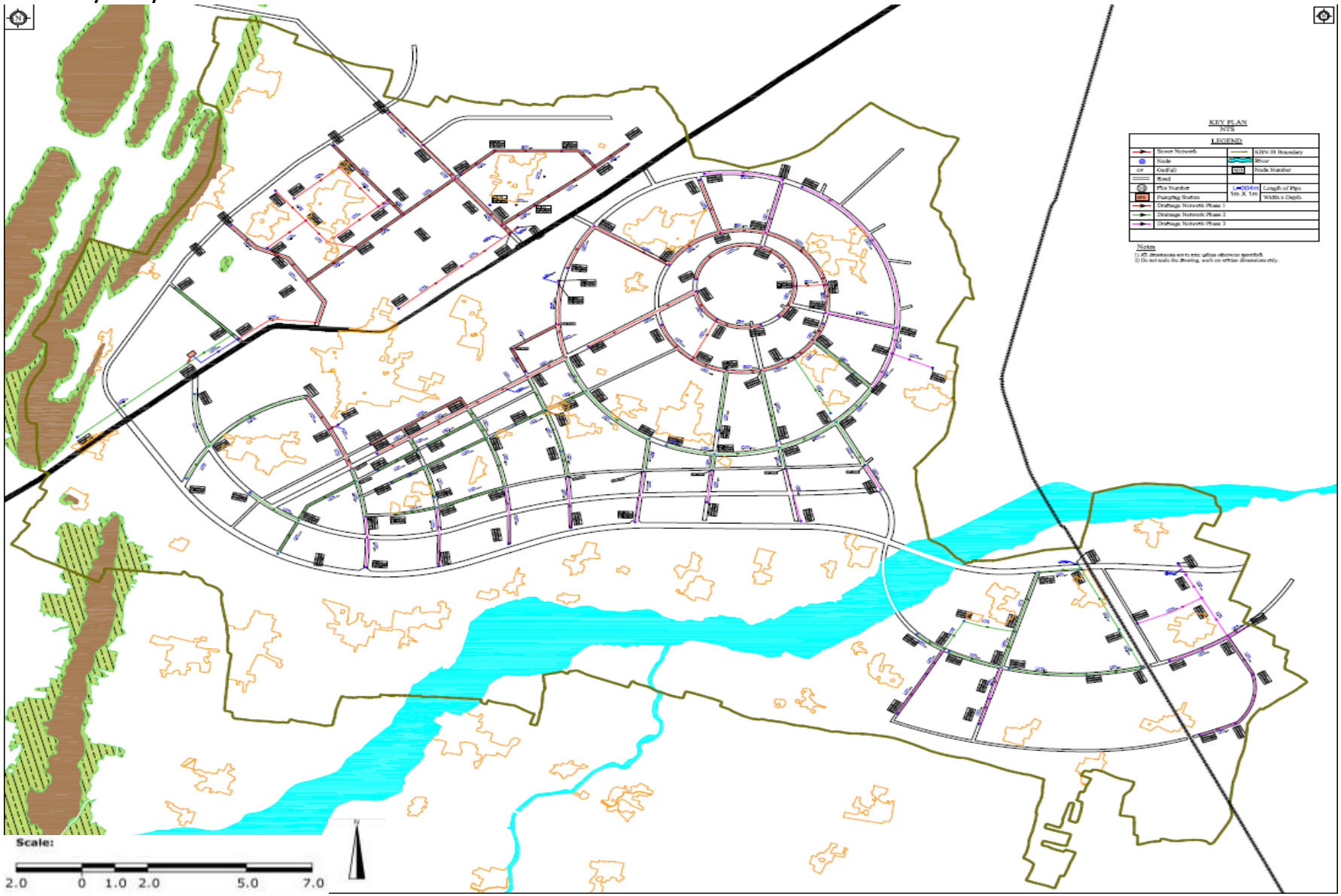
Various pipe materials have been discussed in water supply section. For the present cost estimates DI pipes with lining have been considered. Hence, DI pipe shall be used for the recycled water distribution works.

**Figure 6-19** presents the recycled water network for KBNIR.

### 6.5.3 Disposal of Recycled water

There is an excess availability of treated wastewater in phase III. This Excess recycled water available in phase III can be used for agriculture purpose.

**Figure 6-19: Recycled System for KBNIR**



## 6.6 Storm Water Drainage System

A separate storm water drainage network apart from sewerage system has been proposed for the development. The design aims to collect the storm water and safely disposal of storm water during rainy season. The design criteria to be followed for design of Storm Water Drainage network are broadly based on the recommendations as laid down in the CPHEEO Manual of Sewerage and Sewage Treatment issued by Ministry of Urban Development, Government of India and as per provisions laid down in the relevant I.S. codes and Consultants' past experience in related field.

### 6.6.1 Design Period

Storm water drainage network is to be designed to accommodate the maximum rainfall intensity. This period, with regard to certain components of the project, depend on their useful life. For the purpose of designing this system, a 30-year project period has been considered. Design periods of various drainage components are given in **Table 6-19**.

**Table 6-19: Design period for the drainage components**

| Design period for the drainage components | | | |
|---|---|---|---|
| **S.N.** | **Component** | **Recommended Design Period** | **Remarks/ Clarification** |
| 1. | Drainage Network | 30 year | - |
| 2. | Pumping Stations (Civil Works) | 30 year | Duplicating machinery within the Pumping Station would be easier/ cost of Civil Works would be economical if executed once for full design period. |
| 3. | Pumping Machinery | 15 year | Life of Pumping Machinery is considered as 15 years as per practice/ guidelines. |
| 4. | Conveyance System | 30 year | Provision will be kept for the entire design period, as its' phasing/ replacement is not possible during its use. |
| | | | |

### 6.6.2 Velocity in Storm Sewer

It is required to maintain minimum velocity through the storm sewer to ensure that suspended solids do not deposit and cause choking. Hence, it is mandatory to maintain "self-cleansing velocity" in sewer lines. The CPHEEO norms stipulate the following:

The minimum self-cleansing velocity required is 0.6 m/sec at present peak flow to prevent 0.09 mm sand particles of sp. gr. 2.65 from settling.

The maximum scouring velocity is limited to less than 3.0 m/sec to safeguard the line against abrasion and erosion by sand and other gritty material.

At certain stretches, *viz.* the tail ends, where minimum velocity for design flow is likely to be less than minimum self-cleansing velocity. Flushing tanks, mobile flowing tanks and drain cleaning equipments will be required for sections with velocities less than 0.6 m/sec.

**Gravity Flow**

Manning's formula shall be used for designing slope and sizes of the drainage line to carry the design flow at stated velocity.

**Pressure Flow**

Hazen-Williams Formula is used for closed conduits and pressure flow (e.g. pumping main). This has also been discussed in the section on design of water supply system.

### 6.6.3 Rainfall

Rainfall Data available for the Alwar district shows that it receives an annual average rainfall of 550 mm. The monthly rainfall data along with number of rainy days for Alwar region is given in **Table 6-20** and in **Figure 6-20**.

**Figure 6-20: Rainfall in mm**

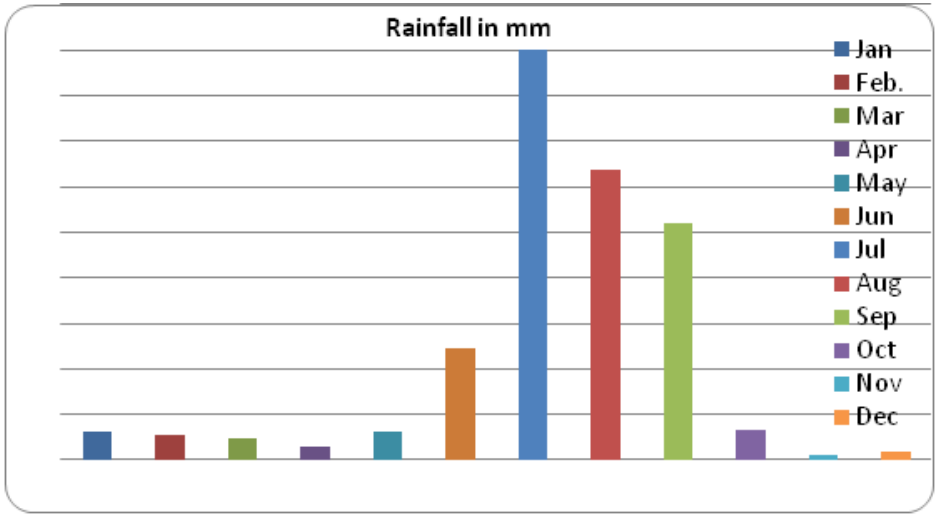



**Table 6-20: Rainy days and rainfall**

| Rainy days and rainfall | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb. | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
| Rainy Days | 1.1 | 1 | 0.8 | 0.6 | 1.1 | 2.9 | 8.4 | 8.3 | 4.4 | 0.6 | 0.2 | 0.22 | 29.9 |

| Rainy days and rainfall | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb. | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
| Rainfall, mm | 12.5 | 10.9 | 9.2 | 5.7 | 12.6 | 49 | 179.9 | 127.7 | 103.7 | 12.9 | 2.4 | 3.3 | 577.7 |
| | | | | | | | | | | | | | |

### 6.6.4 Peak Run off from the Catchments

Storm water runoff reaching to the drains can be determined by using the rational formula, Hydrograph method, Rainfall- run off correlation studies, Digital computer models, and inlet method or empirical method.
It is recommended that the rational method shall be used for the calculation of storm water runoff which is given below.

$$\text{Flow (Q)} = \frac{C.I.A}{360}$$

Q = Flow in cum/ sec/ Ha.
C = Coefficient of run off
I = Intensity of rain fall per hour in mm
A = Area in hectare

It is seen that the maximum rainfall occurs in the month of July. In this Month total rainfall is 176 mm. Hence for the present consideration a rainfall intensity of 12 mm/hr is assumed.

### 6.6.5 Manholes

Transitions occur wherever conduits of different characteristics are connected. The difference may be in flow, size, grade, alignment, material of conduit, with a combination of one or all characteristics. Manholes have

been located at all such transitions with CI/PVC footrest for access. Circular manholes have been provided for the proposed as the following:

For depths up to 1.65 m - 900 mm dia manhole
For depths from 1.65 up to 2.3 m - 1,200 mm dia manhole
For depths from 2.3 m up to 6 m - 1,500 mm dia manhole

The size of the access cover should be of 560 mm clear opening. Cast iron manhole cover and conforming to IS: 12592 have been proposed.

For straight sections, the interval at manholes, which are to be cleaned manually and cannot be entered for cleaning or inspection, the maximum distance between manholes should be kept at 30 m. Drop manholes will be provided when the difference of invert of incoming and outgoing sewer is 0.6 m or above.

### 6.6.6 Drop Arrangement

Drop arrangements are normally provided where the difference in inverts of an incoming line and receiving manhole exceeds 0.6 m. The drop arrangement consists of a pipe that guides the incoming flow to the level of main sewer in the manhole. The diameter of the backdrop pipe should be at least same as the incoming pipe diameter. Drop arrangements provided in manhole have the following functions:

- To convey incoming storm water to the bottom of the manhole without splashing,
- To avoid the scouring action of water falling from a height on the cement concrete floor of manhole,
- Safety of the personnel who enter the manhole

### 6.6.7 Materials of Construction

The Storm water collection system can be of piped system or surface drains. The advantages and disadvantages of both the system are tabulated in table 5.13. A piped drainage system consisted of RCC pipe drains system.

A very common storm water collection system comprises of rectangular channels made of RCC or brickwork. These are covered with RCC slabs to provide safety and aesthetics. The relative merits of the two systems are as in **Table 6-21**.

**Table 6-21: Comparison of storm surface drains and piped system**

| Comparison of storm surface drains and piped system | | |
|---|---|---|
| **S No** | **Surface drains** | **Piped system** |
| 1 | Easy to maintain and clean | Relatively difficult as entry is through manholes only. |
| 2 | Inlets from houses and roadside catch pits are easy to provide. The inlets can be made at any point and the drain made good. | Inlets can be made only at manholes thus there is a limitation to the number of catch pits and inlets. |
| 3 | Depth of drains is shallow. | Depth is more due to minimum cushion requirement and steeper slope requirement. |
| 4 | Covered by precast RCC slab, which can be problematic. However, this can be overcome by providing additional covering with concrete or interlocking tiles etc. For maintenance, intermediate manholes can be provided. The spacing of such manholes is greater than in the case of piped system. | Can be covered with any material and provides a neat finish. |
| 5 | Provides higher carrying capacity for a given cross section. | Provides relatively lower carrying capacity for the same cross section. |

| Comparison of storm surface drains and piped system | | |
|---|---|---|
| S No | Surface drains | Piped system |
| 6 | Requires less space. Easier to construct along with simultaneous service lines with a narrow space. | Requires more space for accommodating the manholes. Relatively difficult to locate valve and manhole chambers of myriad service lines adjacently in case of stretches within narrow strips/ service roads. |
| 7 | More chances of dropping of solid waste through removal of covers but it can be overcome by efficient handling. Also, this is not a threat where the surface is covered with CC/ interlocking tiles. | Lesser chance of dropping of solid waste in the drains. |
| 8 | It is relatively expensive. | It is cheaper. |
| 9 | Construction time is more. | It is lesser. |
| 10 | No Limitation of Size | Pipes upto specific size is available |
| | | |

| | | |
|---|---|---|
| Flow (Q) | = | C.I.A |
| | = | 360 |
| Q | = | Flow in cum/ sec/ Ha. |
| C | = | Coefficient of run off = 1 |
| I | = | Intensity of rain fall per hour in mm |
| A | = | Area in hectare |
| Intensity of rainfall | = | 10 mm per hour for external drains |

This is an external storm water drain system and the terrain is more or less flat. Hence the pipe drain shall not be economical. Hence, the surface drain is recommended.

### 6.6.8 Proposed System

**Concept of Planning**

The project area is 165 sq km in area Overall the area is having flatish slope towards southeast. There are localized hill outside the northern boundary of the project area. The following factors are taken into consideration for planning of the drainage system.

- The pattern of natural slope of the site it extent and direction.
- The natural drainage system in the downstream area (outside the project area).
- The road network system envisaged and finished level of the roads.
- Alignment for the proposed drainage lines.
- Deciding the contributory catchment area for the drainage lines
- Deciding the contributory and cumulative flow for the drainage lines
- Hydraulic design of drains for the slope and section of the drains

**Design Parameters**

Rainfall estimation forms the important part of design of Drainage system. Rational formula has been used to estimate the runoff.

Manning's Formula has been used to estimate the velocity.

$V = 1/N \times R^{0.23} \times S^{0.5}$

Where: Manning's Constant N = 0 .013 (For RCC)

**Type of Drain Adopted**

The aim of the drainage system is to convey the run-off to the outfall. So, the slope of the drain is designed with the objective that the invert level of the drain at the outfall does not fall below the HFL of the outfall drain. To achieve this objective the major part of the drainage network has to be designed as surface drain. Also, the quantum of discharge warrants the

provision of surface drain rather than pipes because pipes are available in limited sizes only and have to be buried deeper than surface drains.

Thus, the section of the drain designed comes to be rectangular with minimum depth by using Manning's formula. Different sections with variable slope have been designed for the proposed network.

**Design Consideration**

Drainage system has been designed for the entire project area. The topography of the area slopes south east of project area. The area has flattish slope but with local depressions at some places. The natural drain available nearby the project area is Sahibi River. As far as permissible natural drainage pattern of the area should be followed. A green buffer has been left all round the project area It is assumed that the water. This area help the in percolating the runoff from the surrounding area and will increase the travel time to the drain. Hence, this rainfall is not accounted while designing the system. It proposed that for all the development happening within the project area it shall be mandatory to have water harvesting structure in each premises. The water harvested using these structures is assumed to be 60% and only 40 % of the rainfall shall reach the drains. An elaborate model for designing the drainage system has been prepared which captures all these assumption.

**Disposal of rain water**

The area is flatish and the area does not have any surface water reserves nearby for disposal. Since the water is very precious attempt should be made to conserve and recharge the water available through rainfall. This can be done by creating ponds wherever possible. During Non monsoon period these ponds could be used to recharge the treated wastewater.

In order to improve the ground water situation it is necessary to artificially recharge the depleted ground water aquifers. The available techniques are easy, cost-effective and sustainable in the long term. Many of these can be adopted by the individuals and village communities with locally available materials and manpower. Artificial recharge techniques normally address to following issues –

(i) To enhance the sustainable yield in areas where over-development has depleted the aquifer.

(ii) Conservation and storage of excess surface water for future requirements, since these requirements often changes within a season or a period.

(iii) To improve the quality of existing ground water through dilution.

(iv) To remove bacteriological and other impurities from sewage and waste water so that water is suitable for re-use.

Detailed study should be conducted to know geological and hydrological features of the area which is useful for adequately selecting the site and the type of recharge structure. In particular, the features, parameters and data to be considered are: geological boundaries; hydraulic boundaries; inflow and outflow of waters; storage capacity; porosity; hydraulic conductivity; transmissivity; natural discharge of springs; water resources available for recharge; natural recharge; water balance; lithology; depth of the aquifer; and tectonic boundaries.

Following studies need to be conducted before designing the recharge structure:

- Infiltration capacity of soil
- Infiltration capacity of soil is an important factor that governs the rate of saturation of the vadose zone and thereby the efficacy or otherwise of a recharge scheme. Infiltration capacity of different soil types are done by field-tests
- Hydro-meteorological studies

These studies are undertaken to understand the rainfall pattern and evaporation losses and thereby to determine the amount of water that would be available from a given catchment and the size of storages to be built. The main factors to be considered are:

- Minimum annual rainfall during the previous 10 years

- Number of rainy spells in a rainy season and duration of each spell
- Amount of rainfall in each rainy spell
- Rainfall intensity (maximum) 3 hourly, 6 hourly etc. as may be relevant for a region.

Wide spectrums of techniques are available to recharge ground water reservoir. Similar to the variations in hydrogeological framework, the artificial recharge techniques too vary widely.

The artificial recharge techniques can be broadly categorised as follows:-

a. Direct surface techniques
- Flooding
- Basins or percolation tanks
- Stream augmentation
- Ditch and furrow system
- Over irrigation

b. Direct sub surface techniques
- Injection wells or recharge wells
- Recharge pits and shafts
- Dug well recharge
- Bore hole flooding
- Natural openings, cavity fillings.

c. Combination surface – sub-surface techniques
- Basin or percolation tanks with pit shaft or wells.
  Recharge shaft

These are the most efficient and cost effective structures to recharge the aquifer directly. These can be constructed in areas where source of water is available either for some time or perennially. These type of the structure can be constructed with or without injection shaft. Following are the site characteristics and design guidelines:

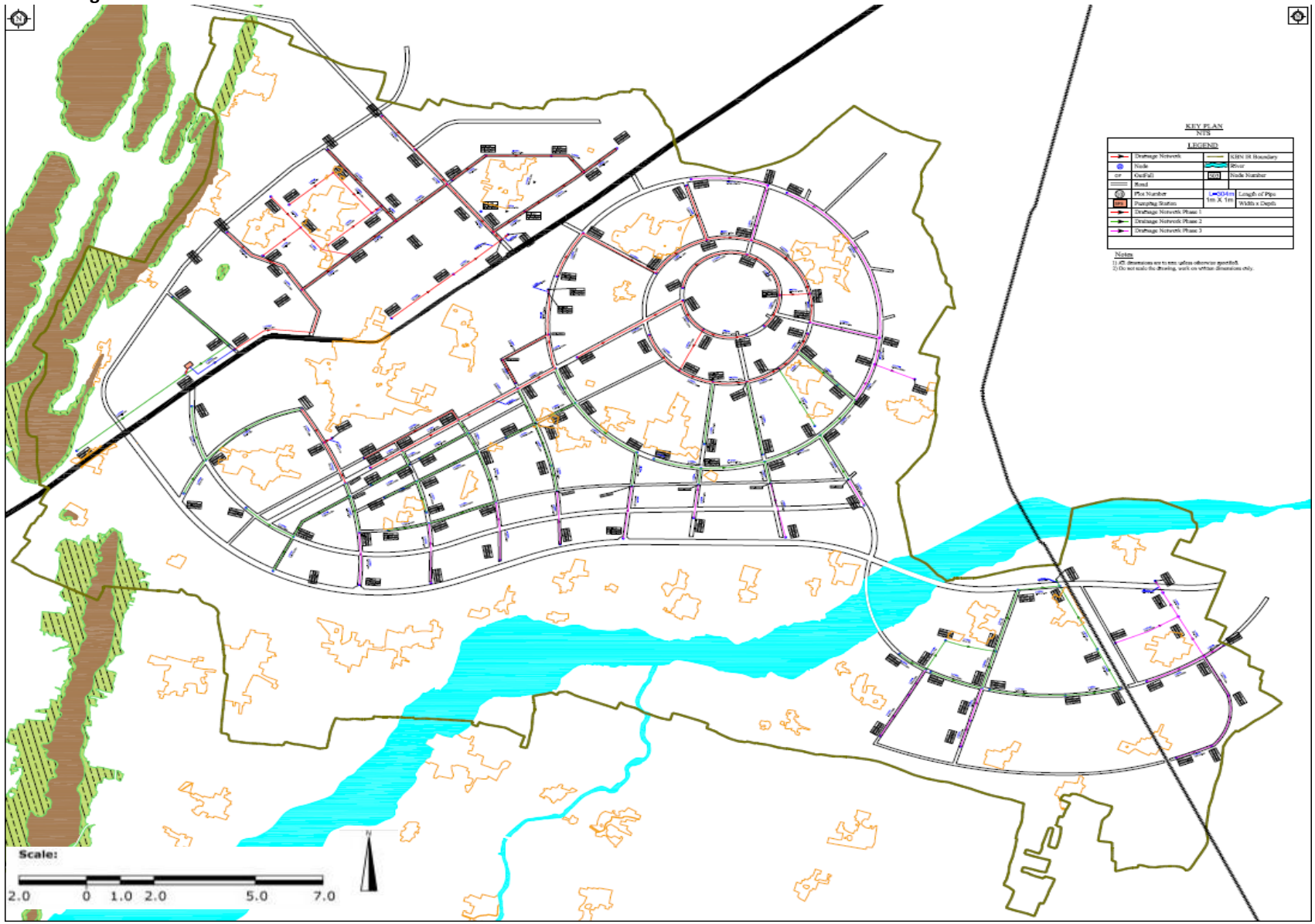
(i) To be dug manually if the strata is of non-caving nature.
(ii) If the strata is caving, proper permeable lining in the form of open work, boulder lining should be provided.
(iii) The diameter of shaft should normally be more than 2 m to accommodate more water and to avoid eddies in the well

Based on the drainage design the runoff generated from the area , the area required for the pond has been estimated. **Table 6-22** gives the detail of the area required for ponds.

**Table 6-22: Area Required for Recharge Pit (Acres)**

| Area Required for Recharge Pit (Acres) | | | | |
|---|---|---|---|---|
| **Description** | **Phase I** | **Phase II** | **Phase III** | **Total** |
| Location 1 | 25.5 | 6.9 | 0.0 | 32.38 |
| Location 2 | 0.86 | 13.27 | 8.36 | 22.48 |
| Location 3 | 6.60 | 5.99 | 7.42 | 20.01 |
| Location 4 | 9.52 | 7.34 | 21.88 | 38.75 |
| Location 5 | 0 | 5.4 | 22.9 | 28.33 |
| | | | | |

**Figure 6-21: Drainage Network for KBNIR**



## 6.7 Solid Waste Management

This section present the solid waste management plan for the KBNIR. The objective of the assignment is to:

- Evolve waste management paradigm and define levels of services for SWM.
- Estimate expected waste loads over the project horizon
- Evolving the overall approach towards effective and safe management.
- Broadly assess the infrastructure for collection, transport, treatment and safe disposal of municipal solid waste.
- Broadly assess the industrial waste loads and strategy for their safe disposal.
- Determine the organizational and institutional setup for services delivery, and
- Estimate the capital and operating costs.

### 6.7.1 Key Highlights of KBNIR

The Concept Master Plan envisions a world class city offering multiple opportunities for investments, higher learning, creativity and innovation. It aims to develop a modern city with sensitivity towards existing rural settlements and their way of life, vast expanse of existing agriculture fields, and the zones with ecological significance. A city with fine blend of land use planning and supported by modern infrastructure, thereby offering superior quality of life to its residents. The guiding principles of the Concept Master Plan, among other considerations, are as follows:

- A city recognising limited supply of land, but at the same time not treading up on the ecologically sensitive zones.
- A city making a fine blend of the existing rural settlements with modern urban development, thereby minimising displacement and offering space for each to grow at its own pace.
- A city having its own expanse for urban agriculture to enable livelihood for the unskilled.
- A city with vast tracts of conservation areas, parks and green cover.
- A city with overriding concerns for environmental, social, cultural and economic sustainability as the guiding mantra.
- A city that embraces the principles of 3R – Reduce, Reuse and Recycle in its planning and operations
- A city with a concern towards its carbon footprint.
- A city with tremendous sense of civic pride.
- A city to care for each other.
- A city to make its residents feel at home.
- A city to admire, to remember and to conserve over.

A noteworthy feature of the proposed Concept Master Plan is the intent of minimising resettlement of existing households in 42 odd villages spread across the length and breadth of the designated 165 sq.km area of the IR. Consequently, all the existing rural settlements will continue to be an integral part of the urban–rural fabric, which will receive the corresponding municipal services that will be offered in the rest of the development area and which will be allowed to grow to a certain extent within a defined planning framework.

Similarly, another noteworthy feature of the plan is the proposal for efficient mobility. In this respect, the plan proposal is to develop an independent road network in synergy with the layouts for industrial, residential, institutional and commercial development so as to be able to offer, to the extent possible a degree of geometrical symmetry and harmony. In this respect, over time, the plan intends to develop new road layouts, notwithstanding the existing rural network.

The industrial areas will be developed away from the rest of the urban growth so as to minimise any adverse impact on the quality of life of the residents. On the same principles, the Plan proposes adoption of only such type of industrial activities where scope for environmental pollution is minimum. With regard to the residential areas, the Plan offer five different

categories of construction comprising 2.5 floor, 4 floor, 5 floor, 10 floor and 15 floor buildings for residents falling in different economic profiles.

Evidently, the quality and effectiveness of infrastructure and services for management of, among others, municipal solid waste, sanitation and wastewater will score high in the planning priority.

The new city which is planned over an area of 165 sq.km. will comprise a blend of high technology based industrial activity in the 'High-tech City' area; educational institutions for higher learning, research and development in the 'Knowledge City' area; and high technology based multi cropping agriculture activity in clearly demarcated 'High-tech Agriculture' area. Besides these three broad economic drivers, a fair part of the city will continue to be used for traditional agriculture by the existing rural population. All the four broad components are expected to work in harmony yielding the desired industrial, economic and social benefits for the original investors, the migrant workers, rural population, developers and other stakeholders. It will also be strongly interconnected with adjoining growth centres/ investment regions/ industrial areas of Gurgaon, Manesar and Bawal in Haryana on one hand and Gihlot, Neemrana and Bhiwadi in Rajasthan on the other hand and of course with the distant markets which will be connected through the Dedicated Freight Corridor.

From a rural base with a population of about 85,000 in 2012 dispersed in 42 villages in the designated area, by the planning horizon of 2040 the new city is expected to be home to about 1.55 million people. This will comprise the original rural population and their extensions, the migrant workers of all categories and their dependents, investors, business community, and a sizable fraction comprising student community. In the year 2040 the student population is estimated to be of the order of 177,000. Population projections for different years over the planning horizon are summarised in **Table 6-23**.

**Table 6-23: Projected Population for the KBNIR**

| Projected Population for the KBNIR | | | | |
|---|---|---|---|---|
| **Year** | **Residents** | **Students** | **Total** | **CAGR, %** |
| 2012 | 93,528 | 0 | 93,528 | 2.93 |
| 2015 | 212,011 | 14,022 | 226,033 | 38 |
| 2020 | 254,178 | 30,334 | 284,512 | 5 |
| 2025 | 352,957 | 48,598 | 401,555 | 7 |
| 2030 | 513,135 | 85,207 | 598,342 | 8 |
| 2035 | 823,967 | 145,270 | 969,237 | 10 |
| 2040 | 1,368,229 | 177,780 | 1,546,009 | 10 |
| | | | | |

The proposed land use pattern suggests that Industry with about 17% area accounts for the largest use, followed by residential (14%) and transport (11%). Existing rural settlements or villages along with the extensions expected over the years will account for around 16%, which represents a significant feature of the planning process within the IR. Agriculture, comprising high-tech and traditional methods together also account for around 17%. Overall green cover in the IR comprising plantations/urban forestry, lawns, parks and nature conservation areas will account for 11%. Considering total area under agriculture and 'Greens' as above, and the river stretch, the overall open areas across the IR will account for about one third of the total planned development.

The relatively higher total area under agriculture and 'Greens' has relevance with regard to the possible method of waste treatment and the guiding principle of the Concept Master Plan seeking the paradigm of resource recovery. Under such a setting, MSW when composted could possibly meet a fair demand for organic soil supplement, mulch or manure locally and thereby enable compliance with the sustainability paradigm.
Evidently over the plan horizon of 25 years, the new city will be developed in phases and which will also be influenced by rate of investment in

industry sector as well as the market demand. As discussed earlier, Phase-I and Phase-II each will cover slightly over a quarter of the total demarcated area and Phase-III will cover slightly less than half.
The Phase wise population distribution is presented in **Table 6-24**.

**Table 6-24 : Phase-Wise Distribution Of Population**

| Phase-Wise Distribution Of Population | | | | |
|---|---|---|---|---|
| **Phase** | **Year** | **Permanent residents** | **Knowledge City** | **Total** |
| I | 2012 | 93,528 | 0 | 93,528 |
| | 2015 | 212,011 | 14,022 | 226,033 |
| | 2020 | 254,178 | 30,334 | 284,512 |
| II | 2025 | 352,957 | 48,598 | 401,555 |
| | 2030 | 513,135 | 85,207 | 598,342 |
| III | 2035 | 823,967 | 145,270 | 969,237 |
| | 2040 | 1,368,229 | 177,780 | 1,546,009 |
| | | | | |

Notes: Knowledge city population comprises students.

### 6.7.2 Waste Management Paradigm

The overriding paradigm for effective and sustainable citywide municipal solid waste management is defined hereunder. A set of appropriate and feasible options for different components of the supply chain from primary collection to the ultimate disposal in a sanitary landfill are also discussed in the ongoing section.

A set of possible measures in the areas of institutional strengthening and community organisation are also presented hereunder, which must ideally be considered as 'conditions precedence' for making effective and sustainable technical interventions.

#### 6.7.2.1 The Overriding Paradigm

The objective is to enable creation of an appropriate institutional framework and infrastructure such that environmental sanitation within and around the project area is always maintained at a very high level, and thereby public health is adequately protected.

The vision is to develop KBNIR as a world class city. Thus, the paradigms of offering improved aesthetics, waste minimisation, achieving '3R' and resource recovery, etc are taken as supplementary and considered subsumed in the overriding paradigm of protection of environment and public health at all times.

#### 6.7.2.2 Approach towards Integrated MSW Management

In line with the paradigm, the parameters of the MSW management system and the service levels to be offered are defined. The approach evolved considers full coverage of the entire KBNIR, irrespective of the category of development, viz., residential, industrial, institutional and commercial, etc. It is therefore assumed that the Concerned Agency/ SIR Authority that it will adopt an integrated approach for total solid waste management from primary collection to its ultimate safe disposal. Also, it would start waste collection and transportation services within its jurisdiction with immediate effect.

#### 6.7.2.3 Primary collection

In order to achieve higher collection efficiency and ensure improved aesthetics across the city, the SIR Authority shall make all necessary and appropriate efforts to introduce a mix of door-to-door collection service supported by adequate number of wheely bins/ containers installed at conveniently spaced community waste storage depots (CWDs). The plan would provide for motorised primary collection as well as motorised lifting of waste from the wheely bins throughout KBNIR.

Practice of storage at source (for all categories of waste generators) be encouraged and promoted, so as to achieve higher operational efficiency and minimise the practice of littering or indiscriminate disposal around individual dwellings. In this context, it is recognised that to a great extent the Indian society traditionally carries out segregation of reusable and recyclable waste at source, e.g., news papers, glass bottles, metal, etc. which is supported by the network of informal recyclers ('Kabariwala'). Further, it is also recognised that for the residual waste, second level of source segregation at household level in terms of biodegradable and non-biodegradable categories is a very challenging proposition and across the country only very few communities have been able to achieve it, although not on a sustained basis. Furthermore, transport of source segregated waste is another challenge which entails high level of planning, operational care and costs. In view of these issues and considerations it is proposed that source segregation of biodegradable fraction will be primarily enforced at bulk sources e.g., vegetable markets, hotels and restaurants, etc. while households shall be encouraged to adopt such practice gradually over a reasonable period of time.

#### 6.7.2.4 Secondary Collection and Transport Of Waste

Secondary collection from community waste depots will be carried out with the help of refuse compactors which are 1) compatible with wheely bins, 2) offer better aesthetics during transport and 3) provide efficient option in terms of time and manpower input. In this regard, to start with, each of the 42 villages will be provided at least one community waste depot. The number of CWDs shall be increased in proportion to the population of a village and waste loads in due course of time. Each CWD will have adequate number of wheely bins to accommodate the waste loads generated at that particular node. With regard to transport of the collected waste to the treatment and disposal facility, where necessary, sufficient number of transfer stations at suitable locations would be provided to achieve economy in long distance hauling and minimise traffic on the city roads. Likewise it is proposed to provide for decentralised parking facilities for waste collection and transportion fleet. For a green-field city it would be possible to integrate these facilities with other utilities e.g., sewage pumping stations or sewage treatment plants, as the case may be.

#### 6.7.2.5 Street sweeping and drain cleaning

In a typical town/ city the street sweeping and drain cleaning (underground or open storm water drains) services are provided by the urban local body. In this case also, as the city expands, the concerned SIR Authority will be required to provide these services. Generally these services are provided by a separate team of municipal workers who are not involved in collection of other streams of MSW e.g., domestic waste, etc. However, depending on the service model to be adopted, an appropriate level of integration can be established. The classification of streets and the frequency of sweeping service to be adopted as a minimum shall be as shown in **Table 6-25**. Depending on the level of activity and importance of certain areas, the concerned authority can increase the frequency.

**Table 6-25 : Classification of Streets and Sweeping Service Levels**

| Classification of Streets and Sweeping Service Levels | | |
|---|---|---|
| **Class of road** | **Streetscape** | **Frequency of sweeping** |
| A | City centre, shopping areas | Daily |
| B | Market areas | Daily |
| C | City centre and minor streets | Daily |
| D | Sub-urban shopping streets | Daily |
| E | Residential areas (high, middle and low income) | Daily |
| F | Roads and streets without any houses or establishments on either side | Once a week |
| G | Sub-urban main streets | Twice a week |
| H | Open spaces | Occasional, as required; At least once a fortnight. |

Source: Manual on MSW management, MoUD, GoI, 2000.

#### 6.7.2.6 Prevention of littering

Littering is a nuisance and makes an immediate adverse impression about the level of service for MSW management. For a world class city which is planned for KBNIR, it will be imperative that to the extent possible littering in prevented or minimised and a cleaner urban-scape is offered to the residents as well as the visitors. To this end, it is required to provide commensurate level of service in terms of the adequate number of and conveniently placed trash/litter bins on road sides as well as the frequency of their emptying. With regard to appeal to the users as well as for regular servicing the material, design and robustness of the litter bins are also equally important and must be considered while selecting.

#### 6.7.2.7 Treatment of mixed MSW

In principle, the objective of treatment of mixed MSW is to achieve reduction in its volume and thereby minimise footprint of the landfill for safe disposal. However, treatment of mixed MSW is recognised to be one of the most challenging aspects of the entire MSW management operations because of a range of uncertainties and issues e.g., feedstock quality characterised by presence of a wide range of contrary materials in varying proportions, uncertainty of delivery of consistent quantity, climatic factors, wear and tear of the plant, unavoidable odour emissions and consequent environmental and social impacts, etc. Further, consequent upon treatment, the reusable or recyclable outputs (e.g., compost), if any, do not enable full cost recovery and therefore essentially represent only supplementary revenue streams. It is therefore recognised that irrespective of the technology, treatment is typically resource intensive or a cost-centre as it requires sustained inflow of funds towards capital and operating expenses over the entire life of the plant.

Moreover, in the case of a green-field urban settlement there is a fair degree of uncertainty of build-up of critical waste loads which could warrant a treatment plant in initial stages. In view of the above described issues and challenges it is proposed to defer construction of an elaborate treatment plant for the initial years.

However, apparently MSW Management Rules, 2000 mandate treatment of mixed MSW prior to its disposal into a sanitary landfill. Therefore in order to achieve compliance with the said Rules, at some point of time installation of a treatment plant would be required. Further, from the point of view of technology, it is recognised that composting is the least risky and most affordable option. Therefore it is proposed that a moderate scale plant should be set up about five years after the first settlement within the KBNIR. In due course as waste loads build up, plant capacity should be augmented suitably.

#### 6.7.2.8 Management of specific streams of municipal waste

Typically in a large urban centre MSW can be classified under several different streams depending on the source or activity leading to their generation. The source also characterises nature of the stream, whether it is suitable for any treatment or reuse, etc. In this regard a set of waste streams and their possible scope for treatment or otherwise is summarised in **Table 6-26**.

**Table 6-26: T & D Options for Different Waste Streams**

| T & D Options for Different Waste Streams | | | |
|---|---|---|---|
| **Sr. No.** | **Waste stream** | **Composition** | **Suitability for treatment** |
| 1 | Street sweepings | Primarily silt, sand, grit, stones, etc. and to some extent packaging material. | Not suitable for any treatment. Should be sent to the SLF. |
| 2 | Drain sludge | Primarily silt, sand, grit, stones, etc. besides of course decomposing organic matter and | Not suitable for treatment. However, after drying can be used for filling foundations, abandoned quarries, etc.. |

| T & D Options for Different Waste Streams | | | |
|---|---|---|---|
| Sr. No. | Waste stream | Composition | Suitability for treatment |
| | | water/moisture. | |
| 3 | Vegetable market waste | Predominantly organic matter along with packaging waste comprising biomass, wood/straw, etc. | Suitable for composting and could be sent directly to the compost platform, bypassing pre-sorting. |
| 4 | Slaughterhouse and meat market waste | Fully organic waste. | Same as above. |
| 5 | Hotel and restaurant waste | Predominantly food waste. | Same as above. |
| 6 | Dairy farm waste | Cattle manure. | Same as above. |
| 7 | Brush/yard waste | Grass cuttings, hedges, fallen trees, branches, dry leaves, etc. | Suitable for mulching and composting by appropriate blending with organic waste, but handled separately. |
| 8 | Hospital waste | Bandages, surgicals, sharps, needles, body parts, etc. | Should be collected under a separate system and sent to a separate facility for treatment and disposal. |
| 9 | Construction debris and demolition waste | Predominantly inert. | Not suitable for treatment. To be collected and stocked separately and used as filling material on construction sites or on the SLF. |
| 10 | Domestic hazardous waste | Cleaning chemicals and containers, batteries, medicines, sharps & needles. | Not suitable for treatment. To be collected separately and disposed of in the SLF. |
| | | | |

Unless done so deliberately by the municipal workers, these streams do not mix with the general stream of domestic solid waste. Therefore with proper care and under a proper system these streams of waste need to be collected separately and sent for appropriate treatment or disposal. However, this is easier said than done because keeping them separate all the way from their source of generation to the T&D site is very challenging and difficult to manage from the point of view of the service provider. It requires considerable cooperation from waste generators, collection centres, logistics in terms of colour coded containers in adequate number at relevant locations, their timely lifting and replacement, transport vehicles, and finally care/ sincerity on the part of the workers. Nevertheless, efficient waste management operations are characterised by such best practices which eventually lead to optimisation of treatment and disposal costs.

#### 6.7.2.9 Mulching of brush

The Development Plan envisages about close to 10% under 'Greens' (urban forestry, parks, and lawns, nature conservation). In addition, the plan proposes extensive avenue plantation as well as plantation along the river front/ in flood plain area. This together will constitute a very large source of brush – comprising all the horticulture waste of plant/vegetation origin e.g., dry leaves, grass and hedge cuttings, fallen trees, branches, twigs, etc. This is a bulky waste stream which is characterised by high fibre and cellulose content and high to very high Carbon to Nitrogen ratio and as a result not readily decomposable. In this respect, it is proposed to handle and treat this stream of waste separately whereby it can be converted into a value added product. It is proposed to produce mulch out of this stream which is a stabilised material and an excellent soil amendment as it helps in soil aeration, improves water holding capacity and protects from temperature shocks in peak winter and summer. Mulch can be applied gainfully in horticulture, floriculture and agriculture within the KBNIR. The biomass can also be used as blending material for the MSW composting piles.

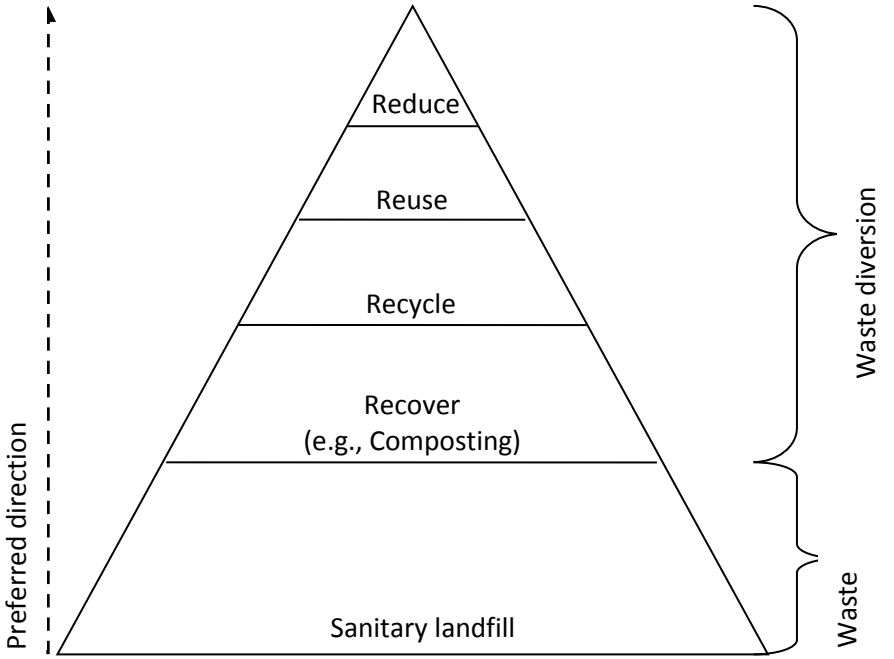
#### 6.7.2.10 Safe disposal of MSW

It is recognised that a sanitary landfill is the most robust, elastic and forgiving option for safe disposal of mixed MSW at all times. It represents bedrock of all MSW infrastructure planning and therefore it is proposed to be constructed at an early stage. Availability of an SLF for a local body helps in ensuring protection of the environment and public health. As shown in Exhibit 3.3, an SLF offers (a) a strong base on which to build, over time, the rest of the strategy and infrastructure for segregation, resource recovery, waste minimisation, etc. and (b) backstopping when a fully developed system experiences temporary closures.

Ideally the compost plant and the sanitary landfill should be constructed at the same location, thereby offering a considerable degree of integration of infrastructure, operations and logistics. However, in the initial years with very low waste loads, where feasible, abandoned quarries could be used as sanitary landfill after taking all the necessary technical measures e.g., an impermeable liner system and a leachate collection system, capping, passive venting of landfill gas, green belt and landscaping, etc. This arrangement will help in minimising initial capex and opex, underutilisation of plant capacity as well as in optimal utilisation of the available land resources.

In line with the above proposed approach, in due course of time SIR Authority shall strive to promote the practices of, among others segregation of waste e.g., hazardous domestic waste (chemicals, medicines, electronics), recyclables such as newspapers, glass and plastic bottles, etc. at source through a sustained campaign for public awareness and community participation. By adopting this approach, it will aspire to achieve compliance with the MSW Rules, 2000 in a phased manner.

**Figure 6-22: Hierarchy Of Waste Management Options**




Source: Adapted from 'What a Waste – A Global Review of Solid Waste Management', World Bank, 2012.

#### 6.7.2.11 Waste Reduction At Source

In order to reduce organic waste loads from households, one of the methods adopted by progressive urban local bodies around the world is promotion of home composting of kitchen waste. It is recognised to be the most effective supplementary element in the overall scheme of integrated MSW management for restricting entry of potentially putrefying domestic waste in the mainstream of the mixed MSW. It enables, among others (a) active community participation in waste management, (b) resource recovery at least cost at the source of generation, (c) when scaled-up to a large number of households, reduction of costs in primary collection and subsequent stages of MSW management, and (d) reducing waste loads destined for SLF. This is especially suitable for plotted developments which are characterised by large horizontal spread, low vertical development and availability of front and/or back yards in houses, etc. It is therefore proposed to promote this practice in bungalow type constructions and offer appropriate incentives for willing households.

Home Composting – An Effective Way To Minimise Domestic Organic Waste



*Courtesy: Foundation for Greentech Environment System.*

On the same lines, as the system evolves the SIR Authority shall facilitate creation and operation of recycling centres in different municipal zones through community participation where potentially reusable material will be received, stocked, sorted and sent to prospective end users/buyers, etc. These centres will preferably be set up at the waste transfer stations and operated in participation with private service providers or local self help groups.

#### 6.7.2.12 Scaling towards a regional facility

For a single city which will start with a small population base, ideally a regional facility for treatment and disposal of MSW would enable economy of scale and also in getting experienced and competent contractors to operate. However, KBNIR being located at the border of Rajasthan and Haryana, and considering long distances to other major towns on Rajasthan side e.g., Bhiwadi and Alwar, at this stage this proposition appears to be difficult. However, at an appropriate time during the second phase of development this aspect could be explored.

Nonetheless, it is suggested that an attempt include adjoining town and the industrial area of Neemrana, Japanese Park, Gehlot Industrial area and possibly Behror which would offer larger scope of work for prospective private service provider.

### 6.7.3 Load Estimates

In a typical urban centre the main sources of waste which contribute to the MSW are households, commercial shops and establishments, institutions and industries, where applicable. In addition, a number of operations, activities/ establishments also contribute waste in varying proportions and impact the quantity and quality of the mixed MSW. These waste sources/ streams among others, comprise, street sweepings, drain cleaning, vegetable and fruit markets, slaughterhouse and meat markets, hotels and restaurants, urban dairy farms, horticulture, lawn and yard waste (brush), hospitals/nursing homes/dispensaries, construction debris and demolition waste and domestic hazardous waste. Depending on the population

distribution, socio-economic profile and dominance of certain activities the relative proportion of various waste streams would vary and that would determine the overall quality of the mixed MSW.

#### 6.7.3.1 Unit Waste Loads

Given the uncertainties in the rate of investment and growth of habitation, for a green-field city it is a challenge to make reliable estimates for mixed MSW. The unit waste load generation rates from the sources are as per the Manual on MSW Management, 2000 are summarised in **Table 6-27**.

**Table 6-27: Unit Waste Generation Rates**

| Unit Waste Generation Rates | | |
|---|---|---|
| **Waste source category** | **Generation (gm/capita/day)** | **Remarks** |
| Residential | 300 – 600 | All household waste |
| Commercial | 100 – 200 | All shops and establishments |
| Street sweeping | 50 – 200 | Including drain cleaning |
| Institutional | 50 – 200 | All offices and institutions |
| Industrial | 100 – 1000 | May partly hazardous and/or recyclable material and may not be entirely acceptable under the MSW collection system. |
| | | |

Source: Manual on MSW Management, 2000, MOUD, GoI, New Delhi.

The above norms are generic and do not differentiate cities/ towns according to their size. Further, they do not include a range of other relevant categories of waste as described above. However, it is noted that as per this criteria, the combined unit generation rate for a city corresponds to 0.6 to 2.2 kg and this would lead to very high waste load estimates.

In this respect the Manual also offers another set of guiding data which is a function of the size of population of a town with a positive correlation. As per this, the combined unit waste loads for towns falling under different sizes are summarised in **Table 6-28**.

**Table 6-28: Combined Unit Waste Generation Rates**

| Combined Unit Waste Generation Rates | | |
|---|---|---|
| **Population (Lakh)** | **Generation (gm/capita/day)** | **Remarks** |
| < 1 | 210 | Based on 328 towns' samples. |
| 1 – 5 | 210 | Based on 255 towns. |
| 5 – 10 | 250 | Based on 31 towns. |
| 10 – 20 | 270 | Based on 14 towns. |
| 20 – 50 | 350 | Based on 6 towns. |
| > 50 | 500 | |
| Metro cities | 600 | |
| | | |

Source: Manual on MSW Management, 2000, MOUD, GoI, New Delhi. Background material provided by NEERI to MoUD, 1996.

Given the uncertainty of growth of population in the KBNIR, the latter set of waste generation rates lead to moderate estimates of waste loads and are considered to be more acceptable. Therefore the latter set is used for estimating waste loads and plan thereafter.

#### 6.7.3.2 Projected MSW loads in KBNIR

Applying above the unit generation rates defined earlier, combined mixed MSW loads across the entire KBNIR are estimated. For the initial period from 2012 to 2015, the population essentially comprises rural settlements across the 42 villages and therefore considering the lower economic profile and dispersed settlements, a rather lower generation rate is considered.

For the subsequent periods, generation rates as per **Table 6-29** have been considered to arrive at lower end of the range. An upper end of the range is estimated considering about 33% higher in the initial period of 2012-2015 and then factoring a growth of about 3% per annum. Average values for the range are provided in the last column.

As per the calculations presented in **Table 6-26** the average combined mixed MSW loads in KBNIR will rise from a low of 17 MT/d in 2012 to about 612 MT/d in 2040. It may be noted that these estimates represent MSW and do not offer any approximation of constituent streams such as organic food waste or horticulture waste, etc.

**Table 6-29: Estimates of MSW Loads in KBNIR**

| Estimates of MSW Loads in KBNIR | | | | | | |
|---|---|---|---|---|---|---|
| Year | Total Population | Waste generation | | Daily waste loads | | |
| | | Lower rate | Upper rate | Lower estimate | Upper estimate | Average |
| | | kg/cap/d | kg/cap/d | MT/d | MT/d | MT/d |
| 2012 | 93,528 | 0.15 | 0.2 | 14 | 19 | 17 |
| 2015 | 226,033 | 0.21 | 0.25 | 47 | 57 | 52 |
| 2020 | 284,512 | 0.21 | 0.30 | 60 | 85 | 73 |
| 2025 | 401,555 | 0.21 | 0.35 | 84 | 140 | 112 |
| 2030 | 598,342 | 0.25 | 0.40 | 150 | 241 | 196 |
| 2035 | 969,237 | 0.25 | 0.45 | 242 | 436 | 339 |
| 2040 | 1,546,009 | 0.27 | 0.52 | 417 | 807 | 612 |
| | | | | | | |

### 6.7.4 Service Levels

The objective of an MSW management plan is to enable SIR Authority to move toward providing 100% service coverage and achieve safe disposal. In case of Greenfield development level of service can be considered uniform across the entire town and the required resources should be mobilised in line with the growth of population/ habitations. However, the ultimate level of service depends on available resources determining among others, manpower (trained, motivated and committed), fleet of collection and transport vehicles, storage containers, the treatment and disposal facilities and support for sustained operation and maintenance. In this regard, a set of indicators for level of service under different categories are provided in **Table 6-30.**

**Table 6-30: Service Levels For Msw Management In KBNIR**

| Service Levels For Msw Management In KBNIR | | | | | |
|---|---|---|---|---|---|
| Stages and Indicators | Level of Service | Year | | | Remarks |
| | | 2012 | 2015 | 2020 | |
| A. Primary stage | | | | | |
| Area under door step collection service | 100% | 100% | 100% | 100% | Aim for full coverage including the villages. |
| Area served through motorised door step collection service. | 100% | 100% | 100% | 100% | Favoured mode with growing coverage. No unsightly cycle rickshaws to be used. |
| Nr. of vehicles for motorised door-to-door collection service. | 1 per 800 hh. | 1 per 800 hh | 1 per 800 hh | 1 per 800 hh | 4 wheelers with raised bucket body and hydraulic tipper, suitable for direct unloading into compactor vehicles and |

| Service Levels For Msw Management In KBNIR | | | | | |
|---|---|---|---|---|---|
| **Stages and Indicators** | **Level of Service** | **Year** | | | **Remarks** |
| | | **2012** | **2015** | **2020** | |
| | | | | | transport to the landfill. |
| Area served by CWDs (containers) as back up for door collection service. | 100% | 5-16% | 100% | 100% | To start with, at least one CWD for each of the 42 villages. |
| Container capacity at CWDs. | 2 cum/ 1000 hh | 2 | 2 | 2 | Covered containers – 1.1 cum plastic make at a spacing of 500 m in all residential areas, commercial areas, near bulk generation sources, etc. |
| Lifting of waste from CWDs in planned urban areas. | 1/d | 1/d | 1/d | 1/d | Higher frequency may be required in commercial and institutional areas. |
| Lifting of waste from CWDs in Abadi and Abadi ext. areas | 1/d | 2/week | 2/week | 1/d | Initial low service level due to poor access and low volumes. |
| Area under daily | 100% | 5- | 100% | 100% | All designated |

| Service Levels For Msw Management In KBNIR | | | | | |
|---|---|---|---|---|---|
| **Stages and Indicators** | **Level of Service** | **Year** | | | **Remarks** |
| | | **2012** | **2015** | **2020** | |
| road sweeping and drain cleaning service | | 16% | | | roads as per defined hierarchy and priority. |
| Nr. of hand carts in use for collection of street sweepings. | 2-4/ km of road. | NA | 4 | 4 | Local Body to evolve appropriate service levels. |
| Spacing of litter bins | 50/100 m | NA | 100 m | 100 m | In all areas with high foot falls. |
| B. Secondary stage | | | | | |
| Covered containers | 100% | 100% | 100% | 100% | As per the requirements of MSW Rules, 2000. |
| Transporting vehicles with a cover | 100% | 100% | 100% | 100% | |
| Combined waste transport capacity | 125% | 100% | 125 | 125% | Depending on distance to SLF and considering 2-3 trips/vehicle/day. |
| C. Tertiary stage | | | | | |
| Daily waste load collection from all sources | 100% | 80% | 90% | 95% | Lifting from CWDs in villages to commence |
| Waste receiving treatment | 100% | 0% | 90% | 95% | Including home composting. Treatment |

| Service Levels For Msw Management In KBNIR | | | | | |
|---|---|---|---|---|---|
| **Stages and Indicators** | **Level of Service** | **Year** | | | **Remarks** |
| | | **2012** | **2015** | **2020** | |
| | | | | | plant should be ready in 3-5 years. |
| Safe disposal in SLF | 30-50% | 80% | 36% | 38% | First phase SLF should be ready in 2 years. |
| Waste released into open environment | 0% | 0% | 10% | 10% | Corresponding only to the uncollected waste. |
| D. Cost recovery | | | | | |
| Households paying user charges | 80% | 10% | 40% | 80% | @ ` 10-50 pm including those in Abadi and Abadi Ext. areas. |
| E. Customer service | | | | | |
| Complaints per year | 1/100 hh/ d | 5/100 hh/d | 1/100 hh/d | 1/100 hh/d | Local Body to monitor, document and continually improve. |
| Complaint turnaround time | 24hrs | 72 | 24 | 24 | Local Body to monitor, document and continually improve. |
| F. Efficiency | | | | | |
| Staff per MT of waste collected | NA | | | | Local Body to define, monitor, document and optimise. |
| Operating cost per MT of waste collected | NA | | | | Local Body to define, monitor, document and continually improve. |

Notes: NA: not available; SLF: sanitary landfill

It is proposed that the entire area including the Abadi and Abdi Ext. area is brought under door step collection service. However in the initial stages extending this level of service to the Abadi area may be difficult. To overcome the challenges, it is proposed that for each Abadi area at least one CWD will be established where the residents can dispose of the waste in containers and which can be subsequently picked by the refuse compactors. All primary collection is proposed to be through motorised vehicles which is an efficient mode and offers superior aesthetics. Unsightly cycle rickshaws are not proposed to be deployed for this purpose.

Community waste depots are to be provided in the entire KBNIR area as a backstopping to the door step collection service. These are to be provided at a convenient spacing of 500 m with a holding capacity of about 12 cum each. Either 6 metallic wheely bins of 2 cum or 11 plastic wheely bins of 1.1 cum capacity should be installed at each CWD. These are to be serviced by refuse compactors and the emptying service will be at least once a day. In areas where waste generation rates or volumes are higher, the lifting frequency must be increased suitably. To start with, for the Abadi areas the

lifting service can be adjusted from once or twice a week to once a day, depending on waste volumes.

In order to offer improved streetscape, 100 litre capacity litter bins should be installed at a spacing of 100 m in such areas where footfalls are high. Likewise, street and drain cleaning service must be defined as per the importance and priority of the roads. To start with, all Abadi areas could possibly be provided with street sweeping service.

For the secondary level, it is proposed that all the containers to be installed at the CWDs shall be with appropriate covers so as to prevent impairment of aesthetics. Likewise all secondary and long haul vehicles will be covered type, preferably refuse compactors for higher efficiency. Ideally the system will have about 25% extra capacity for waste transport, so as to take care of emergencies and special circumstances when spike in waste loads are observed.

The SIR Authority shall strive to collect 100% waste. While treatment plant may take 3-5 years, it is proposed that first phase of the sanitary landfill should come up within 1-2 years. Until the treatment plant gets ready, other factors permitting, first phase of the SLF could be developed at one of the quarries where all the mixed waste could be disposed of safely. As a result, waste released into open environment can be minimised and thereby public health in KBNIR can be protected.

### 6.7.5 Supporting Infrastructure

In order to offer consistently higher service levels, among others, the system should have provision for parking of vehicles in various zones of the IR. This could be arranged at the respective zonal offices, waste transfer stations or at sewage treatment plants/ pumping stations. Secondly, a central workshop is desirable to service all the vehicles and thereby ensure least downtime. The workshop/ transfer stations must also make provision for washing of vehicles and containers – improving aesthetics and working life.

### 6.7.6 Personnel Management and Occupational Health

MSW management operations essentially involve 3M – management of material, machinery and manpower. In the overall scheme manpower plays a very critical role because a bulk of the municipal workers at the lower rung are characterized by low level of education, awareness, commitment, discipline, poor skills, wayward behavior and practices, resource diversion, absenteeism, alcoholism, drug addiction, etc.

Further, due to the very nature of their occupation, MSW workers are exposed to a plethora of disease vectors at various stages of handling of waste. As a result of this high exposure typically morbidity rate is found to be high which then results in poor productivity as well as generally high mortality.

In order to address these issues it is recommended that the SIR Authority should allocate adequate resources for personnel management and occupational health and safety aspects. These will comprise:
A range of short-term training courses round the year on a regular basis for all grades of MWS workers on:

- Motivation, yoga classes, de-addiction, etc.
- Orientation on the significance and importance of their work to the city to enhance self esteem.
- Occupational health and safety aspects, personal health protection, etc.
- Effective and safe working practices, new skills, use of right equipments and implements, etc.
- Regular medical check-up of all MSW/sanitation workers.
- Where necessary, appropriate and commensurate support for curative treatment.

To impart a sense of identity, provision of uniform, caps with KBNIR logo and personal protective equipment on a regular basis.

### 6.7.7 Institutional Strengthening and Capacity Building

In order to offer consistently high quality services in the proposed world class city, a set of measures for institutional strengthening and capacity building are of relevance. These are briefly described in the paragraphs that follow.

**Aligning MSW management with Engineering Dept.**
MSW management is predominantly a material, machine and manpower operation involving logistics planning, fleet management, technical and technology considerations over the entire supply chain, etc. It also involves, among others, manpower management, resource control, and monitoring and evaluation on a continuous basis. An engineer by training is more suited to perform these functions compared to a health officer who has a background in clinical/medical or public health aspects or simply a sanitary inspector. The domain of solid waste management requires 'public health engineering' expertise and it is therefore recommended that the SIR Authority, as and when it gets constituted, should entrust the responsibility to its dedicated cell. With regard to the quality and effectiveness of the services, the 'public health' department should be given the responsibility of monitoring and evaluation.

**Capacity for public relations and community management**
Successful MSW management requires significant inputs in the area of public relations and community management. It requires community organization (formation of CBOs, RWAs, etc.), mobilization (workshops, seminars, conferences, etc.) and regular communication (newsletters, press briefing, etc.) to elicit constructive participation of different stakeholders. It is therefore recommended that SIR Authority should create a sub-group on 'communication and public relations' which should be staffed by qualified and experienced social worker(s) (with master's degree in social work) with good communication skills. He/she should be able to anchor, among others, a sustained awareness campaign on effective solid waste management all across the city.

**Local bylaws for MSW management**
Given the emerging challenges in urban waste management across the country, it would be apt to carry out a review of existing municipal or other relevant bylaws as applicable to MSW management in Rajasthan. Issues that need to be specifically addressed could comprise, among others, storage of waste at source, prevention of littering, promotion of home composting in bungalow type residences, regulation and safe disposal of domestic hazardous waste, limiting use of plastic packaging by local traders/ vendors, responsibility of bulk waste generators, prevention of littering by hawkers/venders and weekly/temporary market shops, handling and management of horticulture waste/ brush, prevention of burning of waste and dry leaves/brush, handling and management of construction debris and demolition waste, and of course incentives for compliance and penalties otherwise, etc.

**Training of councillors and officials**
General experience from across the country establishes deficit in understanding and expertise in MSW management on the part of the concerned municipal councillors and administrative/ supervisory officials. In this regard, it would be appropriate for the SIR Authority to take up from time to time orientation programs on the subject of, but not limited to:

- Principle of and components for effective solid waste management.
- Benefits of a good system and risks of mismanagement.
- Responsibilities of stakeholders and constructive participation.
- Resource required and challenges involved in effective MSW management.

**Participatory monitoring**

In order to complement strengths of the implementing and monitoring departments, SIR Authority should introduce a system of monitoring and inspection by officials from other departments on a rotation basis in different wards of the city. This will ensure higher visibility, transparency, accountability and familiarity with the essential service among the ULB officials at all levels. In the medium- to long-term, it will also lead to consistently improved service levels across the city at least cost. On the same lines, it is also recommended to work with the civil society in evolving a participatory monitoring system for waste management services e.g., in market areas, residential colonies, etc.

**Customized manual on MSW management**

Once the entire MSW management system is in place, at an appropriate stage the SIR Authority should commission a specialist agency for preparation of a customized manual for its officials and for continuation of agreed service levels/ practices / operations. The manual must define the key objectives, issues, challenges, the system adopted to address them and them, the desired level of service and salient features of various components from primary collection to eventual safe disposal into an SLF, etc. The manual must also define different service delivery models that could be considered for adoption during implementation and all the efforts that it must make in ensuring availability of required capacity in-house.

**Customized MIS for MSW Management**

Continuous improvement in service levels is possible only if the delivery system is monitored and evaluated at appropriate levels. Moreover, MSW management being a resource intensive operation with most visibility, it is in the interest of concerned authority to create an appropriate management information system. In this respect it is recommended that at an appropriate stage SIR Authority must develop and install a customized MIS system, make arrangements for data collection and its regular operation and engage qualified persons to operate/ manage the same. Further, in order to improve transparency and community participation, it is recommended that quarterly/half yearly MIS reports should be shared with key stakeholders.

**Quality policy**

With respect to the solid waste management service – both from the point of view of the citizens (customers) and internal systems and processes, it is recommended that a robust service delivery quality policy on the following line be developed for the KBNIR:

- SIR Authority shall lay down a policy of providing timely and quality services to its citizens. To this effect it will also develop and synergise a city level environment and health policy to offer a certain defined level of quality of life.
- SIR Authority shall aspire to fully comply with the stipulations of the MSW Rules, 2000 in a time bound manner. To this effect, the environment policy, as mentioned earlier will establish synergy to prevent pollution of air, surface and ground water, etc.
- SIR Authority shall define a policy of keeping its solid waste management related assets in good conditions. To this effect it shall provide adequate resources for manpower and routine maintenance, upkeep, repairs, servicing and timely replacement, etc.

**Environment, health and safety policy**

SIR Authority shall develop a policy on environment health and safety aspects addressing the needs of the community in general, and the officials and sanitary workers in particular who shall be involved in sanitation and solid waste management works. The policy shall mandate preparation of monthly reports on environmental and public health conditions across the town and which shall serve as a cross-check on the effectiveness of the sanitation services. The policy shall also specify mandatory annual medical check-ups to be commissioned by the SIR Authority for its sanitary workers, mechanism for meeting health costs and provisions for group medical insurance, if any.

**Community Organisation and Participation**

Community organization and participation is imperative for successful solid waste management in a urban centre. In this regard, a set of measures proposed for eliciting higher participation of the community are briefly described in the paragraphs that follow.

**Community organization**

Successful community management requires its organization in small distinguishable groups with designated leadership. Based on the experience of some of the cities across the country, SIR Authority may consider organizing the community on the lines of resident welfare associations, mohalla committees, market/traders associations, women's groups, kitchen garden groups, etc. Such organization will facilitate mobilisation for awareness creation and participation. Further, in line with the 74$^{th}$ Constitution Amendment, these groups could be involved in decentralized planning and monitoring of services.

**Community mobilization and consultation**

SIR Authority shall identify common areas/themes and organize special events to mobilize the community for a dialogue and constructive engagement. At appropriate stages, it must anchor campaigns on the issues of environmental sanitation, MSW management, public health, aesthetics and general quality of life within the city. The feedback received from the community will help in continuous improvement in service delivery and optimizing resources.

**Communication**

For a successful MSW management programme it is desirable to establish regular communication with the target community. Regular dialogue with community groups as defined earlier will form an integral link in this scheme. Among others, a dedicated website and a monthly news letter could be considered as the means for such communication.

### 6.7.8 Primary Collection and Transport System

Sections hereunder describe the primary collection and secondary storage/ transport components of the integrated municipal solid waste management system proposed for the KBNIR. It covers entire supply chain of the waste material from primary storage to transport up to the treatment and disposal facility, interfaced with different sources of generation and stakeholders. The system has been developed keeping in consideration the urban – rural settlement pattern in the initial stages and its gradual evolution to more urbanised area, experience from other cities from across the country and the expected population growth rates

#### 6.7.8.1 Coverage

It is assumed that the service provider would aspire and be geared to offer fairly high service levels from a very early stage. In this respect it is proposed that full coverage be provided to all the habitations – existing villages, their extensions and the new plotted developments.

In the initial years, the population to be serviced will mostly comprise residents of the 42 villages spread across the entire KBNIR. Since these villages will stand merged with the KBNIR, it is imperative that the concerned SIR Authority shall assume the responsibility of providing the essential service of, among others, MSW collection and lifting to the respective residents. Over time, as the new development takes place and habitations in plotted areas develop, the service(s) to the villages will gradually be integrated with the latter and rather uniform level of service will be available to all residents.

#### 6.7.8.2 Primary Storage and Waste Reduction

The community by and large characterised by rather low level of awareness and concern, especially towards environment, aesthetics and public health. It is also recognised that civil society involvement in planning and delivery of basic services is low. Secondly, the SIR Authority may not have the

required capacity to bring about awareness and behaviour change in a short period of time towards source segregation. Moreover, as stated earlier and as experienced over the last decade all over the country, segregation at the level of households, commercial establishments and institutions is extremely difficult to introduce and sustain over time and space (all the way to the landfill/treatment plant).

It is therefore recognised that under the given circumstances promotion of the practice of source segregation, as mandated under the MSW Rules, 2000 from the outset will be an extremely challenging proposition. It is therefore recommended that, to start with, the SIR Authority shall entail the residents in Abadi and Abadi Extension areas to store the waste at source in a single bin and in return offer a reliable collection/lifting service.

In this respect, it proposed to adopt the 'polluter pays' principle, as per which the residents will be required to make own arrangements for storage at source and the SIR Authority shall not be supplying domestic bins to any of the residents – either in the Abadi or the plotted developments. On the same lines, it will also direct waste generators in the industrial, institutional and commercial areas to make appropriate arrangements on their own for waste storage at source.

In due course of time SIR Authority will take up a sustained public awareness campaign and thereby attempt to motivate residents to gradually take up source segregation. To that effect, the respective households and agencies will make own arrangements and the Authority will facilitate the process.

#### 6.7.8.3 Promotion of home composting

As described in the preceding chapter, Home Composting represents ultimate decentralized format for waste reduction, treatment and reuse. As the Concept Master Plan provides for bungalow type residential development for a small percentage of the population, it is recommended that among them the environmentally concerned and motivated citizens be encouraged to take up the practice of home composting at individual household level. To a certain extent this will enable waste reduction at source and resource recovery which collectively represent the paradigm of 'individual environmental responsibility'. Indirectly this will help mobilise community participation at the individual level.

SIR Authority can either distribute composting bins (100-150 lit capacity) to such households or advise construction of perforated brick chamber of equivalent capacity in the backyards of the houses. Because of small waste quantities involved at individual household level, a composting bin has least nuisance potential and represents one of the most effective tools in integrated waste management operations.

SIR Authority shall offer appropriate incentive(s) (e.g., one time rebate in property tax, free or subsidized availability of composting bin, etc.) to the willing households for adopting 'home composting' as a 'green hobby'. It is proposed that about 5-7% of the population (specifically, the residents of bungalows) should be facilitated to move to this paradigm. As a result of this simple initiative, selected areas of the KBNIR will achieve compliance with the MSW Rules, 2000 to a considerable extent. It is also recommended that SIR Authority should include the subject of 'home composting' in its awareness campaign and its communication group personnel be suitably trained.

#### 6.7.8.4 Preventing littering

In order to prevent littering in residential, commercial, institutional and industrial areas, alike, it is desirable or rather essential that some form of receptacles are provided at convenient locations for the benefit of pedestrians, shoppers, visitors, floating population, small vendors, etc. To this effect it is proposed to install litter bins of 70-100 litre capacity at close spacing of 50-100m on the road sides. These bins will be made of either UV resistant FRP (fibre reinforced plastic) or LLDPE (linear low density

polyethylene) with a hood/lid and which can be placed directly on the ground or can be mounted on a MS frame. Some illustrations are presented in **Figure 6-23**.

It is recognized that segregation of waste at such locations is not practicable, and therefore reasons of economy only single bin is proposed to be installed at each location. Spacing in high footfall area will be 50m and in other areas it will be 100m respectively. It is also emphasised that bins will be installed on both sides of the roads in a staggered way so as to ensure higher compliance on the part of a potential disposer. As shown in **Table 6-31**, the number of locations/ litter bins to be installed across the KBNIR by Phase-III is estimated to be around 4700 which is based on lengths of different categories of roads. On a *pro rata* basis for Phase-I, –II, -III the number of bins will be in a ration of 30%, 40% and 30% respectively.

**Figure 6-23: Possible Types Of Litter Bins For Installation Across Kbnir**











**Table 6-31: Estimates of Litter Bins to be Installed Across KBNIR**

| Estimates of Litter Bins to be Installed Across KBNIR | | | | | | |
|---|---|---|---|---|---|---|
| Category | Road | | | Litter bins | | Remarks |
| | Width m | Area sq. km | Length km | Spacing m | Number | |
| Main road, Residential areas | 60 | 1.904 | 31.73 | 100 | 317 | - 70% of the main roads in the category.<br>- 50% roads where bins may be required. |
| City road, Residential areas | 40 | 0.924 | 23.1 | 100 | 462 | 70% of the main roads in the category. |
| Main road, Commercial areas | 60 | 0.816 | 13.6 | 50 | 544 | 30% of the roads in the category. |
| City road, Commercial areas | 40 | 0.396 | 9.9 | 50 | 396 | Same as above. |
| Main road Knoweldge city | 60 | 2.48 | 41.33 | 50 | 827 | 50% of the roads where bins may be required. |
| City road Knowledge City | 40 | 0.07 | 1.75 | 50 | 70 | |
| Main road Hitech City | 60 | 2.24 | 37.33 | 100 | 373 | 50% of the roads where bins may be required. |
| City road Hitech City | 40 | 1.14 | 28.5 | 100 | 570 | |
| NH8 | 500 | 6.01 | 12.02 | NA | | No bins proposed on NH. |
| Road Link | 100 | 1.82 | 18.2 | 100 | | No bins proposed on Link roads. |

| Estimates of Litter Bins to be Installed Across KBNIR | | | | | | |
|---|---|---|---|---|---|---|
| Category | Road | | | Litter bins | | Remarks |
| | Width m | Area sq. km | Length km | Spacing m | Number | |
| Internal roads* | 40 | NA | 56.17 | 100 | 1124 | Length assumed @ 30% of all main road excluding NH and link roads. |
| Total | | | 273.63 | | 4683 | |
| | | | | | | |

Ideally in high footfall areas the bins shall be emptied twice a day and in other areas the service can be reduced to once a day. They will be serviced by the same fleet of vehicles which will be used for lifting street sweepings and drain silt. The stored waste will be transferred directly to vehicles which will transport to the T & D facility.

### 6.7.9 Primary Collection and Secondary Storage

To the extent feasible, SIR Authority will strive to provide door step collection service to all residential, institutional, commercial and industrial areas including the Abadi and Abadi Extension areas.

**Door step collection service**

Although motorised primary collection is a higher level of service but it is found to be more efficient, effective and dependable. Small vehicles are found to be more suitable for congested habitations as well as for areas characterised by undulating topography or spread out development. A motorised collection system also enables integration with and optimisation of the transport component of the overall waste management system. Secondly it is noted that under the current situation of the labour market across the country, manual labour for waste collection service is becoming increasingly difficult to find and sustain over long run. In view of the above, it is proposed that all primary collection in KBNIR will be carried out through motorised rickshaws. For clarity it is underlined that the typical manually drawn cycle rickshaws will not be used for this purpose at any time during the growth of the new city.

In the case of high rise apartments, an appropriate system will be evolved. One option could be to provide chutes on each floor whereby waste packed in a plastic bag can be transferred to a store at the ground floor or basement. Another option would involve individual households from different floors to bring the waste to a common point on the ground floor or the basement. Third option, though not efficient from the point of view of the service provider, would be to visit each flat and collect from the door step.

**Primary collection in Abadi**

The number of households in the KBNIR Village settlement varies from 73 to 2,335 (2012 estimates based on 2001 Census figures)– with an average of 436 and a median of 353 respectively. Because of diffused settlement pattern and small size of most of the habitations, in the initial years with the development confined to the Phase-I area, uniform service level in all the Abadi areas may be difficult. Nonetheless, at the time of implementation appropriate clubbing and routing shall be evolved so as to optimally utilise vehicle capacity and minimise transport costs.

**Fleet requirement**

Salient features of the system for door step collection service are listed below and the fleet size for the motorised auto tippers is worked out in **Table 6-32**.

**Table 6-32: Motorised Auto-Tipper Fleet for Primary Collection**

| Motorised Auto-Tipper Fleet for Primary Collection | | | | | | | |
|---|---|---|---|---|---|---|---|
| Parameter | 2012 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| Population | 93,529 | 226,033 | 284,512 | 401,555 | 598,342 | 969,237 | 1,546,009 |

| Motorised Auto-Tipper Fleet for Primary Collection | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **2012** | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| Household coverage | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Nr. of auto tippers required | 23 | 71 | 89 | 125 | 187 | 303 | 483 |
| Standby @ 10% | 2 | 7 | 9 | 6 | 9 | 15 | 24 |
| Size of auto tipper fleet | 25 | 78 | 98 | 131 | 196 | 318 | 507 |
| Incremental tippers required | 25 | 53 | 20 | 33 | 65 | 122 | 189 |
| | | | | | | | |

Notes:

1. Each motorised auto tipper is expected to serve an average of 800 household in one shift.
2. Incremental tipper requirements should be procured proportionately every year.

Small four wheel vehicles having good manoeuvrability, bucket volume of 2 cum and pay load capacity of around 1 MT will be deployed for this operation.

Each such vehicle will have a hydraulic tipping arrangement for ease in unloading of the waste to either another larger receiving vehicle (i.e., a refuse compactor) or at the T&D site.

The collected waste shall be disposed of at designated transfer stations. However in the initial phase and subsequently depending on distances involved, some of the auto tippers can directly dispose of at the T&D facility. For the initial three year requirements of the motorised tippers procurement can be made in one lot or it can be staggered depending on development of habitations. For the subsequent years capacity will be increased once every five years in line with population growth for maintaining specified service levels. The fleet would have 10% stand-by capacity.

It shall be noted that the last line in above table provides an estimate of incremental requirements of vehicles. In this respect it is underlined that in order to match the desired service levels, the incremental requirements should be met gradually in each year in equal instalments rather than at the end of the 5 year period.

**Community Waste Depots**

Community waste depots (CWD) will form an integral part of the overall system, which represent secondary storage for the waste not picked up through the door step collection service. In residential areas CWDs are supplementary while in commercial and institutional areas they are the main component. The system would comprise of the following:

- CWDs in residential areas will be located at a spacing of 500m on the side of the road.
- All CWD will have proper access for vehicles and adequate drainage arrangement.
- At each CWD a cement concrete platform will be provided for suitably positioning wheely bins and for the lifting compactor vehicle to approach without any difficulty.
- At each CWD at least two or more number of wheely bins of 1.1 cum capacity will be installed.
- In commercial and institutional areas spacing between the CWDs can be reduced to 250m and the number of wheely bins at each location can be increased which shall be determined according to the average volume of waste and generation pattern in the catchment.
- A maximum of 40% of waste in an area may be reaching CWDs on a given day.
- With increasing efficiency of primary collection and lifting of waste, location and number of wheely bins deployed shall be optimised.

The desired minimum number of CWDs and the wheely bins of 1.1 cum capacity (plastic body) to be deployed across the KBNIR are worked out in Table below. These estimates include waste from commercial and institutional sources. However, depending on the geographical spread of residential, commercial and institutional areas, more numbers may be required to offer service levels of 500 m and 250 m respectively and which would be decided by the local authority at that point of time. For instance, if all the 42 villages within KBNIR are to be served from the outset, then at least that many CWDs must be constructed and twice as many wheely bins must be installed. To that effect a correction factor is applied in the bottom two rows of **Table 6-33**.

**Table 6-33: CWD and Wheely Bin Requirements for Secondary Storage**

| CWD and Wheely Bin Requirements for Secondary Storage | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Unit** | **2012** | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| Population | nos. | 93,528 | 226,033 | 284,512 | 401,555 | 598,342 | 969,237 | 1,546,009 |
| Household Size | | 5 | 4 | 4 | 4 | 4 | 4 | 4 |
| Households | | 18706 | 56509 | 71128 | 100389 | 149586 | 242310 | 386503 |
| Average weight of waste per household | Kg/d | 1 | 1 | 1.2 | 1.4 | 1.6 | 1.8 | 2.08 |
| Waste reaching CWDs (@ 40%) | MT/d | 7.48 | 22.6 | 34.16 | 56.2 | 95.72 | 174.48 | 321.56 |
| Density of waste | MT/ cum | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Volume of waste reaching CWDs | cum | 18.7 | 56.5 | 85.4 | 140.5 | 239.3 | 436.2 | 803.9 |
| Storage volume required at CWDs | cum | 37.4 | 113 | 170.8 | 281 | 478.6 | 872.4 | 1607.8 |
| Volume of twin wheely bins at each CWD | cum | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 |
| Number of CWDs required across KBNIR | nos. | 17 | 52 | 78 | 128 | 218 | 397 | 731 |
| Number of incremental CWDs | nos. | 17 | 35 | 26 | 50 | 90 | 179 | 334 |
| Number of 1.1 cum wheely bins required | nos. | 34 | 104 | 156 | 256 | 436 | 794 | 1462 |
| Number of incremental wheely bins | nos. | 34 | 70 | 52 | 100 | 180 | 358 | 668 |
| | | | | | | | | |

Note:

1. Values in parenthesis correspond to the initial requirement for the Abadi area.
2. Incremental requirements to be met proportionately in each year. All the bins shall be serviced by a fleet of refuse compactors which will have a compatible rear loading attachment.
3. Population includes student population

**Collection from non-domestic sources**

Waste collection from commercial and institutional areas in a typical city involves several challenges because of irregular pattern of waste generation, delayed opening of establishments, dispersed locations, bulky packaging waste, limited scope for storage at source, etc. Further such areas may be characterised by congestion, limited space for installing wheely bins/ containers, etc. In this respect, the system for collection of waste from a wide range of non-domestic sources, including bulk generators would comprise the following:

- SIR Authority would designate suitable locations for construction of CWD platforms and install adequate number of wheely bins all commercial areas.
- At bulk generation nodes such as vegetable and fruit markets, etc. either more number of the same type of 1.1 cum bins or 3.5 cum capacity metallic bins shall be installed.
- Waste from hotels, restaurants, marriage halls, community halls, etc. will be lifted daily once or twice through door step collection service. At the same time all such establishments will be mandated to install private wheely bins in proportion to the average waste volumes.
- Likewise waste from other shops and establishments will be lifted to the extent possible through door step collection service.
- Door step collection service from commercial establishments will be provided by deploying separate fleet of motorised auto tippers. Frequency of lifting of commercial waste will be two or three times a day depending on the volume and generation pattern.
- For all the shops and establishments, SIR Authority will enforce storage of waste at source by introducing appropriate rules through local bylaws.
- All mobile vendors will be required to store waste on their cart/ vehicle, etc. and which can then be disposed at designated CWDs. Violators must be fined to discourage indiscriminate disposal.

While the CWD and wheely bin requirements for the commercial and institutional waste are already included in the estimates provided in Table above, the motorised auto tipper fleet requirement is worked out below in **Table 6-34**.

**Table 6-34: Auto Tipper Requirements for Primary Collection Of Waste From Commercial And Institutional Sources**

| Auto Tipper Requirements for Primary Collection Of Waste From Commercial And Institutional Sources | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Unit** | **2012** | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| Total generation | MT/d | 17 | 52 | 73 | 112 | 196 | 339 | 612 |
| Commercial waste @ 25% | MT/d | 4.25 | 13 | 18.25 | 28 | 49 | 84.75 | 153 |
| Density of waste | MT/ cum | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Volume of waste | cum/ d | 14.17 | 43.33 | 60.83 | 93.33 | 163.33 | 282.50 | 510.00 |
| Holding volume of one auto tipper | Cum | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Number of vehicle trips required | No./d | 8 | 22 | 31 | 47 | 82 | 142 | 255 |
| Trips per day per vehicle | No./ veh/d | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Number of auto tippers required | No. | 3 | 8 | 11 | 16 | 28 | 48 | 85 |
| Standby 10% | No. | 1 | 1 | 2 | 2 | 3 | 5 | 9 |
| Total fleet requirement | No. | 4 | 9 | 13 | 18 | 31 | 53 | 94 |
| Incremental tippers required | No. | 4 | 5 | 4 | 5 | 13 | 22 | 41 |
| | | | | | | | | |

Note:

- Commercial waste volume is assumed to be around 25% of the total generation.
- Over and above the door step collection from shops, establishments and offices, the bins at CWDs will also support collection, storage and lifting of commercial waste.
- Incremental requirements to be met proportionately in each year.

### 6.7.10 Street Sweeping and Drain Desilting

SIR Authority shall arrange to carry out street sweeping and drain cleaning operations through appropriate engagement with service providers (either its own regular workers or by outsourcing). The frequency of service will be according to the importance of the road which has been defined earlier. Most of the roads will be cleaned once a day while the NH and the link road can be cleaned at a lower frequency of one or twice a week. On the other hand, the storm water drain will be cleaned / desludged once a fortnight or once a month. Work load estimates for both the services/ operations are worked out in **Table 6-35**. As per this estimate in Phase-III about 390 km of road length and about 204 km of drain length will be required to be cleaned daily. Considering that in an average shift of 8 hours a typical municipal worker is able to clean 1-1.5 km road and drain together, the SIR Authority will be required to deploy about 436 sweepers (including 10% extras). On a pro rata basis, the numbers in Phase-I and –II will be 30% and 40% respectively.

**Table 6-35: Estimates of Road Sweeping And drain Cleaning Requirements**

| Estimates of Road Sweeping And drain Cleaning Requirements | | | | | | | |
|---|---|---|---|---|---|---|---|
| Category | Road | | Two way roads | Road sweeping | | Drain cleaning | |
| | Width M | Length km | Length km | Frequency | Daily coverage km | Frequency | Daily coverage km |
| Main road, Residential areas | 60 | 31.73 | 63.46 | Daily | 63.46 | Fortnightly | 5.29 |
| City road, Residential areas | 40 | 23.10 | 23.10 | Daily | 23.10 | Fortnightly | 3.85 |
| Main road, Commercial areas | 60 | 13.60 | 27.20 | Daily | 27.20 | Fortnightly | 2.27 |
| City road, Commercial areas | 40 | 9.90 | 9.90 | Daily | 9.90 | Fortnightly | 1.65 |
| Main road Knoweldge city | 60 | 41.33 | 82.66 | Daily | 82.66 | Fortnightly | 6.89 |
| City road Knowledge City | 40 | 1.75 | 1.75 | Daily | 1.75 | Fortnightly | 0.29 |
| Main road Hitech City | 60 | 37.33 | 74.66 | Daily | 74.66 | Fortnightly | 6.22 |
| City road Hitech City | 40 | 28.50 | 28.50 | Daily | 28.50 | Fortnightly | 4.75 |
| NH8 | 500 | 12.02 | 24.04 | Weekly | 4.01 | Once a month | 24.04 |
| Road Link | 100 | 18.20 | 36.40 | Twice a week | 12.13 | Once a month | 36.4 |

| Estimates of Road Sweeping And drain Cleaning Requirements | | | | | | | |
|---|---|---|---|---|---|---|---|
| Category | Road | | Two way roads | Road sweeping | | Drain cleaning | |
| | Width M | Length km | Length km | Frequency | Daily coverage km | Frequency | Daily coverage km |
| Internal roads* | 40 | 56.17 | 56.17 | Daily | 56.17 | Once a month | 112.34 |
| Open spaces (equivalent) | | 68.41 | 68.41 | Fortnightly | 5.70 | NA | |
| Total | | | | | 389.24 | | 203.99 |
| | | | | | | | |

Notes:

1. Main roads are considered with two way segregate carriage way with a divider.
2. Sweeping service to be available 6 days a week.
3. Open spaces are considered equivalent to 25% of the total road length in the city.
4. Open/ covered drain for storm water are assumed to be one both sides of the roads.

The waste thus collected will be carted through hand carts/ wheel-barrows to the nearest CWD and safely disposed of in the wheely bins. One wheel borrow will be provided to two sweepers and the estimates of number to be procured in different phase are provided in **Table 6-36**. Each wheel borrow will comprise multiple (4) small plastic containers and rubber gasket wheels for ease in waste handling and pushing the cart.

**Table 6-36: Phasing of Procurement of Street Sweeping Equipment and Implements**

| Phasing of Procurement of Street Sweeping Equipment and Implements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Ph-I | | | Ph-II | | Ph-III | | Total |
| | 2012 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | |
| Number of sweepers | 28 | 54 | 54 | 106 | 70 | 80 | 54 | 446 |
| Number of wheel borrows | 14 | 27 | 27 | 53 | 35 | 40 | 27 | 223 |
| Number of sets of implements and protective equipment | 28 | 54 | 54 | 106 | 70 | 80 | 54 | 446 |

Note: The above numbers are incremental.

Sweepers shall be provided implements such as long handle brooms, spade, hand carts, personal protective equipment, etc. as necessary. The collected waste will be lifted by refuse compactors and transported either to nearest transfer station or to the treatment and disposal facility, as the case may be.

In order to offer consistently higher service levels, a combination of measures for personnel management will be taken:

- First and foremost, all municipal workers must be motivated and inspired (through appropriate programmes and support) to give better service.
- A degree of discipline is required to be ensured.
- The Municipal workers need to be offered appropriate incentives in the form of uniform, personal protective equipment, annual rewards and recognition, etc.
- Monitoring and supervision by SI and Daroga is essential for higher performance.

- SIR Authority could consider community participation in monitoring of this service and seeking feedback on a regular basis.

### 6.7.11 Transfer Stations

In a development that is to take place in multiple phases and spread over a large area of 165 sq.km., from operational economy point of view, it is imperative to provide a set of transfer stations. Moreover, considering that hauling from Phase-I areas to the T&D site can involve a distance of over 20 km, provision of transfer station becomes critical from the point of view of operational efficiency. As mentioned earlier, for reasons of integration of infrastructure and operations and to minimise environmental footprint, it is proposed that to the extent possible transfer stations should be set up next to the proposed sewage treatment plants or sewage pumping stations. Further, it is also proposed that where the situation demands a material recovery and recycling centre should be established at each transfer station. Such an arrangement will help achieve compliance with the 3R principle.

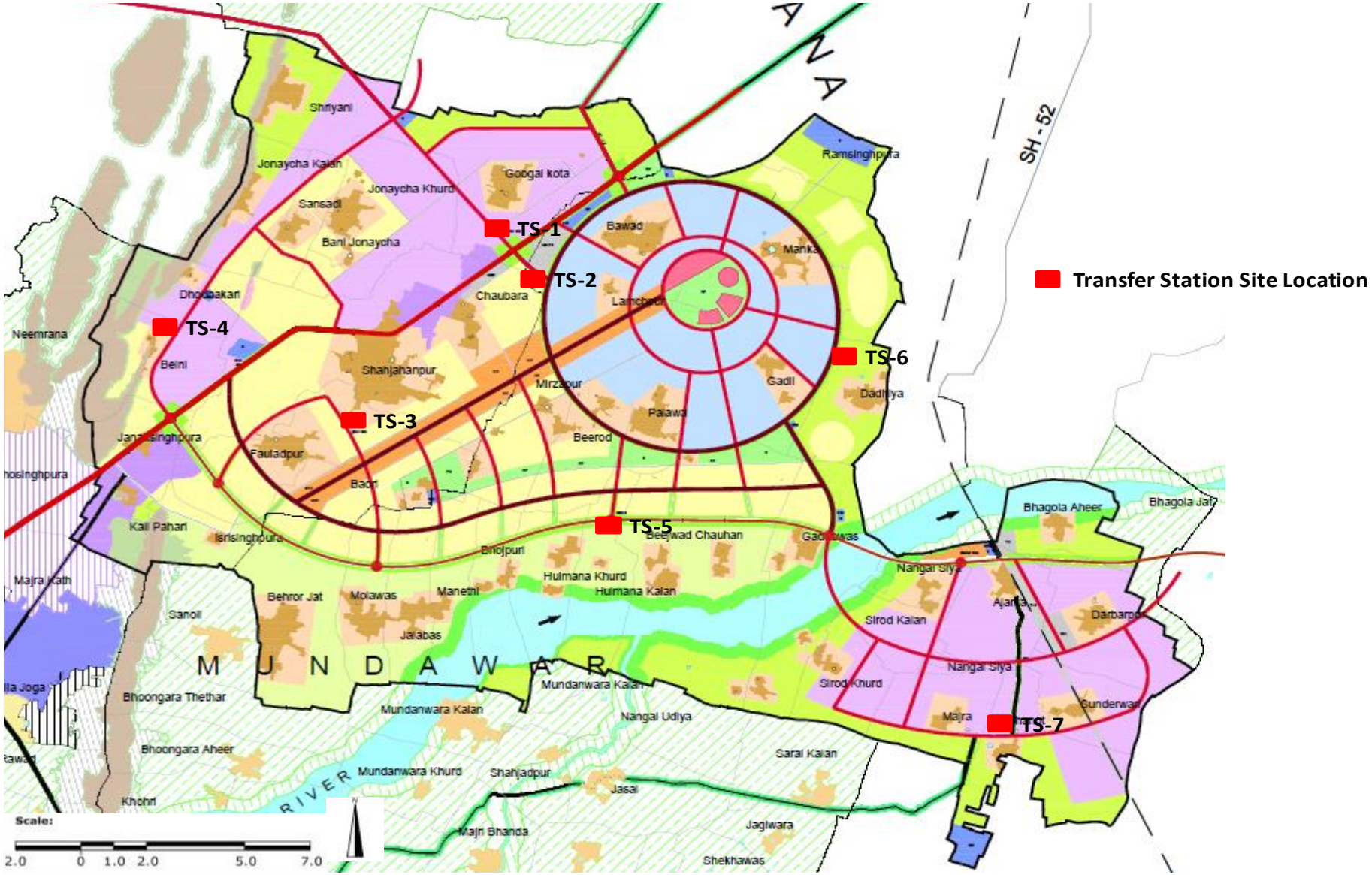
In the above context, it is proposed to set up a total of seven transfer stations across the entire KBNIR are proposed and their locations is as presented in **Figure 6-24.** Besides the above considerations, these locations have been identified keeping in view the possible T&D site being developed at Village Bhanot. Phase-wise development of these transfer stations shall be on the lines as described in **Table 6-37.**

While the expected waste loads at a transfer station will depend on the density of population and other activities in the respective catchment areas, in general each of them should be planned for handling an average of around 250 MT/d. All the transfer stations shall have a concrete platform for parking of the receiving refuse compactors and where smaller primary collection vehicles i.e., auto tippers could conveniently transfer the waste in least turnaround time. Given this arrangement, a ramp type transfer station is not proposed, thereby minimising capex and operational complexities. At the entrance of each such station a double deck weighing bridge shall be installed for monitoring incoming and outgoing waste loads and thereby helping in effective management and control of operations.

**Table 6-37: Waste Transfer Stations in KBNIR**

| Waste Transfer Stations in KBNIR | | | |
|---|---|---|---|
| **TS No** | **KBNIR Phase** | **Location of TS** | **Remarks** |
| TS1 | Ph-I | At the STP near/north of NH-8, in the norther part of Ph-I development. | To be developed and commissioned in Ph-I. |
| TS2 | Ph-I | At the STP on the outer periphery of the Knowledge City, south of NH-8, in the northern part of Ph-I development. | Same as above. |
| TS3 | Ph-I | At the STP on the southern edge of Ph-I. | Same as above. |
| TS4 | Ph-II | In the Hitech City industrial area, south of Ph-I development near Village Belni. | Depending on growth of habitation, could be developed in the later part of Ph-I. |
| TS5 | Ph-I | On the south of the proposed Express Way near Village Bhojpuri /Hulmana Khurd. | In order to service the villages on the south of the Express Way, this TS could be developed in Ph-I itself. |
| TS6 | Ph-III | At the STP in the eastern fringe of KBNIR near Village Dhadhia. | Depending on growth of habitation, could be developed in the later part of Ph-II. |
| TS7 | Ph-III | In the central part of the Hitech City Ph-III, near Village Majra. | To be developed and commissioned in Ph-III. |

**Figure 6-24: Locations Of The Proposed MSW Transfer Stations**



With the objective of minimising environmental footprint and community resistance, it is proposed that the waste transfer area at each station shall have an enclosure and where a slight negative pressure will be maintained.

A bio-filter is proposed to be installed for treatment of the exhaust air so as to avoid odour nuisance.

Each TS would also serve the purpose of keeping the fleet in proper shape and offer adequate safety for parking. To this effect the following features should be added:

- A vehicle washing facility
- A tyre wash trough
- A fuel dispensing pump
- Adequate parking area for the fleet operating in the catchment

Considering all the above requirements, an area of about 2.5 ha shall be allocated for construction of each transfer station at the designated locations.

### 6.7.12 Secondary Transport

Secondary transport involves movement of waste collected through the door step service and that lifted from the community waste depots around the city. The final destination could be either the nearest transfer station or the T&D facility, depending on the distances and loads involved. The key criterion for designing the system is the economy of time and operating cost of the fleet. Following aspects have been taken into considerations while working out the fleet requirements for servicing wheely bins at the CWDs and those for supporting operations at the transport stations respectively, while the separate set of calculations are presented in **Table 6-38** and **Table 6-39**.

Auto tippers to TS: All motorised auto tippers involved in primary door step collection service will unload waste at the nearest TS.
Wheely bins to the T&D site: All the wheely bins to be installed at the CWDs will be serviced by rear loading refuse compactors.

Part of the waste collected from CWDs may be brought to the TS while a majority of it would be taken directly to the T&D facility. This will be determined according to the distances involved.

All vehicles to be used for long distance transport to the T&D site will comprise same type of refuse compactors as proposed for lifting waste from CWDs and brush transport.

The overall transport capacity shall be kept at 125% of the expected total daily waste loads.

**Table 6-38: Estimates of Refuse Compactor Fleet for Lifting and Transporting Waste From CWDs**

| Estimates of Refuse Compactor Fleet for Lifting and Transporting Waste From CWDs | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Unit** | **2012** | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| Waste reaching CWDs | MT/d | 7.48 | 22.6 | 34.16 | 56.2 | 95.72 | 174.48 | 321.56 |
| Density of waste after compaction | MT/cum | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| Volume of waste | cum/d | 12.47 | 37.67 | 56.93 | 93.67 | 159.53 | 290.80 | 535.93 |
| Holding capacity of a refuse | Cum | 14 | 14 | 14 | 14 | 14 | 14 | 14 |

| Estimates of Refuse Compactor Fleet for Lifting and Transporting Waste From CWDs | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Unit** | **2012** | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| compactor | | | | | | | | |
| Number of trips required/d | No./d | 1 | 3 | 5 | 7 | 12 | 21 | 39 |
| Trips per day per vehicle | No./veh/d | 2 | 2 | 2 | 2 | 3 | 4 | 4 |
| Number of refuse compactors required | No. | 1 | 2 | 3 | 4 | 4 | 6 | 10 |
| Standby 25% | No. | 1 | 1 | 1 | 1 | 1 | 2 | 3 |
| Total fleet requirement | No. | 2 | 3 | 4 | 5 | 5 | 8 | 13 |
| Incremental requirements | No. | 2 | 1 | 1 | 1 | 0 | 3 | 5 |

Note:

1. MSW loads at CWDs are assumed to be 40% of the total generation.
2. In the later years the number of trips/RC/day is increased from 2 to 3 or 4 so as to optimise capex through improved efficiency and increased number of working hours/ shifts.
3. Refuse compactors correspond to 14 cum holding capacity having 16 MT of gross vehicle weight (GVW).
4. Incremental requirements as specified in the bottom row should be procured gradually to maintain the desired service levels.

**Table 6-39: Estimates of Refuse Compactor Fleet for Long Haul Transport of Waste from Transfer Stations**

| Estimates of Refuse Compactor Fleet for Long Haul Transport of Waste from Transfer Stations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Unit** | **2012** | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| Total generation | MT/d | 17 | 52 | 73 | 112 | 196 | 339 | 612 |
| Waste loads delivered by auto tippers at the TS | MT/d | 15.3 | 46.8 | 65.7 | 100.8 | 176.4 | 305.1 | 550.8 |
| Density of waste after compaction | MT/cum | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| Volume of waste | cum/d | 25.50 | 78.00 | 109.50 | 168.00 | 294.00 | 508.50 | 918.00 |
| Holding capacity of a refuse compactor | Cum | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Number of trips required | No./d | 2 | 6 | 8 | 12 | 21 | 37 | 66 |
| Trips per day per vehicle | No./veh/day | 2 | 2 | 3 | 3 | 3 | 4 | 4 |
| Number of refuse compactors required | No. | 1 | 3 | 3 | 4 | 7 | 10 | 17 |
| Standby 25% | No. | 1 | 1 | 1 | 1 | 2 | 3 | 5 |
| Total fleet requirement | No. | 2 | 4 | 4 | 5 | 9 | 13 | 22 |
| Incremental requirements | No. | 2 | 2 | 0 | 1 | 4 | 4 | 9 |

Note:
1. MSW loads reaching TS comprising from households, street sweepings, commercial areas and part of the CWDs.
2. In the later years the number of trips/RC/day is increased from 2 to 3 or 4 so as to optimise capex through improved efficiency and increased number of working hours/ shifts.
3. Refuse compactors correspond to 14 cum holding capacity having 16 MT of gross vehicle weight (GVW).
4. Incremental requirements as specified in the bottom row should be procured gradually to maintain the desired service levels.

### 6.7.13 Horticulture Waste

A significant area is proposed to be kept under parks, tree cover and nature conservation. Accordingly horticulture waste comprising grass cuttings, dry leaves, branches, twigs etc., will be available in large quantity. The quantity will depend on, among others, the type of vegetation cover, intensity of plantation, etc. and will vary from season to season. As result at this stage it is difficult to provide an estimate of waste loads.

However, as defined in the previous chapter, this category of waste will be collected and managed separately and will be used for production of mulch. To this effect, the municipal/ horticulture workers will be required to stock the waste separately in respective areas for onward transport to the treatment facility. This being bulky/ voluminous material, it will be best handled by separate fleet of refuse compactors which will be the most effective and economical way. This type of waste will therefore by-pass transfer stations (as described in subsequent section) and be taken directly to the dedicated treatment facility. Estimates of the fleet of refuse compactors to be deployed for this purpose are provided in **Table 6-40**.

**Table 6-40: Refuse Compactors for Transport of Brush**

| Refuse Compactors for Transport of Brush | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Unit** | **2012** | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| Total MSW generation | MT/d | 17 | 52 | 73 | 112 | 196 | 339 | 612 |
| Brush loads @ 10% | MT/d | 0 | 5.2 | 7.3 | 11.2 | 19.6 | 33.9 | 61.2 |
| Density of waste after compaction | MT/cum | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| Volume of waste | Cum/d | 0.00 | 8.67 | 12.17 | 18.67 | 32.67 | 56.50 | 102.00 |
| Holding volume of a refuse compactor | Cum | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Number of vehicle trips required | No./d | 0 | 1 | 1 | 2 | 3 | 5 | 8 |
| Trips per day per vehicle | No./veh/d | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Number of refuse compactors required | No. | 0 | 1 | 1 | 1 | 1 | 2 | 3 |
| Standby 5% | No. | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| Total fleet requirement | No. | 0 | 2 | 2 | 2 | 2 | 3 | 4 |
| Incremental tippers required. | No. | 0 | 2 | 0 | 0 | 0 | 1 | 1 |

Note:
a. Brush load is assumed to be about 10% of the total MSW.
b. In the early years from 2012 to 215 no or little brush waste is expected to be generated.

c. Refuse compactors correspond to 14 cum holding capacity having 16 MT of gross vehicle weight (GVW).
d. Incremental requirements as specified in the bottom row should be procured gradually to maintain the desired service levels.

### 6.7.14 Waste from Other Sources

Besides the households and commercial/ institutional areas certain quantity of waste will be generated from street sweeping and drain cleaning operations as well as that to be collected from the litter bins. These waste streams are proposed to be handled as follows:
Street sweeping and drain cleaning waste: This waste stream will be stored in the nearest CWD and will be lifted and transported by the refuse compactor fleet proposed to service the latter.

Litter bins: This waste stream is proposed to be collected by the motorised auto tippers which will be making round in the commercial and residential areas.

Bulk sources: Each bulk generator within KBNIR will be mandated to store its waste in wheely bins of 240/ 360/ 500 litre capacities which will be compatible with the lifting mechanism fitted in the refuse compactors. Such wheely bins shall be procured individually and will be kept at the premises.

### 6.7.15 Workshop

As part of the SWM management system, as worked out earlier in this chapter, the SIR Authority or the service provider, as the case may be, will be required to operate a fleet of different types of vehicles on a daily basis. In order to ensure a fairly high level of service – preferably 80% vehicles in working condition on a given day, it is most essential that all the vehicles are kept in good working condition. This will require good support from a well equipped workshop and group of committed mechanics. To ensure a good and reliable backup support, it is therefore proposed to construct and develop an in-house workshop. The central workshop will provide routine maintenance as well as all major and minor repairs works. The central workshop should be developed closer to the working area rather than at the distant T&D site. Besides the usual mechanical and electrical facilities for repairs, the workshop shall also have a vehicle and container washing facility, a spray painting shop and a fuel dispensing station.

### 6.7.16 Treatment & Disposal of MSW in KBNIR

Section deals with the end of the supply chain of MSW – wherein after efficient collection and transport, the mixed MSW with considerable risk to public health needs to be safely and economically disposed of.
In order to achieve economy in disposal, the step of treatment is taken as an integral part, where its main purpose is to minimise waste volumes before sending to the landfill. However, as brought out earlier, for a green-field town there is fair degree of uncertainty related to waste loads and an SLF (sanitary landfill) represents the bedrock of a robust and integrated T&D (treatment and disposal) facility, it needs to be dealt on priority. Therefore the subject of SLF is taken up first and that related to treatment of mixed MSW is taken up in the later part of the chapter.

#### 6.7.16.1 Safe Disposal in Sanitary Landfill

The SLF will represent the end of a long chain of operations in the KBNIR whereby upon reaching that stage the waste can be safely disposed of. The SLF will be developed as an integrated facility along with the treatment plant thereby achieving synergy in logistics and operations. In this context, this section provides broad calculations for phase wise area estimates, a brief analysis of alternative identified locations, infrastructure requirements, etc.

### 6.7.16.2 Area requirements

Typically sanitary landfills are developed in phases of 3-5 years. In the case of KBNIR, assuming operations to commence sometime in 2012/2013, the first phase is considered to be of three years while the subsequent phases from 2015 to 2040 are of 5 years each. Area requirements are calculated as per the approach suggested in the Manual on MSW Management and considering two waste load scenarios viz., average and maximum. Corresponding to a compaction density of 0.85 MT/cum and height of 15 m (including capping), the area requirements for various phases are summarised in **Table 6-41**, while the detailed calculations are provided in **Appendix 8**.

**Table 6-41: Area Requirements for SLF**

| Area Requirements for SLF | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Phase-wise landfill area requirements | | | | | | | | |
| | I | II | Total I & II | III | IV | V | VI | VII | Total III – VII |
| Year | 2012 | 2015 | | 2020 | 2025 | 2030 | 2035 | 2040 | |
| Load scenario | | | | | | | | | |
| Average loads | 0.40 | 1.42 | 1.82 | 1.11 | 1.23 | 2.14 | 3.26 | 5.89 | 13.63 |
| Maximum loads | 0.44 | 1.61 | 2.05 | 1.35 | 1.53 | 2.71 | 4.26 | 7.89 | 17.74 |

Notes: All values are in hectare.

Corresponding to average load scenario the total SLF area requirement is estimated to be around 15.45 Ha, while that for the maximum load scenario is around 19.8 Ha. These estimates are inclusive of areas for embankments and infrastructure @30% and for green belt @10-15% respectively.

### 6.7.16.3 Strategy for the initial phases

Initial phase of development is going to be small and therefore a fully fledged treatment plant would not be practicable. In this regard, ideally a sanitary landfill site should be developed in the early stage of the project and which should be independent of the schedule for development of the treatment plant. As per the MSW Rules, 2000 until the commissioning of the treatment plant, all the mixed MSW could be safely disposed of in the landfill.

To this end a stone quarry in Village Dhudhakari in the western half of the KBNIR should be utilised. The quarry is spread over an area of 6 ha and is presently only partially exploited (refer following section). To the extent possible the quarry should be exploited for extraction of building material which would be required in large quantities for the construction activity that is to ensue in the KBNIR. It is proposed that subsequently the exhausted or abandoned part of the quarry should be used for developing the sanitary landfill site for the first two phases of the SLF, viz., from 2012 to 2015 and from 2015 to 2020 respectively for which the aggregate area requirement for is about 2 Ha. Upon completion of filling until 2020, the site should be closed, capped and suitably landscaped. Subsequently it can be developed either as a public park or as a golf course.

### 6.7.16.4 Alternate Sites for the T&D Site

Apart from the above described stone quarry, following four sites have been analysed as possible location for construction of the integrated T&D (treatment and disposal) facility for the KBNIR:

- In Village Ajarka, near the railway station in the South East part of KBNIR.
- In Village Bhanot in the South East of KBNIR.
- In Village Shiryani on the other side of the hill in North West of KBNIR.
- In Village Googlekota in North West of KBNIR.

Location of identified sites for Treatment & Disposal Facility is given in **Figure 6-26**.

The land-use at all the four sites is presently characterised by agriculture, where the terrain is flat. The area available at Village Ajarka is limited while at the other three sites there is no such limitation. The proposed land use pattern for all the sites is either agriculture or natural conservation area. In some cases while the access roads may exist. In other cases new roads would have to be developed. The site in Village Bhanot is at a distant corner, while that in Village Shiryani is cordoned off by a hillock and which are considered as favourable factors in determining their suitability for a T&D facility.

For all the five sites a rigorous analysis on environmental, social and structural safety aspects, as per the criteria suggested in the Manual on MSW Management, MoUD, GoI has been carried out to assess their suitability. The analysis is presented in **Table 6-42** and the conclusions are summarised in the following paragraphs.

The site near the Ajarka Railway Station offers limited capacity and it would involve displacement of few households. Proposal for an SLF at this site may face resistance from community due to proximity to the habitation. It may also impair aesthetics for the proposed express way and rail passengers. On the other hand while the site in Village Googlekota has fairly large area, its proximity to industrial area and habitation make it less suitable.

The site in Village Bhanot and the stone quarry in Dhudhakari are found to be suitable on all respects. The site in Village Shiryani is also found to be suitable, however there could be some concern due to proximity to habitations on either side. In view of the above, the following approach is recommended:

For Phase-I of the KBNIR development (i.e., until 2021) the stone quarry in Village Dhudhakari (as mentioned earlier) should be developed as a sanitary landfill site (representing two phases of the SLF).

For Phase-II and –III of the KBNIR development master plan (i.e., from 2021 onward) when build up in waste loads is experienced, the site in Village Bhanot should be considered for setting up an integrated T&D facility.

In case the stone quarry is not found to be feasible due to administrative, technical or land-use planning considerations, then the entire operations should be set up on the site in Village Bhanot in Phase-I itself.

In case there are any issues with the site in Village Bhanot also, then the site in Village Shiryani should be considered for developing the integrated T&D facility.

**Figure 6-25: Mass study**



**Figure 6-26: Location Of Identified Sites for SLF**

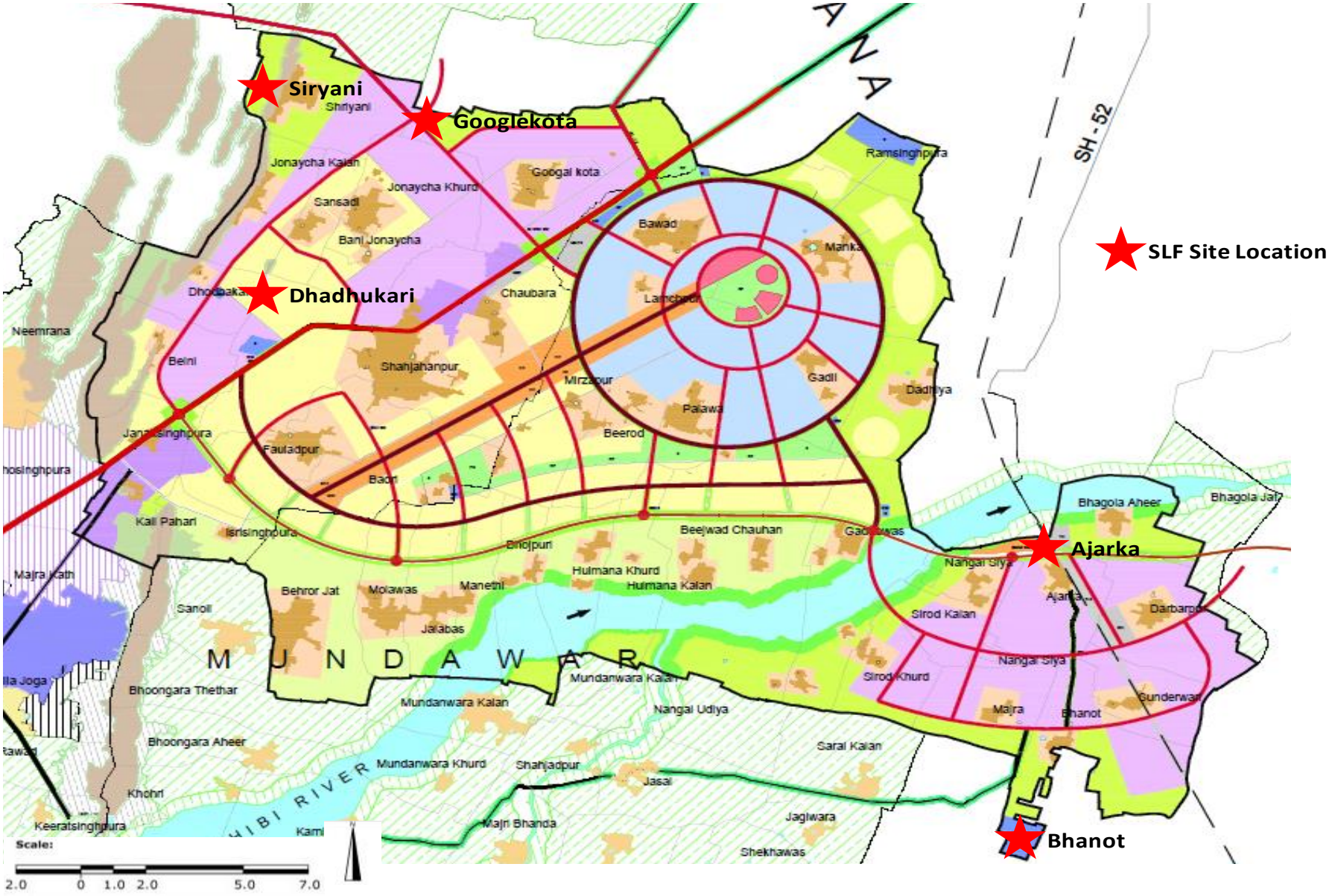


**Table 6-42: Selection Criteria and Actions Suggested for Development of SWM SITE(S) in BNIR**

| Selection Criteria and Actions Suggested for Development of SWM SITE(S) in BNIR | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Parameter** | **Criteria** | **Near Ajarka Railway station** | **Village Bhanot** | **Shiryani** | **Googlekota** | **Quarry in Dhudhakari** |
| 1. | Site Description | | Flat agriculture land on the side of a railway station, having 2-3 pucca houses. Gently sloping to the North towards Sahibi River. Road on two sides offer good access. Proposed land use category – agriculture. Limited area to the extent of only about 15 ha may be available. | Flat agriculture land in a distant corner on the South East side of KBNIR, on the side of road going to Village Amod. Proposed land use category – agriculture. Reasonable access road available. A fairly large area, to the extent of about 42 ha. may be available. | Flat agriculture land in the North West corner of KBNIR, cordoned off by a hillock on the East. Part of the proposed 'nature conservation' area. Fairly large area to the extent of about 30 ha may be available. | Flat agriculture land in the North West part of KBNIR. Close to proposed Industrial area. Proposed land use category - agriculture. Large area, to the extent of about 32 ha may be available. | Active stone quarry with good potential to supply building material. After exhaustion can be used for land filling. Falls within proposed 'residential' land use category. Would require restoration to improve aesthetics. Adequate area, to the extent of 6 ha may be available. |
| 2. | Lake or Pond | No landfill should be constructed within 200 m of any lake or pond. | There is no lake or pond on the site(s) or within a distance of 200m around it. | | | | |
| 3. | River | No landfill should be constructed within 100 m of navigable river or stream. For non- meandering rivers this can be reduced subject to a | There is no navigable river in KBNIR. Sahibi River on the North of the site is more than 700 m away. The river has dried out due to reduced runoff in its | No river within 100m of the site. | | | |

| Selection Criteria and Actions Suggested for Development of SWM SITE(S) in BNIR | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Parameter** | **Criteria** | **Near Ajarka Railway station** | **Village Bhanot** | **Shiryani** | **Googlekota** | **Quarry in Dhudhakari** |
| | | minimum of 30 m. | catchment and has not experienced any flood since 1977. Represents a monsoon stream. | | | | |
| 4. | Flood Plain | No landfill should be constructed within a 100 year flood plain of major rivers. In unavoidable settings, an embankment must be built along the stream. | The site does not fall within the flood plain of the Sahibi River. | No river in the vicinity of the site(s). | | | |
| 5. | Highway | For aesthetic reasons, no landfill should be constructed within 200m of right of way of a state or national highway. If trees and berms are used for screening, this can be reduced to 50m. | The State Highway 52 is about 500 m on the west. An expressway is being proposed on the southern edge and a railway line passes along the eastern edge of the site. Impairment of aesthetics would be a matter of concern. | There is no national or state highway passing within 200 m of the site. | There is no national or state highway passing within 200 m of the site. | Main roads (60/ 100 m wide) are proposed on three sides of the site leading to industrial areas in KBNIR as well as Gihlot. | The site is about 800 m to the west of the National Highway 8. Adequate buffer would be available to screen off the site. |
| 6. | Habitations | A landfill site should be at least 500m from a notified inhabited area. A | Village Ajarka (pop. 1779 in 2012) is on the southern edge and the railway station in on | There are/will be no habitations within 500m of the site in all directions. | Aerial distance to Village Shiryani is less than or close to 500m, but it is | Village Khandora on the north of the site is within 500 m. Industrial area is | Presently there is no habitation. In Phase-I of the KBNIR a residential area is |

| Selection Criteria and Actions Suggested for Development of SWM SITE(S) in BNIR | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Parameter** | **Criteria** | **Near Ajarka Railway station** | **Village Bhanot** | **Shiryani** | **Googlekota** | **Quarry in Dhudhakari** |
| | | zone of 500m around a landfill boundary should be declared a 'No-development Buffer Zone'. | the eastern edge. Two-three pucca houses are located on the site itself. | | blocked by a long hillock/ ridge, as the site is on the other side. Another habitation on the west of the site is about 600 m away. | proposed to be developed within 200m on two sides. Aesthetics and odour emissions could be of concern. | proposed to be developed around the site. However site is to be used only until 2020 and the available area offers adequate buffer. |
| 7. | Public Park | No landfill should be constructed within 300 m of a public park. This may be reduced, if screening with trees, berms and a high fence is provided around the landfill. | There is no public park existing or proposed in or around the site(s). | | | | |
| 8. | Critical Habitat Area | No landfill should be constructed within critical habitat area characterized by presence of one or more endangered species. | There is no such area in and around the site(s). | | | | |
| 9. | Wetland | No landfill should be constructed within wetlands. | There is no wetland in and around the site(s). | | | | |

| Selection Criteria and Actions Suggested for Development of SWM SITE(S) in BNIR | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Parameter** | **Criteria** | **Near Ajarka Railway station** | **Village Bhanot** | **Shiryani** | **Googlekota** | **Quarry in Dhudhakari** |
| 10. | Ground Water Table | A landfill should not be constructed in areas where water table is less than 2 m below ground surface. | Groundwater table in the region is found to be at a considerable depth and this would not be an area of concern. | | | | |
| 11. | Airports | No landfill should be constructed within the limit prescribed by regulatory/ Aviation Authorities. (generally 10 km). | There is no airport within 10 km of the site(s). | | | | |
| 12. | Water Supply Wells | No landfill should be constructed within 500m of any water supply well, especially for down gradient wells. | There are no community water supply wells within 500m of the site(s). | | | | |
| 13. | Coastal Regulation Zone | A landfill should not be sited in a coastal regulation zone. | Not Applicable | | | | |
| 14. | Unstable Zone | A landfill should not be located in potentially unstable zone such as landslide prone areas, fault zone etc. | The site(s) is located on a flat ground which is currently under agriculture. There is no unstable zone around the site. Geological aspects need to be assessed. | | | | The stone quarry is to be used after exhaustion. Geological and geotechnical aspects would need to be assessed. |

| Selection Criteria and Actions Suggested for Development of SWM SITE(S) in BNIR | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Parameter** | **Criteria** | **Near Ajarka Railway station** | **Village Bhanot** | **Shiryani** | **Googlekota** | **Quarry in Dhudhakari** |
| 15. | Buffer Zone | A landfill should have a buffer zone around it, up to a distance prescribed by the regulatory agencies. | Buffer zone may be limited. | Adequate buffer zone would be available. | Adequate buffer zone would be available. | Buffer zone may be limited. | Out of 6 ha, only 2 ha to be used for land filing until 2020. Therefore adequate buffer zone would be available. |
| 16. | Other installations[1] | All measures should be taken to prevent damages to public utilities and installations. | There are no utilities / high tension power lines passing through the site. Under the Master Plan a sewage treatment plant is proposed on the site. | There are no utilities / high tension power lines passing through the site. | There are no utilities / high tension power lines passing through the site. | There are no utilities / high tension power lines passing through the site. | There are no utilities passing through the site. A high tension power line passes on the eastern side, but at a distance and thus not of concern. |
| | Conclusions | | Inadequate area, would involve displacement of few households. May face resistance from community due to proximity and impair aesthetics for the highway and rail passengers. | Suitable in all respects and should be considered for development of an integrated T&D facility when waste loads build up in the second phase. | Second best option. Offers proximity for the first phase of development. | Proximity to industrial area and habitation make the site not suitable. | Suitable in the short- to medium-terms until 2020 to minimize capex in plant and equipment, utilize land optimally/ sustainably and develop a green belt/ public park/ golf course in the long-term. |

Notes:
High tension over head electric line, oil/gas pipe lines, telephone cables, water supply, underground sewer lines, etc.
Source: Manual on Solid Waste Management, Ministry of Urban Development, Government of India, 2000.

### 6.7.16.5 Technical considerations in SLF

The landfill at the stone quarry should be planned for first two phases of operation i.e., only until 2020. A green belt of about 25m around the site should be provided to cordon off and minimise impact on the local environment, if any. As part of the construction, the site should be provided an appropriate impermeable composite liner and a leachate collection system. The leachate should be sent to one of the sewage treatment plants planned under the project. Until such an STP is commissioned, the leachate should be recirculated into the landfill which is an effective and economical way for its treatment. During operations, the site should be provided with a 15 cm thick daily soil cover to prevent odour and breeding of vectors and thereby ensure environmental sanitation. Upon completion of the filling in 2020, the site should be capped, landscaped and converted into either a public park or a golf course. At this stage it must also be provided with adequate passive gas venting to safely release landfill gas.

For the subsequent phases of the SLF from 2021 onwards (phase-III to VII) the total area requirement is estimated to be around 18 ha. In addition, the area requirement for the treatment plant would be around 6 ha. Thus the integrated facility would require total area of about 24 ha. It should be constructed at the site in Village Bhanot and it should be commissioned by the year 2021. The landfill should be developed and operated on the same lines as described in the preceding paragraph. Considering that a number of sewage treatment plants are being planned for the KBNIR, it is proposed that the collected leachate from the site should be sent to the nearest available STP - in this case it will be near the Ajarka Railway Station.

Further, while the construction at this site will commence some time in 2019 or 2020, it is recommended that appropriate measures for development of a green belt around the site should be taken up well in advance.

### 6.7.16.6 Treatment of MSW

As brought out earlier and reproduced in **Table 6-43** the average MSW loads in KBNIR will vary from 17 MT/d in 2012 to around 75 MT/d in 2020. Setting up a full scale plant for small waste loads with fair degree of uncertainty (and where average life of equipment and machinery is not more than 8-10 years) would not be practicable. Therefore it is proposed that the treatment plant should be commissioned only in the year 2021 corresponding to Phase-II of the KBNIR development plan. The phasing of the plant shall be on the following lines:

- First phase of the plant to be commissioned by 2021 for 200 MT/d capacity.
- Second phase of the plant to be commissioned by 2031 for additional capacity of 200 MT/d
- Second phase of the plant to be commissioned by 2036 for additional capacity of 200 MT/d

**Table 6-43: Estimates of MSW Loads in KBNIR**

| Estimates of MSW Loads in KBNIR | | | | | |
|---|---|---|---|---|---|
| Year | Daily waste loads | | | Plant capacity | Remarks |
| | Lower estimate | Upper estimate | Average | | |
| | MT/d | MT/d | MT/d | MT/d | |
| 2012 | 14 | 19 | 17 | Nil | All MSW goes to the SLF. |
| 2015 | 47 | 57 | 52 | | |
| 2020 | 60 | 85 | 73 | | |
| 2025 | 84 | 140 | 112 | 200 | First phase of the plant to commission by 2021. |
| 2030 | 150 | 241 | 196 | | |
| 2035 | 242 | 436 | 339 | 200 | Second phase to commission by 2031. |
| 2040 | 417 | 807 | 612 | 200 | Third phase to commission by 2036. |

Thus, by the year 2040 when the average MSW is projected to rise to around 612 MT/d (within a range of 400-800 MT/d), KBNIR will have a matching aggregate installed treatment capacity.

#### 6.7.16.7 Appropriate treatment technology

In view of the uncertainties on waste loads and characteristics, it is proposed to adopt the least risky treatment option of composting where the performance of the process and the plant is not critically dependent on the input quantities. Secondly, composting also involves least capex and opex and would be more sustainable in the long run.

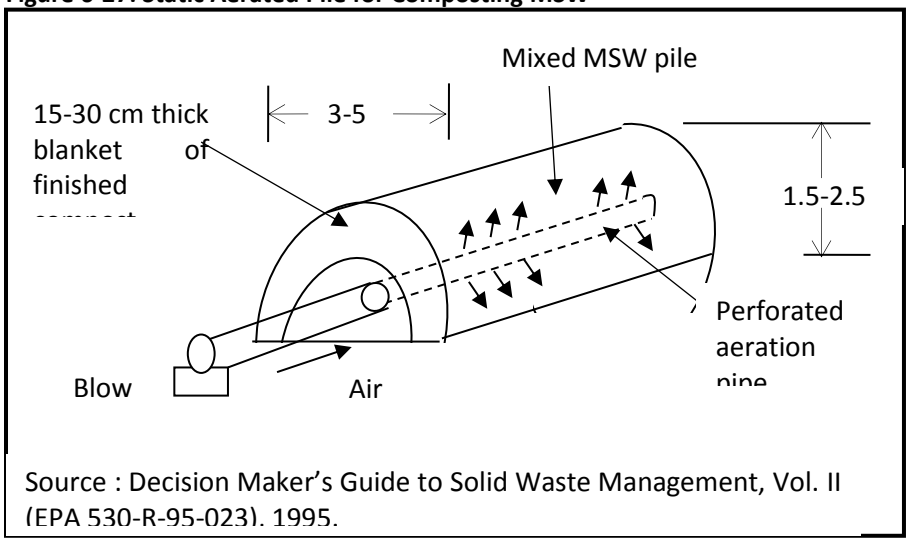
With regard to the process of biological stabilisation of the organic fraction of the waste, it is proposed to adopt an improved version of aerobic composting technology. Aerobic composting is the process of degradation of biodegradable waste matter into simple organic compound by a group of micro-organisms in the presence of air. The main requirements are adequate supplies of air and moisture and maintaining initial carbon to nitrogen ratio in a range of 20-40. Compared to anaerobic process, aerobic conversion process is preferable as it is fast, exothermic and free from odour when adequate amount of oxygen is supplied to the rotting waste. Exothermic feature of the process helps in eliminating pathogenic organisms, weed seeds, larva etc.

Conventionally compost plants in the country have been designed based on windrow technology. This involves staking of mixed waste in 2-3 m high, 3-5 m wide and several metre long piles which are called windrows. Waste receives oxygen through natural diffusion and when the pile is turned with the help of a front end loader – which is generally once or twice a week. However, this arrangement does not provide adequate amount of oxygen as the activity of turning of waste gets neglected due to opex considerations and as a result windrow technology based compost plants are typically characterised by acute problem of odour emission. Besides this, windrow composting is characterised by slow rate of the process, lack of control over the process and the consequent impact on the quality of final product i.e., limited pathogen die off, adverse environmental, social and health impacts on account of odour emission - at times leading to plant closure, high cost of turning of waste piles, etc.

**Static Aerated Pile – an improved composting technology option**

In order to address all of the above cited process and emission related concerns, it is proposed that for the KBNIR Static Aerated Pile (ASP) technology should be adopted which is an improved version of the windrow technology. In an ASP system, as shown in Exhibit 7.2, an aeration pipe is provided underneath the pile of waste to augment oxygen supply and thereby prevent formation of anaerobic conditions. Typically air is drawn through the pile with the help of a vacuum blower/compressor. The blower capacity is determined according to the established oxygen demand characteristics of the rotting waste. The air flow rates can be adjusted according to the stage of rotting and the temperature attained in the core of the waste. To this effect, ideally temperature and oxygen probes should be inserted in the piles which could then be coupled with a micro-processor to the blower. Furthermore, a blanket of 15-30cm thick layer of finished compost or wood chips is placed all over the windrow to provide insulation as well as to suppress odour. When the air is pushed through the pile, it also gets treated for odour causing substances (e.g., volatile organic carbon, mercaptans, etc.) while passing through the top covering of compost. Another option involves drawing the air through the pile which is then passed through a bio-filter (comprising moist heap of tree bark, wood chips and compost) for treatment of odour. **Figure 6-27** presents a schematic of the system and some of the important process parameters are summarized in **Table 6-44**.

**Figure 6-27: Static Aerated Pile for Composting MSW**




Source : Decision Maker's Guide to Solid Waste Management, Vol. II (EPA 530-R-95-023), 1995.

**Table 6-44: Key Process Parameters for Aerated Static Pile Composting**

| Key Process Parameters for Aerated Static Pile Composting | |
|---|---|
| **Parameter** | **Value** |
| Base of the pile | 2-4 m |
| Height of the pile | 1.5-2 m |
| Free pore space | 20-30% |
| Oxygen level in exhaust gas | 5-15% |
| Moisture content during the process | 50-60% |
| Final moisture content | 30-35% |
| Maximum temperature | 50-60°C for 5-7 days<br>To achieve pathogen die off |
| C/N ratio | Initial : 20-40 |
| | Final : 15-20 |
| Retention time | 21 days |
| Curing time | 4-6 weeks in small windrows |

Further, the aeration system is designed considering the variable oxygen requirements of different piles of waste which are at different stages of decomposition and by assessing the pressure drop across the system. While stoichiometric requirement is around 2.54 litre of air/gm of dry feed stock, it varies over wide limits depending on oxygen utilisation rate (typically 50%), initial moisture content and the need for drying of the waste piles. For initial moisture of 65% and 80% the total air demand for drying is 11.4 and 27.6 litre of air/gm of dry feedstock. On the whole, on a practical side average hourly air demand is considered to be approximately 15-20 times the volume of a windrow.

Various arrangements for augmenting the air flow through the rotting mass of waste offer following benefits:

- Full control over intensity and duration of aeration, enabling better control of process parameters, especially temperature of composting mass.
- Continuous oxygen supply eliminates formation of anaerobic conditions, odour emission and thereby potential social and environmental problems.
- Insulation and odour control by the top covering of compost layer/ or collection of foul air stream and its further treatment for odour control in the bio-filter
- Uniform sustained heating of waste leading to destruction of plant pathogens & weed seeds.
- Accelerated decaying, leading to higher throughput and lower platform area requirement.
- Reduced opex due to avoidance of mechanised turnings, and finally
- Higher acceptability by the communities in the vicinity.

ASP composting technology is a robust option under almost all situations, particularly where land is limited, a habitation is close by or climate is cold. At the outset, incorporation of a fixed aeration system may be perceived to be leading to higher capital and recurring cost, however this would be offset to a large extent as a result of reduced turning requirements and by

avoiding purchase of bacterial solutions for odour control which is typically the case in simple windrow composting.

However, this should always be kept in view that aerobic composting is a natural process and the final quality of the product (physical, chemical and biological) and the quantity (end product) would vary from time to time depending on various factors such as:

- Physical and chemical composition of the feedstock, i.e., raw mixed MSW.
- Seasonal variations.
- Yard management and monitoring efficiencies.

**Components of the compost plant**

A compost plant will comprise a series of components/ sections where pre-sorting plant, preparatory plant including compost platform and the refinement section will be housed. In addition it will require a large tipping area for inspection of raw MSW, a curing shed and a finishing godown. Other infrastructure and utilities will comprise compressor room including air supply lines, office cum quality control laboratory (including microbial culture unit), staff quarter, control room including a weigh bridge, a maintenance workshop cum garage, parking, internal roads, underground water tank (45 KL), overhead water tank (2 KL), a leachate collection tank (common with the SLF), tube well and water supply arrangement, water spraying arrangement, toilet block including septic tank and drainage line, etc. Further from the point of view of minimising rejects to the landfill, it is proposed to incorporate a post-processing 'air density separation' unit whereby combustibles could be extracted. A set of material/ earth moving machinery comprising adequate number of front end loaders, backhoe cum excavators, dumper/ tipper, tractor trolley and water / leachate tanker shall be required for smooth operation of the plant for each phase.

Starting from 2020 and over a period of 15 years the plant will be developed in three phases of 200 MT/d each. To this effect plant layout shall be developed in such a way that various components of the three phases can be integrated and the foot print can be minimised. Total area requirement for the three phases is estimated to be 6 ha. Adequate width of green belt/ plantation with appropriate species of local trees will be developed around the plant to minimise impact on the surroundings.
The compost output from the plant would be typically around 15%, while the rejects to the landfill could constitute about 30-40% of the incoming mixed MSW loads.

**Mulching the Horticulture Waste**

The KBNIR plan proposes significant area to be brought under green cover, a fairly large quantity of brush (horticulture waste) comprising dry leaves, branches, twigs and grass clippings is expected to be generated within the KBNIR. In this regard, as and when the brush loads become reasonably large, it is proposed to set up a mulching unit. On one hand, an independent mulching unit will help reduce waste loads to the SLF, and on the other, it will help achieve compliance with the 3R paradigm enunciated in the Concept Master Plan. The mulch – a very high quality stabilised biomass will be useful in further developing and sustaining the greenery within the KBNIR. Stabilised mulch can also be supplied to farmers (both conventional and hitech agriculture practitioners) as soil supplement which will help in improving yields.

Mulching of biomass involves shredding followed by stabilisation/ composting over an extended period of about 3 months. In case an integrated T&D facility is developed in the Phase-I of the project, then the unit should be set up at the proposed site in Village Bhanot. However, if the T&D facility is deferred to Phase-II, then the mulching unit should ideally be set up alongside the horticulture nursery envisaged under the Concept Master Plan. To this effect an area of about 3 ha should be kept aside at the nursery and all the brush shall be transported there by a separate fleet.

The mulching unit shall comprise two mulching machines/ wood chippers of 200-500 kg/hr capacity and a vibratory screen of 4 mm of 500 kg/hr

capacity. A shed and couple of rooms of appropriate sizes shall be provided to accommodate the machines and operating personnel, store, office etc.

### 6.7.17 Recycling Centres

With the objective of adopting the 3R paradigm, a set of recycling centres are proposed to be set up in various parts of the KBNIR. These centres are expected to create livelihood opportunities for the waste picker community and offer a formal and dignified place of working. The centres will stock potentially reusable and recyclable material such as paper, plastic, rubber, demolition waste, etc. They will also collect, stock and help in safely disposing of domestic and commercial hazardous waste. The generators among the households, shops and establishments, institutions, etc. must be informed and asked to deposit reusable, recyclable and hazardous waste at these centre. Where possible the centres should also be allowed to collect and store recyclable industrial waste. Among others, the centres can also be asked to stock and distribute composting bins to the willing households.

Considering the size of the city, its spread and the industrial/ commercial activities likely to ensue, it is understood that more than one such centres would be required. As stated earlier, the recycling centres shall be integrated with the proposed waste transfer stations / sewage treatment plants. These locations will integrate with the logistics operations. To this effect at each TS about 1 ha area should be earmarked separately.

Operation of the recycling centre should ideally be handed over to informal waste recyclers or to local self help groups which can bring a mix of semi-skilled and unskilled workers. The workers should be trained in sorting of different grades of plastics and packaging material, domestic hazardous waste e.g., batteries, discarded electronics, etc. For regular off-take of the sorted material, the operators should be facilitated in establishing linkages with potential end users of various types of materials among industrial recyclers/re-processors. Depending on the extent of resource recovery and potential for revenue generation, if any, SIR Authority may have to commit to compensate the operator suitably and adequately to meet the basic operating costs and to sustain interest.

### 6.7.18 Industrial Solid Waste Management

The KBNIR envisions promotion of industrial areas that would comprise both the non-manufacturing industries and manufacturing industries. Solid waste related issues for these two broad categories of industries would be required to be addressed appropriately so that the quality of the environment and the quality of life in the KBNIR is not compromised.

Solid waste from non-manufacturing industries would primarily comprise (a) food waste from canteen, restaurants, and cafeteria, (b) waste paper and packaging material, and (c) reject office equipment and accessories including electronics items, etc. The scope or potential of hazardous waste generation from this category of industries is minimal. Therefore solid waste from industries/ units falling in this category shall be managed by routing through the usual channels of informal/ formal recyclers and the door-step collection service.

However, in the case of the manufacturing industries it is possible that besides the usual type of solid waste described above there could be some hazardous waste. The latter may be generated from manufacturing operations, discarded chemicals and packaging containers as well as from effluent treatment plants, if any. In this respect, it is proposed to follow the guidelines of the state and central pollution control agencies wherein the generator is obligated to safely store the hazardous waste on site until it is taken away by an authorised agency for safe treatment and disposal. In the case of the KBNIR, the concerned agency authorised by the Rajasthan State Pollution Control Board shall be contracted on cost recovery basis to collect the hazardous waste from individual industries, transfer it to the regional ‘treatment storage and disposal facility’ (TSDF) and adopt appropriate methods for its safe treatment and disposal or

storage as the case may be. All the industries generating hazardous waste shall be required to adhere to the Hazardous Waste (Management and Handling) Rules, 1989. Moreover, a fair degree of responsibility related to enforcing and monitoring industrial development in compliance with the prescribed land use zoning norms/ guidelines will rest with the SIR Authority as well.

At this stage where the nature and extent of industrial operations are not well defined, it is not possible to arrive at any estimates of solid waste quantities. However, it is understood that the usual organic and non-hazardous office waste (corresponding to institutional and commercial enterprises) would get accounted through the per capita waste load norms that have been adopted in arriving at citywide waste loads.

### 6.7.19 Institutional Arrangements

It is presumed that SIR Authority, a special purpose vehicle being created by GoR for development KBNIR,, would be among others, safe management of solid waste that is expected to be generated in residential, commercial, institutional and industrial areas (other than the industrial hazardous waste) across the entire KBNIR.

Further, the project proponent is desirous of adopting 'public private partnership' (PPP) paradigm for creation of infrastructure and providing high level of services for, among others, the MSW management. In this respect, this chapter briefly discusses issues, concerns and possible institutional arrangements/ models for private service provider (PSP) engagement.

### 6.7.20 Infrastructure and Services to be Offered

The preceding sections on MSW have defined the entire chain of operations for which necessary infrastructure and services need to be offered to ensure environmental hygiene / sanitation and protect public health. To recapitulate, these comprise, but are not limited to, the following:

- Door step collection of solid waste from a diverse range of generators.
- Street sweeping and drain cleaning.
- Secondary storage of solid waste at CWDs.
- Lifting from CWDs and secondary transport of soli waste to the transfer stations.
- Establishment and operation of the transfer stations.
- Long haul of the collected waste to the T&D site(s).
- Establishment and operation of the treatment plant, including marketing of outputs.
- Establishment and operation of the sanitary landfill site(s).
- Capping / closure of filled phases of the SLF.
- Miscellaneous:
- Establishment and operation of recycling centre(s).
- Establishment and operation of a workshop.
- Anchoring a sustained campaign for community awareness, mobilisation and participation.
- Anchoring a campaign for promotion of home composting.
- Environmental monitoring around the T&D site during operations.
- Post closure environmental monitoring of the SLF for a period of 15 years.

As per the project costs estimates; presented in next chapter, it is evident that the integrated MSW operations would involve significant and recurring capital expenditure (Capex) and Operational expenditure (Opex) over the entire duration of the project.

The SIR Authority can either take the entire responsibility of creating the infrastructure and delivering services on its own or it can engage PSP(s) for full range of services or part thereof. However, given the unique situation of a green-field town, there are few challenges in taking the PPP paradigm and an appropriate model for sustainable and mutually beneficial

engagement needs to be identified with care. The following sections dwell on these issues.

### 6.7.21 Key Challenges

As discussed earlier, there is a certain degree of uncertainty in realising the projected waste loads. Secondly, in the initial stages bulk of the waste is expected to come in small quantities primarily from the 42 Abadis plus their extensions which are scattered over a large area across the entire KBNIR. Thirdly, while connectivity to the Abadi areas may be a constraint, nonetheless it is presumed that from the outset a uniform and fairly high service level is desired for all present and prospective residents within the limits of the KBNIR.

If a large integrated contract were to be prepared, uncertainties of waste loads would not enable KBNIR – the concessioning authority, to give guarantee on minimum quantities of waste to be handled on a typical day in different phases of development. Further, for a large contractor capable of offering integrated services, small waste loads would not enable to achieve the economy of scale, and therefore from the point of view of the SIR Authority the cost of the service would turn out to be rather high.

In the initial stages servicing the scattered Abadi areas would require comparatively higher manpower inputs as well as logistics for transporting the waste to the landfill site. Poor connectivity would lead to lower efficiency and higher O&M costs.

### 6.7.22 Type of Service Providers

Given the above challenges and the setting, and based on the experience of other towns/cities in the country, the possible type of service providers that could be of relevance comprise small self help groups (SHGs), small local contractors, large national/ regional contractors and the SIR Authority itself if the services are to be provided departmentally. Against each option, the possible service and the advantages and disadvantages are summarised in **Table 6-45.**

**Table 6-45: Potential Service Providers For Msw Management**

| Potential Service Providers For Msw Management | | |
|---|---|---|
| **Service Provider** | **Possible Services** | **Remarks** |
| A. Small self help groups. | Small scale and unskilled operations e.g.:<br>✓ Street sweeping and drain cleaning;<br>✓ Operation of recycling centres;<br>✓ Operation of mulching unit, etc. | + Low overhead costs.<br>+ Creates livelihood opportunities for number of micro-enterprises. |
| | | - Requires higher supervision and monitoring.<br>- Requires handholding, training and skill upgradations. |
| B. More than one small local contractors. | Specified smaller components e.g.:<br>✓ Street sweeping and drain cleaning;<br>✓ Motorised primary collection in designated areas;<br>✓ Lifting and secondary transport from CWDs;<br>✓ Long haul from TS to T&D site;<br>✓ Operation of treatment plant and mulching unit, etc. | + Lower risk of service disruption in entire town in case of differences/ conflict with a contractor. |
| | | - Comparatively higher overheads and higher monitoring and supervision requirements. |
| C. One large contractor. | Integrated operations covering the entire supply chain and the T&D end. | + Higher quality of operation planning and management support.<br>+ Economy of scale.<br>+ Leveraging strengths in all areas i.e., technical, |

| Potential Service Providers For Msw Management | | |
|---|---|---|
| **Service Provider** | **Possible Services** | **Remarks** |
| | | administrative/ managerial, publicity/ community mobilisation, financial, etc.<br>+ Lower requirements for monitoring and supervision. |
| | | - Comparatively higher overheads. |
| D. Internally by the SIR Authority. | Same as above. | + Ease in planning the scale of infrastructure and services in line with the development.<br>+ Optimal deployment of resources in the initial stages with uncertain waste loads. |
| | | - Higher requirements for capacity building, manpower, etc. at the outset.<br>- Concern on quality of planning.<br>- Concerns on coverage and quality of services.<br>- Concerns on efficiency of resource utilisation vis-à-vis levels and quality of service.<br>- Concerns on monitoring and supervision. |
| | | |

Each option presented in **Table 6-44** has certain advantages and disadvantages and evidently suitability of a particular option will depend on its relation to the scale of the challenge or the task. When the operations are small then they can be managed either departmentally or by engaging a group of SHGs and/or small local contractors. However, when the population and thereby the waste loads increase, then there would be a need for bringing a specialised agency capable of providing integrated operations. In terms of timeline, it is proposed that the option of involving such an agency should be considered around 2020 when the treatment plant and the new SLF at Village Bhanot would be realised. However even in that year also the average waste loads will be rather low therefore high overheads may not be justified. Until then a mix of SHGs and small local contractors should be adopted to provide the desired service levels.

### 6.7.23 Investment and Operation Models of Relevance

From the point of view of mobilising capex, minimising risks and optimising service levels a set of models for investment and O&M are examined. Broadly these can be classified under two categories, viz., capex model and opex model and the options under each category are as follows:

**CAPEX MODEL**

a) Build, own and operate arrangement (BOO)
b) Build, own, operate and transfer arrangement (BOOT)
c) Design, build and operate arrangement (DBO), and
d) Departmental procurement and operations

**OPEX MODEL**

a) Management contract
b) O&M contract

Capex model seeks private participation in both the asset creation as well as in their O&M while the Opex model seeks support only in their management and delivery of services. Evidently the capex model involves higher risks and engagement over a must longer time horizon – typically 10-30 years, as compared to the opex model where the risks are low and the engagement is typically for 2 – 7 years. Within the capex model, the BOO and BOOT arrangements are by and large same, except that at the end of the concession period the assets are transferred from the

concessionaire / private service provider (PSP) to the concessioning authority. Within the opex model, the only difference between the management and O&M contract arrangements is that under the former the responsibility of planning and design also rests with PSP while in the latter arrangement it rests with the concessioning authority. Diverse features of the possible contractual arrangements are summarised **Table 6-46**.

**Table 6-46: Options for Investment and Operations Model for MSW Management In KBNIR**

| Options for Investment and Operations Model for MSW Management In KBNIR | | | | | |
|---|---|---|---|---|---|
| Responsibility | Capex model | | | Opex model | |
| | BOO/BOOT contract | DBO contract | Department | O&M contract | Management contract |
| Design | PSP | PSP | KBNIR | KBNIR | PSP |
| Construction | PSP | PSP | KBNIR | KBNIR | KBNIR |
| Financing | PSP | KBNIR | KBNIR | KBNIR | KBNIR |
| O&M | PSP | PSP | KBNIR | PSP | PSP |
| Ownership | PSP | KBNIR | KBNIR | KBNIR | KBNIR |
| Time horizon | 15-35 yrs | 10-25 yrs | Indefinite | 2-7 yrs | 3-5 yrs |

### 6.7.24 Suitable options

Given the uncertainties involved in the proposed system as described earlier, from the point of view of both the KBNIR and the PSPs the BOO/BOOT arrangement would involve significant risks and hence not considered to be suitable. Further, considering the intent of leveraging strength of the private sector in planning and operation of the facilities, in the long run the option of 'Department' running the services may also not be acceptable.

In this context, under the current situation it is determined that depending on the individual components of the proposed system, the options of 'DBO', 'O&M' and 'management' contract arrangements are of relevance. Between the 'O&M' and the 'management' contracts, the latter is found to be more suitable as it leverages the strengths of the private sector and relieves KBNIR the need to develop from the outset the necessary planning and design expertise.

In terms of the specific components, the approach that could be considered shall be as follows:

**Collection and transport components**
In the initial years departmental procurement followed by 'management' or 'O&M' contract with small scale PSPs and SHGs as defined earlier in Exhibit 7.1.
In the intermediate years 'DBO' arrangement with smaller / medium size contractors.

**Treatment and disposal components**
Either the 'DBO' or the 'management' contract arrangement.
The SLF proposed at the stone quarry could be developed under a DBO contract.

Miscellaneous components (recycling centres, workshop, campaigns and environmental monitoring)
Management or O&M contract, as the case may be.

### 6.7.25 Organisational Arrangements

In order to plan, supervise and monitor the performance of PSPs, as the case may be, the SIR Authority will be required to create internal capacity. As discussed earlier, A separate cell/ department would need to be created to this effect. This cell should be anchored within the general engineering department and the overall responsibility should rest with the chief engineer. The public health department shall only be given the

responsibility of monitoring the quality of service and health indicators (for the general public) as well as municipal/ contract workers.

Considering the large capex and opex involved and the immediate impression of services on the public, it is imperative that an elaborate and reliable management information system should be developed and used to maximise efficiency of routine MSW operations.

#### 6.7.26 KBNIR Liability

It is imperative to highlight here the most important aspect of the entire MSW management system. Notwithstanding the contractual arrangements for service provision as delineated in the preceding section, in order to sustain the operations and ensure high quality of services, the SIR Authority will be required to bear almost complete cost towards capex and opex. Across the world it is recognised that MSW operations are inherently 'cost centres' and the 'revenues' if any, are incidental. Therefore the PSPs shall be adequately paid or compensated. The payments to the PSPs involved in C&T and T&D could be in the form of 'gate fee' or 'tipping fee' which shall be linked to perforce / waste loads handled. For the miscellaneous components, the payments shall be appropriately linked to inputs e.g., person hours or other resources, as they came may be.

#### 6.7.27 User Charges

Recognising the 'polluter pays' principle and the need to reduce liability towards operational sustainability, it is imperative that the users of the services i.e., residents of the town shall be required to pay certain fee. Recovery of user charges will be most critical in ensuring sustained delivery of high service levels.

In this respect it is also proposed that the user charges shall be levied directly by the SIR Authority as part of other services e.g., property tax, water, sewerage, electricity, etc. The PSP(s) engaged for MSW operations shall not be required to recover user charges directly. The latter option involves several risks and higher costs and is therefore not recommended.

## 6.8 Power

### 6.8.1 Introduction

The power system of Rajasthan is restructured into a generating company, a transmission company and three distribution companies. The proposed Khushkhera-Bhiwadi-Neemrana Investment Region falls under the JVVNL jurisdiction which is one of the three distribution companies in Rajasthan.

The existing installed generation capacity of Rajasthan, including the share from central generating sources, as on March 2012 is about 10,308 MW. This composes of about 56% capacity from state owned generation, 22% capacity from central generating stations, 14% from shared generating resource and 9% from private generating stations including UMPPs. The significant capacity based on wind generation (about 95% of total renewable capacity) was installed in the state.

The demand supply gap in terms of system peak demand reduced significantly in the last five year period whereas energy deficit prevailed over the period. The demand supply gap in terms of system energy is about 1048 MU, i.e.2.3% of system energy requirement which is marginal and whereas the peak demand deficit is nil for FY 2010. The state has procured short term power through various sources to meet the power demand of the state. The energy deficit would be more if state would have not procured short-term power, i.e. about 18% of total energy requirement.

### 6.8.2 Power Demand

The state power demand is assessed based on CEA's 17th Electricity Power Survey (EPS) growth rates until FY 2022 and projected beyond this period. Also the Energy Department of the State Rajasthan has been consulted when the assumptions were made for the power demand estimates. The power demand in terms of system peak demand requirement and energy requirement is presented in table 1. The demand forecast of energy in MVA in the KBNIR will be close to 6,000 MW by 2040 whereas the overall system capacity in the third phase is considered about 5,000 MVA, which includes solar- and wind power. The total capacity additions planned in the remaining 11th Plan period is about 6,641 MW from various sources and out of which state would get a share of 2,381 MW. The share from the private sector is about 40% (945 MW) of total capacity.

The state generation contributes about 26% (625MW) of total capacity available to state. The available capacities share from the central generating stations, UMPPs and plants would be available under best effort basis respectively are 408MW, 226 MW and 177MW. The total capacity additions planned in the state for 12th Plan period is about 14,000 MW. The capacity available from state projects would be 7340MW (53%). The capacity available from the Case-1 and Case-2 bids would be 3,390MW (24%) and the remaining capacity would be from UMPPs and central sector generating stations. Apart from the above capacity, about 700 MW and 2,700MW of capacity additions are expected from Non-conventional Energy Sources in the remaining 11th plan period and 12th Plan capacity respectively. The demand supply position by the end of 12th plan and by end of horizon period FY 2040 is estimated as given in **Table 6-47**.

**Table 6-47: Peak demand requirement and energy requirement**

| Peak demand requirement and energy requirement | | | | | | |
|---|---|---|---|---|---|---|
| **Details** | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| Growth in peak demand (%) | 6.5 | 5.9 | 5.6 | 5.3 | 5.0 | 4.7 |
| Growth in energy requirement (%) | 6.9 | 6.5 | 6.2 | 5.9 | 5.6 | 5.3 |
| Peak demand(MW) | 9,380 | 12,496 | 16,407 | 21,238 | 27,101 | 34,091 |
| Energy requirement(GWh) | 61,341 | 84,160 | 113,756 | 151,600 | 199,188 | 258,018 |

**Table 6-48: Demand Supply**

| Demand Supply | | |
|---|---|---|
| | **By End of FY 2017** | **By End of FY 2040** |
| State Peak Demand (MW) | 10,599 | 34,091 |
| Installed Capacity requirement (MW) | 12,670 | 40,909 |
| Capacity Additions Reuired (MW) | 4,444 | 33,818 |
| Capacity Addition Planned (MW) | 19,711 | 19,711 |
| Demand-Supply Gap (Deficit(+)/ Surplus(-)) | -15,267 | 14,107 |
| | | |

**Table 6-49: Power transmission infrastructure**

| Power transmission infrastructure | | | |
|---|---|---|---|
| **S. No.** | **Description** | **Unit** | **Value** |
| 1 | 400 kV Transmission lines | | |
| | Number of 400 kV sub-station | Number | 9 |

| Power transmission infrastructure | | | |
|---|---|---|---|
| S. No. | Description | Unit | Value |
| | 400 kV sub-station Aggregate Capacity | MVA | 4895 |
| | 400 kV lines | ckt-km | 2905 |
| 2 | 220 kV Transmission System | | |
| | Number of 220 kV sub-stations | Number | 80 |
| | 220 kV Sub-station Aggregate Capacity | MVA | 15255 |
| | 220 kV lines | ckt-km | 11143 |
| 3 | 132 kV Transmission System | | |
| | Number of 132 kV sub-stations | Number | 331 |
| | 132 kV Sub-stations | MVA | 18193 |
| | 132 kV lines | ckt-km | 14315 |
| | | | |

Source: RVPN

Power demand for the investment region is forecasted based on the projections of category wise demand. The categories considered and the approach for projection of demand for each category is explained below:

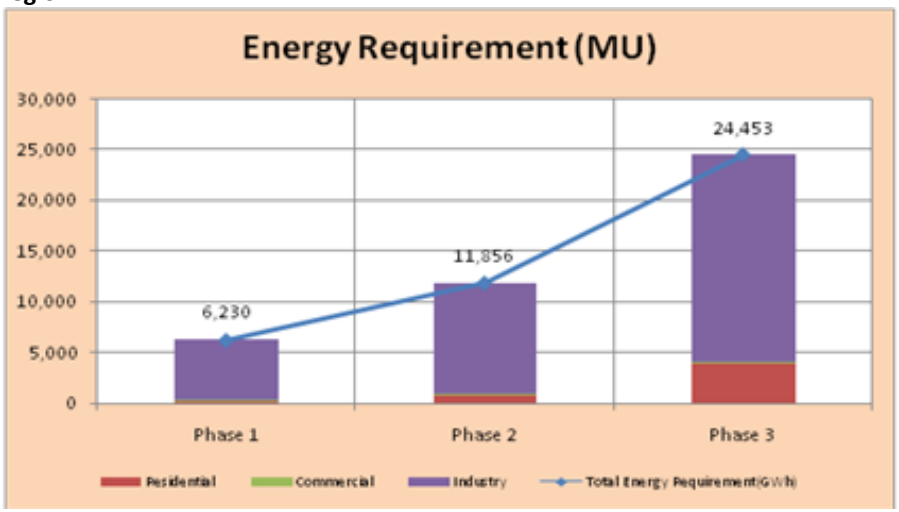
- **Domestic**: Demand for power from domestic category is calculated based on the population, and projections of per-capita domestic power consumption and category load factor. The per-capita for phase 1 with a growth rate of 10%. Load factor is taken as 35% for domestic sector.
- **Commercial**: Land allocation for commercial purposes, built area and gross power input (GPI) are used to estimate power consumption by commercial consumers. A consumption of 200 kWh/sq. m/. Annum is assumed for commercial consumers.
- **Industrial**: Power consumption by industrial consumers is estimated based on the land allocation and assumed power demand per hectare for each class of industry. For example, average power use for median industries 0.2 MW per hectare was taken and 0.3 MW per hectare for heavy industries.

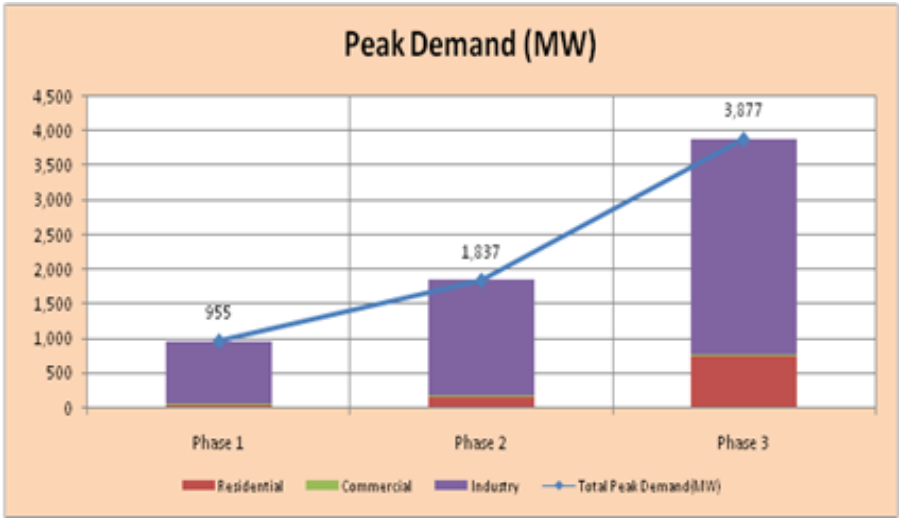
The phase wise projections of peak demand (MW) and energy requirement (MU) for the investment region are shown in the **Table 6-50 & Figure 6-28**.

**Table 6-50: Peak demand (MW) and energy requirement (MU) for the investment region**

| Peak demand (MW) and energy requirement (MU) for the investment region | | | |
|---|---|---|---|
| Phase | Phase 1 | Phase 2 | Phase 3 |
| Total Peak Demand(MW) | 955 | 1,837 | 3,877 |
| Residential | 47 | 152 | 739 |
| Commercial | 9 | 22 | 22 |
| Industry | 900 | 1,663 | 3,116 |
| Total Energy Requirement(GWh) | 6,230 | 11,856 | 24,453 |
| Residential | 246 | 799 | 3,885 |
| Commercial | 32 | 77 | 77 |
| Industry | 5,952 | 10,981 | 20,492 |

**Figure 6-28: Peak demand (MW) & energy requirement (MU) for the investment region**




### 6.8.3 Power transmission and distribution

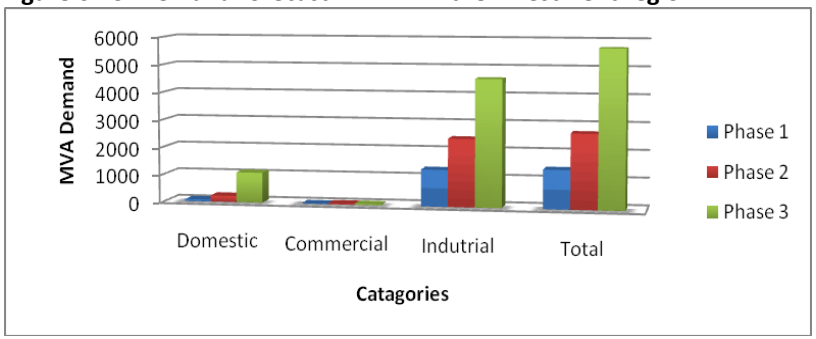
The details of existing power transmission infrastructure in Rajasthan as on March 31, 2011 are shown in the table 5-42. The power distribution network in Rajasthan is operated and maintained by three power distribution companies namely Jaipur Vidyut Vitran Nigam Limited (JVVNL), Ajmer Vidyut Vitran Nigam Limited (AVVNL) and Jodhpur Vidyut Vitran Nigam Limited (JdVVNL).

The State Transmission Utility (STU) RVPN owns, builds, maintains, operates the high voltage transmission system and provides the pathway for power within whole of Rajasthan. The existing transmission system of RVPN composes of about 50% of 132kV network, about 40% 220kV network. Over the next five year period substantial transmission system capacity additions are proposed at all voltage levels. The existing and proposed transmission network of Alwar district is composed of 18 132/33kV substations with a total transformation capacity of 875.5MVA and about 6 220/132kV substations with a total transformation capacity of 1500MVA. Apart from the above POWERGRID has a 400/220kV substation located in Bhiwadi with a total capacity of 630MVA and a 400/220kV substation at Neemrana both in Alwar district. So in the intial 2 to 3 years, the investment region can be supplied electricity from the existing capacity of the RVPNL and Power Grid and voltage can be converted from 400/132 KV and 220/132 KV to supply the region.

### 6.8.4 Design and Planning of Power Transmission Network for KBNIR

The electrical power transmission & distribution network for the investment region has to be flexible enough to accommodate any changes in the future according to the load centre development and requirement of the power, dependent on the actual development in the region. A primary plan is proposed for the electrical power network based on the demand forecast of the region. The MVA demand is shown in **Figure 6-30.**

**Figure 6-29: Demand forecast in MVA in the investment region**




Variation of temperature in the state of Rajasthan is high with peak temperatures touching 48 - 50 degree C, with a low rain and low humidity. The soil is mostly rocky, sandy and environment is dusty. These specific geographical features of Rajasthan should be considered along with other data while designing the network for the region. Selection of equipment also should be made on the basis of the environmental conditions of the area. Taking technical assistance from the RVPNL will be very helpful during the designing phase.

Power System of the investment region should take care of

a. Availability of reliable and good quality power
b. Redundancy in the system is required due to many critical loads in the investment region.
c. Losses, technical & commercial should be kept minimal.

As the actual demand will turn up with time in the investment region, the development of the power system should also come in a modular form to avoid any over investment in the system

### 6.8.4.1 System Capacity

The load of the investment region is forecasted on the basis of different demographic forecasts in the different phases; in MVA at different voltage level is given in **Table 6-51.**

**Table 6-51: Transmission capacity required in different phases in MVA**

| Transmission capacity required in different phases in MVA | | | |
|---|---|---|---|
| MVA Capacity required at different levels | | | |
| **Type** | **Phase I** | **Phase II** | **Phase III** |
| 400 KV | 1216 | 2338 | 4934 |
| 132 KV | 1117 | 2160 | 4639 |
| 33 KV | 608 | 1214 | 2943 |
| 11 KV | 252 | 542 | 1536 |
| | | | |

This system demand will be catered by modular development of the power network developing substations as required. The losses are assumed to be 9% in all the phases which are purely of technical nature as the region is considered to be free from the any type of commercial losses . Transmission losses as directed to RVPNL by RERC plus some cushion value. The overall system capacity required in the third phase is considered about 5000 MVA, which needs a vast power system for catering.

### 6.8.4.2 Main Receiving Station & Primary Substations

It is proposed that the receiving voltage from the grid will be 400 kV which is most used extra high voltage transmission level in Rajasthan. Power shall be sourced from two different 400 kV grid substation located near the investment region by laying two 400 kV D/C lines. (Expected sources are from the POWERGRID station at Nimrana and RVPNs 400 kV Substation at Kushkhera).

- Initially the consultant has recommended direct stepping down of the voltage from 400 kV to 132 kV given the proximity of the 400 kV grid substation to the GIT and the high density of load in GIT.
- Rajasthan Vidyut Prasaran Nigam Limited (RVPNL) is the designated State Transmission Utility (STU) for the state of Rajasthan. RVPNL has suggested that the voltage transformation should be from 400 kV to 220 kV and then to 132 kV. This is to confirm to the existing planning standards of RVPNL.
- Further RVPNL has informed that the transmission network of the CTU and STU (existing and proposed) would have spare capacity to cater to the most of the demand of the Phase-1 of the GIT. Hence, there is a limited requirement for additional transmission capacity in the Phase-1 of the GIT. RVPNL has suggested the following lines to connect GIT to the grid:

RVPNL GSS which can feed KNBIR in first phase

| S. No. | Name of GSS | Current Capacity | Spare Capacity Available(MW) | Proposed Lines to KNBIR |
|---|---|---|---|---|
| 1 | 400/220 kV Neemrana GSS | 1x500 MVA + 1x315 MVA | 340 | 220 kV DC |
| 2 | 220/132 kV Khuskhera GSS | 200 MVA (220 MVA/132 kV) 75 MVA (132/33 kV) | 170/100 | 220 kV D/C 132 kV D/C |
| 3 | 220/132 kV Neemrana GSS | 300 MVA (220/132 kV) 125 MVA | 170/100 | 220 kV D/C 132 kV D/C |
| | | (132/33 kV) | | |
| 4 | 132/33 kV Shahjahanpur GSS | 62.5 MVA | 100 | 132 KV D/C |
| 5 | 132/33 kV Mandan | 37.5 MVA | 100 | 132 KV D/C |
| | **Total** | | **880/740** | |

***Source: RVPNL***

- Thus as suggested by RVPNL in the Phase I power will be supplied from 400 kV, 220 kV and 132 kV substations and region can have 400/220 kV substations to be converted to 400/132 kV substations in later phases.

In the Phase II and Phase III, power will be feed from the grid at 400 kV level, which may be stepped down to 132 kV level of directly. Given the high density of load in the investment region, every 400 kV substation will be directly feeding the 132 KV substations thus saving one level of transmission infrastructure. Further step down of the voltage would be done to cater to the demand at 33 kV, 11 kV and LT. The HT industrial and commercial consumers will directly be fed at 33 kV or 11 kV voltage level.
Keeping the high load density of region, power lines of 132 kV and below shall be kept underground with accessible points for maintenance. This is to prevent continuously open sidewalks during maintenance periods, to prevent illegal electricity tapping from poles, to prevent fire hazards, to confirm to aesthetical consideration etc.

The required numbers of different substations for different transmission levels, calculated as per central electricity authority (CEA) norms are given in table **6-52**.

**Table 6-52: Number of substations required at different levels**

| Number of substations required at different levels | | | |
|---|---|---|---|
| No of substations required at 400 KV/132 KV | | | |
| | Phase I | Phase II | Phase III |
| 400/220/132 KV | 0 | 4 | 8 |
| 132/33 KV | 10 | 20 | 46 |

Sub-station automation is proposed for operating the substations and can be supervised remotely and thus requires minimal man power for supervisory activities. High level system design of one unit is given in **Figure 6-30**.

***Area required for setting up the substations***

Area required for setting up the substations is estimated based on the RVPN guidelines and the phase wise requirement is given in the table.

**Table 6-53: Area Required for substations**

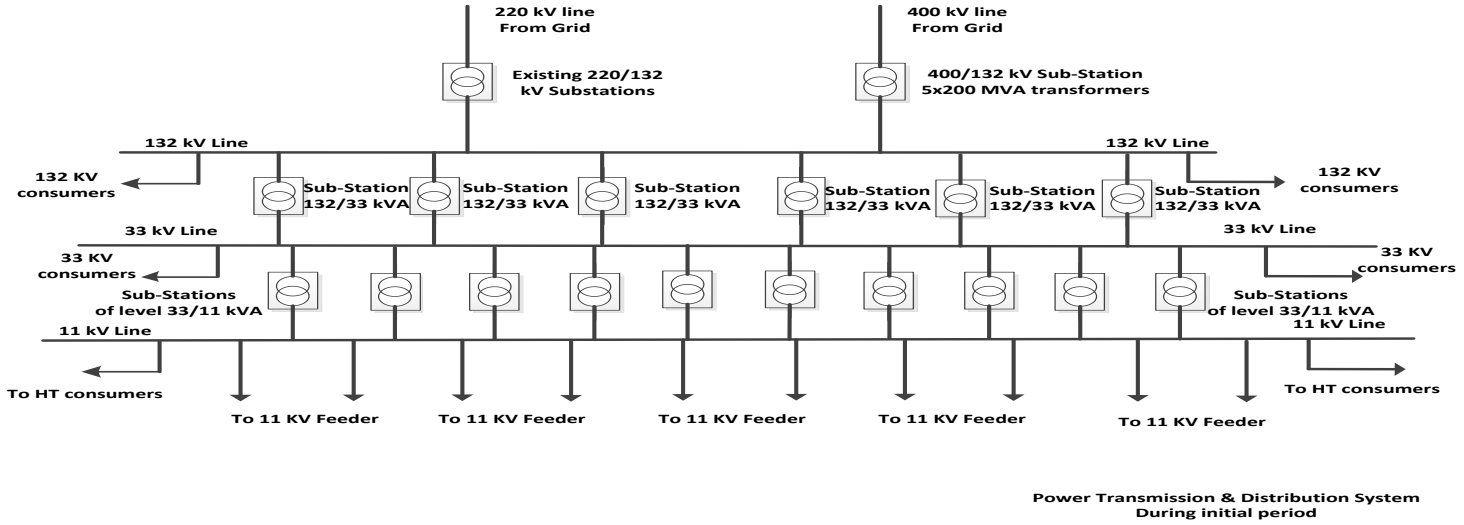
| Area Required for substations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Type | Area Required (Ha) per SS | SS Phase I | Area Phase I | SS Phase II | Area Phase II | SS Phase III | Area Phase II | Total Area |
| 400 kV SS | 20 | 2 | 40 | 2 | 40 | 4 | 80 | 160 |
| 220 kV SS | | | | | | | | |
| 132 kV SS | 3.5 | 10 | 35 | 10 | 35 | 26 | 91 | 161 |
| **Total Area** | | | **75** | | **75** | | **171** | **321** |

### 6.8.5 Power Sources

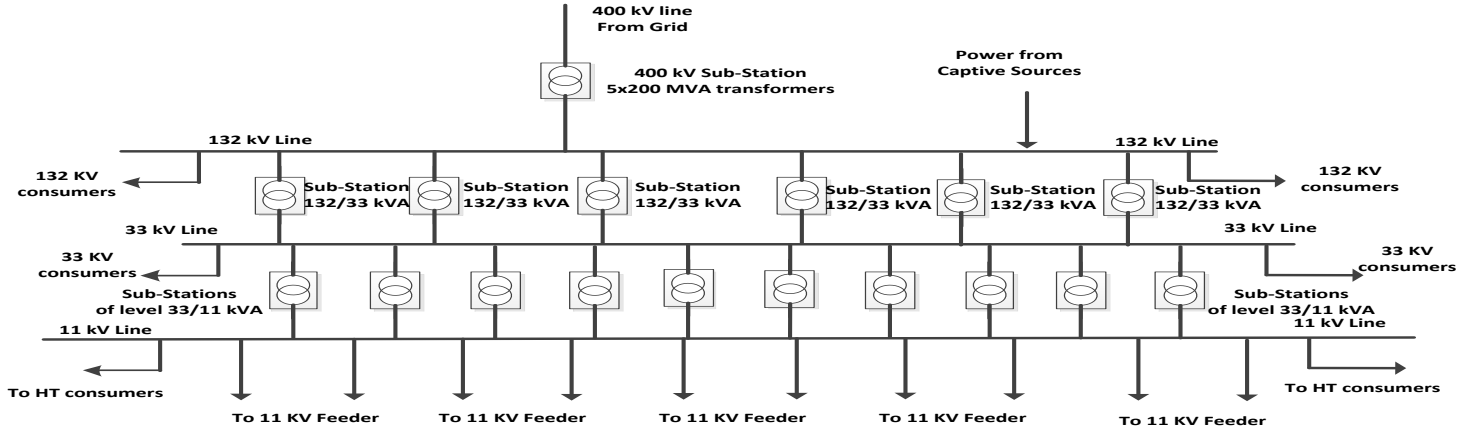
There are various power supply options available to meet the power requirement for the Investment Region. The possible options are as follows:

1. **Power Procurement from Rajasthan Power utilities**: The Investment Region can make use of the least cost resources within the state to meet its requirements;
2. **Long-term Power Procurement through Case-1 bidding**: The power demand of Investment Region can be met through procurement of power through Case-1 bidding process;
3. **Group Captive:** The Investment Region can setup its own generation to meet its power requirements;
4. **Power Procurement from Central Generating Stations:** NTPC has various plans for setting up of its plants across India. Therefore, the power can be procured from NTPC with negotiated tariff through long-term agreement.

**Figure 6-30: Highlevel design of one unit of Transmission and Distribution Network**

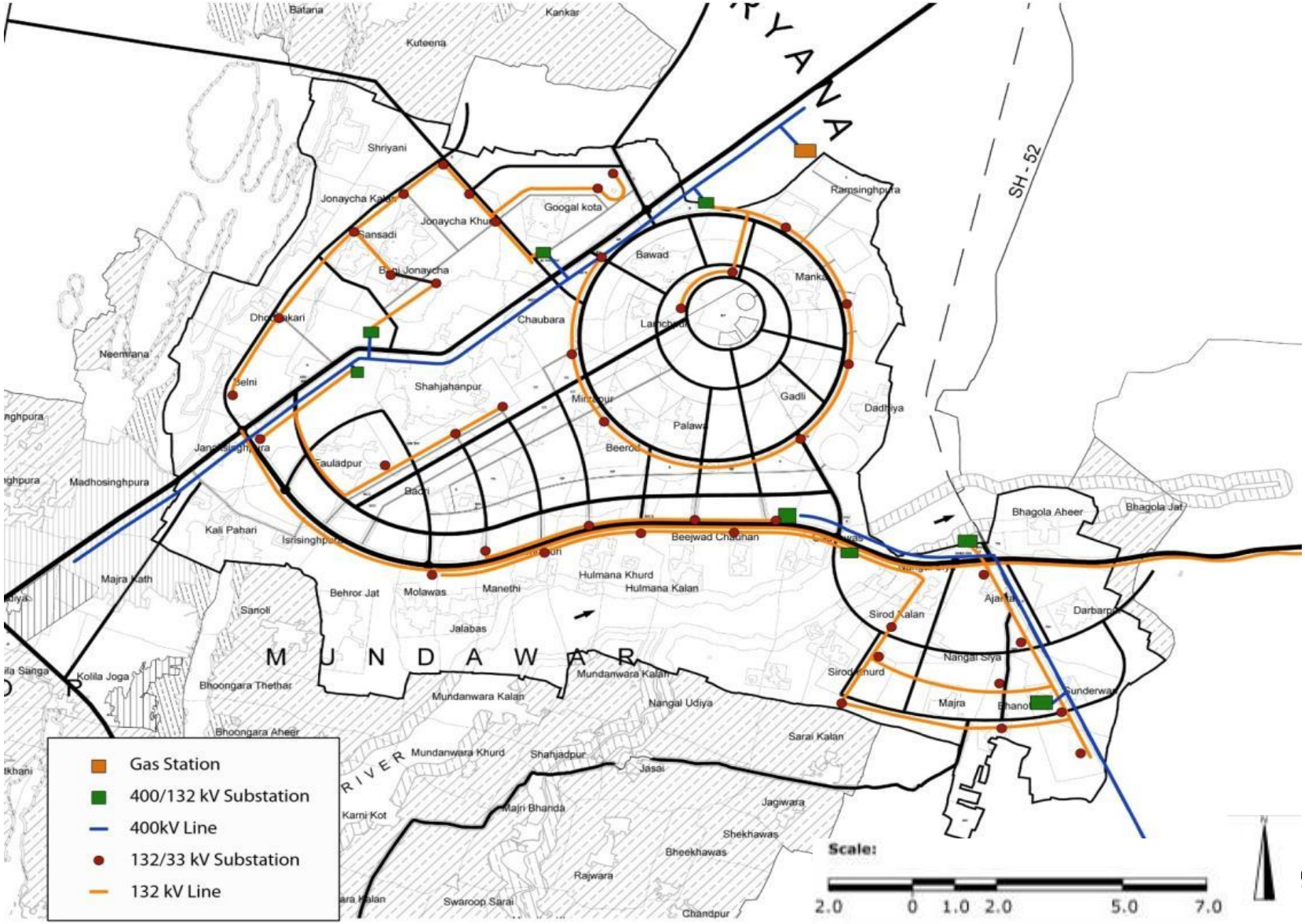



Power Transmission & Distribution System
During initial period




Power Transmission & Distribution System
In later phases

**Figure 6-31: Power Supply Network**



The various captive generation options available are as follows:

1. **Coal-Lignite based Power Generation-** Suitable for base load requirement;
2. **Natural-Gas based Power generation**- Suitable for base and peak load requirement. The natural gas resources within the Investment Region are not identified and it is required to transport fuel from other parts of the region;
3. **Biomass Power Generation-** There is a limited potential of biomass in the form of Juli-flora and Mustard-husk;
4. **Wind Power-** There is no major wind potential in the Investment Region;
5. **Solar Power**- The solar irradiation level in the Investment Region is in the range of 5.0-6.0 kWh/Sq.m/Day and is comparatively low as compared to western part of Rajasthan. This is one of the possible supply options for the Investment Region. To harness the available solar potential in the region and making street lighting system more reliable, solar powered street lamps are proposed for streets in the region.

Considering the above facts, solar power generation along with a plant using natural gas based open cycle and combined cycle generation can be one of the feasible options for captive generation in the Investment Region to meet its peak and base load requirements.

A major part of the load in the investment region is domestic and commercial, peak demand is more than 1250 MW in phase III of the investment region. The nature of load is varying through the day with two peaks. So a captive plant which can support such nature of load during the peak and also in case of grid failure is required for the region.

The peaking demand or backup load can be met from few sources like:
**Hydro power plant:** Though this is the cheapest source of peaking power, it is not available throughout the year, further the region has no hydro power potential. Hence this option is not feasible.

**Gas based power plant:** A gas based thermal plant is ideal for a peaking load and backup power as it can be started in 15-20 minutes when required. The land required for a gas based power plant is also low (0.25 acres/MW) and pollution is less compared to coal.

Two options for the gas based power plant have been examined open cycle and combined cycle. The combined cycle gas power plant generally runs as a base as well as peak load power plant but the cost of electricity from gas based plants is high when compared to coal based power plants which will be major source of energy procurement for the investment region. So, having a gas based captive plant for the base load is not economical. Further the peaking capacity of the combined cycle plants is limited.

Open cycle gas power plant is a good option for supporting the peak load as well as for the power backup option. It can be installed in a modular setting according to the peak and backup requirement of the region. Thought the tariff is high for this, it is comparable to the power cost during peak time and also acts as effective backup.
Gas for the proposed power plant can be supplied from domestic sources or imported LNG, As far as gas fields in Rajasthan are concered the existing production is already booked in full. 0.78 mmscmd produced from Jaisalmer Basin is used in power generation at Ramgarh CC Plant. hence gas has to be transported from the domestic wells or LNG terminals.

At present the total availability of natural gas in India is 166 Million Standard Cubic Meter per day (MMSCMD) with LNG constituting 22 % of it. Gas price for the domestically available gas are fixed by Ministry of Petroleum and is currently $4.2/MMBTU (Million British Thermal Unit). The other source of gas is RLNG imported through long term contracts. Price of long term LNG varies on a monthly basis. Spot RLNG prices are based on market conditions, which are currently hovering around $12-$16/MMBTU.

During XIIth five year plan around 18,200 km of pipeline is expected to be commissioned with design capacity of around 540 MMSCMD which will increase country's pipeline network to around 31,700 Km. with 876 MMSCMD of design capacity. The major pipe line infrastructure is in north and west of India. This capacity is underutilized with a 53% utilization factor

The proposed power plant can supplied from the following options:

1. The existing HBJ pipeline of GAIL can feed the power plant in Rajasthan: 54 mmscmd capacity
2. Two New Pipeline to be commissioned by GSPL by 2014-15:
   a. Mallavaram-Bhopal-Bhilwara-Vijaipur: 76.25 mmscmd capacity
   b. Bhatinda-Jammu-Srinagar: 42.42 mmscmd capacity

The Jaipur – Bhiwadi pipe line is also proposed in the area and passes very close to the region which is an ideal source for the gas supply to the power plant. HBJ which passes through Delhi is also a feasible option for supplying the plant, or any other existing or proposed gas pipe line which passes near the region can be used to supply the gas to the captive plant.
Location of the power plant has to be calculated on the basis of land availability as well as cost benefit analysis with respect to distance from the gas supplying pipe line and the grid injection point. The capacity of the plant should be 270 MW (3x90 MW). The each turbine can be added as per the phase wise requirement of the region.

**Solar Power**

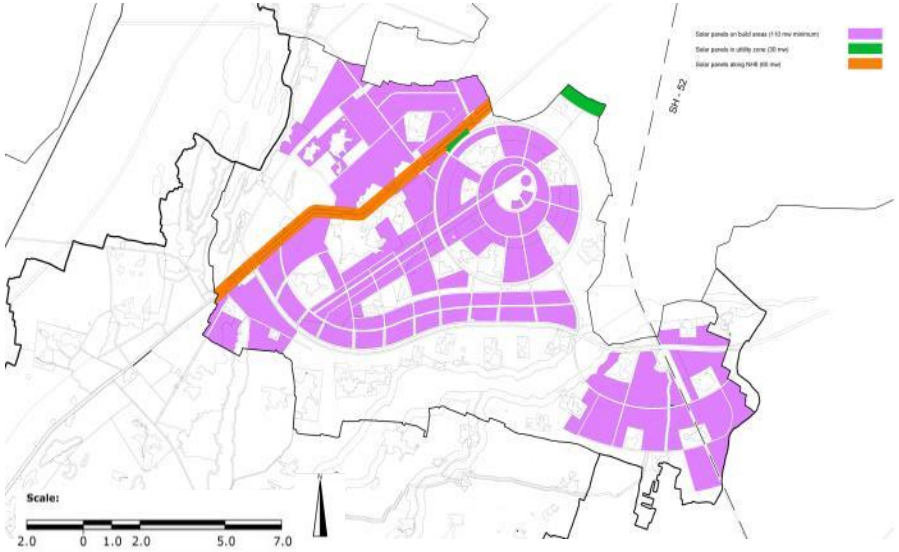
In the short term, the power demand in the KBNIR is expected to be met by the planned and committed capacity additions in the state as shown in the table 5-45. As can be seen from this table, 85% of capacity addition in the short term is from conventional power plants and only 15% is from renewable power plants. However, going forward considering the potential for especially solar power plants in Rajasthan, we expect the proportion of capacity addition of renewable power plants to become higher and it may reach and be sustained at 20% during the plan period. The area availability in the NH-8 region for installation of solar power plant is 2 Sq. km which translates into 494.21 acre of land space. Assuming the installation of Thin film Solar PV technology requiring 7 Acre/MW the capacity that can be installed in the NH-8 area is estimated at approx. 70.6 MW. Further, the capacity expected in the utilities area amounts to 30 MW. Therefore, the total solar PV capacity expected amounts to a total of approximately 100 MW.

In addition rooftops can be used for solar power generation. The built area available for solar rooftop installations amounts to 1,860,320 sq. m. Assuming that the area requirement per kWp is 18 Sq. M, the capacity of solar power that can be generated at rooftops amounts to approximately 103.35 MW. (Approximately 170 MW of Solar power can be developed in the investment region). Less than 10% of the total energy demand in the KBNIR will in 2040 supplied by solar- and wind power. For power generated from recycling of waste / refuse our energy expert assessed there is limited potential for power generation from biomass since the agricultural sector will be overtaken by the development of industry in the KBNIR.

**Table 6-54: 12th Plan Capacity Addition Conventional & Renewable Sources**

| 12th Plan Capacity Addition Conventional & Renewable Sources | |
|---|---|
| | 12th plan capacity addition (MW) |
| Thermal | 13,959 |
| Wind | 1,500 |
| Solar | 1,000 |
| Total Conventional | 13959(85%) |
| Total Renewable | 2500(15%) |
| Total | 16,459 |
| | |

**Figure 6-32: Power supply locations of the investment region**




**Wind Power**

The wind potential in the Investment Region is not major, but the energy can be wheeled from the wind farms located in the western part of the state. Wind farms are mostly located in desert districts such as Jaisalmer, Jodhpur, Barmer but load centres are far away from these districts.

A dedicated 400 kV network with associated 220 & 132 kV strong transmission network in Barmer, Jaisalmer, Jodhpur, Bikaner area was created. Indeed, Rajasthan is the only State in India which has established a strong power evacuation network in desert area.

**Biomass/Waste to Energy**

As the policies of state government supports the biomass/waste to energy generation (Biomass policies_2010). A portion of energy requirement of the investment region can be fulfilled using biomass/waste to energy. The fuel mix can be from the different biomass options like agricultural process and waste material like industrial waste, commercial waste and house hold sources that cannot be used or recycled otherwise.

## 6.9 Telecommunications

### 6.9.1 Recognizing importance of ICT / telecommunications

For a modern day city (especially knowledge driven such as the New City), high standard telecommunication services are vital. In present day this standard is a necessity to be competitive and attract new citizens, institutions, companies, visitors, etc.. The importance of high quality telecommunications infrastructure for efficient free flow of information is critical to the functioning and further development of the modern economy.

The unprecedented growth in telecommunications capacity and in telecommunications applications has changed our lives. Besides basic telephony, especially cellular services and broadband services for (mobile) internet have rapidly increased. It is expected that this trend will continue for the planning horizon of the KBNIR Development Plan.
The provision of a quality and price competitive telecommunications service promotes industrial and commercial development, improves personal security and allows for better communication and networking in the public, business and commercial sectors.

The recognized importance of ICT / Telecommunications for each future city makes it reasonable to assume that fibre optics networks will be created within the urbanized areas of the KBNIR. To create this MAN (Metropolitan Area Network), a Fibre-to-Home network needs to be implemented to connect all houses, businesses, institutions etcetera. The MAN enables telecommunications companies to provide cheap, “always-on”, high-speed broadband access to the internet, a vital tool for industry

and business and invaluable for educational institutes, health and research bodies and private consumers.

### 6.9.2 Broadband

A high quality and high capacity broadband infrastructure is necessary to create maximum accessibility to internet and data. A Fibre-to-Home network to maximize broadband availability within the KBNIR is proposed.

#### 6.9.2.1 Wi-Fi

Wi-Fi enabled devices such as a personal computer, video game console, mobile phone, MP3 player or personal digital assistant can connect to the Internet when within range of a wireless network connected to the Internet. The coverage of one or more interconnected access points — called a hotspot — can comprise an area as small as a few rooms or as large as many square miles covered by a group of access points with overlapping coverage.

Especially within the Knowledge City a public Wi-Fi network (available in e.g. parks and squares) will contribute to the attractiveness and competiveness of this knowledge and education based city part.

### 6.9.3 Land based telephony

The importance of the traditional land based telephony has decreased over recent years due to the rapid upsurge in demand and developments in mobile telephony. Nevertheless, land based telephony remains as an essential part of the telecommunications networks.

### 6.9.4 Mobile telephony

A high quality reliable mobile phone service is a necessity for both business users and the general public. It is important that the a detailed plan contains guidance for the appropriate provision of the required infrastructure. When suitably located and designed, this infrastructure can go largely unnoticed to the general public.

### 6.9.5 Below ground telecommunications structures

Underground cabling of telecommunication network will be combined and located in designated cable corridors, which increases the possibility of efficient installation and maintenance.
This will support a competitive telecommunications service to safeguards existing roads and footpaths from unnecessary excavation.

### 6.9.6 Above ground telecommunications structures

Technology in the field of telecommunications is constantly advancing. This results in infrastructures rapidly becoming outmoded. In order to prevent a proliferation of such infrastructures which would be detrimental to the visual amenities of the town and its environment, these structures should be implemented (visual or physical) in the urban or built fabric.
In rural landscape visual intrusion of large scale telecommunications infrastructure should be avoided as much as possible.

### 6.9.7 Other considerations

For detailed design further considerations are;

- Telecommunications provider to be defined and engaged into the design process to achieve optimal efficiency;
- Decisions regarding dedicated or combined telecoms / site management systems to be made;
- Locations of centralized monitoring points to be defined.

# 7 Block Cost Estimates

The infrastructure plan provides an idea towards the broad cost estimates for key trunk infrastructure required for proposed DP as well as regional infrastructure (connectivity & water transmission). The Key trunk infrastructure includes following:

**A. EXTERNAL INFRASTRUCTURE**

- **Airport:** This includes cost towards proposed Aerotropolis Project near Kotkasim.
- **Road Connectivity** this includes construction of new expressways category road link between Bhiwadi and Neemrana
- **Railway Infrastructure:** this includes extension of MRTS system from Bawal till Sahjahanpur and a lump sum cost towards development of Ajarka railway station).
- **Water Storage & Transmission:** this includes proposed water transmission system from water stored in Jaisamand lake to KBNIR. Costs as provided by PHED for KBNIR.

**B. MBIR INTERNAL INFRASTRUCTURE**

- **Water & Waste Water System:** This includes water distribution system and recycled water distribution system (dual pipe line) and sewerage collection system**.**
- **Power Generation & Distribution System:** This includes power supply generation (in-situ) and distribution networks within KBNIR.
- **Solid Waste Management:** this would include costs towards development of solid waste management infrastructure.
- **Road infrastructure:** includes costs for master plan roads with BRT Corridor. It also includes costs towards, street lighting, storm water drains etc.
- **Landscape:** this includes costs towards development of green belts & buffers along roads and open spaces
- **Site Development:** This includes costs towards leveling & clearing the area for proposed development.

The broad development cost towards KBNIR External & Internal infrastructure shall be around INR 23066 Cr, where external infrastructure accounts for 41% (INR 9380 Cr) and 59% (INR 13685 Cr) for internal infrastructure within KBNIR distributed over three phases. The phase-wise summary of costs towards development of external & internal infrastructure for KBNIR is presented in ***Table 7-1***. It may be noted that operation and maintenance costs are not included in any of the infrastructure items presented in ongoing sections

**Table 7-1: Summary of Block Costs for KBNIR**

| Sl. No. | Infrastructure Component | Capital Cost (INR Cr) | | | |
|---|---|---|---|---|---|
| | | Phase 1 | Phase 2 | Phase 3 | Total |
| **A** | **EXTERNAL INFRA** | | | | |
| 1 | Airport* | 0 | 3902 | 0 | 3902 |
| 2 | Bhiwadi-Neemrana Link Road | 649 | 0 | 0 | 649 |
| 3 | Railway Station | 0 | 0 | 350 | 350 |
| 4 | MRTS | 0 | 2250 | 0 | 2250 |
| 5 | Water Sourcing & Conveyance** | 1776 | 0 | 0 | 1776 |
| **A** | **Total of External Infrastructure** | 2425 | 6152 | 350 | 8927 |
| **B** | **INTERNAL INFRA** | | | | |
| 6 | Site Development | 237 | 79 | 221 | 538 |
| 7 | Road Works, Street lighting, Streetscaping, Planting, etc | 1023 | 883 | 625 | 2532 |
| 8 | Water Supply System | 83 | 89 | 198 | 370 |
| 9 | Recycled Water System | 49 | 59 | 48 | 155 |
| 10 | Sewerage | 211 | 297 | 296 | 805 |
| 11 | Storm Water Drainage | 218 | 201 | 148 | 566 |

| Sl. No. | Infrastructure Component | Capital Cost (INR Cr) | | | |
|---|---|---|---|---|---|
| | | Phase 1 | Phase 2 | Phase 3 | Total |
| 12 | Solid Waste Management | 57 | 63 | 125 | 245 |
| 13 | Power Generation, Transmission & Distribution | 1781 | 2073 | 3431 | 7284 |
| 14 | Landscaping/ Plantation of Green Areas | 108 | 161 | 270 | 539 |
| | Sub-Total | 3767 | 3905 | 5362 | 13034 |
| 15 | Miscellaneous 5% of Internal Infra | 188 | 195 | 268 | 652 |
| | **Total of Internal Infrastructure** | **3956** | **4100** | **5630** | **13685** |
| **C** | **Grand Total (INR Cr)** | **6833** | **10252** | **5980** | **22612** |
| | | | | | |

Note:

** Techno-Economic Feasibility Report on Aerotropolis may be referred for further details. Development phasing of Aerotropolis may be decided by GoR.*

*** Water Sourcing & Conveyance System cost as per PHED.*

## 7.1 Airport

The Consultant had submitted the Techno-economic feasibility study for Aerotropolis Project as part of current assignment. The study has found the feasibility of setting on airport with project cost being INR3902 crores (at 2011 price).

## 7.2 Development of Bhiwadi- Neemrana Road Link

As part of this assignment, along with Aerotropolis, the consultant submitted the techno-economic feasibility study for Development of Bhiwadi – Neemrana Road Link. The length of road link is ~49 km and the estimated capital cost is INR 649cr.

## 7.3 Development of Ajarka Railway Station

The proposed development plan for KBNIR has envisaged an integrated transport strategy, wherein Ajarka station is key node of transport with passenger and cargo handling facilities. A Lump sum cost for development of Ajarka Station ~350 cr has been assigned.

## 7.4 Mass Transit Link to Nearest Cities

It is understood that, DMICDC, is currently undertaking feasibility study on MRTS link between Delhi Metro & Bawal (near Rajasthan border of Haryana), as a part of study for development of Manesar Bawal Investment Region (MBIR)in Haryana. MBIR and KBNIR share their boundary with each other. Shahjahanpur is about 15km from Bawal and it is logical to have both these nodes get connected through MRTS. Hence it is proposed that MRTS from Bawal be extended till Shahjahanpur along the NH8. A lump sum amount, @ 150cr per Km, INR 2250 cr, is estimated cost for development of MRTS between KBNIR & MBIR.

## 7.5 Water Source & Conveyance Infrastructure

Cost of water conveyance and storage systemas per PHED estimates for KBNIR is around INR 1776 crores.

## 7.6 Site Development

The cost associated with site development includes clearing & level site, removing existing infrastructure, buildings etc. This cost shall apply only to land uses (excluding roads) being/ or proposed to be acquired by SIR

authority. It is estimated that around 43.73 sqkm of land would be require site development. The estimated cost for site development, @ INR 11 cr/ sqkm, shall be around INR 534 cr. The phase wise estimates are presented in **Table 7-2**.

**Table 7-2: Site Development Capital Costs**

| Site Development Capital Costs | | | | |
|---|---|---|---|---|
| **Description** | **Phase 1** | **Phase 2** | **Phase 3** | **Total** |
| Estimated Land Area for Site Development | 21.58 | 7.22 | 20.10 | 43.73 |
| Site Development Cost @ INR 11cr/sqkm | **237.37** | **79.46** | **221.15** | **537.98** |
| | | | | |

*Note: All costs are at 2012 rates and do not include any form of escalations.*

## 7.7 Road Infrastructure

The capital cost for road infrastructure includes carriage way, median, plantation, BRT, cycle track, street lighting, street furniture, street signage and drainage. The cost of road development is second highest in internal infrastructure after Power Sector. The block cost estimates for proposed master plan roads is presented in **Table 7-3**, whereas it assumptions are presented in **Appendix 9**.

**Table 7-3: Road Infrastructure Capital Costs.**

| Road Infrastructure Capital Costs | | | | |
|---|---|---|---|---|
| **Type of Road** | **Block Costs (INR Cr)** | | | |
| | **Phase 1** | **Phase 2** | **Phase 3** | **Total** |
| 80m RoW @ 16.77 Cr/km | 177.78 | 235.97 | 233.22 | 646.97 |
| 60m RoW @ 14.76 Cr/km | 630.30 | 281.92 | 148.78 | 1060.99 |
| SH (60m RoW) @ 14.76 | 22.03 | 52.93 | 39.27 | 114.23 |
| Cr/km | | | | |
| 45m RoW @ 12.55 Cr/km | 193.21 | 295.79 | 203.69 | 692.68 |
| 30m RoW @ 7.94 Cr/km | 0.00 | 16.67 | 0.00 | 16.67 |
| Total | **1023.31** | **883.28** | **624.96** | **2531.55** |

*Note: All costs are at 2012 rates and do not include any form of escalations.*

## 7.8 Water Distribution System

**Table 7-4** presents the phase wise cost estimates for water distribution system within KBNIR, whereas cost assumptions are presented in **Appendix -10**.

**Table 7-4: Capital Costs water distribution system for three alternatives.**

| Capital Costs water distribution system for three alternatives | | | | |
|---|---|---|---|---|
| **Description** | **Block Costs (INR Cr)** | | | |
| | **Phase 1** | **Phase 2** | **Phase 3** | **Total** |
| Water Treatment Plant | 33.68 | 33.53 | 105.00 | 172.20 |
| UGT & Pumping Station | 12.58 | 12.49 | 38.55 | 63.62 |
| Distribution Network | 29.07 | 34.88 | 36.78 | 100.73 |
| Sub-Total | 75.32 | 80.89 | 180.33 | 336.55 |
| Contingencies (10%) | 7.53 | 8.09 | 18.03 | 33.65 |
| **Grand Total** | **82.85** | **88.98** | **198.37** | **370.20** |

*Note: All costs are at current rates (2012) and do not include any form of escalations.*

## 7.9 Sewerage System

Sewerage system is standalone to any water source and hence its costs figure is independent to any water source. The capital cost components include collection network, pumping stations and treatment plants. The phase wise and component wise capex details are provided in **Table 7-5**, whereas costing assumptions are presented in **Appendix -10.**

**Table 7-5: Capital Costs for Sewerage System**

| Capital Costs for Sewerage System | | | | |
|---|---|---|---|---|
| **Description** | **Block Costs (INR CR)** | | | |
| | **Phase 1** | **Phase 2** | **Phase 3** | **Total** |
| Network Cost | 39.58 | 34.87 | 24.38 | 98.83 |
| STP | 152.50 | 235.00 | 245.00 | 632.50 |
| SPS | 0.00 | 0.05 | 0.00 | 0.05 |
| Sub-Total | 192.08 | 269.92 | 269.38 | 731.38 |
| Contingencies (10%) | 19.21 | 26.99 | 26.94 | 73.14 |
| **Grand Total** | **211.29** | **296.91** | **296.32** | **804.52** |

*Note: All costs are at 2012 rates and do not include any form of escalations.*

## 7.10 Recycled Water System

The cost for recycled water system is presented in **Table 7-6.**

**Table 7-6: Block Cost Estimates for Recycled Water System**

| Block Cost Estimates for Recycled Water System | | | | |
|---|---|---|---|---|
| **Description** | **Block Costs (INR CR)** | | | |
| | **Phase 1** | **Phase 2** | **Phase 3** | **Total** |
| UGT & Pump House | 4.28 | 2.95 | 7.18 | 14.40 |
| Distribution network | 40.20 | 50.54 | 36.06 | 126.80 |
| Sub-Total | 44.48 | 53.49 | 43.24 | 141.21 |
| Contingencies (10%) | 4.45 | 5.35 | 4.32 | 14.12 |
| **Grand Total** | **48.93** | **58.84** | **47.56** | **155.33** |

*Note: All costs are at 2012 rates and do not include any form of escalations.*

## 7.11 Drainage System

The cost components for drainage system include RCC drains (Major), Road Side drains and recharge pits. Components wise & phase wise capex details for drainage system is provided in **Table 7-7**.

**Table 7-7: Block Cost Estimates for Capital Costs for Drainage System**

| Block Cost Estimates for Capital Costs for Drainage System | | | | |
|---|---|---|---|---|
| **Drainage Components** | **Block Costs (INR)** | | | |
| | **Phase 1** | **Phase 2** | **Phase 3** | **Total** |
| R.C.C Drain | 152.24 | 140.42 | 103.39 | 396.05 |
| Road side Drain | 45.67 | 42.12 | 31.02 | 118.81 |
| Recharge pit | 0.20 | 0.25 | 0.21 | 0.66 |
| Sub-Total | 198.12 | 182.79 | 134.62 | 514.86 |
| Contingencies (10%) | 19.81 | 18.28 | 13.46 | 51.49 |
| **Grand Total** | **217.93** | **201.07** | **148.08** | **566.35** |

*Note: All costs are at 2012 rates and do not include any form of escalations.*

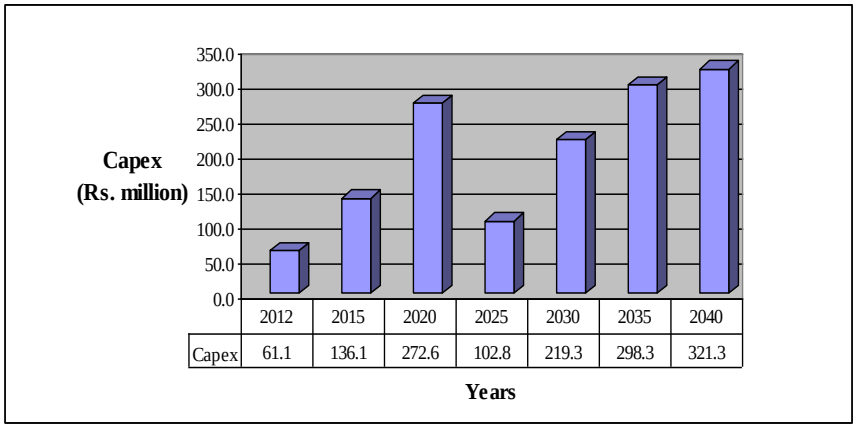
## 7.12 Solid Waste Management

The ball park estimates of capex and opex corresponding to the entire range of operations for collection, transport, treatment and disposal of MSW as described hereunder.

### 7.12.1 Capital Cost Estimates

Capital expenditure over the three phases from 2012 until 2040 has been worked out considering the initial investment in infrastructure, plant and equipment at various stages of the project. A summary of the investment for the initial years and at every 5 year period is presented in **Figure 7-1** while a component wise break up is presented in **Table 7-8**.

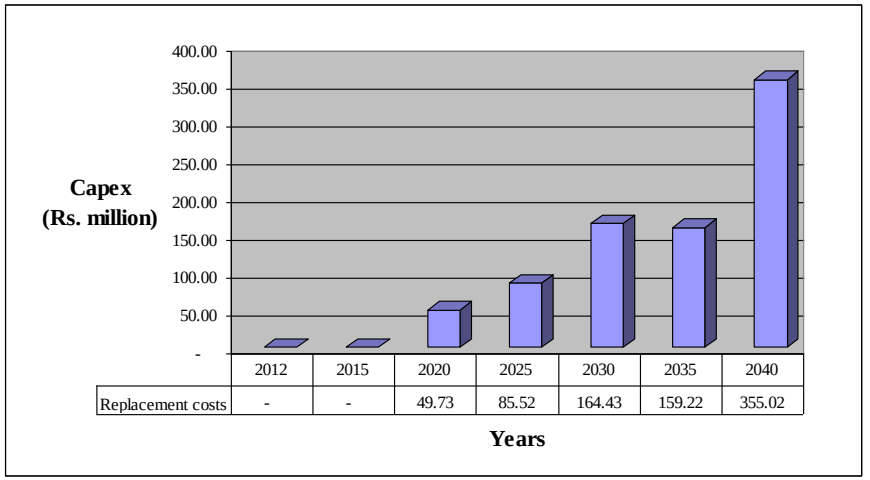
**Figure 7-1: Phase-Wise Capital Investment For MSW Management In KBNIR**




**Note:** All costs are at current rates (2012) and do not include any form of escalations. Figures are in INR million.

Estimates presented in **Figure 7-1** and **Table 7-10** correspond to only the individual phase-wise first time investment for particular infrastructure components. However, municipal solid waste management is one such operation which requires not only continuous incremental investment but also significant replacement costs on account of high wear and tear and corrosion of the plant, equipment, machinery and vehicles attributable to special character of the material being handled. In this respect, considering typical life span of 5 years for smaller vehicles, 8 years for the refuse compactors and about as many for the plant and equipment at the compost plant, the overall capital expenditure over the three phases of the project is worked out. As per this, the replacement costs of particularly the mechanical and electrical components are estimated to vary from Rs. 50 million around 2020 to Rs. 355 million around 2040 respectively. Phase-wise distribution of the replacement costs is presented in **Figure 7-2** while the component and year-wise break up is presented in **Table 7-9** respectively.

**Figure 7-2: Phase-Wise Replacement Costs For MSW Management In KBNIR**




**Note:** All costs are at current rates (2012) and do not include any form of escalations. Figures are in INR million.

**Table 7-8: Phase-Wise Capital Investment (First Time) For Msw Management In Kbnir (INR)**

| Phase-Wise Capital Investment (First Time) For Msw Management In Kbnir (INR) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Component** | **Unit** | **Rate** | **2012** | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| A. PRIMARY COLLECTION | | | | | | | | | |
| 1. Litter bins | Nos. | | 0 | 562 | 843 | 937 | 937 | 703 | 703 |
| | Rs. | 3,500 | | 1,967,000 | 2,950,500 | 3,279,500 | 3,279,500 | 2,460,500 | 2,460,500 |
| 2. Motorised tippers for door step service | Nos. | | 25 | 53 | 20 | 33 | 65 | 122 | 189 |
| | Rs. | 400,000 | 10,000,000 | 21,200,000 | 8,000,000 | 13,200,000 | 26,000,000 | 48,800,000 | 75,600,000 |
| 3. Motorised tippers for commercial waste | Nos. | | 4 | 5 | 4 | 5 | 13 | 22 | 41 |
| | Rs. | 400,000 | 1,600,000 | 2,000,000 | 1,600,000 | 2,000,000 | 5,200,000 | 8,800,000 | 16,400,000 |
| Sub-total | Rs. | | 11,600,000 | 25,167,000 | 12,550,500 | 18,479,500 | 34,479,500 | 60,060,500 | 94,460,500 |
| B. SECONDARY STORAGE | | | | | | | | | |
| 1. Cement concrete platform at CWDs | Nos. | | 17 | 35 | 26 | 50 | 90 | 179 | 334 |
| | Rs. | 10,000 | 170,000 | 350,000 | 260,000 | 500,000 | 900,000 | 1,790,000 | 3,340,000 |
| 2. Wheely bins | Nos. | | 34 | 70 | 52 | 100 | 180 | 358 | 668 |
| | Rs. | 15,000 | 510,000 | 1,050,000 | 780,000 | 1,500,000 | 2,700,000 | 5,370,000 | 10,020,000 |
| Sub-total | Rs. | | 680,000 | 1,400,000 | 1,040,000 | 2,000,000 | 3,600,000 | 7,160,000 | 13,360,000 |
| C. STREET SWEEPING AND DRAIN CLEANING | | | | | | | | | |
| 1. Wheel borrows | Nos. | | 14 | 27 | 27 | 53 | 35 | 40 | 27 |
| | Rs. | 5000 | 70,000 | 135,000 | 135,000 | 265,000 | 175,000 | 200,000 | 135,000 |
| 2. Set of implements and PPE | Nos. | | 28 | 54 | 54 | 106 | 70 | 80 | 54 |
| | Rs. | 2000 | 56,000 | 108,000 | 108,000 | 212,000 | 140,000 | 160,000 | 108,000 |
| Sub-total | Rs. | | 126,000 | 243,000 | 243,000 | 477,000 | 315,000 | 360,000 | 243,000 |
| | | | | | | | | | |
| D. SECONDARY TRANSPORT | | | | | | | | | |
| 1. Transfer stations | Nos. | | 0 | 2 | 2 | 1 | 1 | 1 | 0 |
| | Rs. | 30,000,000 | - | 60,000,000 | 60,000,000 | 30,000,000 | 30,000,000 | 30,000,000 | - |
| 2. Refuse compactors | | | | | | | | | |

| Phase-Wise Capital Investment (First Time) For Msw Management In Kbnir (INR) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Component** | **Unit** | **Rate** | **2012** | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| 2.1 Fleet for lifting horticulture waste | Nos. | | 0 | 2 | 0 | 0 | 0 | 1 | 1 |
| | Rs. | 2,800,000 | - | 5,600,000 | - | - | - | 2,800,000 | 2,800,000 |
| 2.2 Fleet servicing CWDs | Nos. | | 2 | 1 | 1 | 1 | 0 | 3 | 5 |
| | Rs. | 2,800,000 | 5,600,000 | 2,800,000 | 2,800,000 | 2,800,000 | - | 8,400,000 | 14,000,000 |
| 2.3 Fleet for transport from transfer stations | Nos. | | 2 | 2 | 0 | 1 | 4 | 4 | 9 |
| | Rs. | 2,800,000 | 5,600,000 | 5,600,000 | - | 2,800,000 | 11,200,000 | 11,200,000 | 25,200,000 |
| Sub-total | Rs. | | 11,200,000 | 74,000,000 | 62,800,000 | 35,600,000 | 41,200,000 | 52,400,000 | 42,000,000 |
| E. SANITARY LANDFILL | Rs. | | 37,490,189 | 32,750,000 | 119,498,884 | 43,698,999 | 63,233,729 | 101,857,813 | 171,243,927 |
| | | | | | | | | | |
| F. TREATMENT | | | | | | | | | |
| 1. Compost plant (3 x 200 MT/d) | Rs. | | 0 | 0 | 76,500,000 | | 76,500,000 | 76,500,000 | |
| 2. Mulching of brush | | | | 2,500,000 | | 2,500,000 | | | |
| Sub-total | Rs. | | 0 | 2,500,000 | 76,500,000 | 2,500,000 | 76,500,000 | 76,500,000 | 0 |
| Grand total(s) | Rs. | | 61,096,189 | 136,060,000 | 272,632,384 | 102,755,499 | 219,328,229 | 298,338,313 | 321,307,427 |
| **Grand Total (INR Cr)** | | | **6.11** | **13.61** | **27.26** | **10.28** | **21.93** | **29.83** | **32.13** |
| | | | | | | | | | |

Note: Investments are exclusive of the replacement costs.

**Table 7-9: MSW Infrastructure Replacement Costs (INR Million)**

| MSW Infrastructure Replacement Costs (INR Million) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Component** | **Remarks** | **2012** | **2017** | **2020** | **2022** | **2023** | **2025** | **2027** | **2028** | **2030** | **2031** | **2032** | **2033** | **2035** | **2036** | **2037** | **2038** | **2039** | **2040** |
| A. PRIMARY COLLECTION | | | | | | | | | | | | | | | | | | | |
| 1. Litter bins | 5 years | - | - | 1.97 | - | - | 4.92 | - | - | 8.20 | - | - | - | 11.48 | - | - | - | - | 13.94 |
| 2. Motorised tippers for door step service | --do-- | - | 10.00 | 21.20 | 10.00 | - | 29.20 | 10.00 | - | 42.40 | - | 10.00 | - | 68.40 | - | 10.00 | - | - | 117.20 |
| 3. Motorised tippers for commercial waste | --do-- | - | 1.60 | 2.00 | 1.60 | - | 3.60 | 1.60 | - | 5.60 | - | 1.60 | - | 10.80 | - | 1.60 | - | - | 19.60 |
| Sub-total | | - | 11.60 | 25.17 | 11.60 | - | 37.72 | 11.60 | - | 56.20 | - | 11.60 | - | 90.68 | - | 11.60 | - | - | 150.74 |
| B. SECONDARY STORAGE | | | | | | | | | | | | | | | | | | | |
| 1. CC platforms at CWDs | 10 years | - | - | - | 0.17 | - | 0.35 | - | - | 0.26 | - | 0.17 | - | 0.85 | - | - | - | - | 1.16 |
| 2. Wheely bins | 5 years | - | 0.51 | 1.05 | 0.51 | - | 1.83 | 0.51 | - | 3.33 | - | 0.51 | - | 6.03 | - | 0.51 | - | - | 11.40 |
| Sub-total | | - | 0.51 | 1.05 | 0.68 | - | 2.18 | 0.51 | - | 3.59 | - | 0.68 | - | 6.88 | - | 0.51 | - | - | 12.56 |
| C. STREET SWEEPING AND DRAIN CLEANING | | | | | | | | | | | | | | | | | | | |
| Wheel borrows | 5 years | - | 0.07 | 0.14 | 0.07 | - | 0.27 | 0.07 | - | 0.54 | - | 0.07 | - | 0.71 | - | 0.07 | - | - | 0.91 |
| Sub-total | | - | 0.07 | 0.14 | 0.07 | - | 0.27 | 0.07 | - | 0.54 | - | 0.07 | - | 0.71 | - | 0.07 | - | - | 0.91 |
| D. SECONDARY TRANSPORT | | | | | | | | | | | | | | | | | | | |
| 1. Transfer stations | | - | - | - | - | 18.00 | - | - | 18.00 | - | 18.00 | - | 9.00 | - | 18.00 | - | 9.00 | 18.00 | - |
| 2. Refuse compactors | | | | | | | | | | | | | | | | | | | |
| 2.1 Fleet for horticulture waste | 8 years | - | - | - | - | 5.60 | - | - | - | - | 5.60 | - | - | - | - | - | - | 5.60 | - |
| 2.2 Fleet servicing CWDs | --do-- | - | - | 5.60 | - | 2.80 | - | - | 8.40 | - | 2.80 | - | 2.80 | - | 8.40 | - | - | 2.80 | - |
| 2.3 Fleet for transport from transfer stations | --do-- | - | - | 5.60 | - | 5.60 | - | - | 5.60 | - | 5.60 | - | 2.80 | - | 5.60 | - | 11.20 | 5.60 | - |
| Sub-total | | - | - | 11.20 | - | 32.00 | - | - | 32.00 | - | 32.00 | - | 14.60 | - | 32.00 | - | 20.20 | 32.00 | - |
| E. SANITARY LANDFILL | | - | - | - | - | - | - | - | 26.43 | - | - | - | - | - | 26.43 | - | - | - | - |

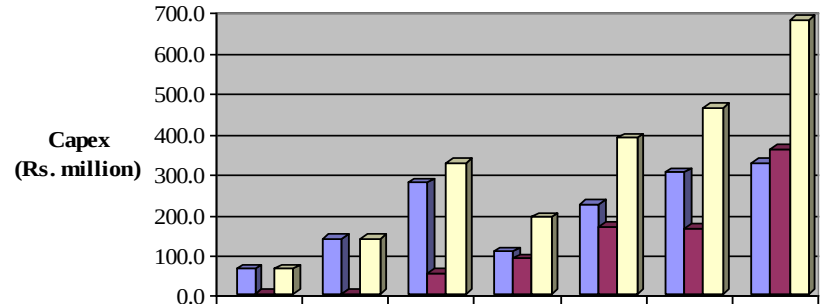
| MSW Infrastructure Replacement Costs (INR Million) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Component** | **Remarks** | **2012** | **2017** | **2020** | **2022** | **2023** | **2025** | **2027** | **2028** | **2030** | **2031** | **2032** | **2033** | **2035** | **2036** | **2037** | **2038** | **2039** | **2040** |
| | | | | | | | | | | | | | | | | | | | |
| F. TREATMENT | | | | | | | | | | | | | | | | | | | |
| 1. Compost plant (3x200 MT/d) | | - | - | - | - | - | - | - | 33.50 | - | - | - | - | - | 33.50 | - | 33.50 | - | - |
| 2. Mulching of brush | | - | - | - | - | 1.00 | - | - | - | - | 1.00 | - | 1.00 | - | - | - | - | 1.00 | - |
| Sub-total | | - | - | - | - | 1.00 | - | - | 33.50 | - | 1.00 | - | 1.00 | - | 33.50 | - | 33.50 | 1.00 | - |
| Grand totals(s) (replacements) | | - | 12.18 | 37.55 | 12.35 | 33.00 | 40.17 | 12.18 | 91.93 | 60.32 | 33.00 | 12.35 | 15.60 | 98.28 | 91.93 | 12.18 | 53.70 | 33.00 | 164.21 |
| **Grand Total (INR Cr)** | | | **1.22** | **3.76** | **1.24** | **3.30** | **4.02** | **1.22** | **9.19** | **6.03** | **3.30** | **1.24** | **1.56** | **9.83** | **9.19** | **1.22** | **5.37** | **3.30** | **16.42** |

Notes:
In the case of transfer stations, replacement of mechanical components approximating to 30% of capex is assumed once every 8 years.
In the case of sanitary landfill, replacement primarily pertains to material moving vehicles. This will be about once in 8 years.
In the case of treatment plant replacement primary pertains to all vehicles and screening equipment, electrical components, etc. Once in 8 years.
Intermediate years without any replacement costs have been excluded from the exhibit.

**Total Capex**

The combined Capex and replacement costs for every five year period until 2040 are presented in **Table 7-10**. In the initial years capex ranges between Rs. 61 to 136 million and the replacement costs are not relevant, while towards 2040 the replacement cost at Rs. 355 million overshoots the capex which is estimated to be around Rs. 321 million. It will be noted that net present values are not worked out as the estimates/ unit rates are not adjusted to inflation.

**Table 7-10: Combined Capex and Replacement Costs**




| | 2012 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|---|
| Capex | 61.1 | 136.1 | 272.6 | 102.8 | 219.3 | 298.3 | 321.3 |
| Replacement cost | - | - | 49.73 | 85.52 | 164.43 | 159.22 | 355.02 |
| Total exp. | 61.10 | 136.06 | 322.36 | 188.28 | 383.76 | 457.56 | 676.33 |

Years

Note: All costs are at 2012 rates and do not include any form of escalations. Figures are in INR million.

**Table 7-11: Summary of cost estimates for Power Supply**

| Summary of cost estimates for Power Supply | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Investment in Power** | **Rate per Unit in Lakhs** | **Quantity Phase I** | **Total Investment in Phase I** | **Quantity Phase II** | **Total Investment in Phase II** | **Quantity Phase III** | **Total Investment in Phase III** | **Total Investment** |
| **400 kV System** | | | | | | | | |
| 400/132 kV Sub Station with transformers, line entry bays and other Infrastructure per substation | 18682 | 2 | 37364 | 2 | 37364 | 4 | 74727 | 149455 |
| 400 kV D/C Transmission Line Circuit kM | 153 | 70 | 10727 | 130 | 19922 | 0 | 0 | 30650 |
| **132KV & Sub-distribution System** | | | | | | | | |
| 132/33/11 kV Sub Station with transformers, line entry bays and other Infrastructure per substation | 4195 | 10 | 41952 | 10 | 41952 | 26 | 109075 | 192979 |
| 132 kV D/C Transmission Line Circuit kM | 21 | 40 | 860 | 30 | 645 | 120 | 2580 | 4085 |
| 33KV Underground cable | 11 | 84 | 926 | 60 | 662 | 218 | 2408 | 3995 |
| **11 kV System** | | | | | | | | |
| 11/.4 kv Transformers | 4 | 1162 | 4484 | 1341 | 5175 | 4585 | 17692 | 27351 |
| 11 kV UG Cable | 9 | 419 | 3692 | 354 | 3124 | 676 | 5964 | 12780 |
| LT lines Circuit kM | 6 | 465 | 2562 | 536 | 2957 | 1834 | 10110 | 15629 |
| **Renewable Energy** | 1000 | 35 | 35000 | 55 | 55000 | 80 | 80000 | 170000 |
| **Captive Power Plant** | 450 | 90 | 40500 | 90 | 40500 | 90 | 40500 | 121500 |
| **Total investment in Rs Lakh** | | | 178067 | | 207300 | | 348057 | 728424 |
| **Total in Rs Billion** | | | 17.81 | | 20.73 | | 34.81 | 72.84 |
| **Investment In Billion USD** | | | 0.36 | | 0.41 | | 0.70 | 1.46 |

## 7.13 Power Generation & Transmission

Cost of power supply is estimated based on the growth of power demand, technical assumptions and other constraints within the investment region. It is proposed to have overhead transmission lines for 400 kV and 132 kV lines and underground lines for voltage level 33 kV and lower.

Summary of the cost estimates for power supply, captive power plant and investment in renewable energy is given in **Table 7-11**.

## 7.14 Landscaping & Plantation

The development plan envisages green buffers/ open spaces along the road network. This is apart from the recreational spaces provided in the master plan. The green buffers/ open spaces are expected to be planted by SIR authority, whereas plantation in recreational spaces would depend on activities and operator. Hence, the consultant has estimated the costs that SIR authority is likely to incur on development of green belt and open spaces and which is around INR 539 cr for ~11 sqkm. The phase wise block costs is presented in **Table 7-12**.

**Table 7-12: Capital Cost for Landscaping and Plantation**

| Capital Cost for Landscaping and Plantation | | | | |
|---|---|---|---|---|
| **Description** | **Phase 1** | **Phase 2** | **Phase 3** | **Total** |
| Land Area for Plantation | 2.15 | 3.21 | 5.41 | 10.78 |
| Site Development Cost @ INR 50 cr/sqkm | **107.72** | **160.60** | **270.48** | **538.80** |
| | | | | |

# 8 Broad Environmental & Social Assessment

DMIDC (Delhi Mumbai Industrial Development Corporation Ltd) has initiated an Environmental Impact Assessment (EIA) Study to meet regulatory requirements for the KBN Investment Region (KBNIR) based on the MoEF prescribed (Terms of Reference) TOR for KBNIR. DMICDC has already appointed an environmental consultant to this effect which is assisting it to obtain required EIA clearance.

Now, the scope of the Consultant under the present scope is limited to the extent of assessment of broad environmental & social impacts of the proposed KBNIR development. Hence, the ongoing chapter.

The intent of this chapter is to assess and evaluate the identified environmental and socio-economic impacts associated with development of KBNIR. The activities performed during the assessment includes following.

- Review of Study of the Concept Master Plan (CMP) for the KBNIR
- Review of the existing secondary information
- Screening of the Project
- Identification of the potential environmental and social impacts and issues in the project
- Identifying suitable mitigation measures to mitigate the impacts and developing environmental and social strategies for their implementation.

The ongoing chapter is structured into three sections, describing the environmental & social baseline, identified potential impacts and followed by suggestive mitigation measures.

## 8.1 Screening of the Project

Environmental Clearance is mandatory for nearly all development activities. The entire process of obtaining clearance is governed by the Environment Impact Assessment Notification 2006 [S.O. 1533 (E)[14/09/06] and the activities listed in its Schedule.

As per S.O. 1533 (E) [14/09/06] - EIA Notification, 2006, and its Schedule, KBNIR would be classified under Township / Area Development Project (Sl. No. 8b of the Schedule). Usually such projects are classified as a Category 'B' project and taken up for consideration at the State Level i.e. in this case by Rajasthan State Environment Impact Assessment Authority (SEIAA). However, the KBNIR is planned as a green field township with certain areas proposed for industrial development. This would imply that the KBNIR may also qualify under Sl. No. 7(c) of the Schedule for Industrial Estates / Parks / Complexes and would be classified as Category 'A' Project (to be appraised by MoEF).

## 8.2 Environmental & Social Baseline

A detailed investigation of the environmental and socio-economic resources within the KBNIR has been carried out to form a baseline [existing] scenario. The study area for the same has been designated as the entire Alwar District in general and the delineated region of KBNIR in particular.

The physical, biological and socio economical component of the study area has been described in **Appendix 2**. The baseline information has been presented based on the information collected during site visits and stakeholder consultations, supplemented with data collected from secondary sources.

## 8.3 Potential Impacts

The identified potential environmental & social impacts area broadly clubbed into three categories, viz a) General Impacts, b) Impacts Specific to Land Use and Impacts specific to Infrastructure. The impacts identified are defined based on phase of Design, Construction and operation. **Table 8-1** presents the indentified potential impacts for KBNIR.

**Table 8-1: Identified Potential Impacts & Mitigation Measures**

| Identified Potential Impacts & Mitigation Measures | | |
|---|---|---|
| **Sl.no.** | **Potential Impacts** | **Phase** |
| A | GENERAL IMPACTS | |
| | The area delineated for the KBNIR has 42 villages with ~68,000 (as per Census 2001) residents. Construction of the KBNIR may lead to displacement of these people and related rehabilitation impacts. | Design |
| | The development of the KBNIR will result in loss of green areas as the Land Use in the project areas is predominantly agricultural. | Design |
| | The energy requirement of the KBNIR is significant considering that it is mostly service oriented with absolute requirement of air conditioned office space with state of art facilities. Measures to bring down the energy requirement are an absolute necessity in terms of Building byelaws and Development Controls. | Design |
| | The KBNIR development will involve site clearance activities. Site clearance will lead to removal of trees and vegetation<br><br>KBNIR has recognized conservation areas in terms of the Sahibi River, forests and protected area around the Aravallis. Encroachment of construction activities in such areas can cause significant environmental damage. | Construction |
| | The project would require significant quantities of borrow material for land development activity. Since the surrounding areas are predominantly agricultural in nature indiscriminate borrowing in such areas shall have significant impacts | Construction |
| | The project would require its share of aggregates for the construction. Some stone quarries are observed along the Aravalli Hills within the project area. Uncontrollable quarrying of stone from these hills through improper / uncontrolled blasting may adversely affect the seismicity / physiography of the region and also have other detrimental impacts on the air and noise quality of its surroundings. It can also have a permanent detrimental impact on the landscape character of the region | Construction |
| | Significant quantities of water will be required for construction of the KBNIR. Since the area is primarily devoid of any major surface water source the likely source of water will be ground water. High rate of extraction of ground water for construction purposes will lead to further deterioration of the already stressed ground water resources. | Construction |
| | Construction activity is likely to temporarily deteriorate air quality of the area, as suspended particulates are likely to increase. | Construction |
| | Noise impacts during the construction stage will be associated with movement of heavy vehicle and construction machinery. People living in the villages close to the work sites will principally experience these impacts | Construction |
| | The construction activity involved in development of KBNIR shall result in significant generation of construction wastes. Inadequate disposal of this construction waste can lead to adverse impacts on adjoining lands and also affect drainage. | Construction |

| Identified Potential Impacts & Mitigation Measures | | |
|---|---|---|
| **Sl.no.** | **Potential Impacts** | **Phase** |
| | The KBNIR will result in generation of solid and liquid wastes due to the working and residential population that can cause a number of impacts on different environmental attributes if the wastes are not collected and disposed properly. | |
| B | IMPACTS SPECIFIC TO LAND USES | |
| | INDUSTRIAL LAND USE | |
| | The KBNIR along with greener industries such as Hospitality, IT, etc is also proposing red and orange category of industries like Automobiles, Textiles, Food Processing, Engineering, with significant pollution potential in terms of emissions and discharge of liquid and solid wastes.<br><br>Since residential areas (new + existing) are also located within KBNIR therefore the siting of the industries and their compatibility with surrounding land uses need to be evaluated to ensure that impacts as a result of these industries on surrounding communities are minimized / mitigated. | Design |
| | The energy requirement from the ICT is expected to be significant as this cluster boasts of the highest employment standards per sq m of office space. Consequently the energy requirement from the cluster is also very high. | Operation |
| | Electronic Waste will be periodically generated from the ICT. Many electronic types of equipment contain individual components made with hazardous constituents, primarily heavy metals. Cathode ray tubes (CRTs) found in colour televisions and colour computer monitors contain significant amount of lead and requires adequate methods of disposal. | Operation |

| Identified Potential Impacts & Mitigation Measures | | |
|---|---|---|
| **Sl.no.** | **Potential Impacts** | **Phase** |
| | The operation of the biotech/ pharma cluster will result in generation of biological wastes during research activities in these fields or in the production or testing of biologicals. The waste may include wastes like sharps, soiled waste, disposables, anatomical waste, cultures, discarded medicines, chemical wastes, etc This waste is highly infectious and can be a serious threat to human health if not managed in a scientific and discriminate manner | Operation |
| | The Automobiles & Other Industrial Clusters will result in generation of industrial wastes that need to be effectively treated and disposed. | Operation |
| | RESIDENTIAL LAND USE | |
| | Residential areas during the operational phase based on their development footprint would generate sewage, municipal solid waste and emissions from power generation, vehicular transport, etc. The magnitude and scale of the impacts will directly depend on the adopted residential densities – higher densities in a particular area would generally cause greater impacts. | Operation |
| | COMMERCIAL LAND USE | |
| | The commercial centers within any city generally tend to get aggregated together within limited business areas. This type of cluttered development often results in local stresses on such business districts in terms of resource utilization and generation of a large floating population resulting in significant generation of wastes and also in terms of disturbance to surrounding residential communities. | Operation |
| | PUBLIC AND SEMI-PUBLIC LAND USE | |
| | The public and semi-public land uses have a beneficial impact on surrounding communities and the environment in terms of improving the quality of community living. | Operation |

| Identified Potential Impacts & Mitigation Measures | | |
|---|---|---|
| **Sl.no.** | **Potential Impacts** | **Phase** |
| | OPEN SPACE AND RECREATIONAL PLAN | |
| | The open spaces and the recreational land uses have a beneficial impact in terms of enhancement and expansion of physical and visual green linkages as part of the open space network of KBNIR as lungs of the region and enrichment of overall quality of life | Operation |
| C | IMPACT SPECIFIC TO INFRASTRUCTURE | |
| | ROAD INFRASTRUCTURE | |
| | The road development activity would require its share of aggregates for the construction of roads and embankment. Some stone quarries are observed along the Aravalli Hills within the project area. Uncontrollable quarrying of stone from these hills through improper / uncontrolled blasting may adversely affect the seismicity of the region and also have other detrimental impacts on the air and noise quality of its surroundings. It can also have a permanent detrimental impact on the landscape character of the region | Construction |
| | The road development programme will involve loss of topsoil cover of open un-urbanised land parcels | Construction |
| | Significant quantities of water will be required for construction of road embankments. Since the area is primarily devoid of any major surface water source the likely source of water will be ground water. High rate of extraction of ground water for construction purposes will lead to further deterioration of the already stressed ground water resources. | Construction |

| Identified Potential Impacts & Mitigation Measures | | |
|---|---|---|
| **Sl.no.** | **Potential Impacts** | **Phase** |
| | Generation of fugitive dust is likely during the construction stage due to (i) Site clearance and use of heavy vehicles and construction machinery; (ii) Procurement and transport of raw materials, borrow and quarry material; (iii) Earthworks; and (iv) Stone crushing operations at the crushers and quarries.<br>Generation of dust is a critical issue and is likely to have adverse impact on health of workers in quarries, borrow areas and stone crushing units. This is a direct adverse impact, which will last almost throughout the construction stage.<br>Generation of exhaust gases during the construction stage is likely due to movement of heavy construction machinery. Another source of air pollution during the construction stage is hot mix plants to be required during construction of roads within the project area. High levels of $SO_2$, HC and NOx are likely from hot mix plant operations. Toxic gases are released through the heating process during bitumen production. Although the impact is much localised, it can spread downwind depending on the wind speeds. | Construction |
| | Noise impacts during the construction stage will be associated with movement of heavy vehicle and construction machinery. People living in close proximity to the work sites will principally experience these impacts. The nature and duration of these impacts will vary depending on the type of work to be undertaken. | Construction |
| | Construction debris will be generated from road construction. The debris if not disposed off properly can affect surrounding landuses and also lead to visual blight. | Construction |
| | As a result of the proposed road developments the number of vehicles plying within the project area will drastically increase. This will imply increased concentration of air pollutants such as Particulate Matter, | Operation |

| Identified Potential Impacts & Mitigation Measures | | |
|---|---|---|
| **Sl.no.** | **Potential Impacts** | **Phase** |
| | Sulphur dioxide ($SO_2$), Oxides of Nitrogen (NOx), Carbon monoxide (CO) and Hydrocarbons (HC). | |
| | As mentioned earlier, there will be a drastic increase in number of vehicles plying within the project area. This will definitely lead to a further increase of noise levels. As such the impacts due to noise pollution are considered as significant. As the increase in operational noise is recognized to be a major impact, it is necessary to identify the noise sensitive zones. | Operation |
| | BUS BASED RAPID TRANSIT SYSTEM | |
| | There will be an increase in the air pollution level due to emission from the buses plying in the KBNIR. Vehicular emission level rises either due to inadequate vehicle maintenance or due to the use of adulterated fuel in vehicles | Operation |
| | With the increase in traffic noise levels are expected to increase in areas along the BRTS routes. The most commonly reported impacts of increased noise levels are interference in oral communication and disturbance in sleep. | Operation |
| | Considerable generation of liquid wastes and oil and grease during vehicle washing and maintenance | Operation |
| | PUBLIC TRANSPORT INFRASTRUCTURE [Bus Terminals &Bus Fleet] | |
| | Considerable generation of liquid waste (sewage & wash waters), oil grease, solid waste, litter etc is expected during operation stage of the passenger hubs | Operation |
| | There will be an increase in the air pollution level due to emission from the increased vehicular movement (bus fleet). With the increase in traffic, ambient noise levels are expected to increase. | Operation |
| | WATER SUPPLY SYSTEM | |

| Identified Potential Impacts & Mitigation Measures | | |
|---|---|---|
| **Sl.no.** | **Potential Impacts** | **Phase** |
| | **Land Acquisition**: Loss of land required for construction of water reservoirs at various locations & treatment plants. However as the sites are smaller in size the impacts are likely to be less pronounced | Design |
| | Operation of Water Treatment Plant | |
| | Occupational Hazard to Workforce due to accidental release of toxic gases like Chlorine<br>Occupational Hazard to Workforce due to working in close vicinity of high noise producing equipment such as pumps and blowers | Operation |
| | Water Distribution Network - | |
| | General Construction Stage Impacts to similar to as described in Road Infrastructure Section (Construction) | Construction |
| | Construction of Conveyance System resulting in: | |
| | Disturbance to local community infrastructure viz. schools, health centers etc along the conveyance route<br>Disruption of public utility services viz. transmission lines, local transport, pipeline etc<br>Increase in fugitive & vehicular emissions<br>Increase in ambient noise levels due to vehicular movement and construction equipments operation<br>Use of Common resource. | Construction |
| | Routine Maintenance of Conveyance System resulting in : | |
| | Disturbance to local community and road users<br>Disruption of public utility services<br>Traffic disruptions | Operation |
| | SEWERAGE SYSTEM | |
| | Sewage Treatment Plants | |
| | For Sewage Treatment Plants, foul odours are produced from fine screens, grit chamber, the sludge dewatering system etc. | Construction |

| Identified Potential Impacts & Mitigation Measures | | |
|---|---|---|
| **Sl.no.** | **Potential Impacts** | **Phase** |
| | Inadequate method of sludge disposal leading to adverse impacts on land and water quality of the River Sahibi | Construction |
| | The treated effluent shall be used for irrigation and general horticultural purposes. Tertiary treated water can be used for ground water recharge or may be stored in Sahibi basin for use during summer months as a non potable source. Potential contamination of the ground water or the river waters can occur in event of periodic non-functioning / bypass of the STP or in case of high flows. | Operation |
| | In case of periods of non operation of the STPs, chances of untreated sewage flowing into the Sahibi riverbed cannot be ruled out | Operation |
| | Hazards to health and safety of workmen during cleaning operations of STP units | Operation |
| | Sewerage Network | |
| | Wastes shall be generated from excavation of the pipe trenches and site preparation activities. These wastes (mostly soil and excavated road material) if not properly managed, shall cause adverse environmental impacts | Construction |
| | During the operation phase, the main wastes shall include silt and organic debris from the maintenance of the sewers. If not properly managed, these could have the potential to cause adverse environmental impacts, including odour due to non-collection of wastes and water quality impacts if wastes enters water bodies | Operation |
| | POWER DISTRIBUTION SYSTEM | |
| | Location of transmission towers and transmission line alignment can cause safety related risks | Design |
| | Location of Substations can lead to noise related disturbance to neighbouring properties | Design |
| | Site clearance will lead to removal of trees and vegetation | Construction |

| Identified Potential Impacts & Mitigation Measures | | |
|---|---|---|
| **Sl.no.** | **Potential Impacts** | **Phase** |
| | Equipment layout and installation causing noise and vibrations in the vicinity | Construction |
| | Physical construction disturbing agricultural activity | Construction |
| | Oil spillage causing Contamination of land/nearby water bodies | Operation |
| | Electric Shock Hazards: Injury / Mortality to Staff and Public | Operation |
| | SOLID WASTE MANAGEMENT | |
| | Transfer Station / Material Recovery Centres | |
| | Location of TS / MRF close to residential areas can cause significant disturbances to the surrounding communities in form of foul odours, breeding of vectors and associated public health impacts and disturbances due to continuous movement of waste collection vehicles. | Design and Operation |
| | Compost Plants | |
| | Location of the Compost Plants close to residential areas can cause significant disturbances to the surrounding communities in form of foul odours, breeding of vectors and associated public health impacts. | Design |
| | The end use for compost should be considered beforehand. In most cases it happens that the manure produced from the Compost plants are costlier than what is available in the market and therefore the manure ultimately finds no buyers. This leads to accumulation of heaps of manure in the adjoining areas of the compost plant thereby leading to numerous problems associated with foul odours, visual blight and public health. | Operation |
| | Sanitary Landfills | |
| | Location of the Sanitary Landfills close to residential areas can cause significant disturbances to the surrounding communities in form of foul odours, breeding of vectors | Design |

| Identified Potential Impacts & Mitigation Measures | | |
|---|---|---|
| **Sl.no.** | **Potential Impacts** | **Phase** |
| | and associated public health impacts. Also operation of heavy machinery and vehicles can also generate high noise levels in the vicinity | |
| | Leveling and compaction of the site will cause generation of a lot of dust and noise, which will have impact on the workers. | Construction |
| | The leachate produced during the operation phase has high contamination levels. The leachate if not collected and treated properly can potentially contaminate soil, and ground water resources. This shall be significant considering the ground water is an extremely precious resource in the region. | Operation |
| | | |

## 8.4 Identified Mitigation Measures

Simultaneously, impact mitigation measures were identified and are presented in the **Table 8-2**.

**Table 8-2: Identified Impact Mitigation Measures**

| Identified Impact Mitigation Measures | | |
|---|---|---|
| **Sl.No.** | **PHASE** | **MITIGATION MEASURES** |
| A | GENERAL IMPACTS | |
| | Design | As part of physical planning, Abadi areas of villages have been kept untouched and additional area for its expansion called “abadi development area” is proposed. In land use classification it is termed as Low Density Residential. Specific plans for the villages have been developed as follows:<br><br>Conservation: Settlements that are sizeable with large populations and are rigid in terms of road widening and provision of basic services and infrastructure may be placed in this class for integration. Services in such cases could only be provided in adjacent lands for lack of sufficient land spaces within. These settlements would therefore retain their rural character and lifestyle.<br><br>Integration: The settlements those are not so large as in case 1, would be provided city level infrastructure (depending upon their requirement/ demand). Roads may be widened and affordable housing together with institutional and recreation facilities proposed. These in a way would merge with the new development and be part of the overall city development<br><br>It is only in case of small and dispersed settlements which cannot be integrated into the KBNIR using either of the typologies mentioned above that rehabilitation and resettlement is expected.<br>The social management plan in this regard has to be developed on the policy outlines specified in the National R&R Policy 2007 and the entitlements specified in by Government of Rajasthan for Rehabilitation and Resettlement of Landowners.. |
| | Design | The KBNIR is planned with an expansive network of City Greens. In addition green buffers are provided along the road network. |
| | Design | The Building Byelaws would insists on day-lighting of at least 60% of the built-space in Residential & public buildings. This will help in cutting down the energy costs for electric illumination during day time. |

| Identified Impact Mitigation Measures | | |
|---|---|---|
| **Sl.No.** | **PHASE** | **MITIGATION MEASURES** |
| | | The byelaws may also specify minimum standard of insulation in the roofs, walls & windows and minimum standard of shading against the hot sun falling on windows in air-conditioned or air-cooled buildings to bring down the energy costs. |
| | Construction | Clearance activity to ensure minimal clearance to existing vegetation. Marking of vegetation prior to its clearance and strict control on clearing activities is proposed. Trees shall not be cut unless it is absolutely necessary. Permission for the same need to be obtained from the State Forest Department/ Concerned Authority. . |
| | Construction | It is proposed that no construction camps, constructions sites, material storage areas, waste disposal area, quarries or borrow areas are allowed within 1000 m of the defined conservation areas in the development plan. |
| | Construction | It should be ensured that borrow pits are not opened in fertile agricultural tracts of land. Redevelopment plans for the borrow areas after completion of the construction activity shall also be prepared. |
| | Construction | It proposed that any contractor/ concessioner/ owner is to be mandated the responsibility to be ensured that such aggregates are procured only from licensed quarries practicing controlled blasting and having adequate environmental safe guards. |
| | Construction | It shall be mandatory that groundwater is not used for construction purposes. Water for construction shall be sourced from perennial surface water sources and brought to the site through water tankers. |
| | Construction | The plants and equipment used for construction strictly confirm to CPCB standards and that the noise level from equipments (measured at one meter from the edge of the equipment in free field) does not exceed 75 dB (A), as specified in the Environmental Protection Rules, 1986.<br>All equipments should be maintained in good working order. Properly designed engine enclosure and intake silencers shall be employed and regular maintenance of equipment is undertaken. |
| | Construction | Material / waste storage would be restricted within the premises of the land designated for the construction sites. Final disposal of construction wastes generated shall be at the designated landfill sites of the KBNIR. |
| B | | IMPACTS SPECIFIC TO LAND USES |
| | | INDUSTRIAL LAND USE |
| | Design | Juxtaposition of industrial clusters to be based on their pollution potential with adequate separation buffers between the industrial and residential areas. Cleaner industries to be located within new towns. This is to provide employment opportunities for residents and curb inter- region traffic flow. |
| | Operation | The consumption of electricity should be encouraged to be spread evenly over the 24 hr. day/night cycle, by charging night-time consumption at lower rates than day-time consumption, then the peak demand for the generation and distribution system is brought down. The containment of peak demand is translated into smaller capacities required for the distribution infrastructure and also reduction in the demand for additional generation capacity.<br>The use of Solar Power Generated with the KBNIR shall be promoted. |
| | Operation | The electronic waste from the ICT Industries shall be sent to specialized recycling centers and then to secure landfill sites. |
| | Operation | The biological waste shall be disinfected and incinerated |

| Identified Impact Mitigation Measures | | |
|---|---|---|
| **Sl.No.** | **PHASE** | **MITIGATION MEASURES** |
| | Operation | It shall be strictly ensured that wastes generated from the industrial cluster are treated and disposed in accordance to the effluent disposal standards laid down by the Rajasthan State Pollution Control Board. |
| | | RESIDENTIAL LAND USE |
| | Operation | Even distribution of residential density ensures affordability of different housing forms and to result in an interesting urban landscape. In KBNIR the residential areas have varying density bands; high density (> 450 PPH) medium density (150-300 PPH) or low density (< 150 PPH)<br>The KBNIR is envisaged to have modern sewerage and drainage system as well as solid waste management facilities. All solid and liquid wastes generated would be effectively, collected, conveyed, treated and disposed in accordance to the prevalent environmental standards. |
| | | COMMERCIAL LAND USE |
| | Operation | The KBNIR has been designed to create linear commercial spaces to serve the varied needs of the communities and with an objective to decentralize development from high-growth areas. This shall result in dispersing the impacts as a result of high traffic volumes and congestion and associated increase in air and noise pollution.<br>It shall also minimize the disturbance to the surrounding residential communities. Further all commercial centers will be designed will specialized sanitation / waste management provisions to cater to the additional demand of the floating population apart from the city level services. |
| | | PUBLIC AND SEMI-PUBLIC LAND USE |
| | Operation | The Knowledge City & government offices areas have been locate at strategic locations that enhance their acceptability and usage. Green band of 100 meters |

| Identified Impact Mitigation Measures | | |
|---|---|---|
| **Sl.No.** | **PHASE** | **MITIGATION MEASURES** |
| | | on the outer radial of knowledge city is proposed to be developed. |
| | | OPEN SPACE AND RECREATIONAL PLAN |
| | Operation | The Development Plan promotes the creation of a hierarchy and network of open spaces **(City Parks, Neighbourhood Parks, green belts and conservation areas)** across the region to serve the varied aesthetic / recreational needs of the community and environmental protection. |
| C | | IMPACT SPECIFIC TO INFRASTRUCTURE |
| | | ROAD INFRASTRUCTURE |
| | Construction | It should be ensured that such aggregates are procured only from licensed quarries practicing controlled blasting and having adequate environmental safe guards. |
| | Construction | The topsoil shall be stripped to a specified depth of 150mm and stored in stockpiles. The stored topsoil will be utilized for top dressing of the road and embankments and slopes and also for development of the City Greens |
| | Construction | It should be made mandatory that groundwater is not used for road construction purposes. Water for construction will be sourced from perennial surface water sources and brought to the site through water tankers. |
| | Construction | Mitigation measures include siting of such plants away from settlements. Air pollution control equipment in terms of cyclone/scrubber to control emissions from the stack of hot mix plants will be provided in the event of the emissions exceeding the SPCB norms. Air quality will be seasonally monitored during the construction phase to ensure compliance with standards. All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the pollution emission |

| Identified Impact Mitigation Measures | | |
|---|---|---|
| **Sl.No.** | **PHASE** | **MITIGATION MEASURES** |
| | | levels conform to the SPCB norms. Vehicles delivering loose and fine materials like sand and fine aggregates shall be covered to reduce spills on existing roads. In addition, water will be sprayed on earthworks, temporary haulage and detour roads and material piles on a regular basis to reduce the dust generation. |
| | Construction | Timing of construction shall be regulated close to settlements. Movement of heavy machinery will not be permitted in high density residential areas. Noise monitoring will be carried out close to construction sites to ensure compliance with standards. Safety devices to be provided to construction workers. |
| | Construction | Construction Yards and material storage and disposal areas would be restricted within the premises of the area designated for the construction camps. |
| | Operation | The landscape development proposed as a part of the project in terms of turfing and tree plantation in linear greens (along roads, canals, etc.) , conservation areas (Aravalli Hills and Sahibi River banks) and also provision of large green lung spaces (City Greens) within the project area will greatly help in reducing the ambient concentration of air pollutants.<br>The seasonal air quality will be monitored at certain important junctions within the KBNIR. Any abnormal increase of air pollutants will be reported to the regulatory authorities (HPCB) and if required adequate mitigation will be initiated in consultation with the Board.<br>Additional measures being implemented by the Central Government (MoEF) would further reduce air pollution related to vehicle emissions. |
| | Operation | The sensitive receptors including residential areas, schools, colleges and hospitals, that are likely to be adversely affected as a result of the road development activity need to be identified At such locations certain mitigation measures will be provided in form of structural or vegetative barriers for the attenuation of noise levels based on more detailed impact assessment studies to be conducted at a later stage. |
| | | BUS BASED RAPID TRANSIT SYSTEM |
| | Operation | It shall be ensured that the buses plying in KBNIR are running on environmentally friendly fuels such as CNG. Tree plantation in the City Greens as part of the landscape strategy will help to attenuate the air pollution levels. The tree species suggested should include broad-leaved tree species, which can help settle particulates with their higher surface areas and thick foliage and reduce the distance for which particulates are carried from the road itself. Other measures include ensuring vehicular maintenance and up-keep, educating drivers about driving behavior / methods are also equally effective in reducing the pollutant levels.<br>To assess the likely concentrations at the various locations along the city, the prediction of the pollutant concentrations has to be carried out using Dispersion Models based on Gaussian Equation.<br>Based on the results of the simulation exercise further mitigation measures can be adopted / developed if required. |
| | Operation | A list of sensitive locations needs to be developed along the BRTS routes. These include prominent residential areas, education institutions, health care facilities, etc. At each of these locations it is necessary to predict the estimated noise levels with the proposed traffic using a Traffic Noise Prediction |

| Identified Impact Mitigation Measures | | |
|---|---|---|
| **Sl.No.** | **PHASE** | **MITIGATION MEASURES** |
| | | Model. Based on the results of the exercise mitigation measures can be designed in form of structural or vegetative noise barriers. |
| | Operation | Proper drainage arrangements shall be made and an Oil & Grease Trap shall be provided at the vehicle washing area. |
| | | PUBLIC TRANSPORT INFRASTRUCTURE [Bus Terminals &Bus Fleet] |
| | Operation | All passenger hubs shall be designed to include provision for adequate number of solid waste bins, toilets and wash rooms with proper drainage facilities, oil and grease interceptors, etc. |
| | Operation | It shall be ensured that the buses plying in KBNIR are running on environmentally friendly fuels such as CNG.<br>Tree plantation in the City Greens as part of the landscape strategy will help to attenuate the air pollution levels.<br>Ensuring vehicular maintenance and up-keep, educating drivers about driving behavior/ methods are also equally effective in reducing the pollutant levels.<br>To assess the likely air quality at the Passenger Hubs, prediction of the pollutant concentrations has to be carried out using Dispersion Models Similarly the estimated noise levels need to be predicted using a Traffic Noise Prediction Model.<br>Based on the results of the simulation exercise further mitigation measures can be adopted / developed if required. |
| | | WATER SUPPLY SYSTEM |
| | Design | Provide compensation as per existing Government statutes.<br>Plan and implement R&R as prescribed by Govt. Rajasthan |

| Identified Impact Mitigation Measures | | |
|---|---|---|
| **Sl.No.** | **PHASE** | **MITIGATION MEASURES** |
| | | Operation of Water Treatment Plant |
| | Operation | Establish workers operational safety & emergency procedures before plant startup<br>Providing periodic training and practice sessions on safe operational procedures<br>Installation of online detectors for Chlorine<br>Installation of Chlorine Scrubber Systems<br>Use of acoustic enclosures for high noise generating equipment<br>Routine and scheduled maintenance of machineries/equipments<br>Ensure proper use of PPEs by workforce and periodic rotation of workers |
| | | Water Distribution Network |
| | Construction | General Construction Stage Impacts Mitigation Measures to be similar to as described in Road Infrastructure Section (Construction) |
| | | Construction of Conveyance System resulting in: |
| | Construction | Plan and develop a community engagement process to enhance community awareness on health and safety.<br>Engage community in the identification of local cultural resources of importance<br>Identify and evaluate the possible risks to the local infrastructure and utility services<br>Formulate site specific management plans to address any possible impact on local infrastructure<br>Plan and schedule contractor operations taking into account peak hours of daytime<br>Implement dust control measures near residential and other sensitive areas<br>All vehicles will be having proper Pollution Under Control (PUC)Certificate<br>Select vehicles and equipment based on noise and vibration considerations |

| Identified Impact Mitigation Measures | | |
|---|---|---|
| **Sl.No.** | **PHASE** | **MITIGATION MEASURES** |
| | | Consultation and engagement with community during construction |
| | | Routine Maintenance of Conveyance System resulting in : |
| | Operation | Road users and local communities to be given prior intimation and alternate arrangements for traffic to be considered |
| | | SEWERAGE SYSTEM |
| | | Sewage Treatment Plan |
| | Construction | The STPs shall be located sufficiently away from the dense residential areas. In addition adequate vegetative buffers shall be provided around the odour producing units to minimise odour related impacts. |
| | Construction | Design to include appropriate sludge management and disposal methods. The sludge shall be either utilized as manure or disposed at designed sanitary landfill sites. |
| | Operation | Standard for treated effluent shall be strictly complied with. And it is to be ensured that untreated waste do not flow into the city greens and river bed. |
| | Operation | Strict implementation of the effluent discharge standards to be followed.<br><br>Periodic monitoring of the river water quality and the river bed sediment quality upstream and downstream of the discharge point to be undertaken, during the operation of the STP. |
| | Operation | Preparation of an occupational safety plan for work force to include:(i) Provision of appropriate protective gear to workers (ii) Training of workers on occupational safety including potential health effects of sludge handling |
| | | Sewerage Network |
| | Construction | Disposal sites of sufficient volume need to be |

| Identified Impact Mitigation Measures | | |
|---|---|---|
| **Sl.No.** | **PHASE** | **MITIGATION MEASURES** |
| | | identified. Material / waste storage and disposal areas shall be restricted within the premises of these pre designated sites |
| | Operation | An O& M Plan for regular inspection, cleaning and maintenance of sewers along with waste / debris management procedures to be developed and implemented. |
| | | POWER DISTRIBUTION SYSTEM |
| | Design | Tower location and line alignment selection shall be with respect to nearest dwellings. Setback of dwellings to line route shall be designed in accordance with permitted level of power frequency and the regulation of supervision at sites. |
| | Design | Plant enclosures will be designed to comply with noise regulations. Substations will be sited and designed to ensure noise will not be a nuisance |
| | Construction | Marking of vegetation to be removed prior to clearance, and strict control on clearing activities will be done to ensure minimal clearance. |
| | Construction | Construction techniques and machinery selection will be done seeking to minimize ground disturbances |
| | Construction | Construction activities on cropping land will be timed to avoid disturbance of standing crops (within one month of harvest wherever possible). |
| | Operation | Substation transformers will be located within secure and impervious sump areas with a storage capacity of at least 100% of the capacity of oil in transformers and associated reserve tanks. |
| | Operation | Careful design using appropriate technologies to minimise hazards. The other measures include (i) Security fences around substations (ii) Appropriate warning signs on facilities and (iii) Electricity safety awareness raising in project area |
| | | SOLID WASTE MANAGEMENT |

| Identified Impact Mitigation Measures | | |
|---|---|---|
| **Sl.No.** | **PHASE** | **MITIGATION MEASURES** |
| | | Transfer Station / Material Recovery Centres |
| | Design and Operation | The location of the TS/MRF has to be selected after assessing the compatibility with surrounding land uses. To the extent possible location of such facilities close to residential areas shall be avoided. Further the facilities shall be provided with adequate green buffer to minimise disturbance to adjoining land uses.<br><br>During operation a high standard of cleanliness shall be maintained along with efficiency of operations to ensure that waste is not stockpiled for long period. A prior schedule of movement of vehicles shall be prepared and strictly adhered to. |
| | | Compost Plants |
| | Design | The location of the Compost Plants has to be selected after assessing the compatibility with surrounding land uses. The locations should avoid residential areas as well as sites with high floral diversity. |
| | Operation | The entire region around the plant is predominantly dependant on agricultural activities. So demand for the manure can be expected to be significant. The manure produced from the plant will be used landscaping and regular maintenance of the huge network of the city greens. |
| | | Sanitary Landfills |
| | Design | The location of the Sanitary Landfills has to be selected after assessing the compatibility with surrounding land uses. The locations should avoid residential areas as well as sites with high floral diversity. |
| | Construction | Worker shall be provided with PPE's like dust masks to minimize the health impacts. Dust suppress in measures to be followed. |

| Identified Impact Mitigation Measures | | |
|---|---|---|
| **Sl.No.** | **PHASE** | **MITIGATION MEASURES** |
| | Operation | Design of leachate collection system through leachate pipes and pits. This will mitigate the impacts associated with leachate generation.<br>The leachate pits shall be emptied periodically by using vacuum pumps and tankers and carried to the nearest STP. |
| | | |

# 9 Institutional & Regulatory Framework

The success of any project lies on the sound institutional mechanism and the case of IR is no different. Even before the organizational structure for regulating, controlling and managing the IR is arrived at, it is important to carry-out the situation analysis of various concerned line departments and determine the functions that are to be performed by Development Agency for IR. This section of reports briefly analyses the prevailing legal framework, agencies[6] and their roles in development of Rajasthan and the consultant's recommendation on Institutional framework.

## 9.1 Legal Framework

Laws of land provide the necessary constitutional validity to the Institutional & governance framework for agency to perform its duties and thereby control and promote the development of the region. This necessitates a comprehensive analysis of prevailing legal options to see the feasibility of setting up development agency for IR within the prevailing legal framework. In Rajasthan, the prevailing legal framework promotes five models of Urban & Industrial development. This includes:

1) The Development Authority Model - a statutory agency of the State government (JDA);
2) The Urban Improvement Trust Model - a statutory agency of the State government;
3) The State Undertaking, a State owned company under the Companies Act; (RIICO)
4) The Special Economic Zone model, controlled and regulated by the Government, but developed and managed largely by the private sector, a kind of Joint Venture;
5) Industrial Area Development Authority Model - a statutory agency of the State government;
6) Municipal Corporation/ Municipal Model - a statutory agency of the State government;

These models are governed by several acts; in fact it is found that within the model there are different acts to govern different cities. For example, in Rajasthan, two development authorities have been created (Jaipur & Jodhpur) so far, however both are governed by two separate acts. For Jaipur Development Authority it's the Jaipur Development Authority Act – 1959, whereas Jodhpur development authority was created under Jodhpur Development Authority Act, 2009.

Similar, is the case with Municipal area, Municipality & Urban Improvement Trust both can perform municipal functions, thereby increasing the duplicity.

The Special Economic zone model, governed by SEZ act, is primarily for industrial areas focusing on exports and is generally covers a small size of area.

Another model is of state undertaking model, wherein a state owned company (RIICO) is created under the Companies Act with specific mandate to develop & facilitated the industrial infrastructure within the State.

In 1995, the government of Rajasthan enacted Industrial Area Development Authority Act. However, the act still remains to be implemented, as no industrial authority for any of industrial area has been set up so far. Thus, questioning the purpose of its enactment.

[6] The Government agencies/ department those are directly or indirectly involved in the development processes and likely to undertake/control development of IR.

The DMIC project aims to have a viable, marketable, free from encumbrances and influences, financially capable, transparent, structured and legally strong Investment Region Development Authority. Now, all this acts/ models, except for Municipal Act for its being purely for performing municipal functions, in there present form provide a legal option for creating a development authority for IR. The Consultant has undertaken a detailed analysis of all the acts providing legal options for their suitability towards creating a sustainable Industrial townships/ investment regions and is discussed hereunder.

## 9.2 Jodhpur Development Authority Act, 2009 (Model-1)

As discussed earlier, two separate acts govern the city region of Jaipur & Jodhpur. The Jaipur Development Authority act 1986 is more than 3 decade old and has undergone several amendments whereas Jodhpur Development Authority Act, 2009 is recently enacted. With the assumption that the Government of Rajasthan has incorporated all of its learning's on Jaipur Development Authority Act, 1986, while framing Jodhpur Development Authority Act 2009, the consultant has studied a very new & updated Jodhpur Development Authority Act 2009.

### 9.2.1 The Objective of the Act

"For forming Jodhpur City and certain contiguous areas into Jodhpur Region, to provide for the establishment of an Authority for the purposes of planning, co-ordinating and supervising the proper, orderly and rapid development of the Jodhpur Region and of executing plans, projects and schemes for such development and to provide for matters connected therewith".

### 9.2.2 Jurisdiction

The Jurisdiction of the Act extends to the area notified as areas under the Jodhpur Development Authority excluding municipal limits.

### 9.2.3 Provisions under the Act

The JDA act empowers the authority with following powers:
Self notification & preparation of development plan along with its control & regulations;
To control & prevent illegal developments which are not in conformity to as planned/ proposed within IR;

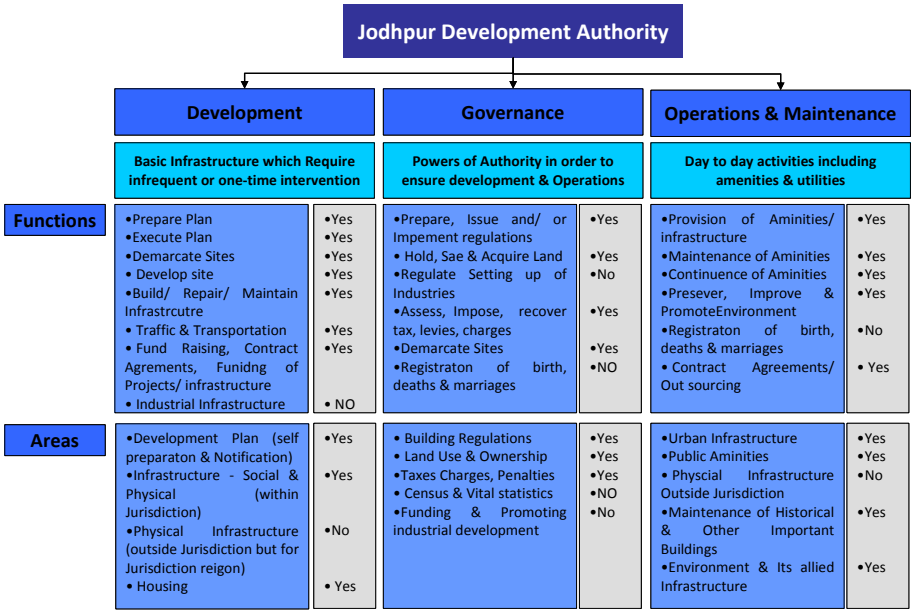
- to impose levies, fees, charges & taxes ,if any;
- to raise fund, fund projects;
- to enter into contracts for services & infrastructure creation;
- to acquire, sale & hold land;
- to create infrastructure, amenities & facilities within its jurisdiction;
- to protect, preserve, and conserve the environment and historical monuments & building of special importance;
- to manage & control traffic along with creation of necessary traffic and transportation infrastructure;
- to instruct other government department to create infrastructure/ provide facilities within its jurisdiction;
- to regulate development of existing village ababi areas;

However what it does not provide for is:

- to create (either by self or any other agency or private company) infrastructure outside the JDA jurisdiction but for Jodhpur City region;
- to create industrial infrastructure;
- to facilitate development of industries;
- to regulate setting up of industries;

- to create a special purpose vehicle for creation of infrastructure, amenities & facilities in order to promote PPP;
- to perform core municipal functions like
- census & vital information
- registration of birth, death & marriage
- development of rural industrial infrastructure agriculture produce storages, cold storage chains, etc

**Figure 9-1: Presents the summary of powers & functions of JDA**




### 9.2.4 The Organisational Structure of JDA

A Board oversees the overall functioning of the Authority. Minister-in-charge, Urban Development of the State of Rajasthan is the Chairman of the Board, while State Minister of Rajasthan for Urban Development is the Vice Chairman. Apart from Chairman and Vice-Chairman, there are 17 members, including Secretary, Urban Development, GoR, Jaipur Development Commissioner (JDC), Chairman, Rajasthan Housing Board, Chief Engineer, PHED, Chief Engineer PWD, Chief Engineer, RSEB, Chairman/ CEO, Jaipur Municipal Council, Zila Pramukh, Zila Parisad, Jaipur District, Chief Town Planner, Rajasthan and 7 non-official members appointed by State Government.

Under the Board, there is a 15 member's executive committee, which is chaired by JDC. The Members are heads of the various departments of the Authority, representatives of State Line Departments, Jodhpur Police, Jodhpur Municipal Corporation and state owned companies.

Powers and functions of the Authority and Executive Committee are defined in the JDA Act.

There are six departments in JDA namely; Engineering, Finance, Planning, General Administration, Law and Special Projects and are headed by Directors. The Engineering section takes care of public works, water supply, solid wastes, etc. JDA area is divided into zones. Each Zone is administered by a Deputy Commissioner, under the engineering department.

There is a Land Acquisition Officer on deputation. The land acquisition acquires land; on behalf of Government of Rajasthan for JDA, and after acquisition transfers the land to JDA.

### 9.2.5 Conclusion:

It is clear from the objective as well as the provisions of the Act that the Act is primarily for planning, co-ordination & supervision of development of Jodhpur city region; however it excludes the activities related to development of industries and industrial infrastructure – the prime objective of DMIC induced Investment Region Project. For this reason, though the act is well equipped to deal with development of city region which also is required for proper development of IR, it is not the suitable legal option for formation of IR Development Agency. Unless an act similar to Jodhpur Development Authority Act 2009, with the additional provisions enabling development of Industries & industrial infrastructure, i.e promote, regulate, enable and facilitate industrial development as well as creation of infrastructure outside IR for IR, is enacted for the Investment Region. This act than could be replicated to entire DMIC sub-region of Rajasthan.

## 9.3 Rajasthan Urban Improvement Act, 1959 (Model-2)

The Govt of Rajasthan in order to facilitate improvement and expansion of the urban areas within the State, in 1959, enacted "The Rajasthan Urban Improvement Act, 1959" - the second available legal options for creating development agency for IR.

### 9.3.1 Jurisdiction

The Jurisdiction of the Act extends to the area notified as areas under the Urban Improvement Trust for the urban area as declared by the Government; it may or may not exclude municipal limits. Further, the state government may, instated of creating UIT for an urban area, entrust with additional responsibility of existing UIT of nearing urban centre.

### 9.3.2 Provisions under the Act

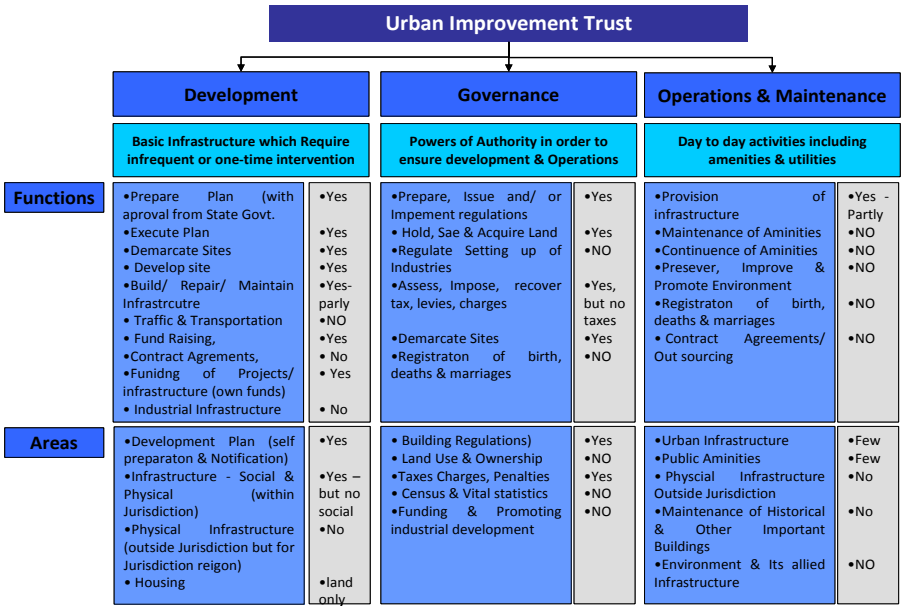
The Jurisdiction of the Act extends to the area notified as areas under the Urban Improvement Act 1959. The UIT act empowers the Trust with following powers:

- To prepare master plans for the development of urban areas in accordance with procedure laid down in Act. The approval of the master plan for the urban area is to vest with State Government;
- to lay down the purpose for which particular site or plot of land shall be use namely for industrial, residential, or other social infrastructure purpose or any specified purpose in such area
- To prepare town planning schemes for urban improvement within its jurisdiction;
- to regulate the erection of structures, buildings and development of land;
- to enter into any land or building with or without assistance;
- To control & prevent illegal developments which are not in conformity to as planned/ proposed within IR;
- to demarcate and develop sites as per the town planning scheme;
- to impose levies, fees and charges;
- to impose penalty and mode of recovery;
- to raise fund, fund projects;
- to acquire, sale & hold land;
- to create amenities & facilities within its jurisdiction;
- to acquire land and other properties under and in accordance with the provisions of the Act and land acquisition act, 1894;
- to provide urban infrastructure for including water supply sewerage, removal of waste, but excluding transport, electricity, etc
- to officiate and transfer either by way of sale or lease or otherwise plots of land, structures, buildings or any other properties for commercial, residential and other social infrastructure purposes;
- powers in respect to transfer of land;
- power to government to make rules and to authority to make regulations;
- promote urban housing

### 9.3.3 Conclusion

The prime objective of the act is to create a Trust for improvement and expansion of urban areas, and thus focus is on master plan preparation, improvement schemes, town planning schemes and create related infrastructure. *Trust model for development of IR would not be feasible for its limitations to enter into agreements/ contracts for creating infrastructure on PPP basis, promote/ facilitate setting up of industries, co-ordination with other agencies, create infrastructure outside its jurisdiction, etc.*

**Figure 9-2: Presents the summary of powers & functions of UIT**




## 9.4 RIICO under Companies Act (Model -3)

Rajasthan State Industrial Development and investment corporation ltd. (RIICO) is a company incorporated under The Companies Act, 1956 and is governed by a) Memorandum of Association for Rajasthan State Industrial Development and Investment Corporation Ltd, b) Articles of Association for Rajasthan State Industrial Development and Investment Corporation ltd, c) RIICO, Disposal of land rules 1979 (amended till date), d) The Rajasthan Industrial Area Development Authority Act, 1995 and e) The RIICO Industrial Areas (Prevention of Un-Authorised Development and Encroachment) Act, 2002. Majority of shares of RIICO are with state government thereby making RIICO a government undertaking company.

RIICO is, the sole government agency in the State involved in development of land for industrial enterprises. Large, medium and small-scale projects get an easy access to a ready -to- use base with supportive infrastructure and facilities in the industrial areas developed and managed by RIICO.

It may be noted that the jurisdiction of RIICO is limited to areas notified as Industrial Land Use in Master Plan/ Development Plan for any region and/ or the area outside development plan but acquired by RIICO for setting up industrial estate/ park or industrial area. Hence the power & functions accorded to it are limited to these areas only – a big limitation if this legal option for creating an independent development agency for IR is to be created.

### 9.4.1 The structure

RIICO is a company limited by shares. The stakeholders are IDBI and Government of Rajasthan. RIICO, formerly Rajasthan State Industrial and Mineral Development Corporation Limited (RSIMDC) incorporated in 1969 was formed under the Companies Act, 1956 in year 1980 and changed name to RIICO on December 1979.

RIICO functions under the "Memorandum of Association of Rajasthan State Industrial Development and Investment Corporation limited", and "Articles of Association of the Rajasthan State Industrial Development and Investment Corporation limited" under The Companies Act 1956 and the amendments to it from time to time.

There is a Board of Directors at the top. The number of members is decided by the State Government. The board is headed by the Chairman, who is generally the Minister in charge of Industrial Development for the State. The Managing Director oversees the functioning of RIICO and its 26 branch offices. To assist him, there are General Managers and Advisors, who are the heads of 7 departments. The Departments include Personnel, Finance, Infrastructure, Industrial Development and Business Promotion, Follow-up and Recovery, Projects and Inspection and Information Technology. Head of the Departments are assisted by Asst GM, / Sr. DGM, DGM/ Managers and Dy GM.

The Head office of RIICO is at Jaipur. There are in all 26-branch offices of RIICO in Rajasthan, headed by Senior Regional manager (SRM). SRM is assisted by Regional Manager and deputy regional managers. Below regional offices there are site offices, and are headed by managers. The regional and branch offices are divided into technical sections and administration sections.

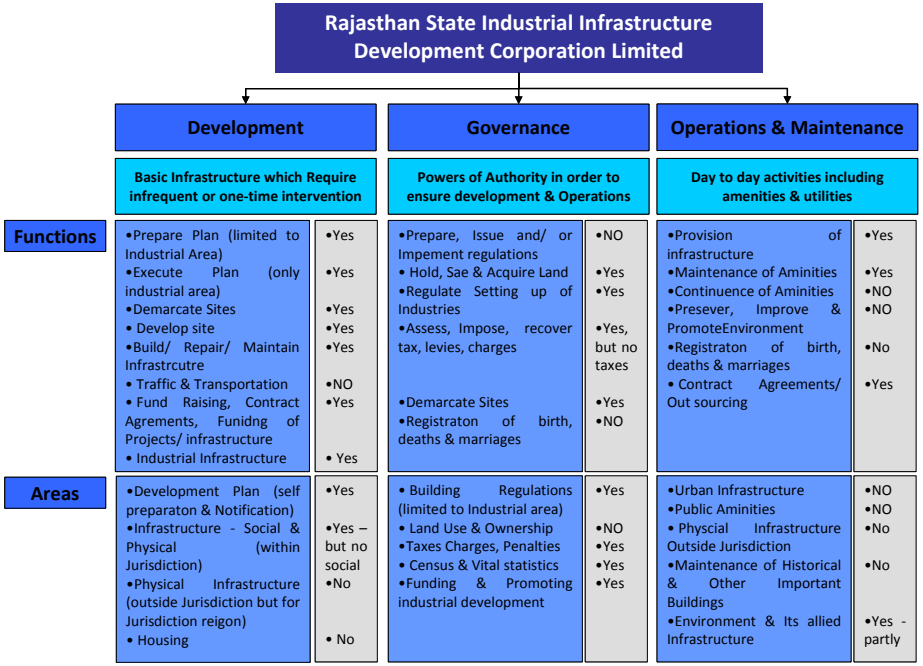
RIICO's Planning wing does the physical and infrastructure planning for the RIICO industrial estates and parks.

### 9.4.2 The objective & function

The objective of the Incorporation of RIICO is to, as following:

- Promote, establish and execute industries, projects or enterprises for material or any substance which are likely to promote industrial development of Rajasthan.
- Promote and create schemes for industrial development of Rajasthan.
- Promote and establish companies or associations for implementation of industries / projects leading to industrial development of Rajasthan.
- Carry out explorations and studies to formulate strategy for industrial development of Rajasthan.
- Carryout Merchant Banking Activities and to set up, promote, mutual funds, asset management companies, venture capital fund etc.
- Provide financial assistance to projects/ industries related to tourism, agro industries, etc
- Provide developed land and infrastructure facilities to industries / companies to set up their business/ industries in Rajasthan.

**Figure 9-3: Presents the summary of powers & functions of RIICO.**




### 9.4.3 Conclusion

RIICO has excellent track record in planning, developing and managing industrial areas/ estate as well as facilitate and fund setting up industries/ business across the State. However, have no experience in developing and managing large scale city regions. Above all, RIICO is a public enterprise within no statutory/ constitutional backing. It is for this reason, the role of RIICO could be to continue with its current functions and facilitate and work closely with IR development agency in promoting & developing Industrial areas within IR. It could as well be a project advisory to the IR development Authority.

## 9.5 Rajasthan Special Economic Zone Act

The Government of Rajasthan enacted Special Economic Zones (SEZ) Act on 10.09.2003 and framed SEZ policy. The prime objective of the Government is to develop specially delineated economic zones conforming to the guidelines of the Government of India to provide enabling infrastructure and a hassle free environment to promote exports from the State. Special emphasis will be laid on development of product specific SEZs to harness inherent potential of the State in the fields of Gems & Jewellery, Handicrafts, Woollen Carpets etc. which would result in increase in exports of these commodities with high value addition. The State Government has also worked out a package of concessions and incentives for SEZ developers and units to be set up in the SEZ.

## 9.6 Rajasthan Industrial Area Development Authority Act

The Government of Rajasthan in 1995 enacted Rajasthan Industrial Area Development Authority Act, to constitute the Authority for the planned and integrated development of the industrial and urban townships within the State.

### 9.6.1 Jurisdiction

The Jurisdiction of the Act extends to the area notified as Industrial Area as declared by the Government; it may or may not exclude municipal limits. Further, the state government may, instated of creating UIT for an urban area, entrust with additional responsibility of existing UIT of nearing urban centre.

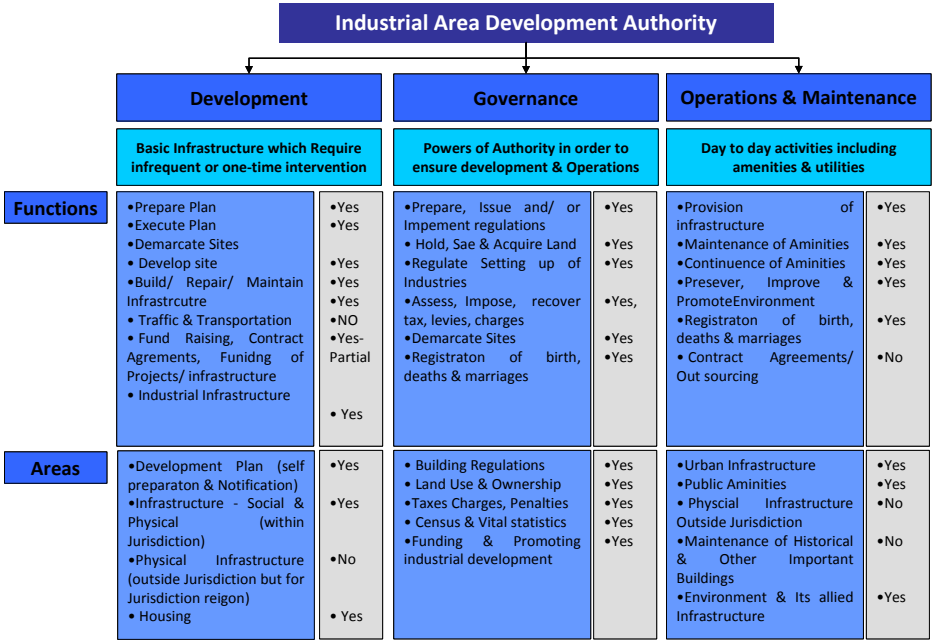
### 9.6.2 Provisions under the Act

The act proposes to create a Industrial Development Authority (IDA)/ Authorities for the Industrial Area/ areas across the State to secure the planned development of the Industrial Area and further delegates functions and powers of the IDA as listed hereunder.

- to acquire land and other properties in the industrial area, under and in accordance with the provisions of the land acquisition act, 1894;
- to prepare plans for the development to industrial area;
- to demarcate and develop sites for industrial, commercial, residential and other social infrastructure purposes according to the plans;
- to provide infrastructure for industrial commercial, social and residential purposes;
- to provide civic amenities including transport, electricity, water supply, housing, sewerage, removal of waste, etc;
- to provide for common facilities for industry such as testing centres, tool room facilities, raw-material depots, training, etc
- to officiate and transfer either by way of sale or lease or otherwise plots of land, structures, buildings or any other properties for industrial, commercial, residential and other social infrastructure purposes;
- to regulate the erection of structures, buildings and setting up of industries
- to lay down the purpose for which particular site or plot of land shall be use namely for industrial, residential, or other social infrastructure purpose or any specified purpose in such area
- powers in respect to transfer of land;
- power to levy of charges & fees;
- impose penalty and mode of recovery;
- power enter into any land or building with or without assistance;
- power to government to make rules and to authority to make regulations;
- No interference by other local bodies in the functions of authority; and
- Transfer of industrial area developed to RIICO to authority;

The act, apart from above power & functions delegated to Authority, in parallel, allows RIICO to continue to own & develop the industrial areas till such time the industrial areas are fully or substantially developed. It also provides for that all new industrial areas to be developed by Public Sector would be owned and developed by RIICO in the first instance as an industrial catalyst.

**Figure 9-4 : Presents the summary of powers & functions of Industrial Area Development Authority.**




### 9.6.3 The Structure

The act do not divulge much details of the structure of the Authority, apart from the Constitution of 15 member Authority chaired by Secretary to Govt. of Rajasthan, Industries Department , as is the case in Jaipur

Development Authority. Wherein, the Act clearly defines the constitution of Authority, committees and functions of various functionaries.

### 9.6.4 Conclusion

As mentioned earlier, the act still remains to be implemented, as no industrial authority for any of industrial area has been set up so far. Further, to the Consultants understanding, the idea was mooted to create a single agency for developing & managing Bhiwadi industrial area. However, the presence of Urban Improvement Trust - Bhiwadi and RIICO, which would have resulted in multiple agency jurisdiction, lead to bereavement of Act.

The Act, though provides for the functions & powers that are required for IR development agency, it still has certain short comings–a) Who would notify the development plan for Investment Region, b) Power to enter into contract agreements, fund raising, funding industrial infrastructure projects within and outside (but required for) the industrial area, c) Formulate town planning schemes for the development plan area, d) Fund industries/ business to start business and e) Create, manage & operate traffic & transportation infrastructure are few to identify.

The Act could provide for the legal options for creating an agency, if the scope of the act is expanded further and Industrial Authority, so created, is delegated with the powers that are described in Jodhpur Development Authority Act, 2009 and Urban Improvement trust act, 1959. To establish a strong and viable Industrial Area Development Authority under such refined Industrial Area Development Authority Act.

## 9.7 Rajasthan Municipalities Act, 2009 (Model -6)

The review of Municipalities Act 2009 is important in the context of Article 243Q of Constitution of India, as it provides for setting up of Industrial Authority in lieu of Urban Local Body. The Section 3, 4 and Section 5 empowers government to de-notify municipalities; exempt municipal area from operation of any provisions of the Act unsuited thereto and exempts establishment and incorporation of municipality in certain urban areas respectively.
The wording of provision under clause 3 of Section 5 pertaining to exemption of constitution of municipality is

In every larger urban area, there shall be established a municipal corporation and every such municipal corporation shall be a body corporate by the name of the municipal corporation of the city by reference to which the municipality is known and shall have perpetual succession and a common seal and may sue and be sued in its corporate name.

Provided that a municipality under this section may not be constituted in such urban area or part thereof as the Governor may, having regard to the size of the area and the municipal services being provided or proposed to be provided by an industrial establishment in that area and such other factors as he may deem fit, by notification, specify to be an industrial township."

The provision under these sections of Municipalities Act paves the way for declaring Investment Region as an industrial area and at the same time delegating municipal functions to the development authority of Industrial Area.

## 9.8 Comparing Prevailing Models

A comparative analysis of powers & functions of prevailing models (excluding SEZ model & Municipal Act Model) is provided in **Table 9-1**.

**Table 9-1: Comparative Analysis of Prevailing Models**

| Comparative Analysis of Prevailing Models | | | | |
|---|---|---|---|---|
| **Heads** | **JDA** | **UIT** | **RIICO** | **IADA** |
| Legal Framework | Under Legislative Act | Under Legislative Act | State Undertaking (under Companies Act) | Under Legislative Act |
| Jurisdiction | Limited to Designated City | All Urban Areas (except for Corporations) | Entire State | Apply to entire State but limited to specific/ designated area excluding RIICO Developed Industrial Areas |
| Development - Functions | | | | |
| Prepare Plan | Yes | Yes - with State Approval | Yes - Limited to Industrial Area | Yes |
| Execute Plan | Yes | Yes | Only Industrial Area | Yes |
| Demarcate Site | Yes | Yes | Within Industrial Area only | Yes |
| Develop Site | Yes | Yes | Within Industrial Area only | Yes |
| Build, Repair & Maintain Infrastructure | Yes | Yes- Partly | Within Industrial Area only | Yes |
| Traffic & Transportation | No | No | No | No |
| Fund Raising, Contract Agreements, Funding of Projects/ Infrastructure, etc | Yes | No | Yes - Limited to Industrial Area | Yes but limited |
| Industrial Infrastructure | No | No | Yes | No |
| Development Areas | | | | |
| Development Plan (self preparation & Notification) | Yes | Only upon State Directive | Yes | Yes |
| Infrastructure - Social & Physic al (within Jurisdiction) | Yes | Physical Infra only | Physical Infra only | Physical Infra only |
| Physical Infrastructure (outside Jurisdiction but for Jurisdiction Region) | No | No | No | No |
| Housing | Yes | Land Only | No | Yes |
| Governance Functions | | | | |
| Prepare, Issue and/ or Implement Regulations | Yes | Yes | No | Yes |
| Hold, Sale, Acquire Land | Yes | Yes | Yes | Yes |
| Regulate Setting Up of Industries | No | No | No | Yes |

| Comparative Analysis of Prevailing Models | | | | |
|---|---|---|---|---|
| **Heads** | **JDA** | **UIT** | **RIICO** | **IADA** |
| Assess, Impose, Recover Taxes, Levies, Fees, Charges | Yes | Yes - No Taxes | Yes - No Taxes | Yes - No Taxes |
| Demarcate Site | Yes | Yes | Yes - Limited to Industrial Area | Yes |
| Registration of Birth, Deaths & Marriages | No | No | No | No |
| Governance Area | | | | |
| Building Regulations | Yes | Yes | Yes - Limited to Industrial Area | Yes |
| Land Use & Ownership | Yes | No | No | Yes |
| Taxes, Charges, Penalties | Yes | Yes | Yes | Yes |
| Census & Vital Statistics | No | No | No | No |
| Funding & Promoting Industrial Development | No | No | Yes | Yes |
| O&M Functions | | | | |
| Provision of Infrastructure | Yes | Partly | Limited to Industrial Area & Industries Related Infrastructure | Yes |
| Maintenance of Amenities | Yes | No | No | Yes |
| Continuance of Amenities | Yes | No | No | Yes |
| Preserve Improve & Promote Environment | Yes | No | No | Yes |

| Comparative Analysis of Prevailing Models | | | | |
|---|---|---|---|---|
| **Heads** | **JDA** | **UIT** | **RIICO** | **IADA** |
| Registration of Birth, Deaths & Marriages | No | No | No | Yes |
| Contract Agreements/ Out Sourcing of Functions | Yes | No | No | No |
| O&M Areas | | | | |
| Urban Infrastructure | Yes | Few | Few | Yes |
| Public Amenities | Yes | Few | Few | Yes |
| Physical Infrastructure Outside Jurisdiction | No | No | No | No |
| Maintenance of Historical & Other Important Buildings | Yes | No | No | No |
| Environment & Its Allied Infrastructure | Yes | No | Yes (as part of physical infrastructure) | Yes |
| | | | | |

## 9.9 Proposed Rajasthan Infrastructure Development Act

The Consultant, during its interactions with state machinery, is given understanding that the Government of Rajasthan is in process to enact the Rajasthan Infrastructure Development Act, which is similar to Infrastructure development act enacted by Government of Gujarat and Government of Andhra Pradesh.

The objective of act is to establish a board to promote public private partnership in the infrastructure sector thereby facilitating development of

Infrastructure and ensuring coordination among various government agencies in the state.

The act proposes to create a Board and that the board would be the apex body in the State for development of Infrastructure through public private partnership. The act further delegates functions and powers of the Board as listed hereunder. It may be noted that provisions referred hereunder are of tentative nature and may vary with the provisions of the Act as and when enacted.

**Functions of the Board:**
The function of the board proposed under the Act is likely to have following functions, as similar to Gujarat Infrastructure Development Act:

- to promote and facilitate Development of Infrastructure projects in the state
- to identify, conceptualise, prioritize infrastructure projects and approve Concessions and state support and monitor and facilitate development of infrastructure projects
- to co-ordinate efforts of the "public infrastructure agency (PIA) – primarily government department, agencies, local authorities, etc" for development of infrastructure in the state;
- to formulate policies and guidelines, Including parameters for grant of concessions, state support, Amount of concession fees payable by the concessionaire, etc. for development of infrastructure projects and advise the public infrastructure agencies on related matters
- to monitor and review progress of implementation of infrastructure projects and make suitable intervention or recommendations for removal of difficulties
- to administer funs created under the provisions of this act
- to give recommendations to the state government for making new policies and scheme sand suggest required amendments in the existing policies, schemes and legislations within respect to the infrastructure development in the state and
- to perform such other functions as may be entrusted to I by the state government

**Powers of the Board:**
Apart from the powers entrusted to the Board to perform functions delegated to it by the act, the act likely to specify following power of the Board:

- to approve development of infrastructure projects requiring grant of concession or state support;
- to give binding directions to any PIA with regards to development of any infrastructure project;
- to call upon any PIA to furnish information, statistics, details, documents and particulars as desired by the Board w.r.t. infrastructure project;
- to inspect, monitor, visit and review the progress of infrastructure project;
- to draw, issue, accept and to endorse, discount and negotiate promissory notes, hundies, and other negotiable or commercial or mercantile or transferable instruments connected with the business of the board;
- to invest and deal with the monies of the board
- to negotiate and enter into contract or arrangement for the more efficient business conduct of the Board
- to borrow and raise monies with or without security by issuance of bonds, debentures, loans or such other instruments as it may deem fit and to receive monies from Indian or foreign source and deposit the monies at interest or otherwise
- To delegate powers and functions to the functionaries of the Board

**Conclusion**
The agency responsible for development of IR shall have functions and power that are proposed for the Infrastructure Board that is to be created under the proposed Rajasthan Infrastructure Development Act.

## 9.10 Institutions Present in IR

The Key Institutions/ Agencies/ Department Present in the delineated IR along with their purpose/ function is as presented in **Table 9-2**.

**Table 9-2: Institutions, Structures and Objectives**

| Institutions, Structures and Objectives | | |
|---|---|---|
| **Name of Institution** | **Structure** | **Objective/ Purpose** |
| Rajasthan State Industrial Infrastructure Development Corporation Limited | Government of Rajasthan Undertaking under Companies Act (performing under the Rajasthan Industrial Area Development Authority Act, 1995. | Site selection and Acquisition of land<br>Financial assistance to smalls medium and large scale projects<br>Equity participation in large projects on merit<br>Technical consultancy for project identification and technical tie up<br>Escort services ,facilitation of government clearances<br>Merchant banking and financial tie -ups<br>Extending incentives and concessions according to the policy of State Government<br>Providing financial assistance by way of term loans, equipment re-finance/equipment leasing and working capital.<br>Industrial Infrastructural development in the State of Rajasthan.<br>Performing Agency functions for entrepreneurs and established industries for enhancement of capacity/modernization |
| Urban Improvement Trust – Bhiwadi | Urban Improvement Trust under the UIT Act, 1959 | To promote and secure development of urban areas in a systematic and planned way with the power to acquire sell and dispose off property, both movable and immovable.<br>Development of acquired land for residential, industrial, recreational and commercial purpose.<br>To make available developed land to Rajasthan Housing Board and other bodies for providing houses to economically weaker sections of the society, and<br>To undertake building works. |
| Urban Development & Housing Department | Government Department (Functions under purview of Rajasthan Urban Improvement Trust Act 1959, and Rajasthan Municipal Act, 2010 | Function performed by the department are as prescribed under Rajasthan Urban Improvement Act, 1959 [Act No. 35 of 1959] and Rajasthan Municipal Ac. Rajasthan as such doesn't have Town & Country planning act till date and the jurisdiction of this acts is limited to area brought/ notified by the department under this acts. |
| Urban Local Bodies (Behror Municipality) | Created under 73rd & 74th Constitutional Amendment Act | Functions as mentioned in Twelfth Schedule of Constitution of India.<br>Urban planning including town planning.<br>Regulation of land-use and construction of buildings.<br>Planning for economic and social development.<br>Roads and bridges.<br>Water supply for domestic, industrial and commercial purposes.<br>Public health, sanitation conservancy and solid waste management.<br>Fire services.<br>Urban forestry, protection of the |

| Institutions, Structures and Objectives | | |
|---|---|---|
| **Name of Institution** | **Structure** | **Objective/ Purpose** |
| | | environment and promotion of ecological aspects.<br>Safeguarding the interests of weaker sections of society, including the handicapped and mentally retarded.<br>Slum improvement and upgradation.<br>Urban poverty alleviation.<br>Provision of urban amenities and facilities such as parks, gardens, playgrounds.<br>Promotion of cultural, educational and aesthetic aspects.<br>Burials and burial grounds; cremations, cremation grounds and electric crematoriums.<br>Cattle pounds; prevention of cruelty to animals.<br>Vital statistics including registration of births and deaths.<br>Public amenities including street lighting, parking lots, bus stops and public conveniences.<br>Regulation of slaughter houses and tanneries<br>**Note:** Devolution of functions and functionaries to ULBs is for implementation of Twelfth schedule, sole discretionary powers are vested with state government and all functions as per twelfth schedule may not necessarily been transferred to ULBs (Table 74) |
| Public Health Engineering Department | Government Department | Piped Drinking Water Supply in Villages.<br>Piped Drinking Water Supply & Sewerage Facilities in Towns.<br>Storm Water Disposal in Towns. |

| Institutions, Structures and Objectives | | |
|---|---|---|
| **Name of Institution** | **Structure** | **Objective/ Purpose** |
| | | Construction of Sewage Treatment Plants.<br>Sanitary Installations & Amenities in Government Buildings |
| Public Works Department | Government Department | Public works department primarily executes following development works:<br>Design, Construction, Maintenance & Repair of Government buildings.<br>Design, Construction, Maintenance & Repair of Roads & Bridges.<br>Undertaking Deposit Contribution works of various Departments, Local Bodies & other<br>For Agencies<br>Relief works in the event of Natural calamities like famine, flood, earthquakes et al.<br>D.R.D.A. Works like Employment Assurance Scheme (EAS) etc.<br>Assessments of rent of private premises requisitioned for housing Govt. offices.<br>Design, construction, maintenance and repairs of airport runway relating to the State Government.<br>Development and maintenance of Public Parks and Gardens in important Public Buildings.<br>Up keeping of Govt. Rest House and Circuit Houses.<br>To permit construction of approaches on both sides of roads to private individual, other institutions, factories, Petrol Pumps etc.<br>To evacuate the encroachment coming along the road sides. |

| Institutions, Structures and Objectives | | |
|---|---|---|
| **Name of Institution** | **Structure** | **Objective/ Purpose** |
| | | Issue of certificates periodically to Cinema Houses about stability of structures/ arrangement related to electrical fittings conforming to Cinema Regulation Act. Plantation of trees along both sides of the road. |
| Rajasthan State Road and Bridges Development Corporation | Government of Rajasthan Undertaking under Companies Act | To construct, erect, build, re-model, repair, execute, develop, improve, administer, manager, control, maintain, demolish, grade, curve, pave, macadamize, cement, highways, expressways, roads, paths, streets, bridges, sideways,, bye-passes, tunnels, pavements, reclamation, improvements, road over bridges, road under bridges, underground roads, or any other structural or architectural work and also to do other similar construction, leveling or paving work at present being a part of the activity of the Rajasthan Public Works Department on Build-Operate and Transfer (BOT) or Build-Own-Operate and Transfer (BOOT) or Build-Operate-Lease and Transfer (BOLT) basis/or on any other Scheme in a manner which will facilitate to undertake the above mentioned work. |
| Rajasthan State Road Transport Corporation | Government Undertaking formulated under Road Transport Act 1950. | The corporation's main objectives are:- To provide efficient, adequate, economical, safe and well coordinated passenger transport service. Through the development of transport facility. To provide essential public transport services both within the State as well as to important destinations in the neighboring |

| Institutions, Structures and Objectives | | |
|---|---|---|
| **Name of Institution** | **Structure** | **Objective/ Purpose** |
| | | States |
| Rajasthan Housing Board | Special purposed authority created under Rajasthan Housing Board Act (Act No. 4 of 1970) | The main objective of the Board is to construct houses for allotment to the public in accordance with the guidelines issued by the State Government and the prescribed procedure. The emphasis is to construct houses for socially and economically weaker sections of the society. |
| Rajasthan Rajya Vidyut Prasaran Nigam Limited (RVPN) | A company under the Companies Act, 1956 and conferred the status of State Transmission Utility under Electricity Act, 2003 | Govt. of Rajasthan under the provisions of the Rajasthan Power Sector Reforms Act, 1999 as the successor company of RSEB. The RERC has granted RVPN a license for transmission and bulk supply and to function as<br><br>RVPN owns, builds, maintains and operates the high-voltage electric transmission system that helps to keep the lights on, businesses running and communities strong.<br>RVPN has following duties and responsibilities:<br>• Intra state transmission of electricity through Intra-State Transmission System<br>• Planning and co-ordination relating to intra-state transmission with all concerned agencies such as CTU, State Govt., generating companies, licensees, Regional Power Committees etc.<br>• Ensuring development of an efficient, co-ordinated and economical system of intra-state transmission of electricity from generating stations to Load Centres. |

| Institutions, Structures and Objectives | | |
|---|---|---|
| **Name of Institution** | **Structure** | **Objective/ Purpose** |
| | | • Non-discriminatory Open Access to its transmission system on payment of transmission charges<br>• Complying with the directions of RLDC and SLDC, operating SLDC until any other authority is established by the State Govt. |
| JAIPUR VIDYUT VITRAN NIGAM LIMITED | Government Undertaking under Companies Act and conferred the status of Distribution Company under Electricity Act, 2003 | Power transmission and distribution within 12 districts of Rajasthan, including Jaipur, Dausa, Alwar, Bharatpur, Dholpur, Kota, Bundi, Baran, Jhalawar, Sawaimadhopur, Tonk and Karoli.. This includes creation of and related infrastructure. |
| Rajasthan Rajya Vidyut Utpadan Nigam Ltd | Government Undertaking under Companies Act and conferred the status of Generation Company under Electricity Act, 2003 | Setting up power generation plants within Rajasthan and outside state as well as operation & maintenance of state owned power stations |
| Irrigation Department | Government Department (performing function under The Rajasthan Irrigation and Drainage Act, 1954) | Construction of major, medium and minor irrigation projects, operation and maintenance of existing tanks, canals and other irrigation structures are the prime function of the Irrigation Department.<br>Flood control measures and floods related remedial measures are also assigned to the Irrigation Department. |

| Institutions, Structures and Objectives | | |
|---|---|---|
| **Name of Institution** | **Structure** | **Objective/ Purpose** |
| | | Construction of irrigation structures under various special schemes like Jawahar Rojgar Yojana, Employment Assurance Scheme, FRW, TADA etc. are entrusted to the Irrigation department.<br>Collection of revenue pertaining to sale of water from tanks irrigating more than 1000 ha. of land is done by the Irrigation Department. However, collection of irrigation charges in respect of tanks Engineering irrigating less than 1000 ha. is assigned to the Patwaries of the Revenue Department.<br>Investigation, Design and Research work<br>Construction and maintenance of the rest houses of irrigation department, office buildings, residential buildings of the staff, gardens, parks, roads etc.<br>The cadre strength of Irrigation and Indira Gandhi Nahar Organisation are being managed by the Irrigation Department.<br>Flood Protection, Drainage for rural areas and Anti-water logging works construction and maintenance thereof;<br>Investigation and formulation of Irrigation Schemes for 5- Year Plans, and future Plans;<br>All matters relating to Irrigation Revenue and Betterment Levy;<br>Inter-State matters- SYL Canal, Upper Yamuna Board; Inter-State Water Disputes;<br>Preparation and implementation of Ground Water Recharge Schemes; |

| Institutions, Structures and Objectives | | |
|---|---|---|
| **Name of Institution** | **Structure** | **Objective/ Purpose** |
| | | Land acquisition and payment of compensation for the purpose of Irrigation Projects,<br>The functions of Irrigation Branch enumerated above will include: (i) Storage of water i.e. conserving extra surface run-off by constructing dams, weirs, barrages, reservoirs; (ii) Equitable distribution of water for irrigation, State drinking water supply schemes and industrial use; (iii) Rotational programme of supply of water to the farmers i.e.warabandi, and (iii) Measures to tackle drought. |
| Rajasthan State Financial Corporation | Set up under an Act of Parliament known as State Financial Corporation's Act 1951 | The Corporation meets the credit/ long term financial needs of small /medium scale industrial units Nursing Homes, Hotels, Amusement Parks, Complexes, Software Development/E-commerce, Vehicles etc by advancing term loans primarily for the purpose of acquiring fixed assets such as land, building and plant & machinery. |
| Rajasthan Small Industries Corporation Ltd. | Government Undertaking under Companies Act | Corporation is performing multifarious activities for the promotion of small scale industries & rural industrial units in the State of Rajasthan. The main activities undertaken by the Corporation are as under:<br>Raw material distribution<br>Marketing assistance to SSI units<br>Export assistance to SSI units<br>Emporia<br>Product Sale Outlets/ Showrooms<br>Training |

| Institutions, Structures and Objectives | | |
|---|---|---|
| **Name of Institution** | **Structure** | **Objective/ Purpose** |
| | | Infrastructural facilities |
| Central Ground Water Authority | | (i) Exercise of powers under section 5 of the Environment (Protection) Act, 1986 for issuing directions and taking such measures in respect of all the matters referred to in sub-section (2) of section 3 of the said Act.<br>(ii) To resort to penal provisions contained in sections 15 to 21 of the said Act.<br>(iii) To regulate and control, management and development of ground water in the country and to issue necessary regulatory directions for the purpose.<br>(iv) Exercise of powers under section 4 of the Environment (Protection) Act, 1986 for the appointment of officers. |
| District Rural Development Authority | Government Department | Implementation of State & Central funded anti-poverty schemes at District level. |
| Rajasthan State Real Estate Development Council (RAJREDCO) | Established and Registered under Co-Operative act and is an apex state level self-regulatory body, affiliated by National Real Estate Development Council. | It represents all spheres of enterprises, engaged in various aspects of real estate and infrastructure development. These include land development, layouts, planning, construction of residential, commercial, industrial and institutional buildings / complexes, development of townships, provision of urban infrastructure (roads, electricity, agriculture, irrigation, drainage, sewerage, water- supply, public transport, tourism & heritage, telecommunication etc.) and social infrastructure (recreational, educational and medical facilities). |

| Institutions, Structures and Objectives | | |
|---|---|---|
| **Name of Institution** | **Structure** | **Objective/ Purpose** |
| | | The other allied fields includes architecture, town planning, supply of building materials, hardware & machineries, finance, insurance, marketing and brokerage and finance in infrastructure, real estate and other allied fields and to have a proper dialogue, between private sector and the State Govt., for solving the practical problems and to make government policies more effective and useful and result oriented. |
| | | |

Source: Line department survey, 2011 and websites of respective institutions.

## 9.11 Dholera Special Investment Region Development Authority - A Case of Gujarat DMIC

The State Government promulgated a legal framework – The Gujarat Special Investment Regional Act, 2009. The Act gives indication of the commitment of the state Government to set up world class hubs of economic activity on the lines of fast growing countries of the world under the DMIC project.

The State Government is very keen to create large size investment Regions and Industrial Areas in the State of Gujarat; The SIR Act provides for the development of such economic hub(s) with global standards. The State has already identified six potential locations to be developed as SIR which include (1) Dholera-Ahmedabad Inbvestment Region (2) Vadodara-Ankleshwar Industrial Area (3) Palanpur-Mehsana Industrial Area (4) Bharuch –Dahej Investment Region as PCPIR (5) Surat-Hazira Industrial Area and (6) Valsad-Umergam Industrial Area. One of the main reasons of economic progress of several countries has been the creation of huge industrial corridors and mega manufacturing and commercial hubs including in Japan, China and South Korea. It is particularly observed that size of such hubs does matter. This helps in the economies of scale particularly in creating and providing robust infrastructure which is uniform and available to all users. In this background, if the State and the country have to achieve a higher growth, a similar pattern may have to be followed.

With that objective, the State Government has passed the SIR ordinance particularly to create large size Investment Regions and Industrial Areas in the State of Gujarat; and to specially enable their development as global hubs of economic activity.

**The Objective**

The objectives of creating DSIRDA are as follows:

To provide for establishment, operation, regulation and management of large size Investment Regions and Industrial Areas in the State of Gujarat.

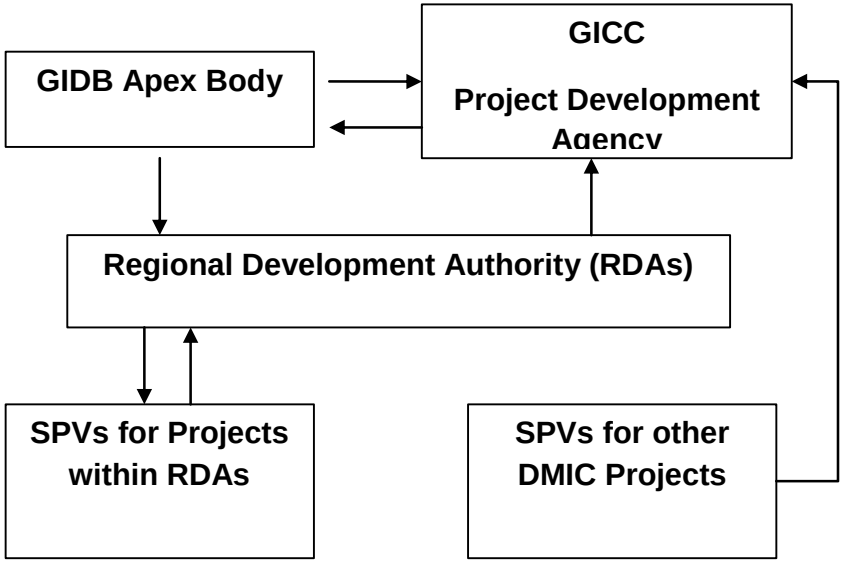
To specially enable their development as global hubs of economic activity.

Supported by world class infrastructure, premium civic amenities, centers of excellence and pro-active policy framework. For setting up an organizational structure with that purpose and for matters incidental thereto

**The Structure**

The Dholera SIR Development Authority follows 4-tier system (Apex authority, RDA, Project Development agency, SPV) as shown in Figure 7.5. RDAs have all the powers and are outside the control of any local authority. But, the authority itself is fully constituted by state government and therefore, does not allow direct private participation.

**Figure 9-5: Structure of DSIRDA**




**The Provisions of Act**

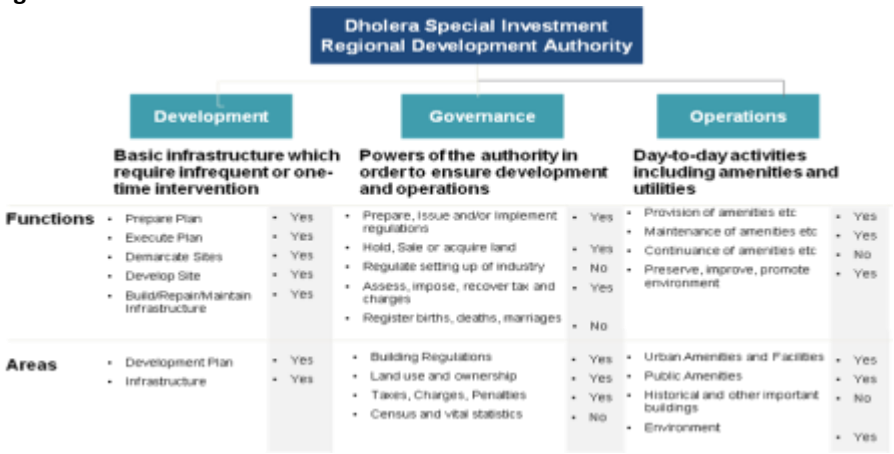
The SIR Act, inter alia, provides for following matters :

- It enables the State Government to establish, develop, operate and regulate the Special Investment Regions (SIR)
- The State is empowered to declare Investment Region or Industrial Area and designate them as Special Investment Region (SIR)
- An Investment Region will have as area of more than 100 sq. Kms and an Industrial Area will have an area of more than 50 sq. Kms
- A four tier administrative mechanism is set up for establishment, operation, regulation and management of the SIRs
- The administrative mechanism comprises of an Apex Authority (GIDB), a SIR Authority(RDA) for each SIR, a Project Development Agency and project specific SPVs
- The Apex Authority will be the highest policy making body
- The RDA will look after the ground level issue of development & regulation
- The RDA will make its own regulations for building, construction and development
- The Apex Authority will be the single window system and the first contact for the setting up any economic activity or amenity in the SIR
- It empower the state government for setting up of a Project Development Agency
- Government has already formed such a project development company in the name of "Gujarat Industrial Corridor Company" (GICC)
- It provides for effective internal dispute settlement mechanism: a three tier system
- It provides an effective framework for private sector participation in infrastructure by drawing upon the Gujarat Infrastructure Development Act (GID) Act – 1999.

**Roles, Responsibilities and Jurisdiction**

The SIR will broadly comprise of various zones including residential, commercial, financial, manufacturing, processing, entertainment and institutional and others in addition to the world class infrastructure in terms of road, water, sanitation and other facilities. The jurisdiction for SIR would be all the areas declared under the SIR Act 2009 except that which falls under the jurisdiction of local authorities (Gram Panchayat, Municipality or Municipal Corporation). Figure below displays the powers and functions of DSIRDA with respect to development, governance and operations.

**Figure 9-6: Powers and Functions of DSIRDA**




**Conclusion**

The structure proposed through Speical Investment Region Development Authority Act of Gujarat, is among the preeminent legal model available for development of investment region under DMIC project. It creates a nodal authority which minimises bureaucracy and achieves most of the objectives set for Investment Region. However, it may be noted that, too many powers are vested with apex body (GIDB) when it comes to setting up economic activities within SIR. Apart from this, a separate agency "project development agency – Gujarat Industrial Corridor Company" is set up to facilitate project development within the SIR, leaving the SIR with powers similar or even less than that are with Jodhpur Development Authority.

Though the model is best among the available options under DMIC project, it still needs a comprehensive look while applying it to Rajasthan DMIC region and devolution of powers & functions under the SIR Act to SIRDA, for it to be most robust one stop solution for development of investment region.

## 9.12 Key Takeaways & Analysis

### 9.12.1 Required Key Functions

The entire lifecycle of the Investment Region would include a number of functions related to a) development, b) operations & c) governance of IR. The Development Agency for IR shall be sufficiently empowered and provided with functions & functionaries to perform all such activities related to IR development, operation & governance. Key activities/ functions that would be required for performing all three aspects of IR lifecycles are as listed below.

- Preparation, Implement & Monitor Development Plan, Town Planning Schemes, Development Control Regulations & Building Byelaws;
- Demarcate and develop sites for industrial, commercial, residential and other social infrastructure purposes according to the plans;
- Levy development charges & fees;
- Impose penalty and mode of recovery;
- Enter into any land or building with or without assistance;
- Land Procurement/ Acquisition;
- Holding, Sale, Lease & Auction of land, buildings structures of industrial, residential, commercial and with other uses;
- Negotiate and enter into contracts/ agreements of any form with for development of land, building, project, infrastructure, for IR;
- Enter into contracts, agreements or concession agreements with any person, entity, developer or organisation for performing its functions;
- Construct, support, monitor and facilitate development of Infrastructure, amenities and utilities (water, waste water, power, solid waste, telecommunication, roads, drains, street lighting, logistic parks, fire stations, flood protections, bridges, etc; within IR as well as outside IR but required for IR;
- Promote, establish and execute industries, projects or enterprises for material or any substance which are likely to promote industrial development of Rajasthan.

- Promote and establish companies or associations for implementation of industries / projects leading to development of investment region.
- Carryout Merchant Banking Activities and to set up, promote, mutual funds, asset management companies, venture capital fund etc;
- Provide financial assistance to projects/ industries related to tourism, agro industries, being setup within investment region;
- Develop, maintain, monitor and operate public transport systems (both rail & road based)and infrastructure solely or through concession agreement
- Provide for common facilities for industry such as testing centres, tool room facilities, raw-material depots, training, etc
- Capable to identify, conceptutalise, prioritize infrastructure projects and approve Concessions upto certain limit without state approval and rest with approval from State
- Co-ordinate with government department, agencies, local authorities, etc" for development of infrastructure in the IR;
- Capable to inspect, monitor, visit and review the progress of infrastructure project;
- Approve development of infrastructure projects requiring grant of concession with State consent;
- Ensure, provide and maintain civic amenities and services;
- Protection, preservation, conservation and upkeep of Environment
- Protection, preservation, conservation and rehabilitation of Historical Monumnets & Buildings of Importance
- Promote and encourage economic activities through marketing initiatives;
- Draw, issue, accept and to endorse, discount and negotiate promissory notes, hundies, and other negotiable or commercial or mercantile or transferable instruments connected with its business;
- Borrow, raise monies and invest money;
- Registration and Certificate of Birth, Death & Marriage ;
- Census & Vital statistics

### 9.12.2 Classification of Activities over Project Life Cycle

Now, let's see where these activities fit into overall life cycle of the project. Table project the assessment of activities with respect to lifecycle of the project .

**Table 9-3: Key Functions Required over Project Life Cycle**

| Key Functions Required over Project Life Cycle | | | |
|---|---|---|---|
| **Activities** | **Development** | **Operations & Maintenance** | **Governance** |
| Preparation, Implement & Monitor Development Plan, Town Planning Schemes, Development Control Regulations & Building Byelaws | Y | Y | Y |
| Demarcate and develop sites for industrial, commercial, residential and other social infrastructure purposes according to the plans | Y | | Y |
| Levy development charges & fees; | Y | Y | Y |
| Impose penalty and mode of recovery | Y | | Y |
| Enter into any land or building with or without assistance | Y | | Y |
| Land Procurement/ Acquisition; | Y | | |
| Holding, Sale, Lease & Auction of land, buildings structures of industrial, residential, commercial and with other uses | Y | Y | |

| Key Functions Required over Project Life Cycle | | | |
|---|---|---|---|
| **Activities** | **Development** | **Operations & Maintenance** | **Governance** |
| Negotiate and enter into contracts/ agreements of any form with for development of land, building, project, infrastructure, for IR | Y | Y | Y |
| Enter into contracts, agreements or concession agreements with any person, entity, developer or organisation for performing its functions | Y | Y | Y |
| Construct, support, monitor and facilitate development of Infrastructure, amenities and utilities (water, waste water, power, solid waste, telecommunication, roads, drains, street lighting, logistic parks, fire stations, flood protections, bridges, etc; within IR as well as outside IR but required for IR | Y | Y | |
| Promote, establish and execute industries, projects or enterprises for material or any substance which are likely to promote industrial development of Rajasthan. | Y | | |
| Promote and establish companies or associations for implementation of industries / projects leading to development of investment region. | Y | | Y |

| Key Functions Required over Project Life Cycle | | | |
|---|---|---|---|
| **Activities** | **Development** | **Operations & Maintenance** | **Governance** |
| Carryout Merchant Banking Activities and to set up, promote, mutual funds, asset management companies, venture capital fund etc | Y | Y | |
| Provide financial assistance to projects/ industries related to tourism, agro industries, being setup within investment region | Y | Y | |
| Develop, maintain, monitor and operate public transport systems (both rail & road based)and infrastructure solely or through concession agreement | Y | Y | |
| Provide for common facilities for industry such as testing centres, tool room facilities, raw-material depots, training, etc | Y | Y | |
| Capable to identify, conceptutalise, prioritize infrastructure projects and approve Concessions upto certain limit without state approval and rest with approval from State | Y | | |
| Co-ordinate with government department, agencies, local authorities, etc" for development of infrastructure in the IR | Y | Y | Y |

| Key Functions Required over Project Life Cycle | | | |
|---|---|---|---|
| **Activities** | **Development** | **Operations & Maintenance** | **Governance** |
| Capable to inspect, monitor, visit and review the progress of infrastructure project | | Y | |
| Approve development of infrastructure projects requiring grant of concession with State consent | Y | | Y |
| Ensure, provide and maintain civic amenities and services | Y | Y | |
| Protection, preservation, conservation and upkeep of Environment | Y | Y | |
| Protection, preservation, conservation and rehabilitation of Historical Monuments & Buildings of Importance | Y | Y | |
| Promote and encourage economic activities through marketing initiatives | Y | | Y |
| Draw, issue, accept and to endorse, discount and negotiate promissory notes, hundies, and other negotiable or commercial or mercantile or transferable instruments connected with its business | Y | Y | |
| Borrow, raise monies and invest money | Y | Y | |
| Registration and Certificate of Birth, Death & Marriage ; | Y | Y | |
| Census & Vital statistics | Y | Y | |

### 9.12.3 Assessing Activities by Agencies

It is important to analyse activities that are currently performed by Institutions present in delineated IR. **Table 9-4** presents activity wise agencies responsible for identified activities.

**Table 9-4: Prevailing Agencies & Desired Functions**

| Prevailing Agencies & Desired Functions | | | |
|---|---|---|---|
| **Activities** | **Development** | **Operations & Maintenance** | **Governance** |
| Preparation, Implement & Monitor Development Plan, Town Planning Schemes, Development Control Regulations & Building Byelaws | Urban Development & Housing Department (City Planning Department) | Urban Improvement Trust – Bhiwadi | Urban Improvement Trust – Bhiwadi |
| Demarcate and develop sites for industrial, commercial, residential and other social infrastructure purposes according to the plans | Urban Improvement Trust – Bhiwadi and RIICO for industrial area | | Urban Improvement Trust – Bhiwadi and RIICO for industrial area |
| Levy development charges & fees; | Urban Improvement Trust – Bhiwadi and RIICO for industrial area | PHE/ RIICO/ Jaipur Vidyut Vitran Nigam Limited | Urban Improvement Trust – Bhiwadi and RIICO for industrial area |
| Impose penalty and mode of recovery | Urban Improvement Trust – Bhiwadi and RIICO for industrial area | | Urban Improvement Trust – Bhiwadi and RIICO for industrial |

| Prevailing Agencies & Desired Functions | | | |
|---|---|---|---|
| **Activities** | **Development** | **Operations & Maintenance** | **Governance** |
| | | | area |
| Enter into any land or building with or without assistance | Urban Improvement Trust – Bhiwadi and RIICO for industrial area | | Urban Improvement Trust – Bhiwadi and RIICO for industrial area |
| Land Procurement/ Acquisition; | RIICO/ Private Sector | | |
| Holding, Sale, Lease & Auction of land, buildings structures of industrial, residential, commercial and with other uses | RIICO/ Private Sector | | |
| Negotiate and enter into contracts/ agreements of any form with for development of land, building, project, infrastructure | RIICO | RIICO | RIICO |
| Enter into contracts, agreements or concession agreements with any person, entity, developer or organisation for performing its functions | RIICO/ PHE/ PWD/ NHAI/ UIT/ Irrigation Department/ RSRBDC/ | RIICO/ PHE / PWD/ NHAI/ UIT/ Irrigation Department/ RSRBDC/ | RIICO/ PHE/ PWD/ NHAI/ UIT/ Irrigation Department/ RSRBDC/ |
| Construct, support, monitor and facilitate development of Infrastructure, amenities and utilities (water, waste water, power, solid waste, telecommunication, roads, drains, street lighting, logistic parks, fire stations, flood protections, bridges, etc; within IR as well as outside IR but required for IR | RIICO/ PHE/ PWD/ NHAI/ UIT/ Irrigation Department/ RSRBDC/ CGWB/ Private Sector | RIICO/ PHE/ PWD/ NHAI/ UIT/ Irrigation Department/ RSRBDC/ CGWB/ Private Sector | |

| Prevailing Agencies & Desired Functions | | | |
|---|---|---|---|
| **Activities** | **Development** | **Operations & Maintenance** | **Governance** |
| Promote, establish and execute industries, projects or enterprises for material or any substance which are likely to promote industrial development of Rajasthan. | RIICO/ Small Industries DevCO/ | | |
| Promote and establish companies or associations for implementation of industries / projects leading to development of investment region. | RIICO for Industrial Development | | |
| Carryout Merchant Banking Activities and to set up, promote, mutual funds, asset management companies, venture capital fund etc | RIICO | RIICO | |
| Provide financial assistance to projects/ industries related to tourism, agro industries, being setup within investment region | RIICO for Industries/ Tourism Department for Tourism | RIICO for Industries/ Tourism Department for Tourism | |
| Develop, maintain, monitor and operate public transport systems (both rail & road based)and infrastructure solely or through concession agreement | Nil | Nil | Nil |
| Provide for common facilities for industry such as testing centres, tool room facilities, raw-material depots, training, etc | RIICO | RIICO | |
| Capable to identify, conceptutalise, prioritize infrastructure projects and approve Concessions upto certain | RIICO for Industrial Area – Rest Nil | | |

| Prevailing Agencies & Desired Functions | | | |
|---|---|---|---|
| **Activities** | **Development** | **Operations & Maintenance** | **Governance** |
| limit without state approval and rest with approval from State | | | |
| Co-ordinate with government department, agencies, local authorities, etc" for development of infrastructure in the IR | NIL | NIL | NIL |
| Capable to inspect, monitor, visit and review the progress of infrastructure project | | RIICO for Industrial Area/ PWD/ PHE/ JVVNL/ | |
| Approve development of infrastructure projects requiring grant of concession with State consent | Nil | | Nil |
| Ensure, provide and maintain civic amenities and services | Nil | Nil | |
| Protection, preservation, conservation and upkeep of Environment | Forest Department/ Pollution Control Board/ RIICO for Industrial Area, | Forest Department/ Pollution Control Board/ RIICO for Industrial Area, | |
| Protection, preservation, conservation and rehabilitation of Historical Monuments & Buildings of Importance | Department of Archeology & Museum & Tourism Department | Department of Archeology & Museum & Tourism Department | |
| Promote and encourage economic activities through marketing initiatives | RIICO for Industrial Area | | |
| Draw, issue, accept and to endorse, discount and negotiate promissory notes, hundies, and other negotiable or commercial or mercantile or transferable instruments connected with its business | | | |
| Borrow, raise monies and invest money | RIICO for Industrial Area | RIICO for Industrial Area | |
| Registration and Certificate of Birth, Death & Marriage ; | District Administration | District Administration | |
| Census & Vital statistics | Census of India | | |
| | | | |

From above table it is quite clear that no single agency is currently holding large number of activities required for development of IR and there are certain activities that have no takers at all – creating a void.

Given the situation and for success of IR, it is advisable to have Single Authority responsible for development of the IR. Else, there is a real risk of fragmented, disjointed and scattered growth and hampering the economic potential.

## 9.13 The Rajasthan Special Investment Region Act

As a result of discussions between State Government and DMICDC on the institutional mechanism for development and management of DMIC nodes in the state of Rajasthan, the GoR has decoded to enact the Rajasthan Special Investment Region Act and is framing the said act. This act shall define the institutional framework, organisational structure, roles and responsibilities, functions and functionaries of the Authority under this act. The authority created/ designated under this act and mandated with KBNIR shall be the Authority for KBNIR.

# 10 Land Procurement & Pricing Strategy

## 10.1 Land Procurement & Phasing strategy for IR

The Land Development Phasing is a key to the success of IR, as it guides the land procurement, financial outlays thereof, development activities of IR and more importantly the setting up of industries. The Consultant has, while framing the development phasing, considered following aspects:

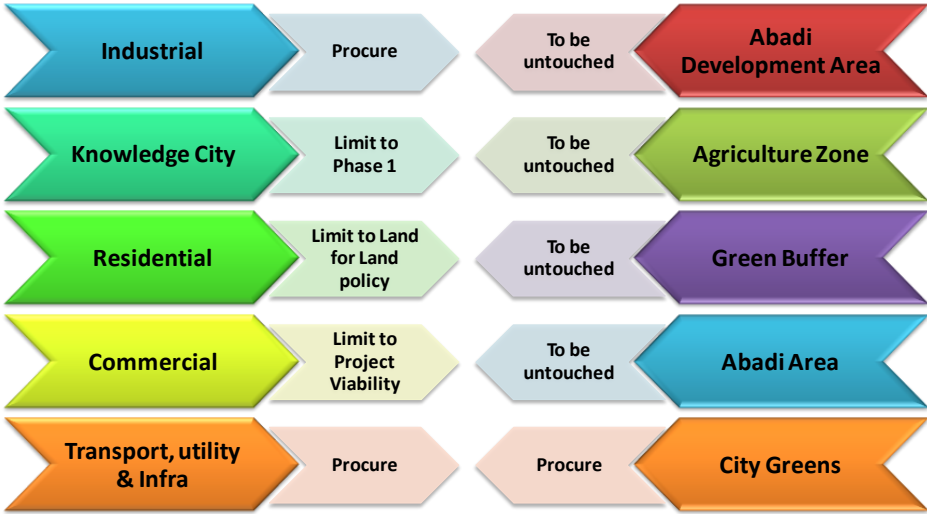
- No land under Abadi Area and Abadi Development Area to be acquired. This is to reduce resettlement of existing population at the same time provide space for their expansion. The expansion shall be in natural form and by way of mutually negotiated land deals between private parties with no government involvement.
- Land under Industrial Land Use to be acquired completely over development phases of Investment Region. [Business/ Industries to have single point of contact for setting up their industries/ business and do not have to go the different land owners (farmers) for procuring industrial land. Also, to provide world class developed industrial infrastructure for industries & business].
- Land under Residential Land Use shall not be acquired unless otherwise required for compensation to land owners whose land being acquired for development activities within Investment Region
- Land under Commercial Use shall be acquired to the extent limited to make investment region as a project & Investment Region Development Authority a viable proposition.
- Land demarcated as knowledge city shall primarily be not acquired. However, Knowledge city being the anchor project for Investment region, it is desirable to have first phase acquired and offered to various institutes/ universities to set up their compasses. This would be one among several incentivises that could be offered by Development Authority to market the IR as investment destination for higher education.
- The success of investment destination depends upon the quality of life offered to its citizens, which is generally measured in terms of quality of infrastructure (physical, social and environmental) offered. In general, most of such services like roads, power, street lighting, drains, public transport infrastructure [bus stop/ depots], solid waste management, etc are generally provided by government agencies (directly or through contract). Hence it is advisable to have this areas acquired for better planning and integration.

The development phasing intern the land procurement phasing for Investment Region is as given in table below and graphically presented in **Table 10-1** & **Figure 10-1**.

**Table 10-1: Land Procurement Strategy**

| Land Procurement Strategy | | | |
|---|---|---|---|
| **Land Use** | **Phase -1** | **Phase-2** | **Phase-3** |
| Abadi Area (Village Settlement Area) | Nil | Nil | Nil |
| Abadi Development Area | Nil | Nil | Nil |
| Industrial | Complete | Complete | Complete |
| Residential | Quantity limited to the land required to be given as compensation, if required. Otherwise NIL | | |
| Commercial | Complete | Partly | Nil |
| Institutional (Knowledge City) | Complete | Nil | Nil |
| Public Infrastructure & Utilities | Complete | Complete | Complete |
| Greens/ Open Space – City Level (Does not include Agriculture/ Green Buffers) | Quantity limited to the land required to for city parks/ playgrounds/ road side green belts, etc. Agriculture belt/ nursery/ farming belt/ city green buffer are not be acquired. | | |
| Transport & Communication | Complete | Complete | Complete |
| Airport | Complete | Complete | Complete |

**Figure 10-1: Land Procurement Strategy**




## 10.2 Land Pricing Strategy

Land pricing strategy is one among influential factors to bring investment and population to the Investment Region and generally goes hand in hand with development model that is likely to be adopted. In order to define the cost components, that are to be included to derive land pricing, the consultant has reviewed methodologies adopted by state government agencies and authorities, and that of CIDCO, RIICO, and RHB in particular. .

The Consultant, having reviewed the available land pricing models and along with the proposed land procurement strategy for IR, would recommend to adopted by CIDCO model of land pricing. Further, it is advised that the RDA shal, while applying this methodology, consider pricing strategy and costs components identified and is summarized in **Table 10-2** and graphically presented in **Figure 10-2**. The land pricing strategy is based on the assumption that RDA would deploy two approaches towards land development within IR.

**Approach – 1**: Comprehensive Land Development and outright sale, wherein land is being acquired and developed by Development Authority and would be sold in market at auction (with minimum floor price is fixed) and/ or transparent and fair sale process.

**Approach – 2**: Infrastructure Creation and Recovery of Funds; here RDA would create infrastructure & utilities as per development plan and would levy infrastructure development charge to residents and business within IR.

**Figure 10-2: Land Cost Components**



It may be note that the two components other use over heads and profits shall not be applicable to following:

- Low Income Housing
- Select Social Infrastructure
- Select City Infrastructure

**Table 10-2: Proposed Land Pricing Mechanism**

| Proposed Land Pricing Mechanism | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Land Use | Land Pricing strategy | Cost Components for Land Pricing | | | | | | |
| | | Land Cost | Infrastructure Development Cost | Cost of Fund | Admin & Legal Cost | Profit | Other Use Over head | Miscell |
| Abadi Area (Settlement Area) | Development Charges to recover Infrastructure created by RDA | NA | YES | YES | YES | YES | NA | YES |
| Abadi Development Area | Development Charges to recover Infrastructure created by RDA | NA | YES | YES | YES | YES | NA | YES |
| Industrial | No Profit no loss with variable rates for different industries | YES | YES | YES | YES | YES | YES | YES |
| Residential 1 | Development Charges to recover Infrastructure created by RDA | NA | YES | YES | YES | YES | YES | YES |
| Residential 2 (For EWS & LIG) | No profit no loss with variable rate for different sections of societies (cross subsidisation) | YES | YES | YES | YES | NA | NO | YES |
| Residential 3 | Cost Plus with variable rate for different sections of societies (MIG & ABOVE) | YES | YES | YES | YES | YES | YES | YES |
| Commercial | Cost Plus with variable rate for different types of commercial establishment | YES | YES | YES | YES | YES | YES | YES |
| Institutional (Universities / Institutes etc) | No Profit No Loss Strategy | YES | YES | YES | YES | YES | NO | YES |
| Institutional (Primary & Secondary Schools) | Free of cost or at 10% of overall cost. The cost of developed land to be added to residential/ commercial & Industrial | Maximum 70% of actual cost | | | | | | |

| Proposed Land Pricing Mechanism | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Land Use | Land Pricing strategy | Cost Components for Land Pricing | | | | | | |
| | | Land Cost | Infrastructure Development Cost | Cost of Fund | Admin & Legal Cost | Profit | Other Use Overhead | Miscell |
| | components) | | | | | | | |
| Public Infrastructure & Utilities | No Profit No Loss | YES | YES | YES | YES | NO | NO | NO |
| Greens/ Open Space – City Level (Does not include Agriculture/ Green Buffers) | Development by RDA whereas maintenance preferably by RWA if possible. The cost of development and maintenance (if not by RWA) then shall be overloaded to other land uses, | | | | | | | |
| Transport & Communication | Public Transport infrastructure like bus depot/ terminals shall be developed on PPP model whereas for bus stop along the road shall be charged under infrastructure development charges to be paid by all residents/ business.<br><br>City transport system shall recover the capital & operations costs through ticketing and advertisement. | | | | | | | |
| Airport | As per detailed feasibility study on the project. | | | | | | | |
| | | | | | | | | |

# 11 Economic Cost Benefit Analysis

## 11.1 Introduction

The economic cost benefit analysis is based on projected streams of costs (investment costs and operating and maintenance costs) and economic benefits. The economic cost benefit analysis (CBA) differs from a financial CBA in the following respect:

- Duties and taxes paid and grants received in relation to the project are excluded from the analysis;
- Prices are corrected for market distortions; and
- If possible, the external effects of the project are internalized by including monetized costs and benefits in the calculations.

With the generated cash flow, the economic internal rate of return (EIRR) have been calculated. If this ratio is above a predefined limit (the opportunity costs of capital), the project is feasible from an economic point of view. Also the economic net present value (ENPV) has been calculated. Below the assumptions are presented followed by the results of the calculations.

The economic internal rate of return (EIRR) will be estimated based on investment costs and net revenues generated by the sale of developed land. Investment costs involve the cost of acquiring land and the costs of building infrastructure. Below the assumptions used in the analysis are reviewed and preliminary results are presented.

Generally, it has been assumed that financial prices are market determined and therefore represent opportunity costs or economic prices. No adjustment therefore was made by applying conversion factors to convert financial into economic prices.[7]

### 11.1.1 Investment costs

*Cost of acquiring land*

The costs of land acquisition include the costs of acquiring land and the costs for resettlement and rehabilitation of people that currently live in the region. The assumptions used for estimating the cost of land procurement are presented in **Table 11-1**.

**Table 11-1: Assumptions with respect to costs for land acquisition (prices of 2013)**

| Assumptions with respect to costs for land acquisition (prices of 2013) | |
|---|---|
| Average Rate for private Land to be acquired (Rs crore per ha) | 2 |
| | |
| Resettlement & Rehabilitation Expenses | |
| Unit Livelihood Compensation (Rs crore per person) | 0,015 |
| Total No. of Project Affected Persons (PAPs) (adults) | 12000 |
| No. of PAPs in Phase 1 | 3.197 |
| No. of PAPs in Phase 2 | 3.836 |
| No. of PAPs in Phase 3 | 4.967 |
| | |

*Investment costs for infrastructure*

The project's engineers have prepared estimates of the investment costs for developing the land and putting in the basic infrastructure. These

[7] E.g. in a recent study on project appraisal with case studies, it was found that conversion factors for most cost items are close to 1: USAID/India Reform Project: The Project Appraisal Practitioner's Guide, 2008

estimates are presented in Table 11-2. These investment costs have been distributed over the three phases of project implementation. Some of these investments can be considered as individual projects generating their own net benefits. The investments have not been included in the economic appraisal of the project. The investment costs in infrastructure that have been taken into account in the economic analysis of the investment region are presented in Table 11-3.

**Table 11-2: Capital investment in infrastructure in Rs crore in prices of 2013**

| Sl. No. | Infrastructure Component | Capital Cost (INR Cr) | | | |
|---|---|---|---|---|---|
| | | Phase 1 | Phase 2 | Phase 3 | Total |
| **A** | **EXTERNAL INFRASTRUCTURE** | | | | |
| 1 | Airport* | 0.00 | 3902.00 | 0.00 | 3902.00 |
| 2 | Bhiwadi-Neemrana Link Road | 649.00 | 0.00 | 0.00 | 649.00 |
| 3 | Railway Station | 0.00 | 0.00 | 350.00 | 350.00 |
| 4 | MRTS | 0.00 | 2250.00 | 0.00 | 2250.00 |
| 5 | Water Sourcing & Conveyance** | 817.31 | 0.00 | 0.00 | 355.53 |
| **A** | **Total of External Infrastructure** | **1466.31** | **6152.00** | **350.00** | **7507** |
| **B** | **INTERNAL INFRASTRUCTURE** | | | | |
| 6 | Site Development | 237.37 | 79.46 | 221.15 | 537.98 |
| 7 | Road Works, Street lighting, Streetscaping, Planting, etc | 1023.31 | 883.28 | 624.96 | 2531.55 |
| 8 | Water Supply System | 82.85 | 88.98 | 198.37 | 370.20 |
| 9 | Recycled Water System | 48.93 | 58.84 | 47.56 | 155.33 |
| 10 | Sewerage | 211.29 | 296.91 | 296.32 | 804.52 |
| 11 | Storm Water Drainage | 217.93 | 201.07 | 148.08 | 566.35 |
| 12 | Solid Waste Management | 57.15 | 62.93 | 124.72 | 244.80 |
| 13 | Power Generation, Transmission & Distribution | 1780.67 | 2073.01 | 3430.56 | 7284.24 |
| 14 | Landscaping/ Plantation of Green Areas | 107.72 | 160.60 | 270.48 | 538.80 |
| | Sub-Total | 3767.22 | 3905.07 | 5362.20 | 13033.76 |
| 15 | Miscellaneous 5% of Internal Infra | 188.36 | 195.25 | 268.11 | 651.69 |
| | **Total of Internal Infrastructure** | **3955.58** | **4100.33** | **5630.31** | **13685** |
| C | **Grand Total (INR Cr)** | **5422** | **10252** | **5980** | **21192** |
| | | | | | |

Note:

** Techno-Economic Feasibility Report on Aerotropolis may be referred for further details. Development phasing of Aerotropolis may be decided by GoR.*

*** Water Sourcing & Conveyance System considered the scheme prepared by GoR and has accordingly modified location of source from Dholpur (On banks of Chambal River) to Jaisamand Lake. The Cost presented here is for transmission main from jaisamand lake to KBNIR (near Ajarka Station). The actual cost of getting water from Dholpur to KBNIR shall be estimated by by GoR.*

**Table 11-3: Capital investment in infrastructure included in the economic appraisal of the IR in Rs crore in prices of 2013**

| Sl. No. | Infrastructure Component | Capital Cost (INR Cr) | | | |
|---|---|---|---|---|---|
| | | Phase 1 | Phase 2 | Phase 3 | Total |
| **A** | **EXTERNAL INFRASTRUCTURE** | | | | |
| 1 | Airport* | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | Bhiwadi-Neemrana Link Road | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | Railway Station | 0.00 | 0.00 | 0.00 | 350.00 |
| 4 | MRTS | 0.00 | 0.00 | 0.00 | 0.00 |
| 5 | Water Sourcing & Conveyance** | 0.00 | 0.00 | 0.00 | 0.00 |
| **A** | **Total of External Infrastructure** | **0.00** | **0.00** | **350.00** | **350.00** |
| **B** | **INTERNAL INFRASTRUCTURE** | | | | |
| 6 | Site Development | 237.37 | 79.46 | 221.15 | 537.98 |
| 7 | Road Works, Street lighting, Street scaping, Planting, etc | 1023.31 | 883.28 | 624.96 | 2531.55 |
| 8 | Water Supply System | 82.85 | 88.98 | 198.37 | 370.20 |
| 9 | Recycled Water System | 48.93 | 58.84 | 47.56 | 155.33 |
| 10 | Sewerage | 211.29 | 296.91 | 296.32 | 804.52 |
| 11 | Storm Water Drainage | 217.93 | 201.07 | 148.08 | 566.35 |
| 12 | Solid Waste Management | 57.15 | 0.00 | 0.00 | 57.15 |
| 13 | Power Generation, Transmission & Distribution | 0.00 | 0.00 | 0.00 | 0.00 |
| 14 | Landscaping/ Plantation of Green Areas | 107.72 | 160.60 | 270.48 | 538.80 |
| | Sub-Total | 1967.55 | 1769.14 | 1806.92 | 5542.88 |
| 15 | Miscellaneous 5% of Internal Infra | 98.00 | 92.00 | 97.00 | 287.00 |
| | **Total of Internal Infrastructure** | **2065.55** | **1860.14** | **1903.92** | **5829.88** |
| C | **Grand Total (INR Cr)** | **2065.35** | **1860.14** | **2252.92** | **6179.88** |
| | | | | | |

### 11.1.2 Recurrent costs

Recurrent costs include operation and maintenance costs of the infrastructure facilities and the costs of marketing. The assumptions for estimating these costs are presented in Table 11-4 below. Administrative and operating expenses (O&M) have been estimated as a percentage of capital expenditure. The percentages used (2% iof capital investment costs for O@M costs and 2% of the land revenue generated by sales for marketing expenditure). are based on experiences with similar projects.

**Table 11-4: Assumptions for estimating the costs of operation and management and for marketing expenses**

| Assumptions for estimating the costs of operation and management and for marketing expenses | |
|---|---|
| Annual cost items | |
| Operation and maintenance costs (O&M) as a percentage of cumulative capital investment | 2% |
| O&M starts in Yr | 4 |
| Marketing Expenses as a percentage of land revenue | 2% |
| Starts in Yr | 4 |

### 11.1.3 Revenue

Revenue estimates are based on the amount of land sold (in ha) and its price. The distribution of land by type of use was presented in Table 5-1 earlier in this report. This table shows that the total land area of the IR amounts to 165 sqkm. Excluding land to be reserved for natural features, nature conservation and agricultural use leaves 125 sqkm to be developed. The distribution of this land by use and the phasing of its development is shown in Table 11-5. The area reserved for the knowledge city was included under the institutional land use category. The miscellaneous category includes recreation use, open spaces and green buffers.

**Table 11-5: Land use of the IR and its development**

| Phasing of development (ha) | | | | |
|---|---|---|---|---|
| | Ph 1 | Ph 2 | Ph 3 | Total |
| Industrial | 13,50 | 4,25 | 9,39 | 27,14 |
| Residential | 13,30 | 17,66 | 13,21 | 44,17 |
| Commercial | 4,42 | 4,96 | 0,85 | 10,23 |
| Institutional | 5,75 | 4,42 | 4,39 | 14,56 |
| Transportation & Logistics | 4,92 | 4,84 | 4,93 | 14,69 |
| Miscellaneous (recreational areas and green buffers) | 2,43 | 3,31 | 8,95 | 14,69 |
| Sub-Total | 44,30 | 39,44 | 41,72 | 125,48 |
| Nature, conservation and agricultural use | 3.49 | 4.96 | 31.71 | 40.16 |
| | 47.80 | 44.38 | 73.42 | 165.61 |

Table 11-6 presents the assumptions used in deriving the amount of land that will be sold under the subsequent phases of the development of the region. The assumptions relate to the proportion of the land that will be sold for each type of land use and the price of land per hectare in Rs crore.

**Table 11-6: Percentage distribution of gross land use, saleable land and land values in prices of 2013**

| Land use, saleable land and land values in prices of 2013 | | | |
|---|---|---|---|
| | Share of Gross Land use | Saleable area | Sales values (Rs crore per ha) |
| Categories of Saleable Area | | | |
| Industrial | 22% | 75% | 5.00 |
| Residential | 35% | 70% | 7.50 |
| Commercial | 8% | 75% | 11.50 |
| Institutional | 12% | 70% | 5.00 |
| Transportation | 11% | 0% | - |
| Miscellaneous | 12% | 30% | 7.50 |
| | | | |
| Total | 100% | 55% | |

In **Table 11-7** the phasing of land sales is presented. It is based on the land use distribution by development phase as presented in Table 11-4 and applying the assumptions on the proportion of land that can be sold for each land use category presented in the same table. In the analysis it is assumed that land sales will start in year 3, when the construction of key infrastructure is largely completed.

**Table 11-7: Phasing of land sales (ha)**

| Phasing of land sales (ha) | | | | |
|---|---|---|---|---|
| | Ph 1 | Ph 2 | Ph 3 | Total |
| Industrial | 949 | 285 | 664 | 1898 |
| Residential | 845 | 1127 | 845 | 2818 |
| Commercial | 345 | 431 | 86 | 863 |
| Institutional | 302 | 173 | 388 | 863 |
| Transportation & Logistics | 0 | 0 | 0 | 0 |
| Miscellaneous | 83 | 104 | 228 | 414 |
| Total | 2524 | 2119 | 2211 | 6854 |
| | | | | |

### 11.1.4 Results

The summary cash flow is presented in Table 11-8. It has been assumed that financial prices reflect economic values. In this cash flow data are presented in constant prices of 2013. In the last year of the cash flow the total value of investments have been included as a benefit. This cash flow results in an economic rate of return of 14%. The minimum EIRR for India has been estimated at 10%[8]. This result therefore shows that the project is economically feasible. The result can also be considered to be quite robust. Increases in the economic rate of return would result from increasing the proportion of land sold, starting to sell land earlier and by selling the land at a faster rate. Moreover, we have not taken into account that a fee would be charged for covering operation and maintenance costs of the infrastructure in the region. Such a fee would constitute an additional economic benefit. Adding a fee covering the annual O&M costs to the annual benefits would increase the ERR by 1% to 15%.

The Economic Net Present Value (ENPV) at a 10% opportunity cost of capital amounts to Rs crore 2,143.

[8] In project appraisals carried out by the National Planning Commissions a 10% opportunity costs is applied. In the study: Devendra Kumar Shukla, Estimation of the Economic Discount Rate for Project Appraisal in India, *Project Appraisal*, March 1997, the economic discount rate was estimated at 10.2%.

**Table 11-8: Cash flow of revenues and costs in Rs crore in prices of 2013**

| Cash flow of revenues and costs in Rs crore in prices of 2013 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Revenue minus recurrent costs | | 93 | 1791 | 1681 | 1582 | 1574 | 1569 | 1568 | 2536 | 3191 | 2661 | 2478 | 2236 | 1673 | 1433 |
| Investment costs | 841 | 2668 | 3658 | 2254 | 475 | 425 | 664 | 909 | 885 | 1732 | 1931 | 2045 | 1632 | 437 | 985 |
| Net Cash Flow | (841) | (2575) | (1867) | (573) | 1108 | 1149 | 905 | 660 | 1651 | 1459 | 730 | 432 | 604 | 1237 | 447 |

| Cash flow of revenues and costs in Rs crore in prices of 2013 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| Revenue minus recurrent costs | 1426 | 1675 | 3376 | 2404 | 1576 | 1290 | 1279 | 1268 | 1260 | 1258 | 862 | (163) | (164) | (164) | (164) |
| Investment costs | 1441 | 1253 | 1701 | 2434 | 2561 | 2123 | 1113 | 525 | 443 | 64 | 37 | 32 | 32 | 0 | 35301 |
| Net Cash Flow | (15) | 421 | 1675 | (30) | (985) | (833) | 166 | 743 | 816 | 1194 | 825 | (195) | (195) | (164) | 35137 |

**Changes from Draft to Final Development Plan**

The Economic Cost Benefit Analysis of the Final Development has been amended compared to the Draft Development Plan.

Based on instructions of the Client the cost of land to be acquired was raised from from 0.35 to 2 crore INR per ha. This resulted in a substantial reduction of the IRR from 12% to 4%; it was therefore necessary to see if costs could be reduced elsewhere and increasing benefits in a plausible manner.

This was done as follows: Increased sales prices by 30% used table 11-2 as the basis for the capital cost investments instead of table 11-8; Classifying investment costs for water supply and sewage as a separate project, so taking these out of the capital costs for the IR; Used table 5-1 for the allocation of gross areas by type of use and by phase; Increased the proportion of saleable land as a percentage of the gross area; Advanced the first year for the sale of land from year 5 to year 3; Also increased the percentage of land sold in the first few years; Corrected for a mistake that had occurred in the cash flow calculation for one year in the earlier version.

### 11.1.5 Development impact on the region

The impact of the development of the KBNIR can also be determined on such economic variables such as employment, value added, exports and investment. These impacts are summarised in **Table 11-9**. They refer to the impact of manufacturing activities expected for the region.

The contribution to value added by manufacturing in the IR can be determined based on the share of value added in output of each of the sub-sectors. The total weighted share of value added in output of the industries that are expected to locate in the Investment Region amounts to 26.5 percent. The investment region will also maken an important contribution to exports. The impact on manufacturing exports has been estimated based on the shares of export in total output.

Total investment in industries in the Investment Region has been estimated assuming a capital-output ratio of 1, i.e. each additional Rupee of output in manufacturing requires one Rupee of investment. Moreover the investment region will be highly attractive for foreign investors. It has been assumed that 15 percent of investment in manufacturing in the region will be by foreign investors.

**Table 11-9: Summary economic effects of the development of the IR to economic in 2040 (monetary values are in current prices)**

| Summary economic effects of the development of the IR to economic in 2040 (monetary values are in current prices) | |
|---|---|
| Economic effects | Amounts |
| Industrial employment (number) | 1.20,000 |
| Total employment (number) | 5,37,000 |
| Gross value added (Lakh Rs) | 5130579 |
| Exports (Lakh Rs) | 2652413 |
| FDI (Lakh Rs) | 2904101 |

The development of business activity in the zone can be expected to result in significant indirect and multiplier benefits. Indirect benefits include additional economic activity of local companies supplying inputs or services, or companies further processing or distributing products from the zone. Multiplier effects include additional spending in local businesses through incomes generated in the zone. These benefits reflect the linkages between the zone and the local economy. The extent to which these benefits occur generally depend on the type of businesses to be established in the zone. They will be higher for companies in manufacturing processing local materials than for companies processing imported inputs or for trading companies.

Based on the Input-Output table for India production multipliers for each of the manufacturing sectors can be determined. For many sectors the resulting production impact including the effect of backward linkages doubles the direct production effect. It can be assumed that a considerable share of these indirect production effect will be realized in the state of Rajasthan, as well as in the nearby Delhi region.

Another important economic effect of increased production is on incomes. This impact is mainly realized through wage and salary incomes of the workers employed in the industries established in the investment region. Based on available information it can be determined that the share of wages and salaries in industrial output amounts to 10 percent. By 2040 generated in the Investment Region. The weighted wages and salary share in increased production amounts to 10 percent and would amount to Rs 5066 crore in 2040 for industrial workers alone

# 12 Marketing Strategy

A marketing strategy comprises the following:

- Vision and marketing objectives;
- Activities with comparative advantage;
- Investor requirements;
- Product development;
- Investment Promotion;
- Action Plan;
- Management Model for Investment Promotion.

## 12.1 Vision and investment promotion objectives

Vision -
"To provide the preferred location in India for high tech and knowledge industries for accelerated and sustained economic growth.

The investment promotion objectives relates to the attraction of domestic and foreign direct investments:

To double the flow of domestic investment and FDI within three years and treble within five years.

As key marketing message the Investment Region could adopt:

The Investment Region can competitively satisfy the needs of companies wishing to more cost effectively serve customers in India while positioning themselves to exploit new and expanding opportunities in South and South East Asia and other countries.

## 12.2 Activities with Comparative Advantage

Activities already implemented by foreign companies, activities making use of relatively little water, activities than can serve the large consumer markets of the NCR and Rajasthan all have a comparative advantage in the Investment Region.

The investment promotion organisation of the Investment Region ought to announce target sectors that form the set of target niches of a 2013 IP Strategy document. The targeted sectors in 2013 could be:

- Automotive components;
- Electronics;
- IT and ITES;
- Wearing apparel;
- Warehousing and logistics.

The targeted sectors are further analysed and defined in the Note on Target Industries for the Investment Region. The number of target industries for the Investment Region should not be more than a handful, - automotive components and IT already being among them. With investment promotion it is with scarce resources the art to select only a few target sectors but promoting these few incredibly good.

## 12.3 Investor Requirements

Locational requirements for electronics, automotives, wearing apparel, warehousing and logistics are summarised in **Table 12-1 12-2, 12-3, 12-4 & 12-5** respectively. In addition, there is investment potential of KNIR consisting of the capital investments required for the trunk and internal infrastructure and, taking a capital/output ratio of 1, the expected investments in industry amounting to 9740342 INR Lakhs in prices of 2010.

**Table 12-1: Locational Requirements for Electronic Components**

| Locational Requirements for Electronic Components | | | |
|---|---|---|---|
| **Electronic components** | **Typical industry requirements** | **Global investment & Technology trends** | **Investment region offerings** |
| Labour Cost and Availability:<br>Mode of Transportation:<br>Material Cost and Availability:<br>Required Factory Space:<br>Market Size:<br>Geographic Location:<br>Technology Required:<br>Utilities: | Semi-skilled and skilled labour (150-350)<br>Land or sea<br>Important, imported if not locally available<br>2,000-5,000m2<br>Should easily be exported<br>Not extremely critical<br>Advanced technology required in some cases<br>Dependent on Electricity | Japanese Consolidation and Retrenchment<br>US firms consolidating in Asia<br>Investments by Korea and Taiwan<br>European firms seeking low-cost production bases in Eastern Europe<br>Increased miniaturisation of components | Region known for semi skilled labour available at reasonable rates.<br>Sea transportation access through Mumbai and Kandla.<br>Available factory space.<br>Provides a good location for labour dependent operations of Indian components manufacturers.<br>Provides reasonably cheap utility costs except for water |
| | | | |

**Table 12-2: Locational Requirements for Automotive Components**

| Locational Requirements for Automotive Components | | | |
|---|---|---|---|
| **Electronic components** | **Typical industry requirements** | **Global investment & Technology trends** | **Investment region offerings** |
| Labour Cost and Availability:<br>Mode of Transportation:<br>Material Cost and Availability:<br>Required Factory Space:<br>Market Size:<br>Geographic Location:<br>Technology Required:<br>Utilities: | Cost is crucial<br>Skilled labour (150-450)<br>Technical labour (10-20)<br>Land or Sea, transport cost is also important<br>Important<br>5,000 to 8,000 m2<br>Large market size needed<br>Preferably close to car producers<br>Advanced<br>High consumption of electricity and telecommunications are important | Components manufacturers build close links with automotive manufacturers and follow them to main markets.<br>There is an emerging demand and competition by developing countries. | Labour available at low wage rates<br>Reasonable transport costs, confirmed by Honda logistic scheme<br>Proximity to large automakers in Asia<br>Electricity and telecommunications available at competing rates |

| Locational Requirements for Automotive Components | | | |
|---|---|---|---|
| **Electronic components** | **Typical industry requirements** | **Global investment & Technology trends** | **Investment region offerings** |
| | | | |

**Table 12-3: Locational Requirements for Wearing Appearal**

| Locational Requirements for Wearing Appearal | | | |
|---|---|---|---|
| **Electronic components** | **Typical industry requirements** | **Global investment & Technology trends** | **Investment region offerings** |
| Labour Cost and Availability:<br>Mode of Transportation:<br>Material Cost and Availability:<br>Required Factory Space and Site Cost:<br>Market Size:<br>Geographic Location:<br>Technology Required:<br>Utilities: | Unskilled Labour<br>Road, sea, air<br>Smooth import and export possibilities<br>2,000 – 3,000 $m^2$<br>Local demand + quality exports to EU<br>Close to rail, road infrastructure<br>IT applications<br>Not highly energy intensive | Speed sourcing and replenishment orders<br>Complete supply chain management<br>Direct delivery to point of retail sale<br>Quick convergence with ICT technology<br>Low wage competition from the Far East | High quality against highly competitive prices<br>Reasonable transport costs and EU access<br>Raw material locally available |
| | | | |

**Table 12-4: Locational Requirements for Transport & Warehousing (Logistics)**

| Locational Requirements for Transport & Warehousing (Logistics) | | | |
|---|---|---|---|
| **Electronic components** | **Typical industry requirements** | **Global investment & Technology trends** | **Investment region offerings** |
| Labour Cost and Availability:<br>Mode of Transportation:<br>Material Cost and Availability:<br>Required Factory Space and Site Cost:<br>Market Size:<br>Geographic Location:<br>Technology Required: | Important<br>Multi-modal locations (road/rail/sea/air)<br>Not relevant<br>Important<br>Important, except for transit shipments<br>Critical; driven by attainable service levels (lead times) and combined in/outbound transport cost | Major trend towards outsourcing to integrated third-party logistics providers (3PLs)<br>Faster transport times lead to fewer distribution centres with economies of scale<br>Trend towards more local value-adding (postponed | Seaports of Mumbai and Kandla<br>Strategic NCR location<br>Ample availability of labour<br>Good road infrastructure |

| Locational Requirements for Transport & Warehousing (Logistics) | | | |
|---|---|---|---|
| **Electronic components** | **Typical industry requirements** | **Global investment & Technology trends** | **Investment region offerings** |
| Utilities: | Warehouse automation technology<br>Good telecommunications infrastructure is a must | manufacturing) | |
| | | | |

## 12.4 Product development

It is not enough to provide a proper infrastructure sit back and expect domestic and foreign investments to follow. The Investment Region as a product should be marketed against competition from other regions and locations.

In case the attractiveness of the IR for an investor in a certain sector is still low but when the attractiveness of the investment is high for the IR one should seek to improve the product. Assuming supply-side problems can be overcome, - for example by providing specific training to workers or solving market connectivity obstacles -, the IR can continue to promote the industry in that sector.

## 12.5 Investment Promotion

First of all it should be known what organisation will be responsible for the management and marketing of the Investment Region. If the industrial area is to be managed and developed by private developers, they will be in charge of the marketing strategy. On the other hand if the management and development will be done by the Government of Rajasthan the industrial land can be marketed by RIICO or a specific zone authority (See section 7 on the recommended management model for investment promotion).

Promotion starts with building a positive image of the State, in which the Rajasthan State Government and the BIP can have a leading role. Subsequently, the Rajasthan State Government and BIP can cooperate with RIICO in the process of approaching potential developers for the IR. It is important that the State Government, the BIP and RIICO closely cooperate in this process. The IR and RIICO need to 'feed' the BIP with relevant information about the IR, which can be used in promoting Rajasthan and the IR.

An investment promotion strategy should gear finding a mutual beneficial match between investors' requirements and a location. Considering that a viable and competitive solution to all types of investments is impossible, a targeting approach has to be applied through a business concept. Designing the business concept requires a precise answer on:

- Whom best to address with the offer – the Target Market (this is the geographic area from where to attract the target industries);
- What to offer – the Location Value Proposition of the Investment Region;
- How this will be communicated to the targeted groups.

The first bullet, the target market does not need further explanation as this was explained in the Note on target industries. For the second bullet, the Location Value Proposition, most of it has also been explained in that note but two points remain important. First the quality of the product in a sector should be advertised by providing benchmarks that show the advantages for investing in the IR versus that of other competing regions which most probably are Haryana and Uttar Pradesh. Secondly, the lens through which a potential investor will interpret the location value proposition will be filtered through the brand of the IR. The IR may be perceived through the lens of how people see the rural poor of India. In this case the IR could differentiate itself from other regions in India by adopting elements of the unique necklace image. The brand *Epicentre of prosperity – a jewel in Rajasthan* should be used consistently in all promotional activities of the IR. The last bullet, how to communicate to target industries is discussed hereunder.

Investment leads generation are the activities related to the generation of investment that lead up until an investment decision. It is important to use the right techniques for investment generation.

The following lead generation tools are advised to be used by the investment zone authority and/or RIICO to attract companies in the target industries and developers to the IR in Rajasthan.

**Brochures and Internet**
Develop new marketing material on the IR for the investment zone authority and/or RIICO, both in Hindi and English. A brochure for BIP could contain up to date information about the IR and the investment climate in Rajasthan, national and state investment regulations and procedures, exemptions and incentives, the legal framework and flow charts of procedures and responsibilities. The RIICO brochure should contain information about processes and procedures within the IR, the IR policy related to rental fees and industrial investment opportunities in the IR. Also, a website dedicated to the IR needs to be made linked to the BIP and RIICO websites.

**Advertising campaigns**
Advertising can be used for both image building and investment generation. There is a significant difference in emphasis between the two objectives. An image-building advertisement may focus on countering negative perceptions and generally promoting the perception of a sound business climate. In contrast, the investment generation advertisement typically underlines the distinctive benefits offered by a location and provides the investor with the compelling reason to seek additional information. While the image-building ad seeks no real action by the investor – other than a heightened awareness or an improved opinion –, investment-generation advertising is intended to stimulate action by the client.

Single advertisements placed in mediocre publications should be avoided. Instead, effective and intensive advertising can contribute to changing or achieving the image of an Investment Region as a favourable place to invest.

**International public relations campaign**
Where image-building budgets are restricted, international public relations can serve as a substitute for direct advertising. Through selective use of international media tours, editorials and letters written to editors of periodicals by prominent politicians, Rajasthan, and BIP in particular, can broadcast their message in a cost-effective and credible way. Advantage can also be taken from visits by foreign representatives and their press entourage to disseminate related stories about the investment locations in the IR.

**Participation in economic missions outside Rajasthan**
Economic missions by representatives from Rajasthan are good opportunities to bring the IR to the attention of investors in other States of

India. In these missions targeted developers are to be contacted and met. Representatives from BIP and RIICO can participate in such missions or initiate the organisation of the economic missions. Taking into account the often official nature of economic missions and the presence of high officials such as ministers, potential developers present will be likely to listen to and discuss presentations by BIP or RIICO.

**Hosting investment conferences**

Investment seminars and conferences are useful tools for communicating promotional messages. They are to be held in key national markets.

Seminars and conferences can bridge the more general image-building and investment generation components of BIP's and RIICO's investment promotion strategy. As with most aspects of promotion, however, these events must be highly focused and well planned. A poorly organised conference can give potential investors a negative impression of the IR in Rajasthan.

**Direct Marketing Campaigns**

Direct marketing campaigns fall under the class of highly targeted activities. Once addresses have been identified for targeted industries, RIICO or the zone developer can send marketing letters to potential investors and follow those letters with phone calls. Despite the advent of e-mail, the traditional written approach to a potential investor is still the best beginning to a direct marketing campaign. Similarly, there is no real substitute for a face-to-face meeting as a way to influence an investor.

RIICO or the zone developer should only use direct marketing to those firms that it believes, based on the previous investor targeting, are likely to be interested in the Investment Region.

A key issue which already was mentioned above is to determine a sound basis for the allocation of different functions between different 'agents' in the investment promotion system in Rajasthan and in particular (in the current context) between the management agencies at IR level (a possible Investment Zone Authority, RIICO, or developer) and BIP.

Since 1969 RIICO is the original Investment Promotion Organisation for industrial investment. In the 1990s the BIP was mandated by the State Government to promote investment also outside industry e.g. in the social infrastructure and medical field. There is some overlap between the BIP and RIICO since both organisations for example could in principle be promoting a university to locate in the State.

Apart from biotech and IT, RIICO is not promoting specific industries. It does not actively promote investments outside India. Inside India, RIICO uses three Unique Selling Points to attract industries:

- Rajasthan is a peaceful State;
- Rajasthan has good market accessibility to the NCR and Mumbai markets;
- India's East-West Corridor passes through Rajasthan.

RIICO and JETRO concluded an MoU in 2006 to introduce Japanese companies to Rajasthan. The MoU had the blessing of the State Government. RIICO created a special zone exclusively for Japanese investment along the NH-8 at Neemrana. These Japanese investments are testimonials to Rajasthan's friendly foreign investment regime. It is recommended to replicate this approach for other countries in Asia.
The Investment Climate Advisory Services team of the World Bank supports the Government of Rajasthan and BIP to promote the state as an increasingly attractive destination for private investments through improvements in the investment climate. This knowledge partnership with the IFC has the following three areas of operation:

- Supporting Government of Rajasthan's Investment promotion and facilitation efforts, including (i) undertaking competitive benchmarking analysis in 4-5 selected sectors and (ii) review and undertake reforms of the State's investment policy framework in the selected sectors;
- Developing and implementing a targeted investment promotion campaign;
- Promoting systemic reforms to improve the business regulatory environment in the state.

The information for this marketing strategy is drawn from a number of interviews with the relevant agents in investment promotion in Rajasthan (Bureau of Investment Promotion, RIICO-Jaipur, RIICO-Neemrana, RIICO-Bhiwadi and Rajasthan Chamber of Commerce and Industry).

## 12.6 Marketing the Investment region

The key steps involved in Marketing Investment Region are listed in the **Table 12-5**.

**Table 12-5: Key Marketing Steps**

| Key Marketing Steps | |
|---|---|
| **Timing** | **Broad outline of actions** |
| Q1 2013 | Establish marketing organisation. Confirm vision and investment promotion objectives. Draft operational plan 2013-2015 |
| Q2 – Q3 2013 | Finalising the target sectors and states for proactive marketing purposes. Preparing the marketing materials, the dedicated website, advertising, international public relations, road shows, seminars and direct marketing campaigns |
| Q4 2013 | Actual start of domestic public relations, local |
| | improvement of the product and streamlining all regulatory aspects |
| 2014 -2015 | Start of implementing the agreed marketing mix |
| Budget needs p.a. | Staff salary, accommodation, travel costs, equipment, car; brochure € 1500, sector fact sheets € 500, website € 1500, advertising € 30000, public relations €1500, domestic road shows € 15000, seminars € 15000, direct marketing (development of database and implementation) € 15000 |
| | |

## 12.7 Models for Management of Investment Promotion

The appropriate model for the promotion of investment in the region of Neemrana, Bhiwadi and Khushkera depends on the characteristics of the region. Five ground models can generally be identified, with differing degrees of public commitment, private sector involvement and institutional complexity:
Model 1: Investment Promotion by the Public Sector (by in-house staff);
Model 2: Autonomous public investment promotion agency;
Model 3: Contractual public-private partnership;
Model 4: Equity public-private partnership;
Model 5: Fully private development

The characteristics, advantages and disadvantages of each model are briefly discussed hereunder.

### 12.7.1 Model 1: Investment Promotion by the Public Sector (by in-house staff)

According to this model, the development and promotion of investment in the region will be performed by in-house public administration staff with straightforward procurement methods for, for example, infrastructure works.

This approach brings no additional overheads for the Government and therefore requires less funding than the creation of a dedicated investment promotion agency. On the other hand, it may be difficult to gather the required combination of skills and expertise within the ranks of the Government staff. The resulting risk is that the quality of investor servicing may be below what is offered elsewhere. There is then also a higher dependence on the national and State investment agencies, which is not desirable. This model is also not advisable for the Neemrana, Bhiwadi and Khushkera investment region, because it covers a relatively large area.

### 12.7.2 Model 2: Autonomous Public Investment Promotion Agency

According to the second model, an autonomous public investment promotion agency is created in the form of a separate legal entity, with the State Government, and other public authorities (such as the Neemrana municipal government) as its main shareholders. Establishing such an agency requires much more commitment from the side of the public sector, but also brings certain benefits such as an improved control. The agency is typically set up for an indefinite period of time.

Some of the drawbacks of creating a dedicated agency include:

1. Increased costs through creation of extra overhead (staff, administration, offices…);
2. In some cases abroad, under-performance or even malpractices have been reported; these risks are due to larger degree of autonomy, and can only be mitigated through more external controls;
3. In case of involvement of several partners, risk of conflicting approaches (e.g. where it concerns decisions regarding the approval of certain investors, selection of real estate offer, price levels and public support).

### 12.7.3 Model 3: Contractual Public-Private Partnership

This model constitutes a mixed form, where the public sector contributes certain assets and resources (e.g. the land itself) but concludes a contractual arrangement with a selected private sector party for specifics like infrastructure development and promotional activities. In this approach, the public sector can benefit from the specific expertise and resources of the private partner, while still avoiding the complexities and risks of entering into a joint equity company with a private partner. From the viewpoint of the public sector, the drawback of this model is reduced control over the strategic orientation and operations of the investment region. In a worst-case scenario, the private concessionaire also might– for various reasons – seriously under-perform and not meet his obligations in terms of investment and employment attraction.

### 12.7.4 Model 4: Equity public-private partnership

This model constitutes the equity (joint-venture) equivalent of the third model, in which the public and private partner(s) decide to set up a joint company for the development and management of the investment region. It is an inherently complex, and therefore more costly, approach that requires a great amount of legal preparatory work (notably in the areas of fair and transparent selection procedures and rules regarding the provision of state aid). Similar, problems as with the contractual PPP model may arise, such as the risk of divergent goals and expectations; a more lengthy open procedure for selection of the partner; risk of non performance of the private partner (e.g. due to other priorities, bankruptcy…); and the possible

difficulties of generating private sector interest in an intrinsically low-return project.

### 12.7.5 Model 5: Fully Private Development

Under the fifth model, the development of the investment region is left entirely to private sector players, often companies that are specialising in investment promotion activities. In this scenario, investors will require adequate financial returns on all the activities undertaken. Consequently, activities that are beneficial for the region, but not necessarily financially profitable, will not be carried out.

It should be noted that even in the fully private development model the Government still has a facilitating role, if not through financial support then through assistance with spatial planning aspects. A main drawback of the scheme is the public sector's reduced control over the development of the investment region, notably in terms of types of activities attracted and of the possibility of offering attractive pricing schemes. Moreover, there have been cases where private developers purchased large tracts of land for speculative purposes, postponing the infrastructure development until demand and prices are sufficiently high.

### 12.7.6 Comparative Summary

The choice of management model will need to consider the specific circumstances, so the "ideal" model does not exist. From the perspective of the Investment Region, the following key drivers of choice can be identified:

1. Cost and time needed for set-up;
2. Commitment of resources (ongoing basis);
3. Operational flexibility (decision-making, contracting…);
4. Complexity and risks;
5. Level of public sector control.

The comparison of models on above drivers is presented in **Table 12-6**.

Clearly, for any specific region, the preferred model will largely depend on the commitment and available resources of the public sector. For the Investment Region, the second model seems to be the best model for managing the implementation of the investment promotion.

**Table 12-6: Comparative Summary – Marketing Management Models**

| Comparative Summary – Marketing Management Models | | | | | |
|---|---|---|---|---|---|
| **From government's perspective** | **Model 1:** | **Model 2:** | **Model 3:** | **Model 4:** | **Model 5:** |
| Cost and time for set-up | Low | Medium | Low | High | None |
| Commitment of resources | Low | Medium | Low | Low | None |
| Operational flexibility | Low | High | Low | Medium | None |
| Complexity and risks | Low | Low | Medium | High | Low |
| Public sector control | High | High | Medium | Medium | Low |
| | | | | | |

# 1 Response to Comments

Response to Comments Received from State Government on July 9, 2013

**A. COMMENTS FROM RIICO**

| Sl. No. | Comment | Response |
|---|---|---|
| 1. | Consultants should Define 1 truck lot space in the draft plan report | Text is added in the report that Truck Lot space is proposed in the Industrial Area to avoid negative influence of heavy traffic on high quality areas. Preferably in vicinity of NH8. **[pg 4-41]** |
| 2. | Industrial Potable Water Demand as given in Table 6-8 of the draft development plan needs to be relooked as it is on lower side. | Potable Demand re assessed and revised figures are presented in Table 6-9. **[pg 6-28]** |
| 3. | Cost Estimates for various roads along with lengths and assumptions to be provided | Cost estimates for various roads (per km basis) as well as length is included in report. Please refer Table7 -4 for summary of costs **[pg 7-3]**and Appendix 9 for Bill of Quantities and rates for one km of road length for 80, 60, 45 and 30 m wide roads for the typical cross sections given in Figure 6-5 to Figure 6-8 **[pg 6-11 to 6-15].** |
| 4. | Assumptions for cost estimates for Power, Water, Sewerage, Drainage & Site Development, etc to be provided | DSR item no and unit rates adopted for water, sewerage, recycled water and drainage provided in **Appendix 10**. Refer Table 7-3 for cost assumption for site development **[pg 7-3]** and Table 7-13 landscaping and plantation **[pg 7-12].** |
| 5. | Provide O&M Costs for infrastructure components | O&M cost shall vary with the type of infrastructure component. General it is expected to be in between 2-3% of capital cost and that shall be taken. |
| 6. | Separate section on Recycled water distribution needs to be included. It shall provide, design basis, cost estimates, etc | Included. Please refer section 6-5. **[pg 6-45]** |
| 7. | Provide source for considering 45kld/ ha assumptions for estimating water demand for industrial process. It may be noted that RIICO considers 1000 gallons/ acre/ day for estimating water demand for industrial demand. | Master Plan Delhi, Naya Raipur Development Plan, Haryana State Industrial Infrastructure Development Corporation, Uttar Pradesh State Industrial Development Corporation and finally the CPHEEO has mention of 45kl/ha/day for industrial areas |
| 8. | Confirm whether defect liability for initial years considered or not in capital costs | It is confirmed that defect liability for initial two years is included in the capital costs. |
| 9. | Economic analysis cost figures do not match with Infrastructure cost provided in Chapter on Infrastructure Cost. It needs to be revised with correct figures. | Figures Matched **[pg 11-1 to 11-7]** |
| 10. | In Table 11-6 land cost is considered as 0.35 cr per ha. It shall be considered as 2cr per ha. | The assumptions for the land procurement and sale value are interconnected. These are based on the information available to the consultant at the time of compilation of this report. If the land |

| Sl. No. | Comment | Response |
|---|---|---|
| | | procurement costs raise, the sale value of the land shall increase accordingly. Economic cost benefit analyses therefore has to be reviewed constantly in order to make sure that costs do not supersede the selling value. **[pg 11-4]** |
| 11. | Economic Analysis needs to Provide Investment Potential of KBNIR | The investment potential of KBNIR consists of the capital investments required for the trunk and internal infrastructure and, taking a capital/output ratio of 1, the expected investments in industry amounting to 9740342 INR Lakhs in 2010 prices. This response has been inserted in section 12.3 of the development plan. **[pg 12-1]** |
| 12. | Economic analysis shall have to determine impact on KBNIR on State Economy | The impact of the Investment Region has been calculated by making a comparison between two scenarios, - with and without the DMIC. The calculations are in table 6.18 of the Demand study for the Investment Region. This response has been inserted in section 12.5 of the development plan. **[pg 12-4]** |
| 13. | In the draft development plan report the sale rate of Industrial, Institutional & Misc have not been provided therefore the same may be provided along with financial model incorporating amended cost of infrastructure etc., It may also be seen that at present, the residential & commercial sale rates of RIICO are 1.5 & 2 times the industrial land price minimum. | We have based our projections on the sales rates that were applicable in 2010 (see Table 11-8 in the Economic Cost Benefit Analysis chapter. Indeed higher land prices for commercial and residential land than for industrial land were taken up in the economic cost benefit analysis. |
| 14. | Table 11.2 regarding summery of economic effect on development of IR of the draft development plan needs to be revised in accordance with the employment figures considered for population projections. | There is no need to change the employment figures in Table 11-2 since these industrial and total employment figures represent our estimates of the additional employment, which results from the creation of the more favourable environment in the KBNIR. |
| 15. | Cost Estimates should be based for Year 2012 or latest. | Most of costs are based on 2012. |
| 16. | Provide references for BSR or scheduled rates used while estimating cost estimates | Please refer response to comment 2& 3. |

**B. Energy Department (RVPNL)**

| Sl. No. | Sl. No. Comments | Response |
|---|---|---|
| 1. | Power Demand Estimates shall be relooked at as they seem to be on higher side. | The power estimates are based on assumptions made by the consultants who consulted the Energy Department at the time. |
| 2. | KBNIR shall be divided in various zones and power loads for these Zone/ Area shall be estimated. | The evolution of the peak demand and the total energy requirement is based on the projected evolution of peak demand and total energy demand in de region. This evolution is based on the projections for three catgeories of (end-) |

| Sl. No. | Sl. No. Comments | Response |
|---|---|---|
| | | consumers: residential consumers, commercial consumers and industrial consumers. These categories of consumers, regrouped in load centers, are indicated on the map. So, various profiles of (end-)consumers, representing load centers, are clearly shown on the map.<br>The projections show a significant increase in peak demand and in total energy demand. |
| 3. | Estimate Demand by Industrial Typology, Uses and also by zone. | We estimated power demand in MW per hectare per type of industry, e.g. average power use amounting to 0.2 MW per hectare for median industries and 0.3 MW per hectare for heavy industries. By zone, total energy requirement and peak demand are given in Table 6-52 of the development plan. **[pg 6-103]** |
| 4. | Detailed assumptions considered while estimating power demand shall have to be provided. | The assumptions taken for the estimated power demand are presented section 6.8.2 **[pg 6-102 to 6-104]** |
| 5. | On site Power Generation through Solar & Wind Power shall be clearly estimated and deducted from overall power demand. | Approximately 170MW of solar power can be developed in the KBNIR from idle areas and roof tops in the short term. Solar and wind energy can in the long run contribute 20% of the additional capacity of power generation. There is not much power generation from wind to be expected in the investment region. Therefore of the total energy demand in the KBNIR by 2040 the share supplied by solar and wind power will still be less than 10%. **[pg 6-109]** |
| 6. | Estimate potential power generation while recycling of waste/ refuse from KBNIR | For power generated from recycling of waste / refuse our energy expert assessed there is a limited potential for power generation from biomass since the agricultural sector will be overtaken by the development of industry in the KBNIR. **[pg 6-109]** |
| 7. | Estimate Net Demand Required to be sourced. This is after deducting solar & wind power. | Demand supply. By the end of 2017, there is a supply surplus of 15 267 MW to be expected. The demand requirement is estimated at 4 444 MW whereas the additional capacity is planned at 19 711 MW. This leads to the 15 267 surplus. The situation drastically changes by the end of 2040, whereby the estimated capacity required is 33 818 MW and the available capacity as planned is 19 711 MW. This will lead to a deficit of 14 107 MW. The energy here could be sourced from other regions, whereby the lack of transmission capacity could create a bottle-neck.<br>Peak demand by the end of Phase 3 will be 3 877 MW whereas the energy requirement is estimated at 24 453 GWh.<br>System capacity. The system capacity demand at Phase III is estimated as follows:<br><br>- 440 kV = 4934 MVA |

| Sl. No. | Sl. No. Comments | Response |
|---|---|---|
| | | - 132 kV = 4639 MVA<br>- 33 kV = 2943 MVA<br>- 11 kV = 1536 MVA. |
| 8. | Power required from external sources shall be drawn from 400KV shahjahanpur sub-station, 220kv Neemrana Sub-Station and other nearby sub-stations as shown in RVPNL Network Map. Network map is provided to Consultant for reference. | Primary source of power shall be 400KV Shahjahanpur sub-station and 220kv Neemrana Sub-Station, as they are within the KBNIR region. **[pg 6-105]** |
| 9. | Power Transmission Network within KBNIR shall be clearly depicted in KBNIR Plan along with sub-station location & type. The current map shown in figure 6.28 of the draft development plan need to be revised in accordance with the above observations. | In the Figure 6-32 with the power supply network the gas station, the substations, the 400kV Line and the 132kV Line are clearly shown. **[pg 6-108]** |
| 10. | Power line with 132 kv and below shall be considered underground. | The Consultant has been requested by DMICDC in earlier stage to keep power lines as much as possible in dedicated underground tunnels with accessible points for maintenance.. DMICDC requested this to prevent continuously open sidewalks during maintenance periods, to prevent illegal electricity tapping from poles, to prevent fire hazards, to increase the esthetical urban areas, and so on. |
| 11. | Power line network 220kv shall be aligned with proposed road network and its corridor shall be defined in plan. | Final Master Plan for SNB UC stands notified and it allows provision of infrastructure in the land use zones. At the time of execution such areas shall be demarcated and acquired by implementing agency. |
| 12. | For 220kv and 132kv sub-stations an area of 6ha and 3.5 ha respectively shall be assigned. | |
| 13. | Roads Cross section shall be amended to incorporate 220kv/ 132 kv lines within RoW. For this purpose 10m for 220kv line & 6m for 132 kv line shall be assigned. | The Consultant has been requested by DMICDC in earlier stage to keep power lines as much as possible in dedicated underground tunnels with accessible points for maintenance.. DMICDC requested this to prevent continuously open sidewalks during maintenance periods, to prevent illegal electricity tapping from poles, to prevent fire hazards, to increase the esthetical urban areas, and so on. |

**C. <u>Irrigation Department</u>**

| Sl. No. | Comments | Response |
|---|---|---|
| 1. | Provide further clarity on potable/ non-potable water demand estimates for KBNIR and for each phase. | Pl refer table 6-9 **[pg 6-28]** |
| 2. | Delete DJB as probable source as the proposal has recently been turned down by Delhi Government. | The consultant is of the opinion that the identified sources would always be option on table. However, their availability is in question. However, in future the source may be available. |
| 3. | Quantum from Rainwater Harvesting shall be estimated. | The broad assessment suggests that the 16MLD of water can be harvested |

| Sl. No. | Comments | Response |
|---|---|---|
| | | over a year. However, to capture 16mld of water entire 165.61 sqkm of area would need strong drain system. |
| 4. | Quantum from Ground Water Shall be estimated. | The estimated ground water availability at current withdrawal rate shall be ~100mld spread over entire KBNIR. |
| 5. | Quantum then required from External Source shall be estimated. | The quantum required from external source shall be 241mld including transmission, distribution and treatment losses. |
| 6. | Provide water balance diagram for KBNIR. | Please refer **Appendix -11**. |
| 7. | Take details from PHE department for Sourcing Water from Chambal and incorporate it in Final DP report. | A new section on Preferred Source has been included in report. The scheme has incorporated feasibility report prepared by PHE department. |
| 8. | Provide map showing rain water harvesting structures within KBNIR. | Pl refer figure 6-19 **[pg 6-44].** |
| 9. | Amend the Water sourcing chapter based on write-up provided by Irrigation Department to BIP | Water sourcing section has been revised accordingly and presented in Chapter 6.2 **[pg 6-20 to 6-31]** |

**D. CTP-NCR, Town Planning Department**

| Sl. No. | Comments | Response |
|---|---|---|
| 1. | Report shall provide clear distinction between SNB UC & KBNIR. | A clear distinction has been made and shown in figures of chapter 1-2 and 1-3. **[pg 1-2]** |
| 2. | Provisions of Final Master Plan for SNB UC, which has recently been notified by Town Planning Department, shall be replicated for KBNIR DP to the extent applicable to KBNIR. While preparing final DP for KBNIR, consultant shall make sure that there is no mis-match between the proposals of notified Master Plan for SNB UC and the Development Plan of Consultant for KBNIR. | The proposals of notified Master Plan for SNB UC and the Development Plan have been brought in line. |
| 3. | It was informed that till the new building byelaws are made applicable in the master plan area, the Bhiwadi building byelaws will continue in the area. Byelaws for KBNIR shall be framed by the Consultants to bring its urban design philosophy to implementable framewok. While doing so, the consultant shall consider Bhiwadi Building Byelaws. It was also suggested that, in case the consultant suggest a different set of building byelaws particularly for KBNIR different from the rest of SNB Master Plan area, the same can be made applicable, as a similar arrangement was made in case of framing separate building byelaws for Vidhyadhar Nagar | The consultant has prepared specific regulations for KBNIR, that are better suitable with the specific ambitions of the Development Plan, and that create flexibility. **[pg 4-1 to 4-93]** |

| Sl. No. | Comments | Response |
|---|---|---|
| | in Jaipur. | |
| 4. | All road cross-sections shall be relooked and revised. | Revisions have been made to the cross-sections refer section on road infrastructure. **[pg 6-11 to 6-15]** |
| 5. | Road Nomenclature shall be as per notified Master Plan for SNB UC | Same Road Nomenclature as per notified Master Plan for SNB UC is used. **[pg 6-10]** |
| 6. | Tables provided in chapter 4: development control regulation shall be relooked and revised. | Development control regulation are relooked and revised |

**E. PWD**

| Sl. No. | Comments | Responsibility |
|---|---|---|
| 1. | Show Delhi Jaipur Expressway Alignment in Development Plan | Delhi Jaipur Expressway Alignment is shown in the images. |
| | | |

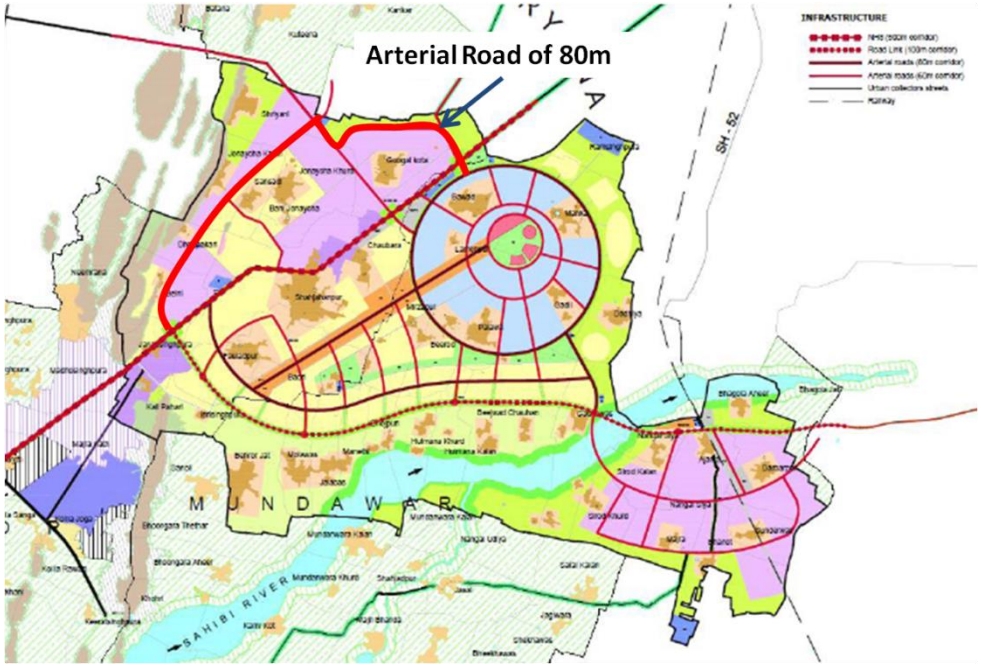
**Response to Comments from IL&FS on September 3, 2012**

| S. No. | Comment |
|---|---|
| 1 | Table 3-2: Planning Norms & Standard for KBNIR: Request you to update on the how many of each facilities would be required for KBNIR (elaborate with Phasewise distribution) |
| Response | A phase wise facility requirement for KBNIR is presented separately in ***Appendix 5***. |
| 2 | Chapter 4: Development promotion and control regulations: Following needs to be covered<br>• Elaborate on the procedures for obtaining the Building Permits<br>• Fire protection and fire safety norms not included<br>• Requirement of Bus Depot, truck terminals, vegetable market and public transport stations needs to be incorporated<br>• Building control norms for stairs in each land use not discussed |
| Response | Urban Improvement Trust – Bhwadi is the designated authority for SNB UC which includes KBNIR. The development promotion & its control for SNB UC are under UIT-Bhiwadi. UIT bhiwadi is granting permission as per the provisions of Greater Bhiwadi Building Byelaws, which covers aspects relating to Building Permits, Fire protection & safety and Stars, etc. The consultant has proposed new item set of guidelines as prescribed in chapter 4. **[pg 4-1 to 4-93]** |
| 3 | Table 4-3 Development Control Regulations for Commercial Area: What do we mean by Hospital C and D |
| Response | Text has been revised. Comment is not applicable anymore. |

| S. No. | Comment |
|---|---|
| 4 | Figure 4-3 Industrial Area KBNIR: Mining area polygon colour matches with the Road Line |
| Response | Rectified. |
| 5 | Table 4- 4 Development Control regulations for Industrial Area: What are the safety norms industries should follow to have permissible uses of school, row housing, apartments & residential services? |
| Response | Depending on the amount and type of dangerous substances various safety norms has to be applied. For each industry norms can be defined according to applicable regulations. Working on the further development and subdivision of sections of the area a detailed zoning of land-use and categories of industries should be prepared that enables housing on pronounced locations. |
| 6 | Figure 4-4 Recreational Area of KBNIR:<br>• Reasons for the location of regional parks/play ground & sport complex only on the southern part of the residential area of KBNIR. Elaborate with reasons.<br>• How are the playground for the residential area along the right side of the Nh-8 and the Abadi development being planned?<br>• Elaborate on the reasons for the location of recreational area concentration within the knowledge city in phase 1.<br>• What is the percentage of recreational area allocated in phase 1 of the plan? |
| Response | • The regional parks / play grounds & sport complexes are mainly in the southern part of the residential area of KBNIR. It is centrally located in the largest residential area in such a way that several green zones are connected to create a large green network for leisure and sports close to residential areas. This green network is at considerable distance from most unhealthy NH8 environment. Greens and playgrounds on a smaller scale are integrated on neighborhood level in the entire KBNIR. **[pg 4-52]**<br>• Small scale playgrounds are integrated in all residential neighborhoods (also on left / right side of NH8), and within the Abadi Development areas. These small scale playgrounds are within walking distance of homes and are minimum 100 square meters as described in tables of chapter 4. **[pg 4-53]**<br>• In this central area the commercial strip, Government buildings and the Knowledge City come together, and as such will become a focus point of the new city. A variety of functions and people will come together in this area.<br>• It is therefore of importance that this central area is of high attractive value, and a green recreational environment is proposed to achieve this.<br>• The percentage of recreational area allocated in phase 1 in DP is 2,64%. (126 hectares recreational area in 7.762 hectares of Phase 1). |
| 7 | 4.11.5 Public /semi – public (Knowledge City/Government Offices): 'Development Control Regulations- Zone 1 along park continuous upto 25 floors Zone 3 along 60 m…… other 2.5 floors' what is the road width in each case? |
| Response | The difference between the three Knowledge City zones is based on the spatial concept of creating a radial (knowledge) City, that is focused on a central area (with Government buildings in attractive green environment).<br>For that reason in zone 1 (closest to center of radial city) the maximum building height is highest, and in zone 3 (furthest from center of radial city) the maximum building height is lowest.<br>Within the three different zones there is a subdivision of maximum building heights, related to the different road categories as indicated in table 4-15 to 4-18. **[pg 4-67 to 4-81]** |

| S. No. | Comment |
|---|---|
| 8 | Figure 4-5 Public and Semi – Public Area KBNIR: What are the norms selected for location of residential, Commercial Area and corporate offices in Public and semi public Land uses? Public and semi public area has been demarcated mainly in the Knowledge City of KBNIR. Elaborate on the reasons and does this mean such type of activities is not permitted in other land uses. If yes, then how these uses are reflected in the Landuse Plan? |
| Response | The norms selected for location of residential, commercial area and corporate offices in public and semi public land use are based in the KBNIR philosophy of creating a mixed use city with the purpose to create maximum urban vibrancy and liveliness.<br>Public and semi public area has been demarcated mainly in the Knowledge City, but these type of activities are also permitted in other land uses. To create a lively city and a vibrant mix of functions in the KBNIR, the strategy is adopted to allow a maximal variety of functions within each land use. However, in each land use there is one dominant activity.<br>These uses are reflected in the tables with permitted uses per Land Use. **[pg 4-4 to 4-88]** |
| 9 | The minimum RoW for roads has been suggested to be 30m in the Development Control Regulations. Does this mean that no internal road would be constructed below 30 m RoW within the Investment region? If yes, then how do we foresee the internal development taking place for the region? |
| Response | The minimum RoW is set at maximum of 30 meters. In the Masterplan for Greenfield Integrated Township it will be shown that internal roads can be smaller than the RoW of 30 meters. |
| 10 | 4.11.6 Transportation and Logistics Permit uses: 'Main use of transportation area (beside transport) is green area. Additional to this, Solar power can be generated. Partial commercial and office building can be established' how do we foresee the establishment of Partial Commercial and office buildings and what are the parking norms to be followed? Elaborate |
| Response | In areas such as Bus or Train Terminals or Multimodal Transit Station, commercial (or office) functions can be integrated. Logistical prime locations are often also prime locations from commercial (many commuters/high accessibility) and office (excellent connectivity) point of view.<br>Car parking is not promoted at these locations to stimulate the usage of public transport to final destination from terminal / station. |
| 11 | Figure 4-6 Transportation and logistic area KBNIR: Location of these areas cannot be comprehended in the map |
| Response | The abbreviations of these areas in the map are readable in the enlarged maps in the Final Development Plan. |
| 12 | Table 4-8 Parking provisions: Parking norms for places of worship and other uses as mentioned in the excel sheet of permitted/ permissible uses must also be incorporated. |
| Response | The parking norm for religious places shall be same that are for Commercial Land Use. |
| 13 | Figure 4-7 Natural Features area KBNIR: How many entry and exit points from NH-8 have been taken and traffic that has been considered for such movement. Is it line with the traffic projection of the NH-8 by NHAI? |
| Response | Ecorys did not look at exit and entry points from NH-8. However, we suggest having four exit- and four entry points at the NH-8. |
| 14 | Are there any sites of heritage importance, forest area within the SNB area? If yes, what are the norms and development control regulations suggested to protect/conserve it? |
| Response | No. |

| S. No. | Comment |
|---|---|
| 15 | Are these Development Controls Norms applicable only for KBNIR or covers entire SNB area? |
| Response | Development Control Norms covers entire SNB UC excluding Behror Municipal Council.<br>It may be noted that the GoR has finalized and notified the development control regulations for Entire SNB UC along with Master Plan for SNB UC and they are presented as it is in Chapter on Development Control. |
| 16 | Section 5.5 Phase 2(2030) Reasons why the development area under phase 2 are located in two separate sites |
| Response | The development area under phase 2 is located on two separate sites because phase 2 development is based on:<br>1. a logical extension of phase 1 to maximal use the existing development, functions, infrastructure etc. of phase 1, and;<br>2. a new development near Ajarka Train Station which will be a prime location for development because its excellent connectivity by road (link) and rail (station).<br>**[pg 5-2 to 5-5]** |
| 17 | How far the Traffic projection on NH-8 gets affected due to Investment Region? |
| Response | Freight traffic is predominantly by train. Person traffic is from home to work and *vice versa*. A few flyovers are suggested also based on the population forecasts. |
| 18 | Phasewise Area Statement and their percentage need to be incorporated.<br>Bifurcation of residential into LIG, MIG and HIG in residential land use needs to be incorporated. |
| Response | Phasewise area statement is presented in chapter 3 development phasing for KBNIR **[pg 5-1].**<br>In the report is integrated that at 30% is LIG, and MIG/HIG is maximum 70%. **[pg 4-4]** |
| 19 | Table 6-3 Traffic projections by category of traffic and mode of traffic in terms of number of trips per day, 2015 – 2040:<br>• The table includes only the trips (number of person ) existing traffic in the region and vehicular traffic projection also needs to be incorporated. |
| Response | See Table 3.3 for vehicle projection in the prefeasibility study for the bus system. The existing traffic is from a very low basis, thus negligible. |
| 20 | Section 6.1.2: Development Strategy external Links: NH-8 – Concor ICD at khatuwas on DFC has been proposed. An Expressway connecting Jaipur with Delhi has been proposed Show the route in map |
| Response | The routes are shown in final notified Master Plan for SNB UC. |
| 21 | What is the present status of the SH-52 and SH -15 and are there any proposal for their expansion? |
| Response | The SH-52 and SH-15 are access roads for which there have been no immediate investment needs determined for expansion and rehabilitation. |
| 22 | Section 6.1.2.3 Regional Rapid transport System: 'The National Capital Planning Board, is currently undertaking……..Bawal Leg of this MRTS to the KBNIR. The proposed MRTS is expected to terminate at Delhi Metro Station.' At which station does the proposed MRTS system is expected to terminate? |
| Response | See above and in Figure 2.5 of the prefeasibility study of the bus system where one can see where the MRTS ends in the KBNIR. The MRTS is proposed to start between Gurgaon and Bawal (close to the Rajasthan and KBNIR boundary). |
| 23 | Figure 6-3 Transport infrastructure in the KBNIR: What is the thought process for not providing any arterial road on the North Eastern side of the |

| S. No. | Comment |
|---|---|
| | investment region? Do we believe that traffic movement would only be more along the Commercial and Knowledge City land use? It is suggested to have a 80m width Road along the eastern side which would cater to the Industrial traffic being generated.<br>  <br><br>**[pg 6-10]** |
| Response | Road Structure is revised according to intensive communication with State Government. |
| 24 | Figure 6-4 Road section 500m Road KBNIR: The land use has been proposed on both side of the NH-8 how is the pedestrian crossing across the road being planned. As 500m wide road is suggested along the NH-8 it is suggested to look into the norms being followed by NHAI. |
| Response | Revised in Final Development Plan **[pg 6-10]** |
| 25 | Figure 6-5 Road section 100m road(Road Link): High Tech Agriculture is proposed for a width of 19.5m Is it restricted only for road link project area falling under the Investment region or it continues till its destination. |
| Response | In the Final Development Plan the 19,5 meters is be converted to green buffer. **[pg 6-11]** |
| 26 | Road Cross – section how are the future extension foreseen for the 80m, 60 m and 30m roads. Suggest measure to stop encroachment as it is believed that the roads would be developed in phases depending on the traffic generated during the course of development of the region. |
| Response | Road sections are adjusted to maximize flexibility for future extensions. **[pg 6-11 to 6-15]** |
| 27 | How do we plan to have Public Transport System and Pedestrian Crossing in each road? |

| S. No. | Comment |
|---|---|
| Response | Road sections are adjusted to maximize flexibility for incorporation Public Transport System and Pedestrian Crossing in each road. **[pg 6-11 to 6-15]** |
| 28 | What is the usage of setback of 15m and another 2.5m Area of Pedestrian? |
| Response | Sections have been revised. Minimal setback is set at 5m. **[pg 6-11 to 6-15]** |
| 29 | To avoid future traffic congestion on the roads parallel parking should be discourage and multi – level parking should be encourage. Compulsory parking provisions for Commercial and institutional area must be planned. And also method to discourage usage of private vehicle must be suggested. |
| Response | Parallel parking is only possible next to service roads. The reason to promote (parallel) parking in the street is to create a lively atmosphere. On other locations only "kiss & ride" parking is made possible. The Consultant agrees to promote designated parking provisions and to discourage cars and encourage sustainable transportation (public transport, rail, electric and gas transport) within the KBNIR. **[pg 6-11 to 6-15]** |
| 30 | Table 6.8: how are the population for each phase derived for Industrial, Commercial, Institutional and Abadi Development Area? What are the density norms being followed? |
| Response | Presented in chapter elements of development plan, **[pg 3-8].** |
| 31 | Section 6.3.4.1 Sourcing and Raw Water Transmission: "As discussed in earlier section the source of water is ground water is the only the source of water supply" the sentence is too confirming and as we have already stated that ground water condition of the region is categorized under over exploited area. Hence the sentence should be reframed as major source of water is ground water as we are suggesting option 2 as source of water. Or we can state ground water crisis can be resolved through Aquifer recharge. |
| Response | Paragraph appropriately amended and included in section 6.2.5 on analysis of alternatives **[pg 6-22].** |
| 32 | The Maps in A4 size is not clear especially the Infrastructure Plan maps. |
| Response | The maps have been made clearer in the Final Development Plan. |
| 33 | Table 6.11: what are the norms considered for calculating the Waste water generated and are drainage system proposed in conformity with the existing natural drainage system? |
| Response | Norms of CPHEEO have been considered for estimating the waste water generation. The drainage system proposed confirms to local natural drainage system and terrain. |
| 34 | Table: 6.16 Capacity of STPs units: |
| Response | Capacity of STPs is in million litters per day (MLD), **[pg 6-41]** |
| 35 | 6.6 Solid Waste Management: table 6-22 states that total population to be 93,528 in 2012 and in the preceding paragraph states that the total population for the year 2012 is 85000. |
| Response | Population number in paragraph stands rectified **[pg 6-55]**. |
| 36 | The Matrix of permissible uses with broad land use categories have identified Government land use as in the draft development plan submitted the public & semi Public land use has been sub – divided into two parts knowledge city and Government. The matrix shows Public & Semi Public Land (inclusive of Knowledge City) and Government land use separate. So what all activities included in Public – semi public land use apart from Knowledge city. |

| S. No. | Comment |
|---|---|
| Response | The matrix of permissible uses within the broad land uses have been finalized by GoR and stands notified along with the Final Master Plan for SNB UC (including KBNIR).<br>The consultant has presented the notified version of Development Control Regulation (permissible/ non-permissible activities) within SNB UC in chapter on Development Control Regulation.<br>Hence, further queries relating to following questions stands addressed in the notified development. |
| Response | A new revised chapter on permissible land uses has been integrated. **[pg 4-1 to 4-93]** |
| 37 | Update the Draft Development Plan as per matrix of the permitted/permissible uses with broad land use categories or vice a versa. At present both the document do not match. |
| Response | The matrix of permissible uses within the broad land uses have been finalized by GoR and stands notified along with the Final Master Plan for SNB UC (including KBNIR).<br>The consultant has presented the notified version of Development Control Regulation (permissible/ non-permissible activities) within SNB UC in chapter on Development Control Regulation.<br>Hence, further queries relating to following questions stands addressed in the notified development |
| 38 | Permitted and permissible uses with Broad Land use Categories (Excel Sheet) Illustrate reasons: |
| Response | The matrix of permissible uses within the broad land uses have been finalized by GoR and stands notified along with the Final Master Plan for SNB UC (including KBNIR).<br>The consultant has presented the notified version of Development Control Regulation (permissible/ non-permissible activities) within SNB UC in chapter on Development Control Regulation. Hence, further queries relating to following questions stands addressed in the notified development. **[pg 4-1 to 4-93]** |

**Response to Comments of Water Resources Department on Revised Development Plan Report for the Khushkhera-Bhiwadi-Neemrana Investment Region of DMIC as a part of Shahjahanpur-Neemrana – Behror Urban Complex and Report on GIT Neemrana received on April 30, 2014**

**The First Report** prepared by Consultant is regarding master plan for Green Field Integrated Township, which aims at development of a city where integrated development of the area will take place along with all facilities:-
**Response:** It may be noted that the report on GIT Neemrana is sub-set (phase – 1) of Larger Development Plan of KBNIR.

**Comment #1:** The Para 7.5 basically deals with storm water drainage design, sub para 7.5.1 deals with disposal of rain water which elaborates that the storm water shall be stored in pools, wherever possible on larger perspective. In order to ensure availability of water for KBNIR, a detailed techno-economic feasibility is required, for which consultant may be appointed by DMIC. The relevant water harvesting options shall be studied by the Consultant. The surface water options from internal source and external source is limited in the area.

**Response**: a) The detailing of storm water drain system shall be done at later date while formulating the detailed project report for the purpose of implementation. b) To prepare a Integrated Water Resource Management Plan, the Consultant have been appointed by DMICDC. C) The surface water options from internal source and external sources are studied by Consultant and recommendations are presented in the report. However, further elaboration/ investigations/ feasibility would be required.

The Following points needs to take care of in planning and design of IWRM for the area.

1. **Comment #2:** Proposed area is in Sabi River basin which is also almost sandy, so land erosion may be recurring problem which needs to be addressed.
   **Response:** Not in Consultants Scope of Work. The state government through its appropriate agency/ department may take up this issue.

2. **Comment #3:** Some villages like siryani, jonyacha kalan, Dhodhakari, Belni, Janak Singhpura, Kali Phadi, Ishwari singh pura, jal behror are semi hilly and Ravines and Nallah are also there, hence land classification may be reviewed.
   **Response:** The Land use classification and protection/ preservations of drainage system shall be as per Notified Final Master Plan for SNB UC.

3. **Comment #4:** Sabi River passes through this proposed region, the main villages on the banks are Jalawas, Manethi, Bhoj Puri, Hulaman Khurd, & Kalan, Bijwar Chouhan, Gaduwas, Sirod Kalan, Nangal Siya, Bhogala Ahir, etc. The proposed integrated township development plan may address development of these villages also.
   **Response:** As mentioned earlier, GIT Neemrana is subset of KBNIR. GIT Neemrana is Phase 1 of KBNIR. The Master Plan for KBNIR has provide Abadi Development Area around the villages and also considered various infrastructure required for villages within KBNIR falling along Sahibi river.

4. **Comment #5:** Master Plan shows intensity of rainfall assumed as 12mm per hour, for which basis has not been elaborated.

**Response:** The details are already provided in section 6.6.3 Rainfall, of Revised Development Plan for KBNIR submitted in December 2013.

5. **Comment #6**: There are no large dams in the area. There exists 14 small dams & ponds with capacity of 582.57 MCft (16.50 Mcum), list enclosed. The dependability of storage in these tanks is less than 50%, which indicates lesser surface water availability in the area. Moreover, there is remote possibility of creation of creation of additional storage facility.
   **Response:** This comment is in relation to sourcing water for KBNIR from Chambal. The water required for KBNIR for year 2040 is 87.965 Mcum/ year. This estimate is based on assumptions that only potable water requirement (241 MLD including losses) of KBNIR is sourced from River Chambal. The KBNIR water requirement is way too high than the total capacity of 14 dams & ponds put together. It is for these reason, the consultant has suggested enhancing the capacity of three selected large reservoirs – Jaisamand, Devti and Siliseth. However, as per the WRD letter dated April 11, 2014 and received by Consultant on April 30, 2014, has communicated that water from Jaisamand, Devti and Siliseth are not available for KBNIR due to prior commitments. Further, during the meeting with SE, WRD, held on May 07, 2014, the consultant was informed that submergence area of these tanks is mostly privately owned and therefore deepening of these reservoirs may not be possible as it would entail acquiring land which is extremely difficult. It was then suggested by SE, that Bhuchara Dam (with capacity of 16.36 MCM), Raipur Patan (9.17 MCM) & Chitoli (24.38 MCM), totaling to 49.91 MCM shall be considered as potential storage reservoir for KBNIR. Also, that the current capacities can be augmented in reservoirs using latest technologies (to reduce seepages, enhance dependability) including IWRM plan like command area management plan, micro/ drip irrigation, etc in command area of these dams/ tanks.

   Again, the consultant would like to highlight here that the selection of tanks for storing required water for KBNIR shall be done only after detailed investigations & studies to establish feasibility of sourcing water for KBNIR, which is currently not in consultant scope. Also, that the development of reservoir/s for storage of water required for KBNIR can be taken by GoR in phased manner, as the ultimate demand for KBNIR is for Year 2041, however the water conveyance pipeline may be laid at once. The study being conducted by PHED may have look into the matter in details on the reservoirs suggested by SE, WRD, whereas the modern technologies for IWRM, shall be studied by IWRM Consultant appointed by DMICDC.

**Report on the Final Development Plan KBNIR** para no. 6.2 Water Sources & Conveyance Infrastructure.

**Comment #7:** The final development plan SNB/ KBNIR prepared by the Consultant has dealt chapter no.6/ para 6.2 on water source & conveyance. The consultant has suggested 3 options at para 6.2.5, the option 2 was considered feasible. However, later on the Consultant has given to understand that DJB treate water may not be available in KBNIR hence sourcing of water from Chambal River is preferred option.

Requirement of KBNIR is 405 MLD up to the year 2041.
405 MLD = 0.0353X405
= 14.30 mcft for one day or 0.405 MCM for one day
= 0.405 X 365 = 147.82 Mcum a year

**Response:** The total water demand for KBNIR is 380mld as per the Revised Development Plan for KBNIR submitted in December 2013. However, only 241 MLD (including losses) required for domestic use is considered. The requirement for industrial process is proposed to be met through recycled water.

Accordingly the above calculations shall be as following:
Fresh water Requirement of KBNIR is 241 MLD from external sources (Chambal River) up to year 2041.
241 MLD = 0.0353X241
= 8.5073mcft for one day or 0.241 MCM for one day
= 0.241 X 365 = 87.965 Mcum a year

1. **Comment #8:** Per day requirement works out to 0.405 Mcum that's 147.82 Mcum of water to be made available for entire period of twelve months, which is not possible through proposed lift, as surplus water is available during monsoon only.
   **Response:** Per day works out to be 0.241 that's 87.965 Mcum a year. The consultant has proposed that surplus water be lifted from the Chambal River and stored in reservoirs for supply to KBNIR through underground pipeline.

2. **Comment #9:** Requirement of water for KBNIR has not been included in the proposed scheme for transfer of water from Chambal River to Jaisamand Dam (alwar).
   **Response:** The Consultant is given to understand that the PHED, GoR is getting study conducted through PDCOR seeking feasibility study of water conveyance from Dholpur to KBNIR via Jaisamand.

3. **Comment #10:** In the proposed scheme of transfer of water from Chambal River to Jaisamand Dam (Alwar) 107.23 Mcum is to be lifted for 60 days in the month of August & September. This quantity of water will be utilized in the tans along the proposed alignment, recharging the ground water and filling the Jaisamand Dam (alwar for providing irrigation in 4790 ha. Area. The quantity of water i.e. 107.23 Mcum has been planned to be utilized as follows:
   (i) To Provide Kharif Irrigation to enroute villages in an area of 20000H =45.45 Mcum
   (ii) To Provide Irrigation through 24 no. enroute tanks in an area of 7500 ha in Bharatpur Distt. =14.16 Mcum
   (iii) To fill up jaisamand tank in Alwar =26.96 Mcum
   (iv) To Provide irrigation through 14 no. enroute tanks in an area of 6020 ha in Alwar Distt. =12.70 Mcum
   **Total =99.27 Mcum**

   **Response:** The estimated requirement of KBNIR by year 2041 is around 87.965 Mcum. Further investigations/ studies shall be carried out to check the feasibility of capacity enhancement of Jaisamand Dam, Devti and Siliseth so that the exact quantities of additional water that can be stored in these three tanks be quantified. The options shall include the deepening as well as creation of embankment. The embankment shall be designed to hold water pressure. Also, as suggested by SE, WRD, in meeting held on May 07, 2014, Dams at Bhuchara, Chitoli and Raipur Patan along with several tanks (as per list provided WRD and presented in Annexure A) shall be studied/ investigated for their feasibility for storing water for KBNIR. The study being conducted by

PHED may look into the suggestions of WRD. Further, IWRM Consultant shall look into the watershed management and use of latest technologies in water conservation.

4. **Comment #11:** The quantity of water is to be lifted as per requirement and criteria of WR Dept. even if, the additional quantity of water (to be lifted from Chambal River) is considered then there is storage problem of the lifted water in the KBNIR region.
   **Response:** The consultant acknowledging this constraint has suggested holding / storing water intermittent locations and transporting KBNIR in its concept scheme for conveyance system from Dholpur to KBNIR. If the suggested reservoirs are found not sufficient to cater to KBNIR requirement additional reservoirs will be required. The additional reservoirs can be any or many from the list of reservoirs, as suggested by SE, WRD, and presented in Annexure A, artificial reservoir or combination of both. The feasibility (technical, financial & economical)of the potential reservoirs need to be established by separate study.

The department is considering transfer of water from Chambal River and efforts are being made to get the feasibility studies done through external consultant. Transportation of water from Chambal River (dholpur) to the area has following constraints:

1. **Comment #12:** The river portion is in Crocodile Sanctuary, it need clearance of empowered committee constituted by Supreme Court and final clearance shall be given by Apex Court.
   **Response:** Please refer point 2.iii presented by PHED during April 03, 2014 meeting, wherein it states that "Although, getting approvals for sourcing water from Dholpur from Chambal requires approval both from the Ministry of Environment & Forest due to the existing crocodile Sanctuary there as well as the Supreme Court but there is already a commissioned project for sourcing drinking water from Chambal at Dholpur to Deegh, Bharatpur for which these permissions were taken from the MOEF as well as Supreme Court". Government will have to work strategically to secure water supply for KBNIR.

2. **Comment #13:** The possible alignment may pass through reserved forest/ forest from the off – taking point of Dholpur may require clearance of the forest department.
   **Response**: As for any project, forest clearance, if required, would be required to be taken from forest department/ MoEF.

3. **Comment #14:** The utilization of Chambal River is being shared by the M.P.-Rajasthan state, hence interstate clearance will be required. The proposed route involves a total lift of 226 m. with multistage pumping (38 pumping station) hence the recurring cost of approx 50 crore for sixty days in a year appears very high.
   **Response:** a) As for any project of such nature, clearances are required to be taken. b) the success of KBNIR as a city is dependent on availability of water and such cost are expected to be borne by city residents.

4. **Comment #15:** The total water to be lifted in sixty days. The water needs to be made available for entire period of twelve months, which is not possible through the proposed lift, as the surplus water is available in monsoon period only.

**Response**: It is proposed that total water is lifted during monsoon season (or during overflows) and stored in several reservoirs enroute pipeline. The water stored in these reservoirs is pumped for supply to KBNIR over twelve months.

5. **Comment #16**: The water storage capacity in KBNIR region is limited and possibility of creation of additional storage is remote.
   **Response**: Please refer to response to point 5 of GIT Neemrana.

**Comment #17:** The report states that tanks viz Devti, Jaisamand, Siliseth serves an area of 697.82 hect (table 6-6 page 6-23), whereas CCA of these tanks is 7045 hect. The irrigation requirement from these reservoir is 27.22 Mcum whereas report has shown 23.12 Mcum. The total losses including evaporation and conveyance/ seepage recreation amount to 21.53 Mcum. Total Requirement is approx 48.75 Mcum. Hence additional water may not be available from these tanks for the KBNIR region.

There are two more tanks in vicinity i.e. Hersora & Babriya, which has the capacity of 9.43 Mcum. The Irrigation requirement form these two tanks is 6.92 Mcum and 3.42 Mcum is seepage/ evaporation losses.

To enhance the storage capacity, raising height of these reservoirs upto 15m may not be possible as area under submergence will be quite significant & compensation, rehabilitation shall not be possible.

**Response**: The water required for KBNIR for year 2040 is 87.965 Mcum/ year. This estimate is based on assumptions that only potable water requirement (241 MLD including losses) of KBNIR is sourced from River Chambal. The KBNIR water requirement is way too high than the total capacity of 14 dams & ponds put together. It is for these reason, the consultant has suggested enhancing the capacity of three selected large reservoirs – Jaisamand, Devti and Siliseth. However, as per the WRD letter dated April 11, 2014 and received by Consultant on April 30, 2014, has communicated that water from Jaisamand, Devti and Siliseth are not available for KBNIR due to prior commitments. Further, during the meeting with SE, WRD, held on May 07, 2014, the consultant was informed that submergence area of these tanks is mostly privately owned and therefore deepening of these reservoirs may not be possible as it would entail acquiring land which is extremely difficult. It was then suggested by SE, that Bhuchara Dam (with capacity of 16.36 MCM), Raipur Patan (9.17 MCM) & Chitoli (24.38 MCM), totaling to 49.91 MCM as well as other reservoirs as presented in Annexure 6 and shall be considered as potential storage reservoir for KBNIR. Also, that the current capacities can be augmented in reservoirs using latest technologies (to reduce seepages) including IWRM plan like command area management plan, micro/ drip irrigation, etc in command area of these dams/ tanks.

Again, the consultant would like to highlight here that the selection of tanks for storing required water for KBNIR shall be done only after detailed investigations & studies to establish feasibility of sourcing water for KBNIR, which is currently not in consultant scope. Also, that the development of reservoir/s for storage of water required for KBNIR can be taken by GoR in phased manner, as the ultimate demand for KBNIR is for Year 2041, however the water conveyance pipeline may be laid at once. The study being conducted by PHED may have look into the matter in details on the reservoirs suggested by SE, WRD, whereas the modern technologies for IWRM, shall be studied by IWRM Consultant appointed by DMICDC.

**Comment:** Hence the possible alternatives are as follows:

i) **Comment #18:** The area may be divided in to micro water shed and water conservation practices may be adopted. A comprehensive master plan may be prepared:
ii) **Response:** DMICDC has appointed Consultant to prepare Integrated Water Resource Management Plan for KBNIR region.
iii) **Comment #19:** Construction of roof top rain water harvesting structure may be suggested to be made compulsory in all private and public building in NCR region and the potable quantum of water which can be saved be assessed.
iv) **Response:** The section 4.14 Mandatory Provisions of revised final report on Development Plan for KBNIR/ SNBUC submitted by Consultant has mandated to installation of rain water harvesting system in each building as per the GoR guidelines of rain water harvesting.
v) **Comment #20:** Saving of the water can be made by introducing modern methods of irrigation like sprinkler and drip irrigation system in the area for which farmers are using ground water. As per CGWB, the average ground water recharge is 386 MCM, hence a sizeable quantum of water can be saved by adopting water saving techniques.
vi) **Response:** DMICDC has already appointed Consultant to prepare Integrated Water Resource Management Plan for KBNIR region to address these issues. .
vii) **Comment #21**: Recycling of sewerage and industrial waste water may be suggested and the quantum of water be assessed. The DMIC may consider surplus water which can be made available from DJB. Which is approx 300 MLD (90.05 mcum for a year) to fulfill the part of anticipated requirement.
viii) **Response:** As mentioned earlier, the total water demand of KBNIR by year 2041 is 380 MLD, of which 230 MLD is freshwater demand while rest is recycled water. The fresh water from external sources (Chambal River) is 241 MLD (including losses). The industrial process water demand is proposed to be met through recycled water only. The water balance diagram was presented in Annex 11 of revised Final Development Plan for KBNIR/ SNBUC submitted by Consultant in December 2013. Further, the pre-feasibility study on water management for Phase -1 has identified recycled water from Bhiwadi CETP &STP as potential source for supplying water to industrial process. The recycled water source from Bhiwadi was endorsed by PHED dept.

It is important to note that, GoR took up the matter regarding sourcing treated water from DJB on Consultants recommendations. As per initial communication from CE, DJB around 40-50 MGD (150-160 MLD) is the potential quantum of waste water that could have been made available.

**Comment #22:** The DMIC may consider lifting of water from Yamuna River. The lifted water of Yamuna may be stored in Sabi River/ redundant Masani Barrage.
**Response:** DMICDC has appointed Consultant to prepare Integrated Water Resource Management Plan for KBNIR region and the MBIR of Haryana.

**Comment #23:** Detailed micro studies need to be undertaken for assessing availability of surface and ground water.
**Response:** DMICDC has appointed Consultant to prepare Integrated Water Resource Management Plan for KBNIR region for this purpose.

**Minutes of the meeting held on 3rd April 2014 regarding DMIC reports, to review the revised master plan for KBNIR of DMIC and the report on GIT Neemrana**

*Date Minutes; April 9th 2014*

A meeting was held to consolidate the comments of concerned Departments on the revised Master plan for Khushkhera-Bhiwadi-Neemrana (KBNIR) of DMIC along with revised report on GIT Neemrana on 3rd April 2013.

| Sr. | |
|---|---|
| **1** | **Comments from Energy Department** |
| 1.1 | It was noted that the consultants have recently made changes in the DP based on the comments received from Energy Department. It was once again reiterated that 400/220/132 KV Sub-stations needs to be avoided as two 400 kv sub-stations are already available nearby KBNIR (one at Neemrana & one near kotputli). It was suggested that Transmission lines may be drawn from these sub-stations to get power for KBNIR and 220/132 kv sub-stations may be used within KBNIR. |
| Action: | • Phase I (2021) – As per our discussion with RVPNL, we are confirming that 400/220/132 KV Sub-stations is avoided as two 400 kV sub-stations are already available nearby KBNIR (one at Neemrana & one near kotputli). We have suggested that Transmission lines shall be drawn from these sub-stations to get power for KBNIR and 220/132 kV sub-stations may be used within KBNIR.<br>• Phase II (2031) and Phase III (2041) - Given the high density of load in the investment region in the later phases. We have suggested 400/220/132 kV substations (dedicated to investment region) in phase II and phase III only. This will save on one transmission level in the region<br>During meeting of Consultants with Sona Shishodia (RVPNL, Executive Engineer PSS) and Er. L. N. Nimawat (RVPNL, Chief Engineer PMM) on May 5th 2014, the above was discussed. RVPNL indicated that the report could be submitted and accepted. |

| **2** | **Comments from Department of PHE** |
|---|---|
| 2.1 | It was informed that the Department has already getting a study done with the help of PDCOR (consultants) for sourcing water from Chambal River for the entire Alwar area keeping in view the total water requirement of KBNIR. |
| Action: | Noted. PHED may want to incorporate suggestions of Water Resources & Irrigation Department on storage reservoirs as per the list provided in **Annexure A** and three reservoirs namely Bhuchara Dam, Raipur Patan and Chitoli in particular have been suggested by SE, WRD. |

| | |
|---|---|
| 2.2 | It was also informed that the water sourcing for the project site is being worked out on the basis of providing dedicated water supply-lines to KBNIR. |
| Action: | Noted. |

| | |
|---|---|
| 2.3 | Although, getting approvals for sourcing water from Dholpur from Chambal requires approval both from the Ministry of Environment & Forest due to the existing crocodile Sanctuary there as well as the Supreme Court but there is already a commissioned project for sourcing drinking water from Chambal at Dholpur to Deegh, Bharatpur for which these permissions were taken from the MOEF as well as Supreme Court. |
| Action: | Noted. |

| **3** | **Comments from Department of Water Resources & Irrigation** |
|---|---|
| 3.1 | provide justification/ assumptions used for estimating water saved using rainwater harvesting. |
| Action: | It is proposed that each of the plots in the development shall have recharge structure. Construction of the recharge pit shall be mandatory. The overflow from the recharge pit shall come to the external drainage system. Please refer section 6.6.3 Rainfall, of Revised Development Plan for KBNIR submitted in December 2013. |

| | |
|---|---|
| 3.2 | Provide large and clear map for recharge structure/ drainage map |
| Action: | Included As **Annexure B** |

| | |
|---|---|
| 3.3 | Areas taken for Jaisamand, deori and other lakes need to revised based on latest information from Irrigation department. |
| Action: | The area of lakes considered in the report was provided by Water Resources & Irrigation Department on previous occasion. Further, during the meeting with SE, Water Resources Department, held on May 07, 2014, it was suggested to consider three new reservoirs - Bhuchara Dam, Raipur Patan and Chitoli, along with list of reservoirs presented in Annexure A. It was agreed that the further investigations & studies are required to establish the feasibility (in terms of technical, financial & economical) as well as select reservoir/s (from the list of reservoirs in Annexure A) for storing water for KBNIR. The feasibility of reservoirs is to be carried out separately. Further, as pointed out by PHED in its comments, the PHED is getting the feasibility study conducted for getting water from Chambal for KBNIR. |

| | |
|---|---|
| 3.4 | The suggestion of consultants in the report regarding deepening of existing reservoir to 15m may not be a technically workable solution and be relooked into and consultants may consider additional reservoirs (list of which will be shared) or sahibi river for storage of water from Chambal. |
| Action: | The evapotranspiration rate in the area is very high resulting in huge water loses. It is therefore suggested to keep the reservoir deep instead of increasing the area. It is suggested that Lake shall be partially deepened and partially embankment can be constructed above GL. Embankments can be designed to retain the water pressure. However, it would require further investigations, geo-technical studies, etc to establish the feasibility of deepening the existing reservoirs. Additional reservoirs will have to be identified for their capacity to store water from KBNIR, in case the option of deepening is found unviable. The additional reservoirs for storing water for KBNIR can be the a) existing reservoirs (from the list of reservoirs provided in Annexure A in as is form), b) existing reservoirs with capacity augmentation, c) by creating artificial reservoirs by acquiring land enroute pipeline alignment and/ or d) combination of a, b and c. This can be done established only after detailed feasibility study for water conveyance system for KBNIR from Dholpur, which is currently being done by PHED. Also, the scope of consultant is limited to provide broad |

| | |
|---|---|
| | concept of water conveyance system and not to establish the feasibility of water conveyance system.<br><br>It was discussed in the meeting with SE, WRD, held on May 07, 2014 that the Sahibi River is highly porous as well as its underground water flow (assuming that it follows the river course) is towards north direction going into State of Haryana. Further, the River is already having problems of land erosion. The KBNIR is located at Rajasthan – Haryana Border any proposal to use Sahibi as storage reservoir shall require detailed investigations/ studies on soil/ underground aquifers and other technical evaluations before finalizing the site on Sahibi River bed within KBNIR limits. The detailed investigations are not part of Consultants scope. The DMICDC has already appointed consultants to look into the aspects of Integrated Water Resource Management (IWRM) for this region Further, River Sahibi as reservoir can be on site storage reservoir; however intermittent reservoirs would be required to immediately capture the water and store it, as the water is to capture during monsoon season only. |

| | |
|---|---|
| 3.5 | Water Balance Diagram needs to be relooked by the consultants. |
| Action: | Water balance diagram was discussed with SE, Water Resource Department in meeting held on May 07, 2014. No change suggested. |

| | |
|---|---|
| 3.6 | Proposed area is in the Sahibi river basin and area is almost sandy, so land erosion is the recurring problem which needs to be addressed. |
| Action: | Not in Consultants Scope of Work. The state government through its appropriate agency/ department may take up this issue. |

| | |
|---|---|
| 3.7 | lf was suggested that although the proposal sourcing of waste water from Yamuna at Okhla Barrage for industrial water use in KBNIR has been withdrawn by the Delhi Government, the proposal should be revived and taken up with Delhi Government once again. |
| Action: | The consultant has not ruled out the Sewage Water from Delhi Jal Board as water source for Industrial Purposes. It is upto the Government of Rajasthan to pursue the matter with various departments of State and Central Government. |

| | |
|---|---|
| 3.8 | Modern methods of irrigation needs to be introduced along with roof top rainwater harvesting, water conservation practices by which sizeable quantum of water can be saved. |
| Action: | The Consultant right from the inception of project has been advising on the modern methods of agriculture. The Report on Gap Assessment and Delineation was the first report which has recommended adoption of modern technology. DMICDC has already appointed a consultant to prepare Integrated Water Resource Management Plan for DMIC nodes in the state of Rajasthan and Haryana to address this issue. |

| | |
|---|---|
| 3.9 | Some villages like Siryani, Jonachaya Kalan, Dhodhakari, Belni, Janaksinghpura, Kali Pahadilshwari Singh Pura, Jat Behrore are semi hilly and revies and nallah are also there hence land classification may be looked into accordingly. |
| Action: | - |

| | |
|---|---|
| 3.10 | Master plan shows intensity of rainfall assumed as 12 mm/hr, however, the basis have not been provided for this in the report. |
| Action: | Please refer section 6.6.3 Rainfall, of Revised Development Plan for KBNIR submitted in December 2013 |

| | |
|---|---|
| 3.11 | In the area no large dams exists however, only 14 small dams & ponds with capacity 582.57 mcft (16.50 mcum) are there. The dependability of Storage in these tanks is less than 50% which indicates low surface water availability in the area. Moreover, there is remote possibility of additional creation of Storage facility. |
| Action: | The water required for KBNIR for year 2041 is 87.965Mcum/ year. This estimate is based on assumptions that only potable water requirement (241 MLD including losses) of KBNIR is sourced from River Chambal. The KBNIR water requirement is way too high than the total capacity of 14 dams & ponds put together. It is for these reason, the consultant has suggested enhancing the capacity of three selected large reservoirs – jaisamand, Devti and Siliseth. However, as per the WRD letter dated April 11, 2014 and received by Consultant on April 30, 2014, has communicated that water from Jaisamand, Devti and Siliseth are not available for KBNIR due to prior commitments. Further, during the meeting with SE, WRD, held on May 07, 2014, the consultant was informed that submergence area of these tanks is mostly privately owned and therefore deepening of these reservoirs may not be possible as it would entail acquiring land which is extremely difficult. It was then suggested by SE, that Bhuchara Dam (with capacity of 16.36 MCM), Raipur Patan (9.17 MCM) & Chitoli (24.38 MCM), totaling to 49.91 MCM shall be considered as potential storage reservoir for KBNIR. Also, that the current capacities can be augmented in reservoirs using latest technologies (to reduce seepages) including IWRM plan like command area management plan, micro/ drip irrigation, etc in command area of these dams/ tanks.<br><br>Again, the consultant would like to highlight here that the selection of tanks for storing required water for KBNIR shall be done only after detailed investigations & studies to establish feasibility of sourcing water for KBNIR, which is currently not in consultant scope. Also, that the development of reservoir/s for storage of water required for KBNIR can be taken by GoR in phased manner, as the ultimate demand for KBNIR is for Year 2041, however the water conveyance pipeline may be laid at once. The study being conducted by PHED may have look into the matter in details on the reservoirs suggested by SE, WRD, whereas for the detailed study on the modern technologies for IWRM, DMICDC has already appointed a consultant. |

| | |
|---|---|
| 3.12 | The formal comments along with details of reservoirs shall be provided by the Department in a week's time. |
| Action: | - |

| **4** | **Comments from RIICO** |
|---|---|
| 4.1 | Per kiloliter cost of water for sourcing water from external source needs to be provided. |
| Action: | The Per kiloliter cost of water for sourcing water from external sources can be established by results of study being conducted by PHED, GoR, on sourcing water for KBNIR from River Chambal. |

| | |
|---|---|
| 4.2 | Clearly define the extent of development that would be possible without external water source. |
| Action: | Currently ground water is the only source for KBNIR and that the area falls under over exploited category region as per CGWB. The Consultant has |

| | |
|---|---|
| | clearly established in its report that the success of KBNIR is dependent on External Sources of water and therefore identified potential water sources. |

| | |
|---|---|
| 4.3 | Amend the Institutional sections looking into recent development on SIR act/ Authority. |
| Action: | The Chapter 9 on Institutional & Regulatory Framework have been appropriately amended looking into the recent development on SIR Act/ Authority. |

| | |
|---|---|
| 4.4 | Provide rationale for limiting Economic Benefit analysis of KBNIR for Internal Infrastructure. |
| Action: | The main investment component to be considered for the area of KBNIR was the improvement of the internal infrastructure, which included, besides the land acquisition cost, the trunk infrastructure (the upgrading of highways, railway line & station, MRTS links to the nearest cities, water sourcing & transmission) and the internal infrastructure (site development, roadworks, street shaping & lighting, water treatment & distribution, sewerage, stormwater drainage, solid waste management, public transport, landscaping & signages). Including the costs of these infrastructure components gives a fair justification for the land prices used as benefits. These land prices reflect the value of developed land, i.e. including basic infrastructure services. We have not taken into account power generation and distribution because this service will be provided on a PPP basis generating its own revenues. This applies also to other investments to be undertaken, e.g factories, shopping centres and housing.<br>The Knowledge City, Aerotropolis and the Road Link had their own economic cost benefit analyses. |

| | |
|---|---|
| 4.5 | In economic analysis section, include sensitivity analysis with increase in land prices for LO% & 20% and its implication on land sale prices |
| Action: | We did sensitivity analysis by increasing the proportion of land sold to the private sector, starting to sell land earlier and by selling the land at a faster rate. These scenarios showed that the project is economically feasible and that this result is robust. With respect to varying assumptions about land prices, the values assumed are already quite high. In an earlier version of the analysis lower land prices were assumed at 0.35 Rs crore per hectare. In the December 2013 analysis we brought the land price to 2 Rs crore per hectare.<br>With a further increase of 20% of the land prices (from 2 to 2.4 Rs crore per hectare the internal rate of return declines to 10%. An increase of the selling price of developed land by 20% brings the IRR to 15%. |

| | |
|---|---|
| 4.6 | RIICO has already in December 2013 provided inputs on the saleable area calculations which needs to be taken care off. |
| Action: | The RIICO inputs on saleable area have been taken incorporated in our updated Economic Cost Benefit Analysis of December 2013. |

| **5** | **Comments from UDH** |
|---|---|
| 5.1 | Consultant prepare building byelaws for KBNIR separately and assist UDH in notifying the byelaws. |
| Action: | The Development Promotion and Control Regulations take care of the total KBNIR.<br>The Masterplan GIT is the first phase of development within the framework of the Notified Masterplan and the final Development Plan. |

| | |
|---|---|
| | Under chapter 4 of the Development Plan SNB UC / KBNIR permitted & permissible activities/ uses within the broad land uses classifications, and the Control Regulations for different land uses have been taken care of. These are discussed with the CTP and fine tuned in accordance with the existing laws. See the revised Development Promotion and Control Regulations for details. |

| | |
|---|---|
| 5.2 | RRTS alignment is being amended. The Consultant shall revise the development based on revised RRTS alignment. |
| Action: | RRTS alignment is a very important part of the infrastructure in the Notified SNB Master Plan. The whole concept is based upon RRTS alignment after number of discussions in the past. |

| **6** | **Comments of UDH Department on GIT** |
|---|---|
| 6.1 | GIT Master Plan land use is not in line with Notified Master Plan for SNB UC and hence need revisited completely |
| Action: | On May 5th, 7th and 8th 2014 the Consultant has discussed the Masterplan GIT with CTP / UDH. Based on these discussions revisions have been made to Masterplan GIT . The Masterplan GIT report as such has been appreciated and accepted by the CTP. |

| | |
|---|---|
| 6.2 | GIT Master Plan land use shows indicative land uses like institutions/ commercial. They are not in sync with local regulatory environment. Hence needs to be removed or defined very clearly in the Master Plan for GIT. |
| Action: | Consultant has removed these indications from Masterplan GIT. |

| | |
|---|---|
| 6.3 | DMIC, Rajasthan may provide Large (A1) size GIT master plan land use map immediately for further review and comments. |
| Action: | A1 size map has been shared. |

| | |
|---|---|
| 6.4 | The saleable area assumption taken in the report is close to 20% which is a non-workable option and needs to be relooked. |
| Action: | Consultant explained to CTP / UDH that the real saleable area is much higher than 20%, and that the saleable area is in line with the Notified SNB Master Plan;<br><br>The total area of the Masterplan GIT is 47.9 $km^2$<br><br>Land uses with no impact on the saleable land is as given below:<br>Hill Conservation Zone 0.30 $km^2$<br>Hills 0.60 $km^2$<br>Ponds 0.10 $km^2$<br>Agriculture 2.30 $km^2$<br>Abadi 4.80 $km^2$ |

| | |
|---|---|
| | RICCO 1.00 $km^2$<br>NH8 1.07 $km^2$<br>The total of the above is 10.17 $km^2$<br><br>This can be deducted from the total area (47.9 $km^2$) to calculate the remaining net area of GIT which is 37.73 $km^2$<br><br>The roads, green buffers, city greens, sector green and recreation land is together 10.2 $km^2$<br><br>So the gross saleable area is (37.73 – 10.2) 27.53 $km^2$<br>That is 73% of the remaining net area of GIT.<br><br>According to international norms 60% of this area should be net saleable. That is 16.5 $km^2$. This is 43.8% of the gross saleable area. |

| **7** | **In addition to the above, the consultants were directed to also look into the following:** |
|---|---|
| 7.1 | The cost of land for the purpose of calculations may be considered as per the new land acquisition regime. |
| Action: | We do not know the details of the new land acquisition regime. There will be more changes in the future. What counts is that the result of the economic cost benefit analysis of the KBNIR in December 2013 was feasible and robust. If the land prices decline this result becomes more robust; if the land prices increase as a result of the new land acquisition regime the scenarios mentioned in 4.5 will have to be applied. |

| | |
|---|---|
| 7.2 | The consultants while making estimations/ calculations has not taken into account the decision by the State Level Steering Committee on DMIC in its sixth meeting held in August 2011, wherein it was decided that the model for acquisition for only trunk infrastructure and industry would be adopted for KBNIR. It may be seen that only for Phase-IA, some part of Knowledge City, residential, commercial, etc. such acquisition has been taken up. |
| Action: | Since we are addressing the development of the whole region, it is unimportant who actually buys the land, government or a private developer. It does not make sense to do a partial economic analysis on the area that can be acquired by the government, as the infrastructure to be established on that area will benefit the whole region to be developed.<br><br>It is stated that the purchase of land by the state will be limited to land for trunk infrastructure and industry. With respect to the cost for acquiring land for industrial development, these costs should be recovered through the selling price of the developed land (this is done in our cost benefit calculations) or in case the land is leased out, in the lease price.<br><br>With respect to the cost of land for infrastructure, this is not sold, these costs are part of the cost of this infrastructure, like the cost of building the infrastructure. These costs should be recouped through user fees (toll charges) or incorporated in the property tax regime or levied as special |

| | |
|---|---|
| | infrastructure charges for land owners in the region. This can be done, for example, by annualizing the investment costs in infrastructure (including the cost of land) dividing by m2 so that you get a cost per m2 and incorporate that with other public property related costs in the annual property tax per m2. One may also differentiate the charge per m2 depending on the type of users.<br><br>This was discussed with Dr. Ashok Singhvi, Principal Secretary DMIC, Government of Rajasthan. The meeting with Mr. Ashok Singhvi resulted in their acceptance of our report without any amendments. |

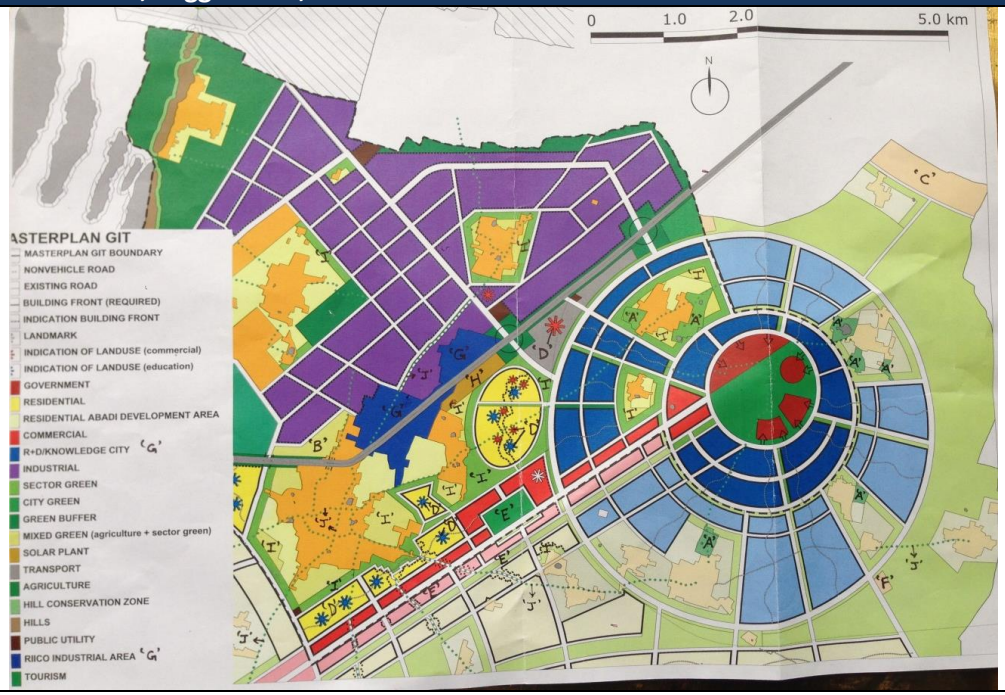
| | |
|---|---|
| 7.3 | Consultants were also directed to take due note of the comments given by various departments in July 2013 on the draft Development Plan. |
| Action: | Noted. |

**Comments to Minutes of Meetings with Chief Town Planner, on finalization of Development Plan (December 2013), and Master Plan GIT (December 2013) during week 5-9 May 2014, Jaipur**

Date : May 5th & May 7th & May 8th , 2014
Location : Udyog Bhawan
Attending : J.B. Jakhar (CTP NCR)
Accompanied by his staff
Anshu Dutta (BIP, only on 5th of May)
Ashok Bhalotra (KuiperCompagnons)
Mark Niesten (KuiperCompagnons)

Hereunder is an exhaustive report about the major comments and responses from the CTP NCR. For the detailed compliances see appendix 1-A.

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| 1. | CTP NCR handed over a map (as shown below and document with comments and recommendations regarding the Masterplan GIT. These comments and recommendations are listed below. | - |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| |  | |
| 1.A | The consultant has detailed out the Layout Plan of KBNIR indicating the alignment of RRTS as proposed in the Shahjahanpur-Neemrana-Behror Urban Complex Master Plan – 2041. A final decision regarding the alignment of RRTS is passing through SNB Urban Complex is yet to be taken. Accordingly there could be a change in the Layout Plan. | RRTS alignment is a very important part of the infrastructure in the Notified SNB Master Plan. The whole concept is based upon RRTS alignment after number of discussions in the past. |
| 1.B | The consultant has not given the details regarding Building Byelaws that are adopted for KBNIR. The consultant was required to re-examine the development control regulation which has not been incorporated in this report. | The Development Promotion and Control Regulations take care of the total KBNIR.<br>The Masterplan GIT is the first phase of development within the framework of the Notified Masterplan and the final Development Plan.<br>Under chapter 4 of the Development Plan SNB UC / KBNIR permitted & permissible activities/ uses within the broad land uses classifications, and the Control Regulations for different land uses have been taken care |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | | of. These are discussed with the CTP and fine tuned in accordance with the existing laws. See the revised Development Promotion and Control Regulations for details. |
| 1.C | The color indicators in the legend do not match within the colors indicated in the Layout Plan of KBNIR | This has been corrected accordingly. Detailing shall be done at the zonal plan level. |
| 1.D | The consultant has provided green spaces in the area proposed for existing abadi development in the SNB Master Plan – 2041.<br>Indicated as 'A' in the enclosed map of Layout Plan. | The consultants underline that at this stage the green buffer zones not need to be fixed. This has been corrected accordingly. |
| 1.E | The consultant has provided green spaces in the area proposed for industrial area in the SNB Master Plan – 2041. Indicated as 'B' in the enclosed map of Layout Plan. | This has been corrected accordingly. |
| 1.F | As per SNB Master Plan – 2041 area indicated as 'C' in the enclosed map of Layout Plan as electrical plants, the consultant has proposed those areas as residential land use in the Layout Plan of KBNIR. | This has been corrected according to the Notified SNB Master Plan. |
| 1.G | The indicator as shown in legend for land marks of commercial and education in the Layout Plan are not clear and specific. Indicated as 'D' in the enclosed map of Layout Plan. | The indicators have been corrected in the masterplan drawing but kept as suggestions in the possible detailing of the report. |
| 1.H | The land use and road width indicated as 'E' in the enclosed map of Layout Plan are different from SNB Master Plan proposals. | This has been corrected accordingly. |
| 1.I | The consultant has proposed residential land use in the Layout Plan of KBNIR instead of area proposed for waste water in SNB Master Plan – 2041. Indicated as 'F' in the enclosed map of Layout Plan. | This has been corrected accordingly. |
| 1.J | The consultant has shown the existing RIICO industrial area in Blue color which is almost same as the color shown for knowledge city in the legend of layout plan for KBNIR. Indicated as 'G' in the enclosed map of Layout Plan. | This has been corrected accordingly. |
| 1.K | The consultant has proposed area for Solar Plant in the Layout Plan of KBNIR instead of area proposed for Bus Terminus in SNB Master Plan – 2041. Indicated as 'H' in the enclosed map of Layout Plan. | This has been corrected accordingly. |
| 1.L | The consultant has provided sector green and mixed green spaces at various places in the area proposed for residential land use. This proposed sector green areas are very huge and will not be possible to maintain. Indicated as 'I' in the enclosed map of Layout Plan. | This has been corrected accordingly. The green spaces shall be defined in the zonal plan level for different plots. |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| 1.M | The proposed Road Network has been worked out for the whole GIT Master Plan. So the existing road as shown in the layout plan need not to be followed and also did not to be shown in the Layout Plan. Indicated as 'J' in the enclosed map of Layout Plan. | The suggestion has been taken over for the masterplan drawing but kept as essential structural elements to be worked out at the plot level. |
| 1.N | The saleable area proposed by the consultant in the Layout Plan of GIT Master Plan is quite low. So it is not advisable to finalize the Master Plan on this proposed saleable area. | There were drafting errors in the Masterplan GIT drawing which may have resulted in unclarity about saleable land areas. These drafting errors have been corrected. The consultant explained that the saleable area is in line with the Notified SNB Master Plan. On the recommendation of CTP green buffers within the Abadi Development Area have been removed. |
| 1.O | Area During the meeting it was pointed out that there are no green parks as land use taken up in the Industrial Area. | During the meeting between CTP and Consultant on May 8th the consultant emphasized that these would be defined in the plot development phase. This not to decrease the saleable land. |
| 2. | CTP NCR explained that they got the Development Plan only the day of the meeting on April 3rd 2014 regarding the DMIC reports. | - |
| 3. | CTP NCR was not aware of the fact that in the Development Plan the Development Control Regulations have been included. | - |
| 4. | The consultant provided CTP NCR with a hard copy of the Development Plan and the Pre Feasibility Study report "Integrated Multimodal Passenger Hub". | - |
| 5. | The comments on the Masterplan GIT were discussed in details. The consultant realized that a serious computer drafting errors has been taken place whereby a lot of existing Abadi areas are colored green.<br><br>CTP NCR pointed out that according to their calculations the saleable area is not more than 20% which is not feasible.<br><br>CTP NCR also explained that the green buffer zones around the Abadi Development Areas are not advisable as they decrease the saleable land and moreover it does not give any flexibility in the following phases. | - |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | The consultants agreed with their suggestions and propose to remove green buffers around the Abadi Development Areas. The minimum percentage of public green has already been taken care of in the Final Development Plan.<br><br>The meeting was continued on the 7th of May 2014.<br><br>The CTP NCR explained their suggestions regarding the Final Development Plan and handed over the hard copy with their suggestions page wise.<br><br>The consultant presented the revisions of the Masterplan GIT on the 7th of May with a new drawing. This was accepted by the CTP NCR.<br><br>The consultant clarified that with the revision a much higher percentage of saleable land is achieved.<br><br>The consultant in the meantime has worked out the saleable land area for the Masterplan GIT as attached herewith according to international standards and in coherence with the Notified Masterplan SNB / KBNIR.<br><br>The CTP NCR had no comments on the Pre Feasibility Study report “Integrated Multimodal Passenger Hub”. CTP agreed with the contents and complimented the consultants.<br><br>It was a very fruitful exchange of thoughts. CTP NCR underlined the basic philosophy and the contents of the Final Development Plan and the Masterplan GIT.<br>Their written revisions are more about the details specially from a very practical point of view within the Indian context.<br><br>The meeting was continued on the 8th of May where consultant clarified in general the responses on the comments and suggestions. To sum up the major observations and the response of the consultant: | |
| 5.A | Change the FSI for the Abadi Development Area from 1.0 into 1.67 - 2.25. | The consultant advised not to amend the FSI. The FSI for |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | | the Abadi Development Areas is to continue with the existing character, density and the building volumes. |
| 5.B | Give a range of FSI instead of a single figure (e.g. 1.67 – 2.25 instead of 2.0). | This suggestion does not give the clarity for the users, developers, etc. This would make the development of the city very hybrid and specially in terms of infrastructure and amenities.<br>This would increase the density enormously specially in the Abadi Development Areas. This is not advisable because the infrastructure provided is not geared to such a change. Just think about the scarcity of water in the region and it shall not be in coherence with the Notified Masterplan SNB / KBNIR. Therefore the consultant has not taken over this suggestion.<br>CTP NCR accepted the arguments. |
| 5.C | CTP NCR suggested a wider Right of Way (RoW) for various land uses. The argument that land uses like hospitals, restaurants, taxi stands and other uses which attract a larger amount of vehicular traffic should be provided with a larger public spaces. This in order to cater for more public parking, green and movement of traffic. | The consultant in general has taken over the amendments and is convinced with the arguments. |
| 5.D | CTP NCR suggested to have higher green area percentage at plot level. | The consultant amended accordingly. |
| 5.E | CTP NCR suggested to change the permissible building heights to “equal to right of RoW”. | The consultant has revised the maximum building heights and has added “or equal to RoW” but keeping the permissible heights as provided in the Masterplan GIT. |
| 5.F | CTP NCR suggested to change the maximum building length to “2/3 of the plot length”. | Consultant has retained the minimum / maximum building length but has added “or 2/3 of the plot length”. |
| 5.G | CTP NCR commented on the setback specially regarding fire regulations. The proposed amendment regarding minimum setbacks (F)ront – (R)ear – (S)ide is<br>Upto 15 m: F: 3 or 4.5 m / R: 3m or /3 of height / S: 3m or /3 of height.<br>Above 15 m: F: 9 m / R: 1/3 of height / S: 1/3 of height. | The consultants agreed with the setbacks proposed by CTP NCR regarding buildings below 15 m.<br>Above 15 m. consultant is convinced in order to get the continuity of building lines along the major roads, that a minimum setback of 9 meters is more than enough. This minimum ensures an urban city form in the classical sense. More than 9 m. shall lead to scattered building |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | | complexes which we see all over the world with quite negative consequences. The rational and efficient use of the road fronts is of utmost importance for a dynamic, vibrant city. In terms of daylight and privacy there are other better measures available at architectural level. |
| 5.H | CTP NCR suggested to lower the percentage of EWS from 30% to 5%. | The consultant reminded that this was an important decision taken by the client and emphasized that a social and income group mixture is one of the fundaments of social and cultural sustainability.<br>The consultant has not taken over this amendment. |
| 5.I | There were many detailed suggestions provided by CTP which have been taken care of in the compliance report. The consultant communicated with the CTP NCR on a general level.<br><br>The CTP NCR indicated that after the proposed revisions by the consultant, the Final Development Plan, the Masterplan GIT and the Pre Feasibility Studies have their acceptance. | - |
| 6 | CTP indicated that the roads in Master Plan are of very large size. | The Consultant explained that this was decided and as such is a part of the Notified Master Plan. |
| 7 | CTP indicates that the “indicative” legends on the GIT map are not clear in Indian planning context. | Consultant will remove these indications from Masterplan GIT. |
| | | |

**Response to Minutes of Meeting with Agriculture Departments, on finalization of Development Plan, Masterplan GIT and Pre Feasibility Study for High Tech Agriculture & Food Cluster, Jaipur**

Date : May 8th, and May 9th 2014
Place : Kishi Bhawan, Jaipur
Present : Mr. Dr. V. K. Pathak (OSD World Bank Projects, RSAMB)
Ashok Bhalotra (KuiperCompagnons)
Mark Niesten (KuiperCompagnons)

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| 1 | During the meeting with Mr. Dr. V. K. Pathak it was explained by the consultants that Agriculture has been incorporated in the pending reports. Mr. Dr. V. K. Pathak appreciated the integration of the topic in the reports and gave suggestions concerning Agriculture for the detailed plans in following phases. These suggestions have been attached below. | Suggestions are noted and appreciated, they result in no revisions to the Development Plan, Masterplan GIT and Pre Feasibility Study for High Tech Agriculture & Food Cluster was required. |
| 2 | Suggestions on Pre Feasibility study, Hightech agriculture & Food cluster<br><br>By Dr. V. K. Pathak, OSD World Bank Projects, RSAMB, Hishi Bhawan, Jaipur<br><br>With reference to the visit of BIP officers to seek the comments on the above mentioned study, the suggestions offered are as under:<br><br>The report prepared and submitted is appreciabein aspect of agriculture development through adoption of the high tech technology but this needs a sensitive working while deciding the parameters of implementation of this study for the benefit and up liftment of the economic status of the farmers. A few focus interventions for considerations suggested are:<br>1. Agri/Horticulture Crop identification with high-tech methods needed.<br>2. Reclaimation of poor soil to bring waste land under cultivation.<br>3. Improve water use efficiency through modern system of irrigation.<br>4. Organic farming.<br>5. Human resource development. | The consultant strongly advice to involve the suggestions of the Agricultural Department for the future feasibility study. |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | 6. Strengthening of post harvest management and merketing.<br>7. Stable price stabilization scheme to protect the farmers from the vagaries of the market and weather change.<br>8. Food processing involving any type of value addition to agricultural or horticultural produce. The food processing industry provides vital linkages and synergies between industry and agriculture. India's food processing sector covers a wide range of products fruit and vegetables; meat and poultry; milk and milk products, alcoholic beverages, plantation, grain processing and other consumers product groups like confectionery, chocolates and cocoa products, Soya-based products, mineral water, high protein foods, etc.<br><br>Two nodal agencies, Agricultural & Processed food products Export Development Authority (APEDA) and Marine Products Export Development Authority (MPEDA), where formed for promoting exports from India. MPEDA is responsible for the exports of other processed food products.<br><br>Key Growth Drivers of Food Processing Sector in India<br>• Increasing spending on health and nutritional foods.<br>• Increasing number of nuclear families and working women.<br>• Changing lifestyle.<br>• Funtional foods, fresh or processed foods.<br>• Organized retail and private label penetration.<br>• Changing demographics and rising disposable incomes.<br><br>Key Opportunities in Food processing Sector<br>• Processable varieties of crop.<br>• Contract farming.<br>• Investments in Infrastructure through Publi Private partnership (PPP).<br>• Mega Food Parks.<br>• Integrated cold chain.<br>• Food safety Management Systems. | |

**Response to Minutes of Meeting with PHED, on finalization Development Plan and Masterplan GIT, Jaipur**

Date : May 6th, 2014
Time : 13:30
Place : Jaipur
Present : Mr. Banoe Sing (Chief Engineer PHED)
2nd person from PHED
Anshu Dutta (BIP)
Ashok Bhalotra (KuiperCompagnons)
Mark Niesten (KuiperCompagnons)
Nikhil Desphande (RHDHV)

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| 1. | Mr. Singh states that water demand for drinking water is 8%, water demand for irrigation is 80%. Reducing water for agriculture usage would significantly contribute to solving water problem. | Noted |
| 2. | Mr. Singh states that for first phase water should come from rain water harvesting and waste water treatment. For later stages water from Chambal river is required. | Noted |
| 3. | Water from Chambal coming 5-7 years not possible because crocodile sanctuary. Later stages water can probably be used for KBNIR. | Noted |
| 4. | From Chambal river water extraction is possible for 7 months a year, for the other 5 months it is required to get water from rain water harvesting and waste water treatment. | Noted |
| 5. | Mr. Singh states that local rain harvesting should adopted. Consultants replies that this is implemented in the reports. | Noted |
| 6. | Mr. Singh states that PDCOR has got 'water parameters' from PHED for their study. | Noted |
| 7. | Waste water treatment from Bhiwadi waste water at the Ajarka plant is discussed. | Noted |
| 8. | Mr. Singh states that people have to be made aware that water has its value, so they will not waste it. | Noted |
| 9. | Mr. Singh states water should be charged in categories. Who can afford it, should be more. | Consultant agrees and it is commonly decided that this could be implemented at later stages. |
| 10. | After the meeting Anshu Dutta suggested that this meeting (and content) should be mentioned in report. | These Minutes of Meetings refer to this meeting. |

**Response to Minutes of Meeting with RVPNL, on finalization Development Plan and Masterplan GIT, Jaipur**

Date : May 5th, 2014
Time : 16:30
Place : Vidyut Bhawan, Janpath, Jaipur
Present : Sona Shishodia (RVPNL, Executive Engineer PSS, +91 9414030303)
Er. L. N. Nimawat (RVPNL, Chief Engineer PMM, +91 9413345570)
Ashok Bhalotra (KuiperCompagnons)
Mark Niesten (KuiperCompagnons)

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| 1. | It was discussed that in the revised chapter on Power from the Masterplan GIT report will be revised: | |
| 1.A | In table 6-6 (number of substations required at different levels) the first row has to be changed from “400/132 KV” towards “400/220/132 KV”. | report revised accordingly |
| 1.B | All the three voltages should be mentioned in the report. | report revised accordingly |
| 1.C | In the text more emphasis should be given on Solar Power. It should be mentioned that use of Solar Power is made mandatory. It should be highlighted in the report that power lines will be located underground. | report revised accordingly |
| 2. | The Consultant has amended the revised Power chapter from the Masterplan GIT according to the discussions and got it approved by Mrs. Sona Shishodia, Executive Engineer PSS. | - |

**Response to Minutes of Meeting with Superintendent Engineer, Department of Water Resource, GoR, Jaipur**

Meeting with Superintendent Engineer, Department of Water Resource, GoR
Held on May 07, 2014
On Revised Development Plan for KBNIR/ SNB UC

The agenda of the meeting was to discuss and formalize the comments presented by Water Resource Department, GoR on Revised Final Development Plan for KBNIR/ SNB UC on April 09, 2014 and April 30, 2014.

At the onset, the Consultant introduced the team and briefed SE about objective/ scope of study. Then followed by point by point discuss on the comments provided by the Department of Water Resource, GoR on Water Sourcing & Conveyance for KBNIR.

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| 1. | Provide justification/ assumptions used for estimating water saved using rainwater harvesting | The Consultant informed the SE that each plots/ building is proposed to have rain water recharge structure and that it's a mandatory provision in Development Plan. Further, average rainfall for the region has been considered for estimating quantity of water saved using rain water harvesting. |
| 2. | Provide large and clear map for recharge structure/ drainage map | The Consultant agreed to include larger and clear map showing recharge structure and drainage map. |
| 3. | Areas taken for Jaisamand, Deori and other lakes need to be revised based on latest information from irrigation department. | The Consultant informed the SE that the area of lakes considered in the report was provided by Water Resources & Irrigation Department on previous occasion. However, it would amend the figures in report if new data is provided. |
| 4. | Further, during the meeting, SE suggested to consider three new reservoirs - Bhuchara Dam, Raipur Patan and Chitoli, along with list of reservoirs shared by officials of WRD. It was agreed that the further investigations & studies are required to establish the feasibility (in terms of technical, financial & economical) as well as select reservoir/s (from the list of reserviors provided) for storing water for KBNIR. However, since the feasibility study is outside the Consultant scope of work, the feasibility need to be carried out separately. The representative from BIP informed the SE that IWRM Consultant has been appointed by DMICDC for preparation of integrated water | - |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | resource management plan for KBNIR/ SNBU and the further investigation on water aspect is part of IWRM Consultant scope.<br><br>In addition it was brought to the notice of SE that the PHED is getting the feasibility study conducted from PDCOR. | |
| 5. | The suggestion of consultants in the report regarding deepening of existing reservoir to 15m may not be a technically workable solution and be relooked into and consultants may consider additional reservoirs (list of which will be shared) or sahibi river for storage of water from Chambal. | The Consultant brought to the notice of SE that the evapotranspiration rate in the area is very high resulting in huge water loses and it was therefore advisable to keep the reservoir deep instead of increasing the area. Also that lake shall be partially deepened and partially embankment can be constructed above GL. Embankments can be designed to retain the water pressure. SE, agreeing to the concept said that such proposals need to be evaluated only after detailed technical investigations.<br><br>The Consultant also informed SE that additional reservoirs will have to be identified for their capacity to store water from KBNIR, in case the option of deepening is found unviable. And that the additional reservoirs for storing water for KBNIR can be the a) existing reservoirs, b) existing reservoirs with capacity augmentation, c) by creating artificial reservoirs by acquiring land enroute pipeline alignment and/ or d) combination of a, b and c. This can be done only after detailed feasibility study for water conveyance system for KBNIR from Dholpur, which is currently being done by PHED.<br><br>The Consultant once again clarified that the scope of Consultant is limited to provide broad concept of water conveyance system and not to establish the feasibility of water conveyance system.<br><br>On the suggestion regarding Sahibi River, the SE, WRD, was informed that the Sahibi River is highly porous as well as its underground water flow (assuming that it follows the river course) is towards north direction going into State of Haryana. Further, the River is already having problems of land erosion. The KBNIR is |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | | located at Rajasthan – Haryana Border any proposal to use Sahibi as storage reservoir shall require detailed investigations/ studies on soil/ underground aquifers and other technical evaluations before finalizing the site on Sahibi River bed within KBNIR limits. River Sahibi as reservoir can be on-site storage reservoir; however intermittent reservoirs would be required to immediately capture the water and store it, as the water is to capture during monsoon season only.<br><br>The representative from BIP, Rajasthan informed the SE, WRD that IWRM consultant appointed by DMICDC will have to look into the details of Sahibi River as a storage reservoir as well as water source for KBNIR. |
| 6. | Water Balance Diagram needs to be relooked by the consultants. | Water balance diagram was discussed with SE, WRD during the meeting and no change was suggested. |
| 7. | Proposed area is in the Sahibi river basin and area is almost sandy, so land erosion is the recurring problem which needs to be addressed. | The Consultant informed SE that the aspect relating to land erosion in Sahibi river basin is not in Consultants Scope of Work and that the IWRM Consultant appointed by DMICDC shall look into the land erosion issue. |
| 8. | It was suggested that although the proposal sourcing of waste water from Yamuna at Okhla Barrage for industrial water use in' KBNIR has been withdrawn by the Delhi Government; the proposal should be revived and taken up with Delhi Government once again. | The Consultant informed the SE that it has not ruled out the Sewage Water from Delhi Jal Board as water source for Industrial Purposes and that it is upto the Government of Rajasthan to pursue the matter with various departments of State and Central Government to get the water from DJB. |
| 9. | Modern methods of irrigation needs to be introduced along with roof top rainwater harvesting, water conservation practices by which sizeable quantum of water can be saved. | The Consultant appraised SE, WRD that right from the inception of project has been advising on the modern methods. The Report on Gap Assessment and Delineation was the first report in which the Consultant recommended adoption of modern technology. It was brought to the notic of SE, WRD that DMICDC has appointed a consultant to prepare Integrated Water Resource Management Plan for DMIC nodes in the state of Rajasthan, which shall address above suggestion. |
| 10. | In the area no large dams exist however, only 14 small dams & ponds | The Consultant informed the SE, WRD, that the water required for |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | with capacity 582.57 mcft (16.50 mcum) are there. The dependability of Storage in these tanks is less than 50% which indicates low surface water availability in the area. Moreover, there is remote possibility of additional creation of Storage facility. | KBNIR for year 2041 is 87.965Mcum/ year (with the assumption that only potable water requirement (241 MLD including losses) of KBNIR is sourced from River Chambal) and KBNIR water requirement is way higher than the total capacity of 14 dams & ponds put together. It is for these reason, the Consultant had suggested enhancing the capacity of three selected large reservoirs – jaisamand, Devti and Siliseth.<br><br>SE, WRD, informed that water from Jaisamand, Devti and Siliseth are not available for KBNIR due to prior commitments. Also, that the submergence area of these tanks is mostly privately owned and therefore deepening of these reservoirs may not be possible as it would entail acquiring land which is extremely difficult. SE,WRD suggested that Bhuchara Dam (with capacity of 16.36 MCM), Raipur Patan (9.17 MCM) & Chitoli (24.38 MCM), totaling to 49.91 MCM shall be considered as potential storage reservoir for KBNIR. Also, that the current capacities can be augmented in reservoirs using latest technologies (to reduce seepages) including IWRM plan like command area management plan, micro/ drip irrigation, etc in command area of these dams/ tanks.<br><br>The Consultant once again reiterated that the selection of tanks for storing required water for KBNIR shall be done only after detailed investigations & studies to establish feasibility of sourcing water for KBNIR, which is currently not in consultant scope. The Consultant suggested that the development of reservoir/s for storage of water required for KBNIR can be taken by GoR in phased manner, as the ultimate demand for KBNIR is for Year 2041, however the water conveyance pipeline may be laid at once. |
| 11. | Points discussed & Agreed on GIT Report:<br><br>• The Consultant Informed SE, WRD that the report on GIT Neemrana is sub-set (phase – 1) of Larger Development Plan of | - |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | KBNIR.<br>• The Consultant informed SE, WRD that the detailing of storm water drain system shall be done at later date while formulating the detailed project report for the purpose of implementation.<br>• The Consultant informed SE, WRD, that to prepare a Integrated Water Resource Management Plan, the IWRM Consultant have been appointed by DMICDC.<br>• In response to query from SE, WRD on the surface water options from different sources, the Consultant informed SE, WRD that the surface water options from internal source and external sources are studied by Consultant and recommendations are presented in the report. However, further elaboration/ investigations/ feasibility are required by IWRM consultant appointed by DMICDC as well as the study being currently undertaken by PHED, GoR. | |
| 12. | Points Discussed on Water Conveyance & Storage System:<br>• The Consultant informed the SE, WRD that the water calculation presented by WRD in its comments dtd April 30, 2014 need to revised as the water demand for KBNIR is 380 MLD at year 2041 and that only 241MLD (including transmissions & storage losses) is to be sourced from River Chambal and the calculation for the same would form part of formal response of Consultant to comments.<br>• The SE, WRD observed that in the proposed scheme of transfer of water from Chambal River to Jaisamand Dam (Alwar) 107.23 Mcum is to be lifted for 60 days in the month of August & September. This quantity of water will be utilized in the tans along the proposed alignment, recharging the ground water | After detailed discussion and deliberations, it was agreed that the Consultant in its report would just present the concept scheme on water storage and conveyance system and would provide the quantum of water required to be stored. However, details on to which reservoirs & alignment of conveyance system shall be as per the studies being conducted by GoR. |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | and filling the Jaisamand Dam (alwar for providing irrigation in 4790 ha. Area. The quantity of water i.e. 107.23 Mcum has been planned and being utilized. The Consultant, putting forward the estimated requirement of KBNIR i.e ~87.965 Mcumby 2041 suggested further investigations/ studies to check the feasibility of capacity enhancement of Jaisamand Dam, Devti and Siliseth so that the exact quantities of additional water that can be stored in these three tanks be quantified. The Consultant Opined that the study being conducted by PHED may look into the suggestions of WRD. Further, IWRM Consultant shall look into the watershed management and use of latest technologies in water conservation.<br><br>• The SE, WRD, suggested that the quantity of water is to be lifted as per requirement and criteria of WR Dept. and even if, the additional quantity of water (to be lifted from Chambal River) is considered then there is storage problem of the lifted water in the KBNIR region. The Consultant, acknowledging the process involved in such large scale project, opined that the implementing agency shall look into inter-departmental procedure for ease of implementation. The Consultant, brought to notice of SE, WRD that looking at constraints on water availability it has suggested holding/ storing water intermittent locations and transporting KBNIR in its concept scheme for conveyance system from Dholpur to KBNIR. Also, if the suggested reservoirs are found not sufficient to cater to KBNIR requirement additional reservoirs will be required.<br><br>• The SE, WRD, brought to the notice that the river portion is in Crocodile Sanctuary, it need clearance of empowered committee constituted by Supreme Court and final clearance shall be given by Apex Court. Also, that the proposed alignment | |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | may pass through forest areas. The Consultant highlighted the point presented by PHDED during April 03 meeting which read "Although, getting approvals for sourcing water from Dholpur from Chambal requires approval both from the Ministry of Environment & Forest due to the existing crocodile Sanctuary there as well as the Supreme Court but there is already a commissioned project for sourcing drinking water from Chambal at Dholpur to Deegh, Bharatpur for which these permissions were taken from the MOEF as well as Supreme Court". And stressed upon that the Government will have to work strategically to secure water supply for KBNIR. The Consultant presenting its view said that as for any project, forest clearance, if required, would be required to be taken from forest department/ MoEF at appropriate stage of project by implementing agency.<br><br>• The SE, WRD, suggested various other methods of water conservations so as to make water available for KBNIR region following:<br><br>ix) It was suggested that the area may be divided in to micro water shed and water conservation practices may be adopted. A comprehensive master plan may be prepared. The Consultant informed SE, WRD, that DMICDC has appointed Consultant to prepare Integrated Water Resource Management Plan for KBNIR region. The IWRM consultant appointed by DMICDC shall look into this comment.<br>x) Construction of roof top rain water harvesting structure may be suggested to be made compulsory in all private and public building in NCR region and the potable quantum of water which can be saved be assessed. The Consultant informed SE, WRD that the rain water harvesting is the mandatory provision in the Development Plan report. | |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | xi) SE opined that saving of the water can be made by introducing modern methods of irrigation like sprinkler and drip irrigation system in the area for which farmers are using ground water. As per CGWB, the average ground water recharge is 386 MCM, hence a sizeable quantum of water can be saved by adopting water saving techniques. The Consultant agreeing to the views of SE, WRD, suggested that DMICDC appointed IWRM Consultant shall address to this comment. At the same time brought to the notice of SE, WRD that such interventions are of long term in nature requiring gestation period of 10-15 years. However, water requirement for KBNIR is point/ time specific.<br>xii) The SE, WRD, suggested that the tecycling of sewerage and industrial waste water may be suggested and the quantum of water be assessed. The DMIC may consider surplus water which can be made available from DJB to fulfill the part of anticipated requirement. The Consultant informed SE, WRD that the industrial process water demand is proposed to be met through recycled water only. Further, the pre-feasibility study on water management for Phase -1 has identified recycled water from Bhiwadi CETP &STP as potential source for supplying water to industrial process. The Consultant brought to the notice of SE, WRD that GoR took up the matter regarding sourcing treated water from DJB on Consultants recommendations and as per initial communication from CE, DJB around 40-50 MGD (150-160 MLD) is the potential quantum of waste water that could have been made available.<br>xiii) The SE, WRD, suggested that the DMIC may consider lifting of water from Yamuna River. The lifted water of Yamuna may be stored in Sabi River/ redundant Masani Barrage. Also, Detailed micro studies need to be undertaken for assessing availability of surface and ground water. The Consultant | |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | informed the SE, WRD that the DMICDC has appointed Consultant to prepare Integrated Water Resource Management Plan for KBNIR region. The IWRM consultant appointed by DMICDC shall look into this comment | |

The meeting ended with vote of thanks.

**Response to Minutes of Meeting with Officials of PHED (NCR) Alwar, GoR, Jaipur**

Held on May 09, 2014
On Revised Development Plan for KBNIR/ SNB UC

The agenda of the meeting was to discuss and formalize the comments presented by Water Resource Department, GoR on Revised Final Development Plan for KBNIR/ SNB UC.

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| 1. | At the onset, consultant briefed the official on the discussions it has with SE, WRD on water sourcing, storage and conveyance system. The Consultant informed that the SE, WRD is of the view that the number of reservoirs required for KBNIR shall be as per details feasibility study and also the alignment of conveyance system. | after discussion it was agreed that the consultant would provide only conceptual theme for the Water Sourcing & Conveyance while the actual details would be as per the Feasibility study being conducted by PHED department. Also, that PHED would look into the suggestions of WRD on storage reservoirs. |

The meeting ended with vote of thanks.

**Response to Minutes of Meeting with Principal Secretary DMIC on Economic Cost Benefit Analysis of Development Plan SNB / KBNIR, Jaipur**

Date : May 9th 2014
Present : Dr. Ashok Singhvi, Principal Secretary DMIC, Government of Rajasthan
Mr. Yadav
Mrs. Anshu Dutta (BIP)
Ashok Bhalotra (KuiperCompagnons)

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| 1. | During the meeting on April 3 2014 is was noted that the consultants while making estimations/ calculations has not taken into account the decision by the State Level Steering Committee on DMIC in its sixth meeting held in August 2011, wherein it was decided that the model for acquisition for only trunk infrastructure and industry would be adopted for KBNIR. It may be seen that only for Phase-IA, some part of Knowledge City, residential, commercial, etc. such acquisition has been taken up. | During the meeting on May 9th 2014 the consultant explained to Dr. Ashok Singhvi that since we are addressing the development of the whole region, it is unimportant who actually buys the land, government or a private developer. It does not make sense to do a partial economic analysis on the area that can be acquired by the government, as the infrastructure to be established on that area will benefit the whole region to be developed.<br><br>It is stated that the purchase of land by the state will be limited to land for trunk infrastructure and industry. With respect to the cost for acquiring land for industrial development, these costs should be recovered through the selling price of the developed land (this is done in our cost benefit calculations) or in case the land is leased out, in the lease price.<br><br>With respect to the cost of land for infrastructure, this is not sold, these costs are part of the cost of this infrastructure, like the cost of building the infrastructure. These costs should be recouped through user fees (toll charges) or incorporated in the property tax regime or levied as special infrastructure charges for land owners in the region. This can be done, for example, by annualizing |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | | the investment costs in infrastructure (including the cost of land) dividing by m2 so that you get a cost per m2 and incorporate that with other public property related costs in the annual property tax per m2. One may also differentiate the charge per m2 depending on the type of users.<br><br>This was discussed with Dr. Ashok Singhvi, Principal Secretary DMIC, Government of Rajasthan. There is a serious concern by the client about the enormous hike in the cost of land along the NH8. It was explained that the cost of land as per 2013 ( Rupees 2 crores per ha.) has already been included in the report. |
| 2. | During the discussions Dr. Ashok Singhvi poised with the idea to move the investment region further away from the NH8. | It was explained that it would not be coherent with approved and notified Master-Plan for SNB. |
| 3. | The meeting with Mr. Ashok Singhvi resulted in their acceptance of our report without any amendments. | - |

**Response to Additional Comments Compliance for Development Plan**

It was requested by Bureau of Investment Promotions, Jaipur, to include in the Development Plan the following six aspects.

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| 1 | Estimated Phase wise employment proections from KBNIR. | Employment projections per phase:<br>Phase-1: 80,000<br>Phase-2: 255,000<br>Phase-3: 550,000 |
| 2 | Estimated phase wise Economic Growth Rate. | The average economic growth rate over the period 2010-2040 is 6.2% p.a. in the base case and 11% p.a. in the high growth scenario. These annual average economic growth rates will be lower than the average growth rate for the first phase and higher for the subsequent two phases. |
| 3 | Expected Phase wise Investment likely to fall in the IR. | The expected Phase wise investments are given in Table 11-2 of the Development Plan (December 2013)<br>Phase 1:5422 Cr INR<br>Phase 2: 10252 Cr IINR<br>Phase 3: 5980 Cr INR |
| 4 | Details along with categories of roads proposed with corresponding lengths in the IR. | The proposed roads along with corresponding lengths in the IR are given in table 3-6 of the Development Plan (December 2013). These lengths are:<br>National Highway: 33.3 km<br>Station Highway:7.74 km<br>Bhiwadi-Neemrana Road Link:19 km<br>80m RoW: 38.6 km<br>60m RoW: 71.9 km<br>45m RoW: 55.2 km<br>30m RoW: 2.1 km |
| 5 | Suitably incorporate the DSCR for ICT Master Plan. | The Consultant has included the DSCR for ICT Master Plan (as shared on May 16, 2014 by BIP to Consultant) in the Development Plan report |
| 6 | The master plan has been notified for the horizon year 2041, which is also | The Consultant has changed the years of phasing of |

| Sr. No. | Comments, Suggestions, Remarks | Response |
|---|---|---|
| | mentioned in the DP, so the phasing should be revised accordingly. | KBNIR from 2020 to 2021 (for Phase 1), from 2030 to 2031 (for Phase 2), and from 2040 to 2041 (for Phase 3) in the reports. |

## Appendix 1-A referring to Detailed Comments and Suggestions from CTP and response

Suggestion by CTP as shared on May 7th 2014 is marked with yellow.
Where Consultant takes over suggestion of CTP is marked with bleu.
Where Consultant does not take over suggestion of CTP is marked with red.

**Table 4-1 : Development Control Regulation for Abadi development Area**

| Development Control Regulation for Abadi development Area | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building lenght** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum % EWS housing** | **Minimum area for playground and green** | **Broad land-use classification** |
| **A.1** | Existing roads | 1.0<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Development Plan. | 50 %<br>40 %<br>Agreed | G + 1,5<br>Equal to R/W<br>Agreed | 5-100m<br>Max. 2/3 of plot length<br>Agreed | 0m- 0m- 0m<br>**Up to 15m:**<br>F: 3.0 m<br>R: 1/3 of ht<br>S: 1/3 of ht<br>**Above 15 m:**<br>F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | 20 % | free | 30%<br>5% area of FSI or 5% of units which is his Consultant will maintain 30% based on the approved policy of the client and the philosophy of the Development Plan. | | Agriculture, parks, leisure, recreational or sports facilities |
| **A.2** | From 10m<br>From 18m<br>Agreed | 1.0<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved | 50%<br>40 %<br>Agreed | G+1.5 floors<br>1.5 time R/W<br>Consult will | 5-100m<br>Max. 2/3 of plot length<br>Agreed | 5m –<br>3m - 3m<br>**Up to 15m:**<br>F: 3.0 m<br>R: 1/3 of ht<br>S: 1/3 of ht<br>**Above 15 m:** | 20 % | free | 30%<br>5% area of FSI or 5% of units which is his Consultant will maintain 30% based on | 15 % of site minimum 100 m2<br>15 % of site minimum 150 m2<br>Agreed | Villa/Bungalow; Row House Neighbourhood Retail; public facilities (Primary or secondary schools, care, Health Club; Swimming Pool , Day Care Centre), Utility Building |

| Development Control Regulation for Abadi development Area | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building lenght** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum % EWS housing** | **Minimum area for playground and green** | **Broad land-use classification** |
| | | policy of the client and the philosophy of the Development Plan. | | change in Equal to R/W | | F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | | | the approved policy of the client and the philosophy of the Development Plan. | | |
| **A.3** | 10 or less | 1.0<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Development Plan. | 50% | G+1.5 floors<br>Equal to R/W<br>Agreed | 5-100m<br>Max. 2/3 of plot length<br>Agreed | 0m –<br>0m - 0m<br>**Up to 15m:**<br>F: 3.0 m<br>R: 1/3 of ht<br>S: 1/3 of ht<br>**Above 15 m:**<br>F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | 20 % | free | 30%<br>Not applied<br>Consultant will maintain 30% based on the approved policy of the client and the philosophy of the Development Plan. | 15 % of site minimum 100 m2 | Villa/Bungalow; Row House Neighbourhood Retail; public facilities (Primary or secondary schools, care, Health Club; Swimming Pool , Day Care Centre), Utility Building |

**Table 4-2: Permitted Use Premises in Abadi Development Area Use Zone**

| Permitted Use Premises in Abadi Development Area Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| 3 | Anganwari | 0.02 | 9 mt & above<br>12 mt & above<br>Agreed | Anganwari as a space provision of residential housing / neighborhood level is a centre for provide service for children of six years age, pregnant woman , Feeding mother etc. under the integrated child development scheme ( ICBS) | Kitchen , Toilet and Hall |
| 4 | Banquet hall | 0.2 | 18 mt. & Above<br>24 mt. & Above<br>Agreed | A premises to hold small public gatherings, community functions, marriage etc. | Hall for public gatherings, marriages, cooking facilities and other logistic. |
| 6 | Community Centre/ Hall | 0.2 | On 18 mt. & above road<br>On 24 mt. & above road<br>Agreed | A premise having an enclosed space for various social and cultural activities of a residential area. | Community hall, Watch and ward residence (upto 30 sq.m), Soft drink and Snack stall. |
| 7 | Convenience Shopping Centre | 0.1 | On 12 mt. & above road<br>On 18 mt. & above road<br>Agreed | A group of shops not exceeding 50 in number in residential area serving a population of 5000 persons. | Retail, Repair and Personnel service shop, Restaurant, clinic. |
| 9 | Dairy Booth | As per requirement | Not in MDP Right of Way<br>Agreed | Premises with basic facility for the supply of daily groceries to the local population. | Booth |
| 21 | Local shopping centre | 0.4 | 12 mt. & above<br>18 mt. & above<br>Agreed | A group of shops not exceeding 75 numbers in residential area serving a population of 15,000 persons. | Retail, Repair and Personnel service shop, Informal sector unit, Commercial office, Cottage and Service industry, Clinical Laboratory, Clinic & Polyclinic, Restaurant, Soft drink & Snack stall, Post office and Bank extension counter, Nursing home and Guest house. |
| 25 | Nursing Home | 0.1 | 12 mt. & above<br>18 mt. & above<br>Consultant maintain 12mt. & above | A premise having medical facilities for indoor and outdoor patients having up to 30 beds. It shall be managed by a doctor or a group of doctors on commercial basis. | Nursing home, watch & ward Residence (upto 30 sqm each), Chemist shop (up to 15 sqm each). |

| Permitted Use Premises in Abadi Development Area Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| 26 | Old Age Home/ care centre for physically/ mentally/ challenged/ working woman/ men hostel | 0.1 | 12 mt. & above 18 mt. & above Consultant maintain 12mt. & above | A premise with residential and related facilities for old age persons. | Old age home, Residence/flat for Caretaker and watch & ward. Personnel service shop, Dispensary, Club, Community hall. |
| 33 | Professional Offices | 0.05 | 12 mt. & above 18 mt. & above Consultant maintain 12mt. & above | | |
| 37 | Residential Flat | 0.075 | 12 mt. & above 18 mt. & above Agreed | A residential accommodation for one family (one household) which may occur as a part of group housing or independently. | Residence, Professional activity |
| 39 | School for Handicapped Children | 0.2 | 12 mt. & above 18 mt. & above Agreed | | |
| 47 | Yoga Centre | 0.05 | 12 mt. & above Allowed in Residential Units 12 mt. & above Agreed | A premises having facilities for self attainment, achieving higher quality of mind and body, Spiritual and religious discourse etc. | Yoga centre, Meditation, Spiritual and Religious discourse centre- Yoga centre, Meditation, Spiritual and Religious discourse centre, Watch & ward residence (upto 30 sqm), Hostel, Soft drink & stall. |

**Table 4-3: Permissible Use Premises in Abadi Development Area Use Zone**

| Permissible Use Premises in Abadi Development Area Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in Meters)** | **Definitions** | **Use Premises** |
| 5 | Motor Cycle repairing work shop garages | 45 sq.mt | 12 mt. & above 18 mt. & above Agreed | | |

| Permissible Use Premises in Abadi Development Area Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in Meters)** | **Definitions** | **Use Premises** |
| 9 | Post office | As per requirement | 12 mtr & above<br>18 mt. & above<br>Agreed | A premise with facilities for postal communication for use by the public | Post office, Post & telegraph office, Watch & ward residence (upto 30 sqm),Canteen |
| 11 | Restaurants | 0.05 | 12 mt. & above<br>18 mt. & above<br>Agreed | A premises used for serving food items on commercial basis including cooking facilities. It may have covered or open or both for sitting arrangement. | Restaurants |

**Table 4-4: Development Control Regulations for Residential Area**

| Development Control Regulations for Residential Area | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum/ Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum % EWS housing** | **Minimum area for playground and green** | **Broad land-use classification** |
| **R.1** | 100<br>or 80<br>or 60 | 1.5<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Development | 50%<br>40%<br>Agreed | G+5 floors<br>Equal to R/W<br>Consultants combined in: Equal to R/W Or Equal to R/W which is less | 30-100m<br>2/3 of plot length<br>Consultants combined in: 30-100m Or 2/3 of plot length | 5m –<br>3m – 3m<br>**Up to 15m:**<br>F: 3.0 m<br>R: 1/3 of ht<br>S: 1/3 of ht<br>**Above 15 m:**<br>F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | 100 % | All begin at the setback line | 30%<br>5% area of FSI or 5% of units which is his Consultant will maintain 30% based on the approved policy of the client and the philosophy of the | 15 % of site minimum 100 m2 1 playground per 25 ha. | Multi-storey apartment and clusters thereof;, restaurants, cafes, hotels, commercial centers, Mall, Petrol Pump, Hospitals, public services (post office, bank), police station, places of worship, Retail |

| Development Control Regulations for Residential Area | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sr No | Road RoW (m) | Max FSI | Max Ground coverage % of plot area | Max Building Height | Minimum/ Maximum building length | Minimum Setbacks (Front- Rear- Side) | Maximum % Hard pavement front set back | Building alignment | Minimum % EWS housing | Minimum area for playground and green | Broad land-use classification |
| | | Plan. | | | | | | | Development Plan. | | |
| **R.2** | 45 to 24<br>Up to 18<br>Agreed | 1.5 | 50%<br>40%<br>Agreed | G+5 floors<br>Equal to R/W which is less<br>G+5 floors Or or Equal to R/W, within the max. allowed building height | 30-100m<br>2/3 of plot length<br>Consultants combined in:<br>30-100m Or<br>2/3 of plot length | 5m – 3m – 3m<br>**Up to 15m:**<br>F: 3.0 m<br>R: 1/3 of ht<br>S: 1/3 of ht<br>**Above 15 m:**<br>F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | 100 % | All begin at the setback line | 30%<br>5% area of FSI or 5% of units which is his Consultant will maintain 30% based on the approved policy of the client and the philosophy of the Development Plan. | 15 % of site minimum 100 m2 1 playground per 25 ha. | Multi-storey apartment and clusters thereof;, restaurants, cafes, hotels, commercial centers, Mall, Petrol Pump, Hospitals, public services (post office, bank), police station, places of worship, Retail, Public Facility/Infrastructure/ Utility Buildings |
| **R.3** | 24 or less<br>Less than 18<br>Agreed | 1.5 | 50%<br>45%<br>Agreed | G+5 floors<br>Equal to R/W<br>G+5 floors Or or Equal to R/W, within | 30-100m<br>2/3 of plot length<br>Consultants combined in:<br>30-100m | 5m – 3m - 3m<br>4.5m – 3m - 3m<br>Agreed | 100 % | All begin at the setback line | 50%<br>Not applied<br>Agreed | 15 % of site minimum 100 m2 1 playground per 25 ha. | Multi-storey apartment and clusters thereof;, restaurants, cafes, hotels, commercial centers, Mall, Petrol Pump, Hospitals, public services (post office, bank), police station, places of worship, Retail, Public Facility/Infrastructure/ Utility Buildings<br>Terraced/Row House; Villa/Bungalow; Housing for EWS; Night Shelter; primary and |

| Development Control Regulations for Residential Area | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sr No | Road RoW (m) | Max FSI | Max Ground coverage % of plot area | Max Building Height | Minimum/ Maximum building length | Minimum Setbacks (Front- Rear- Side) | Maximum % Hard pavement front set back | Building alignment | Minimum % EWS housing | Minimum area for playground and green | Broad land-use classification |
| | | | | the max. allowed building height | Or 2/3 of plot length | | | | | | secondary schools ,Old-Age Home; Neighbourhood Retail/Service Shop, Café, Maternity Home, Nursing Home, Kindergarten, Day-care, Dispensary, Veterinary Clinic, Health-club, Place of Worship on Plot smaller than 1000 sq m, Community Hall, Health-Club, Swimming Pool, |

**Table 4-5: Permitted Use Premises in Residential Use Zone**

| Permitted Use Premises in Residential Use Zone | | | | | |
|---|---|---|---|---|---|
| Sl. No. | Activity | Minimum Area (Ha) | Road Width (in meter) | Definitions | Use Premises |
| 3 | Anganwari | 0.2<br>0.02<br>Agreed | 12 mt & above | Anganwari as a space provision of residential housing / neighbourhood level is a centre for provide service for children of six years age, pregnant woman , Feeding mother etc. under the integrated child development scheme ( ICBS) | Kitchen , Toilet and Hall |
| 5 | Banquet Hall | 0.2 | 18 mt. & Above<br>24 mt. & Above<br>Agreed | A premises used for marriage and other social functions | Hall for public gatherings, marriages, cooking facilities and other logistics. |
| 9 | Community Centre | 0.2 | 18 mt. & above<br>24 mt. & Above<br>Agreed | A premise having an enclosed space for various social and cultural activities of a residential area. | Community hall, Watch and ward residence (upto 30 sq.m), Soft drink and Snack stall. |
| 10 | Convenience Shopping Centre | 0.1 | 12 mt. & above<br>28 mt. & Above<br>Agreed | A group of shops not exceeding 50 in number in residential area serving a population of 5000 persons. | Retail, Repair & Personnel service shop, Restaurant, clinic. |
| 29 | Local shopping | 0.4 | 18 mt. & above | A group of shops not exceeding 75 numbers in | Retail , Repair and Personnel service |

| Permitted Use Premises in Residential Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| | centre | | 24 mt. & Above Agreed | residential area serving a population of 15,000 persons. | shop, Informal sector unit, Commercial office, Cottage and Service industry, Clinical Laboratory, Clinic & Polyclinic, Restaurant, Soft drink & Snack stall, Post office and Bank extension counter, Nursing home and Guest house. |
| 31 | Nursery & kinder garter school | 0.1 | 12 mt. & above 18 mt. & Above Consultant maintain 12 mt. & above | A premise with facilities for training and playing for children preparatory to the school. | Nursery and kindergarten school watch & ward residence (up to 30 sq.m). |
| 33 | Old Age Home/care centre for physically/mentally/challenged/working woman/men hostel | 0.1 | 12 mt. & above 18 mt. & Above Consultant maintain 12 mt. & above | A premise with residential and related facilities for old age persons. | Old age home, Residence/flat for Caretaker and watch & ward. Personnel service shop, Dispensary, Club, Community hall. |
| 42 | Religious Premises | 0.05 | 12 mt. & above 18 mt. & Above Agreed | A premise dedicated to accommodations and service of god or other objects of religious nature. It may have different nomenclature in different religions like temple (all faiths), Mosque, Church, Gurudwara, Ashram. | (i) Temple, (ii) Mosque, (iii) Church, (iv) Gurudwara, (v) Synagogue, (vi) Ashram, (vii) Bathing tank, (viii) Dargah and (ix) Charitable dispensary and Library. |
| 45 | Residential Flat | 0.075 | 12 mt. & above 18 mt. & Above Agreed | A residential accommodation for one family (one household) which may occur as a part of group housing or independently. | Residence, Professional activity |
| 46 | School for Handicapped Children | 0.2 | 12 mt. & above 18 mt. & Above Consultant maintain 12 mt. & above | | |
| 50 | Taxi and Auto Stand | As per requirement | 18 mt & above 12 mt. & above 24 mt. & Above Agreed | | |

**Table 4-6: Permissible Use Premises in Residential Use Zone**

| Permissible Use Premises in Residential Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in Meters)** | **Definitions** | **Use Premises** |
| 6 | Cinema Hall | 0.15<br>0.25<br>Agreed | 30 mt. & above | A premise with facilities for projection of movies | Cinema, Watch & ward residence (upto 30sqm), |
| 10 | Motor Cycle repairing work shop garages | 45 sq.mt | 18 mt & above<br>24 mt & above<br>Agreed | In convenient shopping centre. | |
| 12 | Municipal state and central govt. office | As per requirement | 12 mt. & above<br>18 mt & above<br>Agreed | | |
| 13 | Multiplex | 0.2<br>0.25<br>Agreed | 30 mt. & above | and stills with a covered space to seat audience | Administrative office, Soft drink & Snack stall, Museum, Auditorium. |

**Table 4-7: Development Control Regulations for Commercial Area**

| Development Control Regulations for Commercial Area | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum/ Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum % green** | **Broad land-use classification** |
| **C.1** | 80 or 60 | 2.0<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the | 70%<br>40%<br>Consultant will maintain 70% | G+14 floors<br>Equal to R/W<br>G+14 floors or Equal to R/W, | 30-100m<br>2/3 of plot length<br>Consultants combine to:<br>30-100m<br>2/3 of plot | 5m –<br>3m – 3m<br>**Up to 15m:**<br>F: 4.5 m -<br>R: 3 m -<br>S: 3 m -<br>**Above 15 m:**<br>F: 9.0 m - | 100 % | All begin at the setback line | 5% of area | Commercial plinth, Office Complex, integrated Parking; Retail Mall, Cinema Hall; Commercial Complex, Other Retail; Public/ Govt Institutional Buildings, Training Centre; Art Gallery Convention and Exhibition Centre; Hospital, Sports Complex; Auditorium; Integrated Museum; Residential |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | philosophy of the Development Plan. | | within the max. allowed building height | length | R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | | | | Multistorey Apartments; Serviced Apartments, and all uses given below |
| **C.2** | 45 to 24<br>45 to 18<br>Agreed | 2.0<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Development Plan. | 60%<br>40%<br>Consultant will maintain 60% | G+14 floors<br>G+14 floors or equal to R/W<br>or Equal to R/W, within the max. allowed building height | 30-100m<br>2/3 of plot length<br>Consultants combine to:<br>30-100m<br>2/3 of plot length | 5m –<br>3m – 3m<br>**Up to 15m:**<br>F: 4.5 m -<br>R: 3 m -<br>S: 3 m -<br>**Above 15 m:**<br>F: 9.0 m -<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | 100 % | All begin at the setback line | 10% of area | Office Complex, integrated Parking; Retail Mall, Cinema Hall; Commercial Complex, Other Retail; Public/ Govt Institutional Buildings, Training Centre; Art Gallery; Diagnostic/Radiology Centre; Hospital; Health/Welfare Centre; Place of Worship larger than 1000sqm; Public Facility/Infrastructure/ Utility Buildings; Petrol Pump |
| **C.3** | 24 or less<br>Less than 18<br>Agreed | 2.0<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Development Plan. | 50%<br>45%<br>Consultant will maintain 50% | G+14 floors<br>Equal to R/W<br>G+14 floors or Equal to R/W, within the max. allowed building height | 30-100m<br>2/3 of plot length<br>Consultants combine to:<br>30-100m<br>2/3 of plot length | 5m –<br>3m - 3m<br>4.5m –<br>3m - 3m<br>Agreed | 100 % | All begin at the setback line | 15% of area | Neighbourhood Retail Shop; Community Hall; Health Club; Dispensary; Place of Worship M smaller than 1000sqm; |

**Table 4-8: Permitted Use Premises in Commercial Use Zone**

| Permitted Use Premises in Commercial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width in Meters** | **Definitions** | **Use Premises** |
| 2 | Auto/Thela/Rickshaw stand | As per requirement | 18 mt. & above<br>24 mt. & above<br>Agreed | A premise providing space for parking of Auto/Rickshaw with or without parking fee. | |
| 9 | Cinema | 0.15<br>0.25<br>Agreed | 30 mt. & above | A premise with facilities for projection of movies and stills with a covered space to seat audience | Cinema, watch & ward residence (Upto 30 sq.m). Administrative office ,soft drink & snack stall, Museum, Auditorium |
| 10 | Commercial office | 0.05 | 18 mtr & above<br>24 mt. & above<br>Agreed | A premises used for offices of profit making organisation | Commercial office, retail & personnel Service shop, Restaurant, bank, Post & Telegraph office |
| 16 | Gas Booking Office | 3 mt. X 3 mt.<br>0.03<br>Agreed | 18 mtr & above | | |
| 26 | Motor Driving School | 0.1 | 18 mt & above<br>24 mt. & above<br>Agreed | A premise having facilities for training of driving automobiles | Motor Driving Training Centre, Watch & ward residence ( upto 30 sq.m ), Soft drink & Snack stall |
| 27 | Multiplex | 0.2<br>0.25<br>Agreed | 30 mt. & above | A premise with facilities for projection of movies and stills with a covered space to seat audience. | Cinema, Watch & ward residence (upto 30 sq.m.), Administrative office, Soft drink & Snack stall, Museum, Auditorium. |
| 28 | Night Shelter | | 12 mt & above<br>18 mt. & above<br>Agreed | A premises providing night accommodation to individuals without any charges or with token charges it may be run by local government of voluntary agencies | Night Shelter |
| 34 | Post office | As per requirement | 12 mtr & above<br>18 mt. & above<br>Agreed | A premise with facilities for postal communication for use by the public | Post office, Post & telegraph office, Watch & ward residence ( upto 30 sq.m ),Canteen |
| 40 | Service Center & Service Industry | 0.05 | 18 mt & above<br>24 mt. & above<br>Agreed | A premise essentially having repair shops for automobiles, electrical appliances, building material, etc. to provide essential services to neighboring residential areas | Retail, Repair & personnel service shop, Cottage industry, Gas Godown, commercial office. |

**Table 4-9: Permissible Use Premises in Commercial Use Zone**

| Permissible Use Premises in Commercial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area (Ha)** | **Road Width (in Meters)** | **Definitions** | **Use Premises** |
| 5 | Community Centre | 0.2 | 18 mt. & above<br>24 mt. & above<br>Agreed | A premise having an enclosed space for various social & cultural activities of a residential area. | Community hall, Watch & Ward Residence (up to 30 sq. m.) soft drink Snack stall. |
| 11 | Health centre | 0.2 | 18 mt. & above<br>24 mt. & above<br>Agreed | A premise having facilities for treatment of indoor and outdoor patients having up to 30 beds. The health centre may be managed by a public or a charitable institution on non-commercial basis. | Health centre watch and ward residence (upto 30 sq.m), chemist shop (upto 15 sq.m each) |
| 14 | Motor garage and workshop | 0.05 | 18 mt. & above<br>24 mt. & above<br>Agreed | Premises for servicing and repair of automobiles. | Workshop, Watch & Ward residence ( up to 30 sq. m. ) soft drink Snack stall Administrative office. |
| 17 | Religious Building | 0.05 | 12 mt. & above<br>18 mt. & above<br>Agreed | Premises dedicated to accommodations and service of god or other objects of religious nature. It may have different nomenclature in different religions like temple (all faiths), mosque, church, gurudwara, Ashram. | (i)Temple ( ii) Mosque ( iii) Church (iv)Gurudwara (v) Synagogue , (vi) Ashram ( vii) Bathing tank , ( viii) Dargah and ( ix) Charitable dispensary and Library |
| 20 | Voluntary health service | 0.05 | 12 mt. & above<br>18 mt. & above<br>Agreed | Premises having medical facilities for treatment of outdoor patients and other like blood bank, etc. by voluntary institutions. This service may also take the form of temporary camp with charitable motive. | Voluntary health service, watch & ward residence (up to 30 sq.mt), administrative office, dispensary, canteen. |

**Table 4-10: Development Control Regulations for Industrial Area**

| | Development Control Regulations for Industrial Area | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sr No | Road RoW (m) | Max FSI | Max Ground coverage % of plot area | Max Building Height | Minimum Maximum building length | Minimum Setbacks (Front-Rear-Side) | Maximum % Hard pavement front set back | Building alignment | Minimum % Green space | Broad land-use classification |
| I.1 | 100 or 80 or 60 | 2.0<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Development Plan. | 50%<br>40%<br>Agreed | G+3floors<br>Max. 30 m<br>Agreed | 30-300m<br>2/3 of plot length<br>Consultant combines into:<br>30-300m<br>Or<br>2/3 of plot length | 15m – 9m – 9m | 20 % | free | 10 % of area | High-tech industry Cluster<br>This cluster includes industries that have been classified by the CSO of India as knowledge based industries. They include; chemicals (NIC 24), metal products (NIC 28), machinery (NIC 29), office and accounting equipment (NIC 30), electrical equipment (NIC 31), televisions and radios (NIC 32), medical and optical goods (NIC 33), parts of motor vehicles and other transportation equipment (NIC 34 and 35).<br><br>Light industry Cluster<br>These are largely consumer-oriented industries based on already (partially) processed inputs, including textiles and weaving (NIC 17 and 18), leather products and footwear (NIC 19), printing and publishing (NIC 22), furniture and miscellaneous industries (NIC 39) and 80 percent of logistics services (NIC 630).<br><br>Medium Industry Cluster<br>Industries that are processing semi-fabricates, including wood products (NIC 20), paper products (NIC 21), rubber and plastic products (NIC 25), glass products and nonmetallic minerals (NIC 26), iron and steel, and non-ferrous metals and precious products (NIC 27). |

| | Development Control Regulations for Industrial Area | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sr No | Road RoW (m) | Max FSI | Max Ground coverage % of plot area | Max Building Height | Minimum Maximum building length | Minimum Setbacks (Front-Rear-Side) | Maximum % Hard pavement front set back | Building alignment | Minimum % Green space | Broad land-use classification |
| | | | | | | | | | | Optional:<br>Agrifood industry |
| I.2 | 45 to 24<br>45 to 18<br>Agreed | 2.0<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Development Plan. | 50%<br>40%<br>Agreed | G+3floors<br>Max.18 m<br>Agreed | 30-300m<br>2/3 of plot length<br>Consultant combines into:<br>30-300m<br>Or<br>2/3 of plot length | 15m – 9m – 9m | 20 % | free | 10 % of area | Same as As I.1 plus row housing, apartments, residential services (schools, neighbourhood commercial centres) hotels |
| I.3 | 24 or less<br>Less than 18<br>Agreed | 2.0<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Development Plan. | 50 %<br>40%<br>Agreed | G+3 floors<br>Equal to R/W<br>Agreed | 30-200m<br>2/3 of plot length<br>Consultant combines into:<br>30-300m<br>Or<br>2/3 of plot length | 15m – 9m - 9m | 20 % | free | 10 % of area | Same as As I.1 plus row housing, apartments, residential services (schools, neighbourhood commercial centres) hotels |

**Table 4-11: Permitted Use Premises in Industrial Use Zone**

| Permitted Use Premises in Industrial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| In industrial use, Manufacturing, service, and light industry, extensive and heavy industry, special industrial areas and warehousing etc would be allowed within the Industrial estates/ use. In industrial use zone the buildings and shall normally be used for identified and associated permitted and permissible use/activities, on an application.premises | | | | | |
| 5 | Cinema | 0.15<br>0.25<br>Agreed | 30 mt. & above | A premise with facilities for projection of movies and stills with a covered space to seat audience | cinema, watch & ward residence (upto 30 sq.m), admisnistration office, soft drink & snack stall, museum, audiotorium |
| 8 | Commercial Complex | 0.1 | 18 mt. & above<br>24 mt. & above<br>Agreed | A premise having training facilities for Stenography, Correspondence, Record keeping, etc. | Commercial and Secretarial training centre, Watch & ward Residence (up to 30 sq.m.), Canteen. |
| 17 | Nursing Home | 0.1 | 18 mt & above<br>24 mt. & above<br>Agreed | Apremise having facilities for indoor and outdoor patients having upto 30 beds. It shall be managed by a doctor or a group of doctor on commercial basis | Nursing home, watch & ward residence (upto 30 sq m), chemical shop (upto 10 sq.m each) |
| 21 | Police Station/ Police Post | As per requirement | 12 mtr & above<br>24 mt. & above<br>Agreed | A premise having facilities for the offices of local police station. | Police Station, Essential staff housing,. Police post, Essential staff housing |
| 23 | Restaurants | 0.05 | 18 mt & above<br>24 mt. & above<br>Agreed | A premises used for serving food items on commercial basis including cooking facilities. It may have covered or open or both for sitting arrangement. | Restaurant |

**Table 4-12: Permissible Use Premises in Industrial Use Zone**

| Permissible Use Premises in Industrial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 1 | Auto/thela/ Rickshaw stand | As per requirement | 18 mt & above<br>24 mt. & above<br>Agreed | Premises for Auto/Thela/Rickshaw for Parking the same during non committing time. | |
| 6 | Govt./Semi-Govt private business. Establishment | 0.1 | 18 mt & above<br>24 mt. & above<br>Agreed | | |
| 12 | Motor garage and workshop | 0.05 | 18mt & above<br>24 mt. & above<br>Agreed | A premise for servicing and repair of automobiles | Workshop, Watch & ward residence (up to 30 sq.m.) Soft drink & Snack stall Administrative office. |
| 14 | Night Shelter | | 12 mt & above<br>18 mt. & above<br>Agreed | A premises providing night accommodation to individuals without any charges or with token charges. It may be run by local government or voluntary agencies. | Night Shelter |
| 17 | Religious Buildings | 0.05 | 12 mt. & above<br>18 mt. & above<br>Agreed | A premise dedicated to accommodations and service of god or other objects of religious nature. It may have different nomenclature in different religions like Temple (all faiths), Mosque, Church, Gurudwara, Ashram. | (i) Temple, (ii) Mosque, (iii) Church, (iv) Gurudwara, (v) synagogue, (vi) Ashram, (vii) Bathing Tank, (viii) Dargah and (ix) Charitable Dispensary and Library |
| 19 | Service Stations | 0.1 | 18 mt. & above<br>24 mt. & above<br>Agreed | Premises essentially having repair shops for Automobiles, Electrical appliances, Building material, etc. to provide essential services to neighbouring residential areas. | Retail, Repair & Personnel Service shop, Cottage industry, Gas godown, Commercial office. |

| Permissible Use Premises in Industrial Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 23 | Workshops/garages | 0.05 | 18 mt & above<br>24 mt. & above<br>Agreed | A premise for servicing and repair of automobiles. | Workshop, Watch & ward Residence (up to 30 sq.m.) Soft drink & Snack stall Administrative office. |

**Table 4-13: Permitted Use Premises in Recreation Use Zone**

| Permitted Use Premises in Recreation Use Zone | | | | | |
|---|---|---|---|---|---|
| **S.No** | **Activity** | **Minimum Area (ha)** | **Road Width (mtr)** | **Definitions** | **Use Premises** |
| 11 | Dairy Booth | As per requirement<br>Not in R/W<br>Consultant maintains As per requirement | | | |

**Table 4-14: Permitted Use Premises in Tourism Use Zone**

| Permitted Use Premises in Tourism Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| 8 | Cinema Hall | 0.15<br>0.25<br>Agreed | 30 mt. & above | A premise with facilities for projection of movies and stills with a covered space to seat audience. | Cinema, Watch & ward residence (upto 30 sq.m.), Administrative office, Soft drink & Snack stall, Museum, Auditorium. |
| 9 | Commercial Complex | 0.1 | 18 mt. & above<br>24 mt. & above | A premise having training facilities for Stenography, Correspondence, Record keeping, etc. | Commercial and Secretarial training centre, Watch & ward Residence (up to 30 sq.m.), Canteen. |

| Permitted Use Premises in Tourism Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| | | | Agreed | | |
| 10 | Community Centre | 0.2 | 18 mt. & above<br>24 mt. & above<br>Agreed | A premise having an enclosed space for various social and cultural activities of a residential area. | Community hall, Watch and ward residence (upto 30 sq.m), Soft drink and Snack stall. |
| 11 | Convenience Shopping Centre | 0.1 | 12 mt. & above<br>18 mt. & above<br>Agreed | A group of shops not exceeding 50 in number in residential area serving a population of 5000 persons. | Retail, Repair and Personnel service shop, Restaurant, clinic. |
| 16 | Government Offices (Tourism Related) | As per requirement | 18 mt & above<br>24 mt. & above<br>Agreed | A premises used for the office of union /State Government | Central government, State government, local government & Public undertaking office. Watch & ward residence ( upto Sq. m). retail shop, Chemist, Books and Stationery, Consumer store ( upto to 20 sq.m each on ground floor), canteen, bank Extension Counter , Post office Extension Counter. |
| 20 | Health Centre | 0.2 | 18 mt & above<br>24 mt. & above<br>Agreed | A premise having facilities for treatment of indoor and outdoor patients having up to 30 beds. The health centre may be managed by a public or a charitable institution on non-commercial basis. | Health Centre watch and ward residence (upto 30 sq.m), Chemist shop (upto 15 sq.m each) |
| 22 | Local shopping centre | 0.4 | 18 mt. & above<br>24 mt. & above<br>Agreed | A group of shops not exceeding 75 numbers in residential area serving a population of 15,000 persons. | Retail , Repair and Personnel service shop, Informal sector unit, Commercial office, Cottage and Service industry, Clinical Laboratory, Clinic & Polyclinic,Restaurant, Soft drink & Snack stall, Post office and Bank extension counter, Nursing home and Guest house. |
| 25 | Multiplex | 0.2<br>0.25<br>Agreed | 30 mt. & above | A premise with facilities for projection of movies and stills with a covered space to seat audience. | Cinema, Watch & ward residence (upto 30 sq.m.), Administrative office, Soft drink & Snack stall, Museum, Auditorium. |

| Permitted Use Premises in Tourism Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (in meter)** | **Definitions** | **Use Premises** |
| 35 | Post office | As per requirement | 12 mtr & above<br>18 mt. & above<br>Agreed | A premise with facilities for postal communication for use by the public | Post office, Post & telegraph office, Watch & ward residence ( upto 30 sq.m ),Canteen |
| 36 | Professional Offices | 0.05 | 12 mt. & above<br>18 mt. & above<br>Agreed | | |
| 40 | Restaurants | 0.05 | 18 mt. & above<br>24 mt. & above<br>Agreed | A premises used for serving food items on commercial basis including cooking facilities. It may have covered or open or both for sitting arrangement. | Restaurants |
| 42 | Taxi and Auto Stand | As per requirement | 18 mt & above<br>24 mt. & above<br>Agreed | | |

**Table 4-15: Development Control Regulations for Public/ Semi-public (Knowledge City) 1**

| Development Control Regulations for Public/ Semi-public (Knowledge City) 1 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum area for green** | **Broad land-use classification** |
| **K1.1** | 80 or 60 m along central green | 2.0<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Development Plan. | 50 %<br>40%<br>Agreed | G+14 floors<br>Equal to R/W<br>Agreed | 30-100m<br>2/3 of the plot length<br>Consultant combine to:<br>30-100<br>Or<br>2/3 of the plot length | 5m – 3m – 3m<br>**Up to 15m:**<br>F: 4.5 m<br>R: 3 m<br>S: 3 m<br>**Above 15 m:**<br>F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants,<br>Offices, governmental offices<br>Apartments; Hostel, Hotels Library;<br>Health Club; Public Facility/Infrastructure/ Utility Building, hospital |
| **K1. 2** | 80 or 60 | 2.0<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the | 50 %<br>40%<br>Agreed | G+9 floors<br>Equal to R/W<br>Agreed | 30-100m<br>2/3 of the plot length<br>Consultant combine to:<br>30-100<br>Or<br>2/3 of the plot length | 5m – 3m – 3m<br>**Up to 15m:**<br>F: 4.5 m<br>R: 3 m<br>S: 3 m<br>**Above 15 m:**<br>F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants,<br>Offices,<br>Apartments; Hostel, Hotels Library;<br>Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building, hospital |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Developme nt Plan. | | | | | | | | |
| **K1.3** | 45 to 24<br>45 to 18<br>Agreed | 2.0<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Developme nt Plan. | 50 %<br>40%<br>Agreed | G+9 floors<br>Equal to R/W<br>Agreed | 30-100m<br>2/3 of the plot length<br>Consultan t combine to:<br>30-100<br>Or<br>2/3 of the plot length | 5m –<br>3m – 3m<br>**Up to 15m:**<br>F: 4.5 m<br>R: 3 m<br>S: 3 m<br>**Above 15 m:**<br>F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants,<br>Offices,<br>Apartments; Hostel, Hotels Library;<br>Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building |
| **K1.4** | 24 or less<br>Less than 18<br>Agreed | 2.0<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Developme nt Plan. | 50 %<br>45%<br>Agreed | G+9 floors<br>Equal to R/W<br>Agreed | 30-100m<br>2/3 of the plot length<br>Consultan t combine to:<br>30-100<br>Or<br>2/3 of the plot length | 5m –<br>3m – 3m<br>**Up to 15m:**<br>F: 4.5 m<br>R: 3 m<br>S: 3 m<br>**Above 15 m:**<br>F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants,<br>Offices,<br>Apartments; Hostel, Hotels Library;<br>Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building |

**Table 4-16: Development Control Regulations for Public/ Semi-public (Knowledge City) 2**

| Development Control Regulations for Public/ Semi-public (Knowledge City) 2 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum area for green** | **Broad land-use classification** |
| **K2. 1** | 80 or 60 Central park | 1.5<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Development Plan. | 50 %<br>40%<br>Agreed | G+4 floors, 20%<br>G +14 floors<br>Equal to R/W<br>G + 4 floors, 20% G+14 floors,<br>or Equal to R/W, within the max. allowed building height | 30-100m<br>2/3 of the plot length<br>Consultants combine to:<br>30-100<br>Or<br>2/3 of the plot length | 5m – 3m – 3m<br>**Up to 15m:**<br>F: 4.5 m<br>R: 3 m -<br>S: 3 m<br>**Above 15 m:**<br>F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants,<br>Offices, governmental offices<br>Apartments; Hostel, Hotels Library; Health Club; Public Facility/Infrastructure/ Utility Building, hospital |
| **K2.2** | 80 or 60 | 1.5<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Development Plan. | 50 %<br>40%<br>Agreed | G+4 floors, 20%<br>G +14 floors<br>Equal to R/W<br>Consultants combine to:<br>G + 4 floors, 20% G+14 floors,<br>or Equal to R/W, within the max. allowed | 30-100m<br>2/3 of the plot length<br>Consultants combine to:<br>30-100<br>Or<br>2/3 of the plot length | 5m – 3m – 3m<br>**Up to 15m:**<br>F: 4.5 m<br>R: 3 m -<br>S: 3 m<br>**Above 15 m:**<br>F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants,<br>offices<br>Apartments; Hostel, Hotels Library; Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building, hospital |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | building height | | | | | | |
| **K2.3** | 45 to 24<br>45 to 18<br>Agreed | 1.5<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Development Plan. | 50 %<br>40%<br>Agreed | G+4 floors, 20%<br>G +14 floors<br>Equal to R/W<br>Consultants combine to:<br>G + 4 floors, 20% G+14 floors,<br>or Equal to R/W, within the max. allowed building height | 30-100m<br>2/3 of the plot length<br>Consultants combine to:<br>30-100<br>Or<br>2/3 of the plot length | 5m –<br>3m – 3m<br>**Up to 15m:**<br>F: 4.5 m<br>R: 3 m -<br>S: 3 m<br>**Above 15 m:**<br>F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants,<br>offices<br>Apartments; Hostel, Hotels Library; Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building |
| **K2.4** | 24 or less<br>Less than 18<br>Agreed | 1.5<br>1.67-2.25<br>Consultant will remain FSI of 2.0 based on the approved policy of the client and the philosophy of the Development Plan. | 50 %<br>45%<br>Agreed | G+4 floors, 20%<br>G +14 floors<br>Equal to R/W<br>G + 4 floors, 20% G+14 floors,<br>or Equal to R/W, within the max. allowed building height | 30-100m<br>2/3 of the plot length<br>Consultants combine to:<br>30-100<br>Or<br>2/3 of the plot length | 5m –<br>3m – 3m<br>4.5m –<br>3m – 3m<br>Agreed | 100 % | All begin at the setback line | 15 % of site | University Campus; Hotel, café , restaurants,<br>offices<br>Apartments; Hostel, Hotels Library; Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building |

**Table 4-17: Development Control Regulations for Public/ Semi-public (Knowledge City) 3**

| Development Control Regulations for Public/ Semi-public (Knowledge City) 3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum area for green** | **Broad land-use classification** |
| **K3. 1** | 80 or 60 | 0.7<br>1.67-2.25<br>Consultant will remain FSI of 0.7 based on the approved policy of the client and the philosophy of the Development Plan. | 50 %<br>40 %<br>Agreed | G+4 floors<br>Equal to R/W<br>Consultants combine into: G + 4 floors, or Equal to R/W, within the max. allowed building height | 30-100m<br>2/3 of the plot length<br>Consultants combine to: 30-100<br>Or<br>2/3 of the plot length | 5m – 3m – 3m<br>**Up to 15m:**<br>F: 4.5 m<br>R: 3 m<br>S: 3 m<br>**Above 15 m:**<br>F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m<br>Partially Agreed | 100 % | All begin at the setback line | 15 % of site minimum 100 m2 | University Campus; Hotel, café , restaurants, offices<br>Apartments; Hostel, Hotels Library; Health Club; Public Facility/Infrastructure/ Utility Building, hospital |
| **K3.2** | 45 to 24<br>45 to 18<br>Agreed | 0.7<br>1.67-2.25<br>Consultant will remain FSI of 0.7 based on the approved policy of the client and the philosophy of | 50 %<br>40 %<br>Agreed | G+4 floors<br>Equal to R/W<br>G + 4 floors, or Equal to R/W, within the max. allowed | 30-100m<br>2/3 of the plot length<br>Consultants combine to: 30-100<br>Or | 5m – 3m – 3m<br>**Up to 15m:**<br>F: 4.5 m<br>R: 3 m -<br>S: 3 m<br>**Above 15 m:**<br>F: 9.0 m<br>R: 9.0 m<br>S: 9.0 m | 100 % | All begin at the setback line | 15 % of site minimum 100 m2 | University Campus; Hotel, café , restaurants, offices<br>Apartments; Hostel, Hotels Library; Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building, hospital |

| Development Control Regulations for Public/ Semi-public (Knowledge City) 3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building length** | **Minimum Setbacks (Front- Rear- Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum area for green** | **Broad land-use classification** |
| | | the Development Plan. | | building height | 2/3 of the plot length | Partially Agreed | | | | |
| **K3.3** | 24 or less<br>Less than 18<br>Agreed | 0.7<br>1.67-2.25<br>Consultant will remain FSI of 0.7 based on the approved policy of the client and the philosophy of the Development Plan. | 50 %<br>40 %<br>Agreed | G+1.5 floors<br>Equal to R/W<br>G + 1.5 or Equal to R/W, within the max. allowed building height | 30-100m<br>2/3 of the plot length<br>Consultants combine to:<br>30-100<br>Or<br>2/3 of the plot length | 5m – 3m – 3m<br>4.5m – 3m – 3m<br>Agreed | 100 % | All begin at the setback line | 15 % of site minimum 100 m2 | University Campus; Hotel, café , restaurants, offices<br>Apartments; Villa/Bungalow; Row House Hostel, Hotels Library; Health Club; Day Care Centre; Public Facility/Infrastructure/ Utility Building |

**Table 4-18: Permitted Use Premises in Public/ Semi-Public Use Zone**

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 5 | Banquet hall | 0.2 | 18 mt. & above<br>24 mt. & above<br>Agreed | A premises to hold small public gathering Community functions, Marriage etc. | Hall for public gatherings, Marriages, Cooking facilities and Other logistics. |
| 7 | Cinema | 0.15<br>0.25<br>Agreed | 30 mt. & above | A premise with facilities for projection of movies and stills with a covered space to seat audience | Cinema, watch & ward residence (Upto 30 sq.m). Administrative office ,soft drink & snack stall, Museum, Auditorium |
| 12 | Commercial & Secretarial Training centre | 0.1 | 18 mt. & above<br>24 mt. & above<br>Agreed | A premises having training facilities for Stenography , Correspondence , Record keeping etc. | Commercial & Secretarial Training centre watch & ward residence ( up to 30sq.m.), Canteen. |
| 16 | Cremation / Burial ground | The site for cremation ground shall be identified in locations which are not in proximities to residential area. | 12 mt.& above<br>16 mt. & above<br>Agreed | A premise with facilities of performing last rites of dead bookies by burning. | Burial ground, Cremation ground , cemetery a Crematorium , Retail shops , wood, Flowers and related materials. Watch & ward Residence ( up to 20 sq. m.) |
| 20 | Disaster management centre | As per requirement | 18 mt. & above<br>24 mt. & above<br>Agreed | A premises having facilities of training for emergency backup hospital facility training centre for disaster preparedness wireless communication etc. | Disaster management training centre, open ground for practice and relief camps communication centre, Hostels, Staff residence fire station. Watch and ward residence ( up to 30 sq.mt.) etc. |
| 31 | Government Offices | As per requirement | 18 mt & above<br>24 mt. & above<br>Agreed | A premises used for the office of union /State Government | Central government, State government, local government & Public undertaking office. Watch & ward residence ( upto Sq. m). retail shop, Chemist, Books and Stationery, Consumer store ( upto to 20 sq.m each on ground floor), canteen, bank Extension Counter , Post office Extension Counter. |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 32 | Hospital (i) 500 beds & above (ii) 201 to 500 beds (iii) 101 to 200 beds (iv) up to 100 7 beds | 6 4.00 – 6.00 2.50 – 4.00 1.00 – 2.50 ( Area requirements may be relaxed looking to the non availability of Land )<br>6 - 4 – 6 Consultants maintained: 6.00 4 – 6.00 1.00 – 2.50 (Area requirements may be relaxed looking to the non availability of Land ) | 30 mt. & above | A premises providing medical facilities of general or specialized nature for treatment of indoor and outdoor patients. | Hospital, Residential flat ( employees and service personal ) , institutional hostel , Medical college, Retail Shop (Confectionary , Grocery & general merchandise , Books and Stationary , Barber , Launderer, Vegetable). |
| 33 | Health Centre ( including family welfare centre) | 0.20 – 0.30 | 18 mt. & above<br>24 mt. & above Agreed | A premises having facilities for treatment of indoor and outdoor patients having up to 30 beds. The health centre may be managed by a public or a charitable institution on non – commercial basis. It includes family welfare centre. | Health centre, Nursing home, watch & ward residence ( up to 30 sq.m. each ), Chemist shop (up to 15 sq.m. each). |
| 34 | Health Centre | 0.2 | 18 mt. & above<br>24 mt. & above Agreed | A premise having facilities for treatment of indoor and outdoor patients having up to 30 beds. The health centre may be managed by a public or a charitable institution on non-commercial basis. It includes family welfare centre. | Health Centre, Nursing home , watch & ward residence ( up to 30 sq.m. each ), Chemist shop (up to 15 sq. m. each). |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 41 | Local Shopping Centre | 0.4 | 18 mt. & above<br>24 mt. & above<br>Agreed | A group of shops not exceeding 75 numbers in residential area serving a population of 15,000 persons. | Retail , Repair and Personnel service shop, Informal sector unit, Commercial office, Cottage and Service industry, Clinical Laboratory, Clinic & Polyclinic,Restaurant, Soft drink & Snack stall, Post office and Bank extension counter, Nursing home and Guest house. |
| 42 | Motor driving school | 0.1 | 18 mt.& above<br>24 mt. & above<br>Agreed | A premise having facilities for training of driving automobiles. | Motor driving training centre, Watch & ward residence ( up to 30sq.m.) , Soft drink & snack Stall. |
| 43 | Motor garage and workshop | 0.05 | 18 mt. & above<br>24 mt. & above<br>Agreed | A premise for serving and repair of automobiles. | |
| 45 | Multipurpose community hall | 0.2 | 18 mt. & above<br>24 mt. & above<br>Agreed | A premises having an enclosed space for various social and cultural activities of a residential area. | Community hall, Watch & ward residence ( up to 30sq.m.), Soft drink & snack stall. |
| 48 | Night shelter | | 12 mt. & above<br>18 mt. & above<br>Agreed | A premises providing night accommodation to individuals without any charges or with taken charges. It may be run by local government or voluntary agencies. | Night shelter |
| 49 | Nursing home /Maternity home / Poly –clinic | 0.1 | 18 mt. & above<br>24 mt. & above<br>Agreed | A premises having facilities for indoor and outdoor patients having up to 30 beds. It shall be managed by a doctor or a group of doctors. | Health centre, Nursing home , watch & ward residence ( up to 30 sq.m. each ), Chemist shop (up to 15 sq.m. each). |
| 51 | Old age home / care centre for physically / mentally / challenged/ working woman / men Hostel | 0.1 | 12 mt. & above<br>18 mt. & above<br>Agreed | | |
| 61 | Post and telegraph office | As per requirement | 12 mt.& above<br>18 mt. & above<br>Agreed | A premise with facilities for Postal and telecommunication for use by the public | Post office, Post & Tele graph office, Watch & ward residence ( up to 30 sq. m.) |

| Permitted Use Premises in Public/ Semi-Public Use Zone | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 62 | Post office | As per requirement | 12 mt.& above<br>18 mt. & above<br>Agreed | A premise with facilities of postal communication for use by the public | Post office , Post & Telegraph office , Watch & Ward residence ( up to 30 sq.m.), Canteen |
| 67 | Religious / premises/building | 0.05 | 12 mt. & above<br>18 mt. & above<br>Agreed | A premises dedicated to the service of the objects of religious nature it may have different nomenclature in different religions / faiths. | Temple, mosque, church, gurudwara etc. charitable dispensary, library. |
| 85 | Voluntary health service | 0.05 | 12 mt. & above<br>18 mt. & above<br>Agreed | A premises having medical facilities for treatment of outdoor patients and other like blood bank, etc. by voluntary institutions. This service may also take the form of temporary camp with charitable motive. | Voluntary health service, Watch & ward residence (up to 30 sq . mt. Administrative office,. Dispensary, Canteen. |

**Table 4-19: Development Control Regulations for governmental (Knowledge City)**

| Development Control Regulations for governmental (Knowledge City) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sr No** | **Road RoW (m)** | **Max FSI** | **Max Ground coverage % of plot area** | **Max Building Height** | **Minimum Maximum building lenght** | **Minimum Setbacks (Front-Rear-Side)** | **Maximum % Hard pavement front set back** | **Building alignment** | **Minimum area for green** | **Broad land-use classification** |
| **G** | 60 | 1.5<br>1.67-2.25<br>Consultant will remain FSI of 1.5 based on the approved policy of the client and the philosophy of the | 70 %<br>40 %<br>Agreed | G+4 floors<br>Equal to R/W<br>Agreed | 300m | 15m –<br>9m – 9m | 50 % | free | 35 % of site | Governmental offices, civic centres, Conference, culture and expo centres, museum, restaurant, trade fair ground |

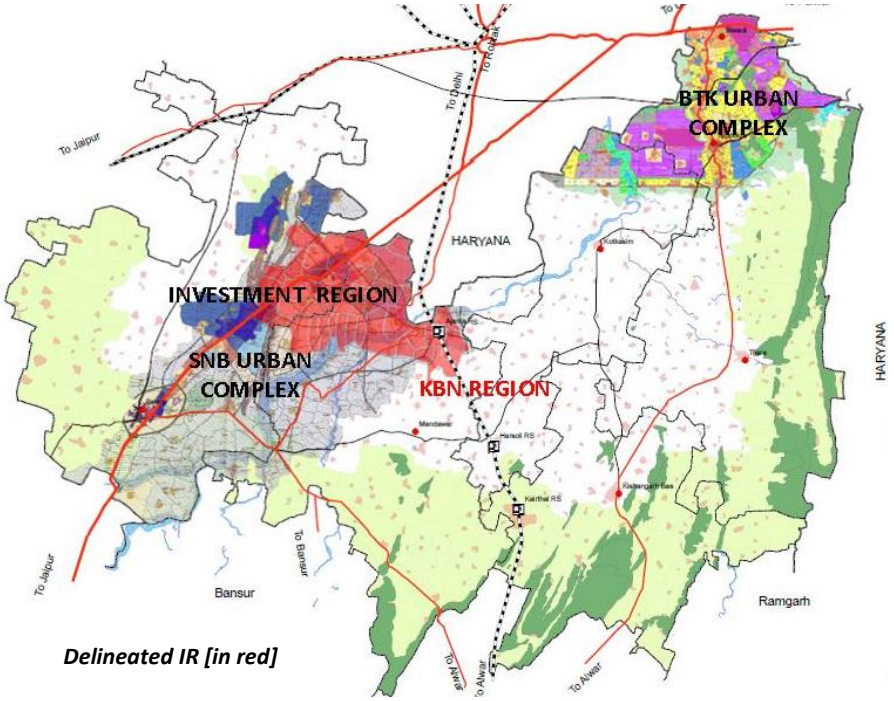
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Development Plan. | | | | | | | | |

**Table 4-20: Permitted Use Premises in Government Use Zone**

| Permitted Use Premises in Government Use Zone | | | | | |
|---|---|---|---|---|---|
| **SlNo.** | **Activity** | **Minimum Area Required (Ha)** | **Road Width (Mts)** | **Definitions** | **Use Premises** |
| 4 | Commercial & Secretarial Training centre | 0.1 | 18 mt. & above<br>24 mt. & above<br>Agreed | A premises having training facilities for Stenography , Correspondence , Record keeping etc. | Commercial & Secretarial Training centre watch & ward residence ( up to 30sq.m.), Canteen. |
| 19 | Restaurant | 0.5 | 18 mt. & above<br>24 mt. & above<br>Agreed | Restaurant “Road transport booking office ‘ – A premises used for the offices of a road transport agency. | Restaurant |

# 2 Baseline Scenario for KBNIR

## 2.1 Location & Connectivity




***Delineated IR [in red]***

Delineated KBNIR is positioned within Alwar District of Rajasthan. Alwar Town (district HQ) is located at 70 KM in the south-west direction of the delineated IR whereas the State Capital Jaipur is 150 km south. The geographical position of the district is $27^{O}54'$N to $28^{O}3'$N latitude and $76^{O}23'$E to $76^{O}36'$E longitudes. Alwar District is the only district of Rajasthan constituting to National Capital Region (NCR). Delineated KBNIR positioned within the controlled areas of Shahjahanpur Neemrana Behror (SNB) Urban Complex and is an extension to Shahjahanpur Industrial Town. Regionally its is located in between Behror & Bawal (Haryana) town

Shahjahanpur is ~108km from Nationl Captial – New Delhi [Connaught Place}. The nearest airport is Indira Gandhi International Airport New Delhi is at 94km. Though the nearest railway station is Rewari Junction station at 60km, for long distance trains to other than Mumbai Route, New Delhi railway station is the only boarding point.

The area carved out lies on the North-eastern edge of Alwar District, and follows state boundary on all north; the Aravallis determine the western boundary, eastern boundary is determined by SNB Urban Complex Master Plan boundary except for one villages near ajarka station (where two villages are of outside SNB area on eastern boundary) and the southern boundary is determinied by Neemrana Town & Sahibi River.

## 2.2 Road and Rail network

The NH8 has strong national importance due to it connecting the Indian capital city of New Delhi with the Indian Financial capital city of Mumbai. In the Master Plan for NCR 2021 a Highway Corridor Zone with a minimum width of 500 meters inclusive of green buffer on either side of the right of way is proposed. State Highways 25 and 14 have regional importance and are within (the influence area) of the KBNIR. The SH52 connects Rewari with Bansur / Alwar. This State Highway crosses the Sahibi river wadi within the KBNIR close to Ajarka Railway Station.

The Master Plan for SNB Urban Complex provides for bye-passes for three major settlements along NH-8, SH level six roads with RoW of 45-60 m and having 4-6 lanes and thirteen numbers major roads with RoW of 45 m and having 4 lanes.

The Rail Road from Delhi / Rewari to Alwar / Jaipur crosses the KBNIR in the east. The only (rural) railway station within the KBNIR is located in the village of Ajarka.

As part of the DMIC, the railway of the Dedicated Freight Corridor (DFC) is running north of the region, but will have impact on the development of the area. The alignment of the DFC passes south of Rewari and runs through the BTK Complex. A Dry Port on the DFC is proposed in Kahrani, near Bhiwadi in the BTK Complex.

The NCR has proposed a Regional Rapid Transport System (RRTS) connecting Delhi-Gurgaon-Rewari-Alwar. The proposed alignment of the (elevated) RRTS enters the KBNIR from the north combined with the NH8, making a southern turn in the northern part of the KBNIR. The proposed RRTS alignment joins the rail road Rewari-Alwar south of Ajarka station.

In parallel, it is understood that DMICDC Consultant working on MBIR Node of Haryana is undertaking pre-feasibility study on Mass Rapid Transit System between Gurgaon and Bawal. The proposed MRTS system is expected to be modelled on sub-urban (Mumbai local) technology with intermodal connectivity with Delhi Metro and would primarily run along NH8 upto Rajashtan Border.

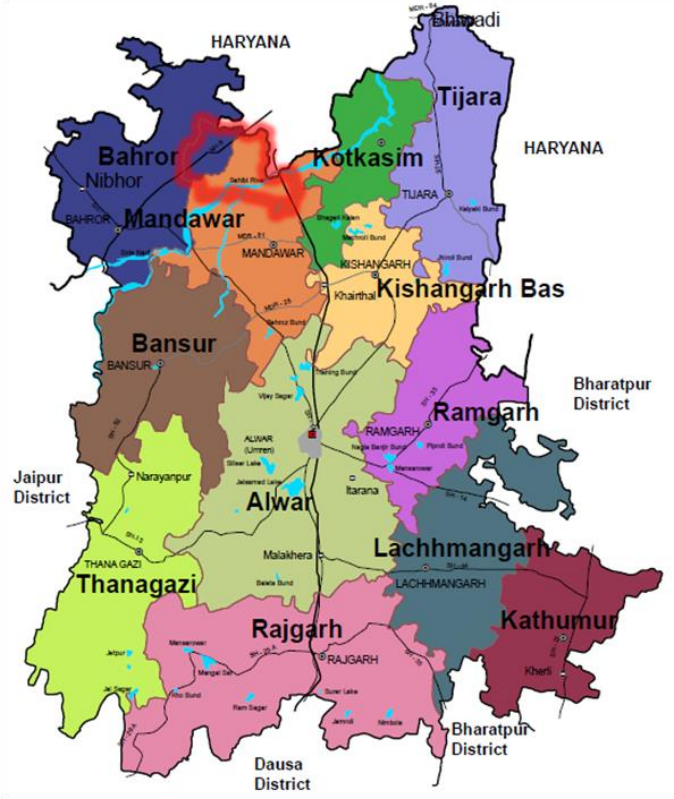
## 2.3 Air Connectivity

The Indira Gandhi International Airport is the nearest Airport for the KBNIR with a distance of about 70 Kms. The other airport in the close vicinity of the Investment Region is Jaipur airport which is about 150 Kms. As part of the assignment for the preparation of a Development Plan for the KBN Investment Region a Techno-Economic Feasibility study for an aerotropolis is being conducted. The proposed location for the aerotropolis is south of BTK Industrial Complex, connected by a road link to the KBNIR.

## 2.4 Administrative Setup

Delineated KBN IR covers an area of 165.51 Sq Km and administratively, falls within tehsils of Behror and Mandawar spread over 42 villages & 2 towns [including Shahjahanpur town & industrial estate]. Of 42 villages, 40 Villages fall within SNB Urban Complex Master Plan while two outside

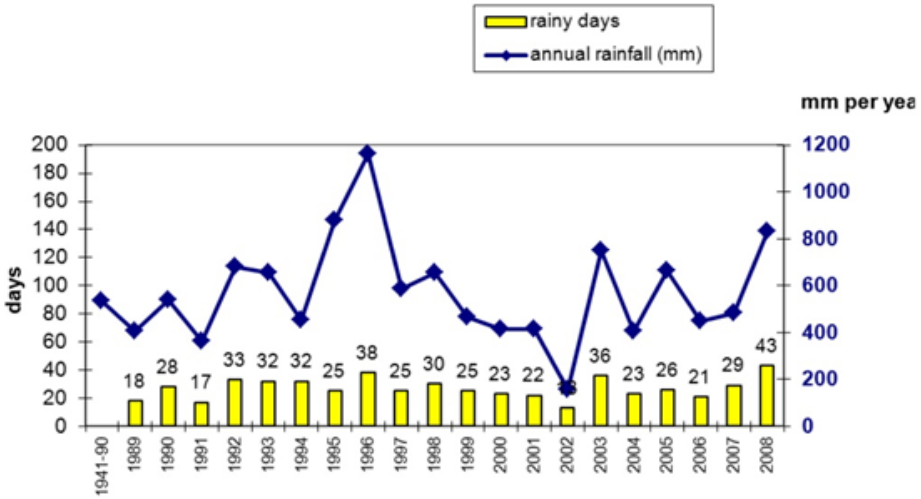
The delineated zone consists of the Shahjahanpur industrial estate in totality and part of Neemrana Industrial Area, both developed by RIICO and is home to multiple industries spread across sectors including auto ancillary, metals, metals fabrication, textiles and agro products.



## 2.5 Natural & Climatic Features

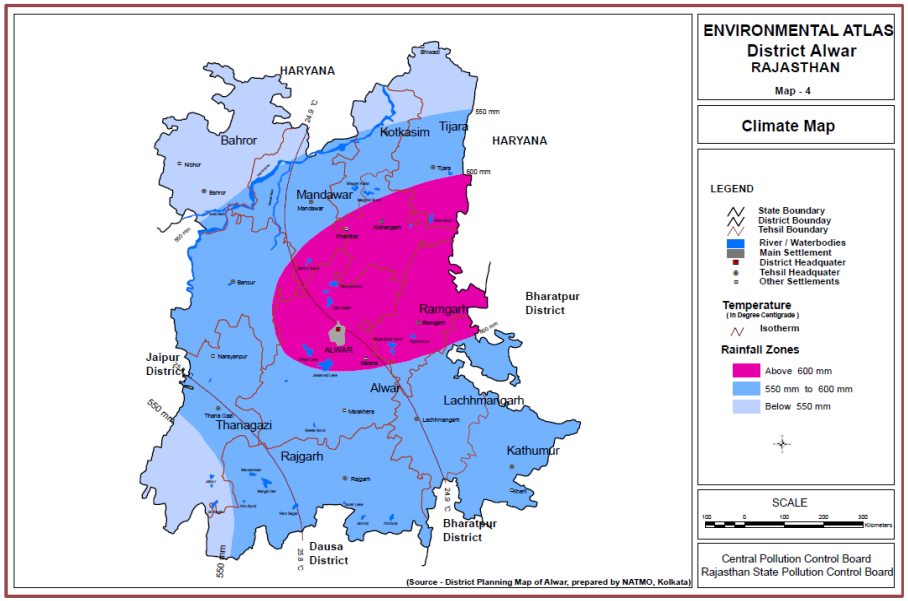
### 2.5.1 Climate and Rainfall

The climate of the Investment Region can be classified as semi-arid. Hot summer, cold winter and a fairly short monsoon season characterize it. The average rainfall for the last 20 years (1989-2008) works out to be 570 mm with average 27 rainy days in a year. The monsoon season counts for about 90% of total annual rainfall. This annual rainfall differs largely from year to year. Rainfall in the Investment Region is often associated with eastern winds.




### 2.5.2 Temperature

The cold season starts from about middle of November and continues till the end of February. January is the coldest month of the year with mean daily maximum temperature at 21.8C and mean daily minimum temperature at 7.7C. Both day and night temperatures increase rapidly from March onwards. May and June are the hottest months of the year with maximum temperature crossing 45C and minimum temperature at 28C. There is appreciable fall in temperature with onset of south-west monsoon by the end of June. After the withdrawal of monsoon in mid-September, the day temperature increases for a brief period. The night temperature however, continues to fall gradually.




### 2.5.3 Winds

Winds are strongest (13.1 km/h) in June and lightest (5.6 km/h) in November. The micrometeorological data reveals that in most of the time, the calm conditions prevail. Wind directions vary with season. In the summers, the predominant wind directions are from the west in the morning and either west or northwest in the evening. In the monsoons, the predominant wind directions are from the southeast or west in the morning and from east (in July and August) or north-west (in September) in the evenings. During the post monsoon season, west and calm winds predominate in the mornings while in the evenings, north and northwest

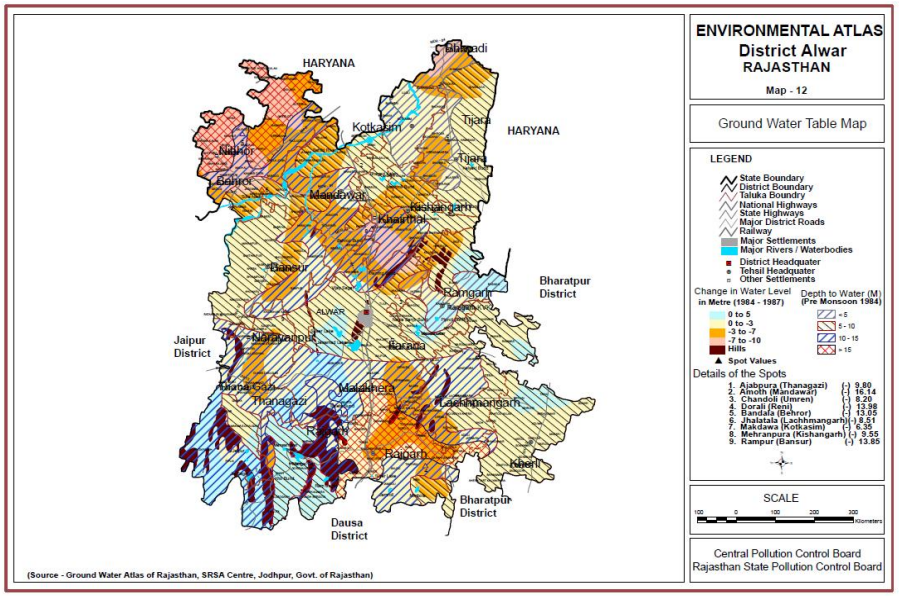
winds are most frequent. In the winter mornings, southwest and west winds dominate, while in the evenings, northwest and north winds are frequent. During the cold weather periods, the winds are generally light. Violet and dust raising winds are experienced in the entire district during summer. Winds are generally stronger over the western part of the district than the eastern part.

### 2.5.4 Water

The entire region is dependent on ground water and there is no surface water source except a ephemeral River Sahibi and some minor tributaries of the river in the region. Over the years, the Sahibi River has lost its existence in most parts of this region due to construction of Check dams/ water retaining structure in the upstream of the catchment and the river course has been converted to agricultural fields whereby in most parts of the region, tracking the river bed/ course is almost impossible. However, the subsurface flow of river in the areas adjoining the river course keeps the water table at lesser depths due to recharging of aquifer. In absence of any surface water source, the entire area is dependent on ground water source only, both for agriculture as well as domestic and industrial water requirements.

Though the Sahibi River has witnessed no floods since 1978 in this region, it still posses a threat of flooding to IR looking at the long term (50 years) flood frequency, therefore needs to be taken into account while developing concept master plan for IR.

The ground water levels for varies for different parts of the region; western side & eastern side of NH8. The water table in Behror Tehsil on the western side of NH-8 have gone as deep as 60-70m and even higher in some parts, whereas the Water Table on the eastern side of NH-8 (Mandawar Tehsil) is in the range of 30m. The distribution of water Table depths across the region clearly indicates that there is much higher level of ground water exploitation in the Behror Tehsil and the sub-surface flow of Sahibi River is favouring the eastern side (Mandawar Tehsil). This is in addition to the natural drainage pattern from the ridges on the eastern boundary of the IR which helps in water recharging for the areas under Mandawar Tehsil.




As per CGWB ground water status report for year 2010, the Behror, Nimrana & Mandawar blocks of IR falls under overexploited category with average (for period 1995-2009) ground water decline rate being - 1.64, - 1.02 and – 0.46 meters per year. The higher rate of decline in Behror Tehsil (Behror and Neemrana) is primarily due to the soil characteristics of the area with larger clay content and thus recharging in this zone is lower compare to other parts where sand content is higher and the soil is more permeable.

Taking note of the situation, CGWB through its notification dated 2.12.2006 brought Behror Block under the jurisdiction of Central Ground

Water Authority for control and regulation of ground water. Thus prohibiting construction of new ground water structures, however the permission of drilling tube wells is being granted only to the Govt. agencies responsible for drinking water supply.

### 2.5.5 Relative humidity

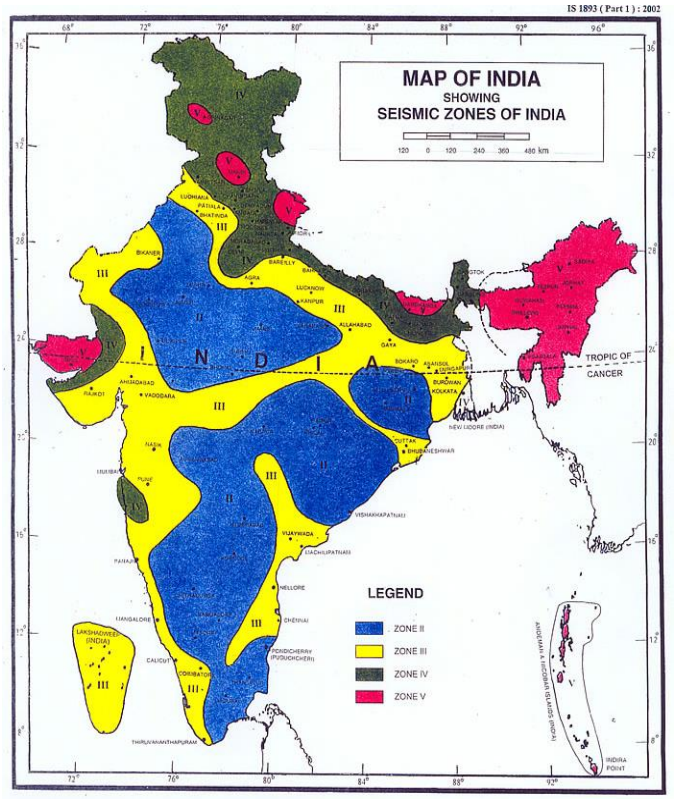
The air is generally dry except in the south-west monsoon season. In the summer months, the relative humidity is very low, often less than 20% in the afternoon. However, the relative humidity values are much higher during monsoon season. August is the most humid with mean daily relative humidity of 80% in the morning and 70% in the afternoon.

### 2.5.6 Natural hazards

**Draughts:** The Investment Region is vulnerable to draughts. Draughts results from deficient rainfall (less than 75% of the normal rainfall) causing acute scarcity of moisture in the soil. The deficiency of moisture leads to loss of soil productivity, deprivation of vegetation and initiation of desertification. Sand spread can cause acute moisture stress on agriculture lands producing draught-like situation in these areas every year. In the driest and hottest months high temperatures can lead to heat stress especially for the urban communities.

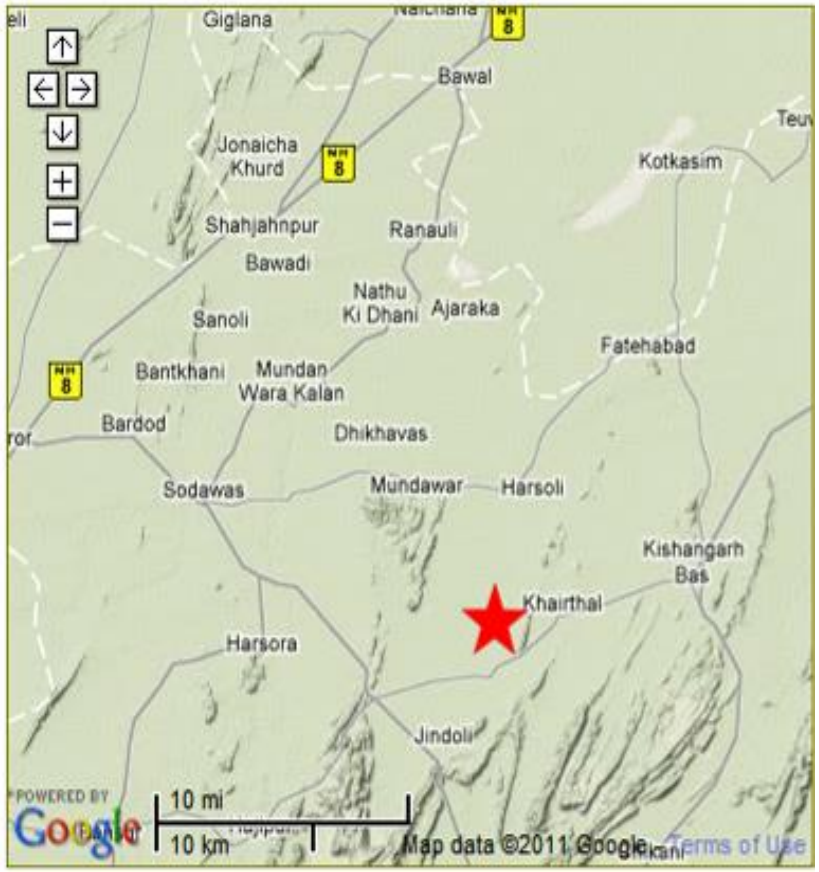
**Earthquakes:** Investment region and its immediate surrounding are seismically activity, as it falls under Zone IV of seismic classification. This is evident from the fact that it has witnessed two low (magnitude below 4.0 at rector scale), intensity earthquakes within last decade. The epicentre of both the earthquake is within the radius of 10km. The recent one was on April 7$^{th}$, 2010 with magnitude of 3.3 at rector scale. Figure 10 presents the epicentre for April 7$^{th}$, 2010 earthquake within reference to IR.

**Seismic Zones of India**




Source: www.portal.gsi.gov.in

**Location of Epicentre of earthquake dated April 07, 2010**

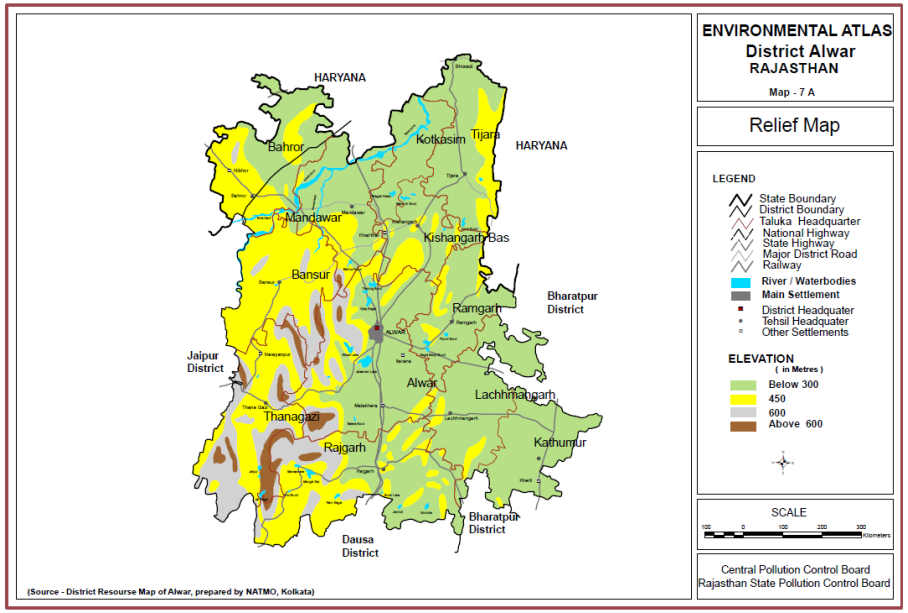


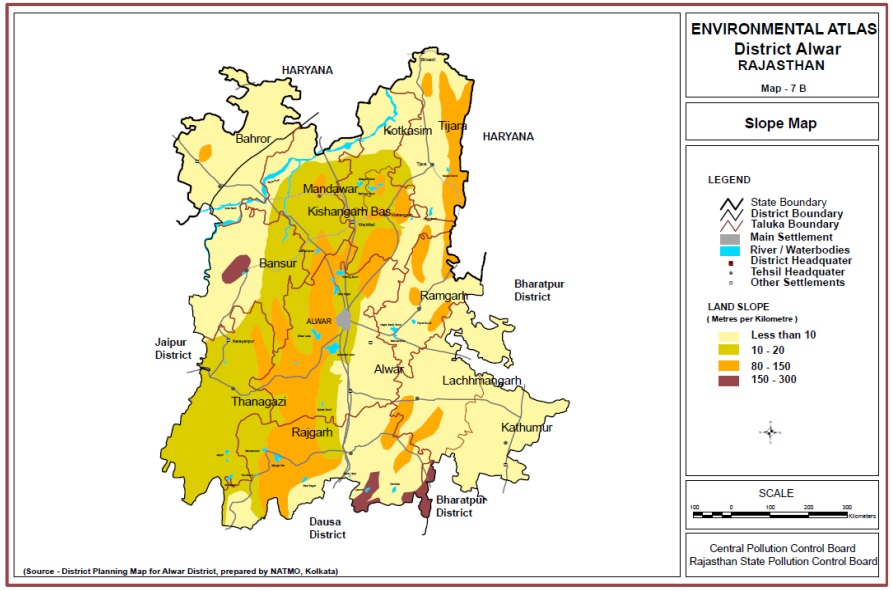

Source: www. asc-india.org

### 2.5.7 Physiography

**Relief:** The Aravalli ranges runs along the boarder on NE-E & SE sides of the KBNIR and here the maximum elevation is 470mts, whereas from the foothills of Aravalli Hills the ground elevation varies from 293 mts (near Belni) to 275mts (near State Border along Sahibi River). **Figure 6.2** Aravalli range with respect to IR.

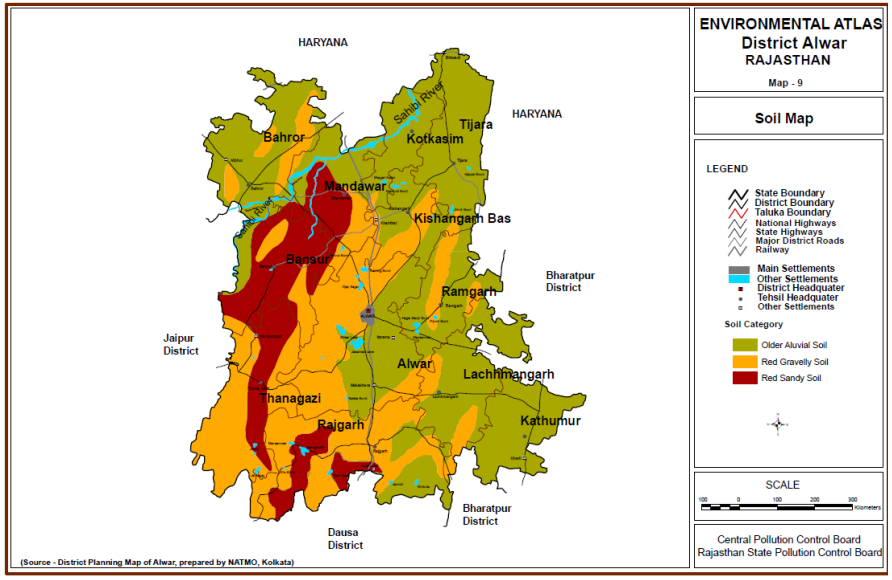
**Slope:** The Aravalli Ranges are marked with steep slopes, however rest of KBNIR plain is almost flat to gentle slope. The slope direction is towards the Sahibi River from Aravalli Hills. On average, the slope is around 1.2 :1000 i.e. 1.2mts per kilometre. (Note: The slope is derived from the elevation points available on SoI toposheets).

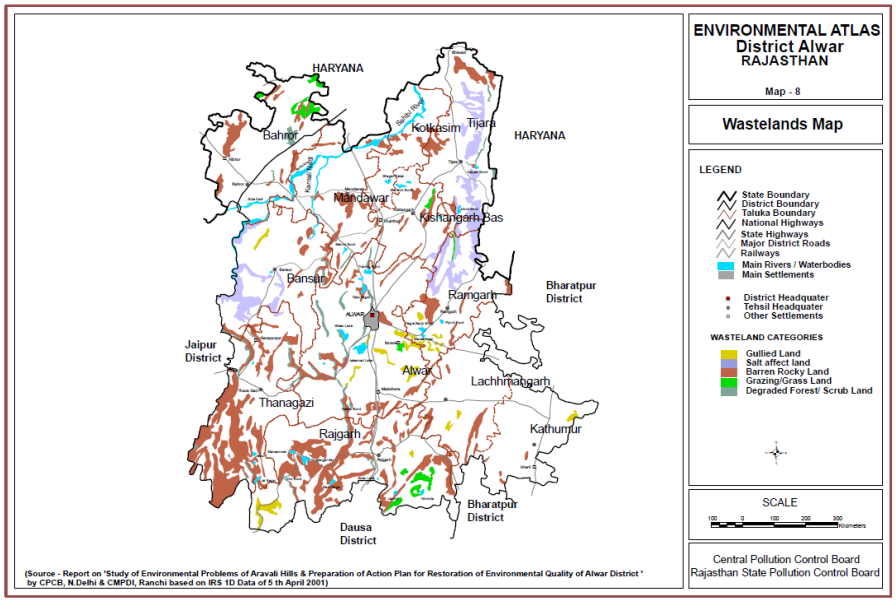


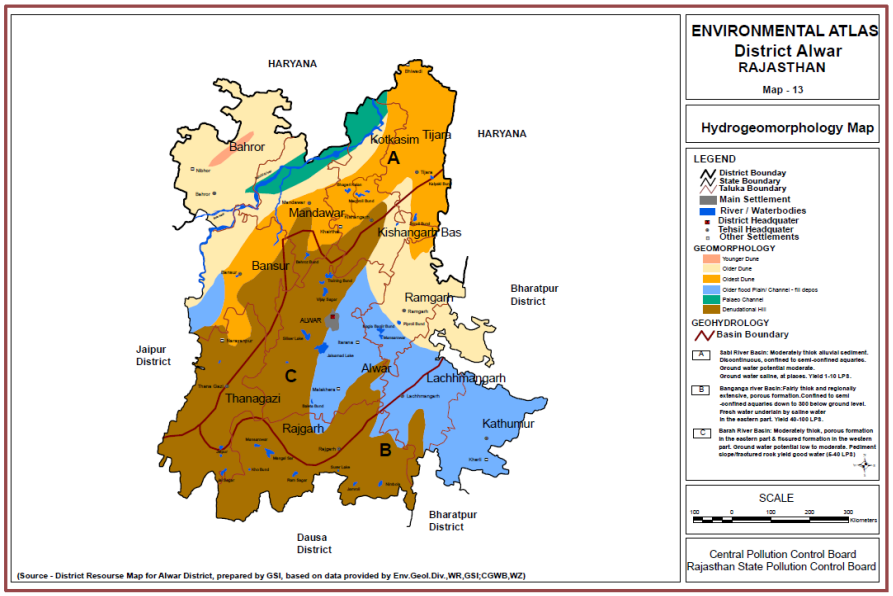




### 2.5.8 Geology, Geomorphology and Soil

The geology of the Investment Region comprises of Older Alluvium. The here present Alluvial Plains have loamy soils with patches of sandy plains, that are formed by sedimentation of historical rivers. The sandy soils have poor water holding and nutrient holding capacity that make these areas less agricultural productive. The hills from the Aravali range consist of slate and are not suitable for agriculture.



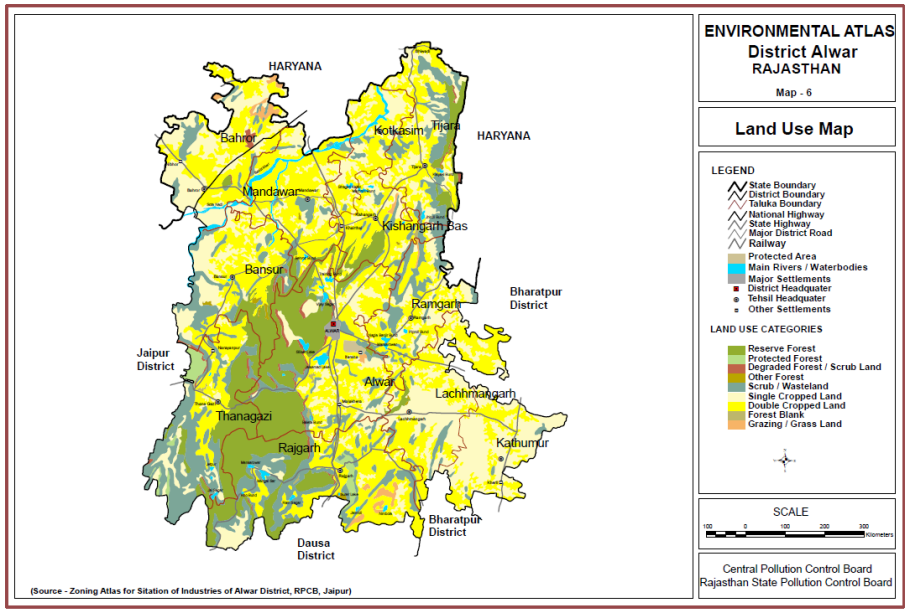

### 2.5.9 Forests

The recorded forest area of the State 32,639 sq.km, which is 9.54% of State's geographical area (Source: India State of Forest Report, 2009, Forest Survey of India, GoI). Reserved forest constitutes 38.16%, Protected Forests 53.36% and Unclassed Forests around 8.48% of the total forest area of state. However, the report on State of Environment – Rajasthan, 2009 sighting reference of Basic Data of Rajasthan, puts the forest area at 7.87% of State's Geographical Area. In comparison to State, the District Alwar has much higher share of forest areas with 21.29% to geographical area. Forest area ration within KBNIR is considerably less compared to District & State Level. The forest estimated forest area within KBNIR is about 2.15% of total delineated area. The forest areas of KBNIR includes existing (noticed through Satellite Image) scrub areas, physical boundaries of Hills, and land defined as protected through MoEF notification S.O.319 (E). The area so estimated stands at 356 Ha.

| Name of District | Reserved Forest | Protected Forest | Unclassified Forest | Total | Geographical Area | % total Area |
|---|---|---|---|---|---|---|
| **KBN IR** | | | | 355.954 | 16561.76 | 2.15% |
| **Alwar** | 1,006.06 | 636.83 | 141.25 | 1,784.14 | 8380.00 | 21.29% |
| **Rajasthan** | 12,453.92 | 17,415.96 | 2,768.86 | 32,638.74 | 342,239.00 | 9.54% |
| | | | | | | |

Source: Rajasthan - State of Environment Report, 2009

Note: the forest areas for KBNIR includes areas under Aravalli Hills (physical boundary as per satellite image), Areas as defined and notified in MoEF notification S.O. 319 (E), existing scrub areas (and not entire areas as shown in SoI Toposheets)

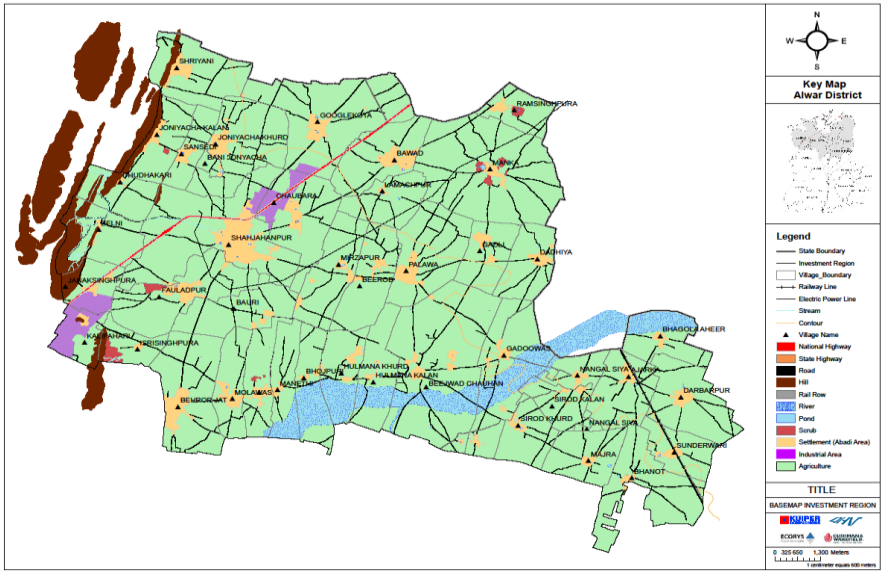



## 2.6 Existing Land Use

The region has two distinct land uses – Industrial Estates (Shahjahanpur & Neemrana) and rural hinterland. The Shahjahanpur industrial area is at the centre of delineated KBNIR along NH8 and would form the backbone to the industrial development envisaged under DMIC project. Rural hinterland is primarily agricultural fields (extensively based on ground water resource due to less supply of irrigation water) with village settlements (Abadi Areas). The integration of rural settlement with urban development has been and is a challenge task in Indian context.

The predominant use is agriculture with ~84% of IR being agriculture field followed by settlements (builtup areas including village/ urban abadi areas and industrial estate) at 7.8% and River & Hill Areas at ~6.95%. Infrastructure (like roads and railways) constitutes 1.6% of total area. Similarly water bodies (including river Sahibi) comprises of negligible areas within KBNIR. Table below presents Existing Land Use statement.

**Existing Land Use Map for KBNIR**




**Existing Land Use Statement**

| Use | Area (Ha) | % |
|---|---|---|
| **Settlement** | 1022.437 | 6.17% |
| **Industrial Area** | 269.062 | 1.62% |
| **Roads (NH/ SH/ ODR/ MDR/ VR)** | 248.614 | 1.50% |
| **Railway (Land Owned by Railways)** | 16.736 | 0.10% |
| **River** | 794.43 | 4.80% |
| **Ponds** | 13.895 | 0.08% |
| **Aravalli Hills/ Forest** | 355.954 | 2.15% |
| **Agriculture** | 13840.64 | 83.57% |
| **Total** | 16561.76 | 100.00% |
| | | |

Note: Area estimated here are the result of analysis of satellite imagery, SoI toposheets and Revenue Information. Whereever the discripancy/ variation between SOI & Satellite Imagery is observed, the satellite imagery information has prevailed; particularly in case of Scrubs & Hills. Also, revenue infromation/ records has formed based for generating existing land use statement.



Certain amount of industrial activities in terms of brick/ stone manufacturing industries was observed in agriculture area of delineated IR.

The existing settlements are scattered throughout the KBNIR. Though, a range of villages are located alongside the Sahibi river wadi. The villages are embedded in the landscape and are connected with each other by small roads. In the direct vicinity of the villages there are often water ponds. There are no large towns present in the KBNIR.

The Rajasthan State Industrial Development and Investment Corporation (RIICO), a state agency for promoting industrial development in the state has been a prime mover in promoting industrial pockets in Neemrana since early 1980's. RIICO has acted as a catalyst for the development of the region and has been instrumental in promoting the industrial activities. It has developed several industrial areas/ estates in Neemrana(Phase I, Phase II, EPIP, NIC) area and Shahjahanpur.

The largest present industries (>2.000 employees) in the regional context of the KBNIR are 1) Food products and beverages, 2) Plastic Products, 3) non metallic minerals, 4) basic Iron and Steel, 4) non-ferrous & precious m., 5) parts of motor vehicles. *(Source: ASI 2005-06 and extrapolation by consultants / Report on Site Selection, Area Delineation, Market Analysis and Gap Assessment for Investment Region, dated January 9th, 2011, Part-I, page 35).*

Agriculture is historically the most dominant land use in the Investment Region. In relation to Rajasthan average the KBNIR has limited potential for agricultural use. The most productive agricultural lands (multi-cropping) are located at distance from the NH8, near the Sahibi river wadi. The highly productive lands are to be protected from urbanisation as much as possible.

## 2.7 Socio-Economic Characteristics

The delineated KBNIR has 68048 resident population (as per Census 2001), but for town areas of Shahjahanpur, the population is primarily rural. It is believed, over next 30 years, the development of KBNIR would induce industrialisation lead urbanisation and the rural population would get transformed to urban. It is also expected that the industries within KBNIR would employ local people. It is therefore anticipated that the existing population would form part of projected population for KBNIR.

Various social and economic aspects have been compiled and assessed towards determining the socio-economic characteristics of Investment Region; comprising 42 villages. This section presents results of analysis of socio-economic parameters. Further, it also provides an account of the social infrastructure available in the region.

### 2.7.1 Population

As per Census 2001, the 42 villages of IR together accounts for 68048 populations. Majority of existing population within Investment Region resides in Mandawar Tehsil (59%) while rest in Behror Tehsil. Of total population the split between male & female population of IR stands at 52:48 (for 100 people). Census also records presence of 11014 households within IR; 58% in Mandawar Tehsil (which is in line within population number and 42% in Behror. **Table 6.1** presents the summary of population characteristics by Tehsil, whereas **Table** 6.2 presents the details each individual village within IR, whereas **Figure 6.2** depicts the populations range within IR.

**Tehsil Wise Population Characteristics**

| Tehsil | Number of Villages | Population | Household |
|---|---|---|---|
| Behror | 15 | 27666 | 4619 |
| Mandawar | 27 | 40382 | 6395 |
| **Total** | **42** | **68048** | **11014** |
| | | | |

**Village wise population**

| Sl.No. | Tehsil | Villages | Population | Tehsil Total |
|---|---|---|---|---|
| 1 | Behror | Bani Jonaycha | 273 | 27666 (41% of IR) |
| 2 | Behror | Baori | 488 | |
| 3 | Behror | Belni | 940 | |
| 4 | Behror | Chaubara | 2049 | |
| 5 | Behror | Dhodhakari | 336 | |
| 6 | Behror | Fauladpur | 3035 | |
| 7 | Behror | Googal Kota | 2601 | |
| 8 | Behror | Isrisinghpura | 441 | |
| 9 | Behror | Janaksinghpura | 634 | |
| 10 | Behror | Jonaycha Khurd | 2834 | |
| 11 | Behror | Jonaycha Kalan | 1288 | |
| 12 | Behror | Kalipahari | 476 | |
| 13 | Behror | Sansedi | 1416 | |
| 14 | Behror | Shahjahanpur | 8682 | |
| 15 | Behror | Shriyani | 2173 | |
| 16 | Mandawar | Ajarka | 1476 | 40383 (59% of IR) |
| 17 | Mandawar | Bawad | 2980 | |
| 18 | Mandawar | Beejwad Chauhan | 4163 | |
| 19 | Mandawar | Beerod | 1337 | |
| 20 | Mandawar | Bhagola Aheer | 1404 | |
| 21 | Mandawar | Bhanot | 915 | |
| 22 | Mandawar | Bhojpuri | 766 | |
| 23 | Mandawar | Dadhiya | 1443 | |
| 24 | Mandawar | Darbarpur | 1911 | |
| 25 | Mandawar | Gadli | 1166 | |
| 26 | Mandawar | Gadoowas | 2470 | |
| 27 | Mandawar | Hulmana | 547 | |
| | | Kalan | | |
| 28 | Mandawar | Hulmana Khurd | 860 | |
| 29 | Mandawar | Jalawas | 1542 | |
| 30 | Mandawar | Jatt Behror | 3116 | |
| 31 | Mandawar | Lamachpur | 522 | |
| 32 | Mandawar | Majra | 1165 | |
| 33 | Mandawar | Manethi | 988 | |
| 34 | Mandawar | Manka | 1826 | |
| 35 | Mandawar | Mirzapur | 1383 | |
| 36 | Mandawar | Molawas | 1842 | |
| 37 | Mandawar | Nangal Siya | 582 | |
| 38 | Mandawar | Palawa | 2295 | |
| 39 | Mandawar | Ramsinghpura | 797 | |
| 40 | Mandawar | Sirod Kalan | 751 | |
| 41 | Mandawar | Sirod Khurd | 1201 | |
| 42 | Mandawar | Sundarwari | 934 | |
| | | | | |

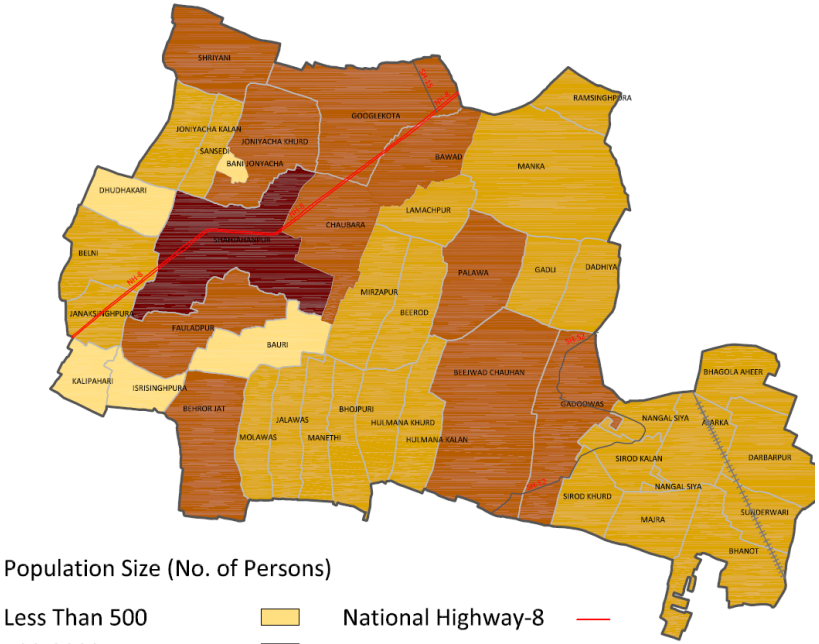
### 2.7.2 Population Density

The average population density of IR is 418 persons per sqkm which is closer to district (418 persons per sq.km). However, the density of Mandwar Teshil at 391 persons per sqkm is considerably lower despite being more populated than Behror Tehsil. The population density of Behror tehsil is 467 persons per sqkm which is higher than both the IR and the district. **Figure 6.3** presents the village wise density within IR.

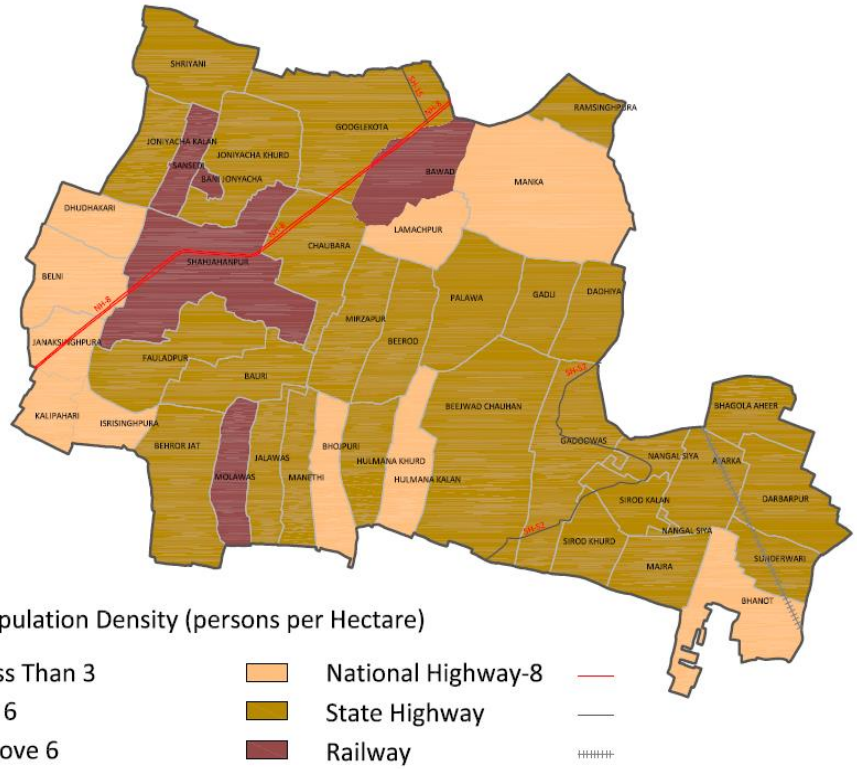
### 2.7.3 Household Size

As per Census 2001, 11014 numbers of households were recorded within IR. With population of **68048** the average household size works out to be 6.17 and is lesser than that at district (6.47).

**Villages by Population Size**




**Population Density**




### 2.7.4 Vulnerability

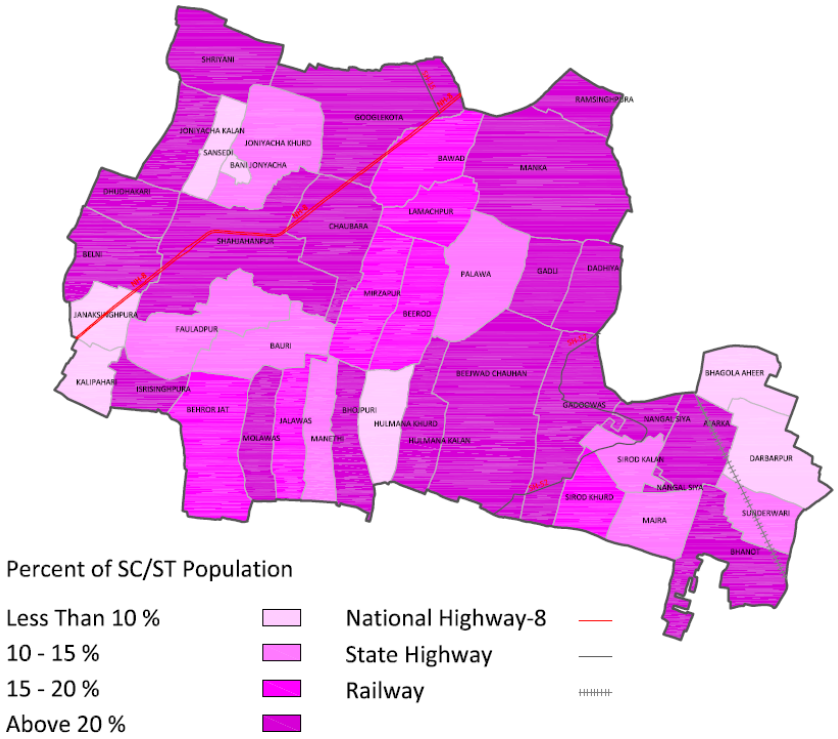
Vulnerability of population has been assessed by presence underprivileged groups. District & Investment region has presence of tribal population (ST – 4.3%) as well as SC (16.4%) population but is lower than the district (st-18.0% , SC-8.0% and combined 26%).

**Concentration of SC/ ST Population**

| TEHSIL | SC | ST | Total | % of SC | % of ST | % of (SC/ ST Combined) |
|---|---|---|---|---|---|---|
| **Behror** | **4289** | **1954** | **6243** | **15.5%** | **7.1%** | **22.6.1%** |
| **Mandawar** | **6865** | **999** | **7864** | **17.0%** | **2.5%** | **19.5%** |
| **IR** | **11154** | **2953** | **14107** | **16.4%** | **4.3%** | **20.7%** |
| **Alwar** | **539036** | **239905** | **778941** | **18.0%** | **8.0%** | **26.0%** |
| | | | | | | |

Source: Census of India, 2001.

**Share of SC&ST Population to Total Population**




## 2.7.5 Literacy

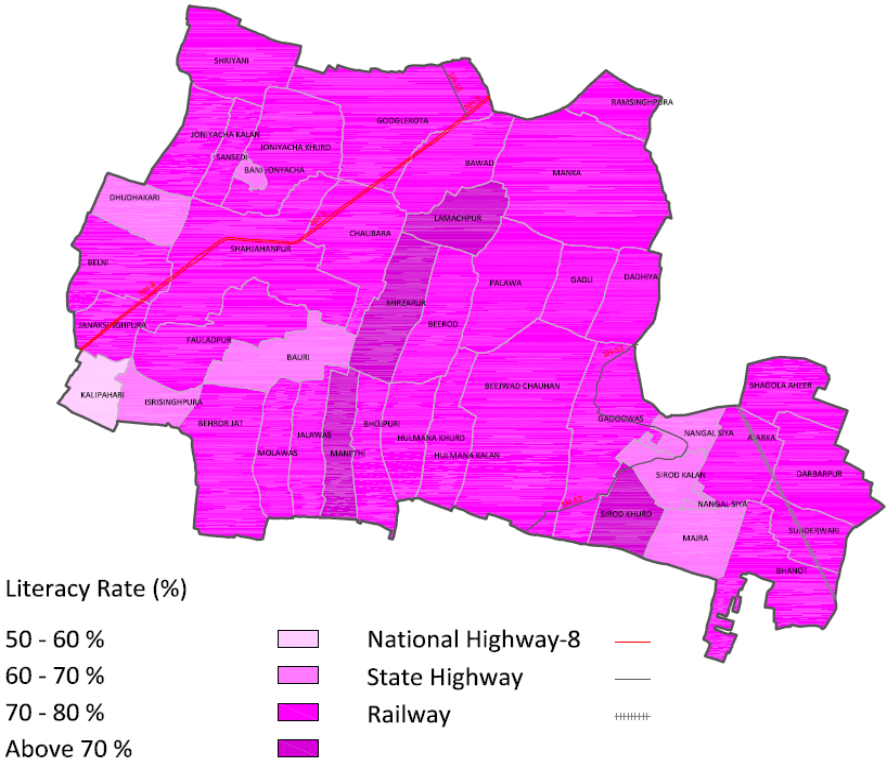
Literacy rate can be used as an indicator of development for a particular area and based on which different ways of utilization of existing human resources for new opportunities created through the proposed developments can be formulated. The literacy rate in IR is marginally higher at 62.66% compare to 61.74% for Alwar districts. There exists a huge divide in the male and female literacy rates with the female literacy rate being a mere 49.8% compared to 74.3% of males. **Table below** presents tehsil wise literate population and their share to total population, whereas **Figure** below presents the village wise literacy rate.

**IR Literacy Rate**

| TEHSIL | Literate population | | | Literates Among | | |
|---|---|---|---|---|---|---|
| | Male | Female | Total | Male | Female | Total Population |
| Behror | 10888 | 6639 | 17527 | 75.3% | 50.3% | 63.4% |
| Mandawar | 15588 | 9524 | 25112 | 73.7% | 49.5% | 62.2% |
| **Total** | **26476** | **16163** | **42639** | **74.3%** | **49.8%** | 62.7% |

Source: Census of India, 2001.

**Literacy Rate**




### 2.7.6 Gender Distribution

Sex ratio (females per 1000 males) for IR and that for Alwar districts is 911 and 886 respectively. However, the sex ratio is lower than the national average of 923. Table below presents sex ratio statistics for IR & Alwar district whereas

**Sex Ratio**

| Tehsil | Sex Ratio |
|---|---|
| Behror | 913 |
| Mandawar | 909 |
| **Total** | 911 |
| | |

Source: Census of India, 2001.

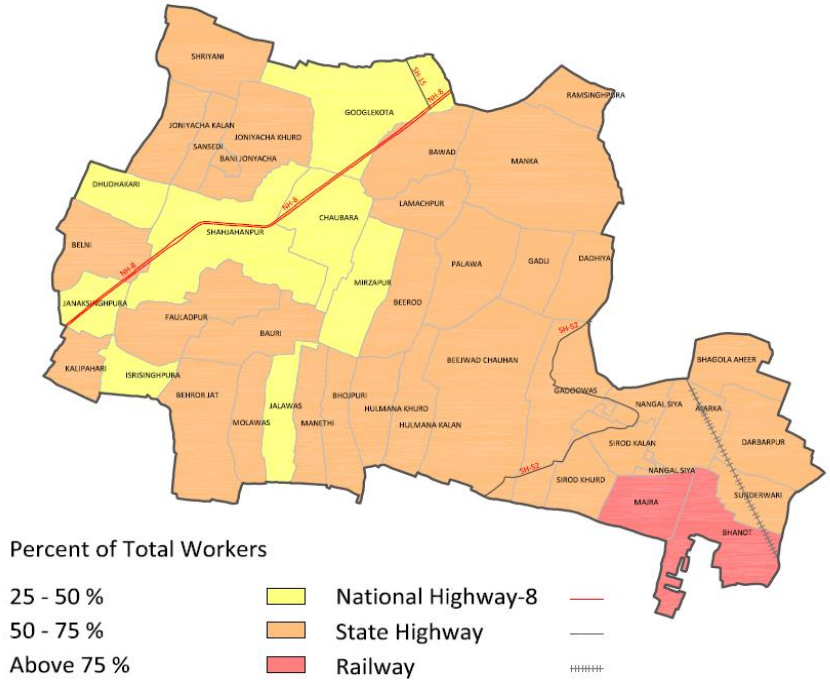
### 2.7.7 Employment Pattern

The employment pattern of the IR gives a vivid idea of development within the area. Out of the total population of 68048 in IR, 57.69% (39254) are workers, whereas rest 42.31% (28794) is non workers. Main workers comprise 47.82% of the total working population while rests (52.18%) are marginal workers.

**Table 2.1: IR Employment Profile**

| TEHSIL | Main worker | Marginal Worker | Total Worker | Non Worker | % of Main Worker to Total Worker | % of Marginal worker to total worker |
|---|---|---|---|---|---|---|
| Behror | 7726 | 5963 | 13689 | 13977 | 56.44 | 43.56 |
| Mandawar | 11047 | 14518 | 25565 | 14817 | 176.09 | 76.09 |
| **Total** | 18773 | 20481 | 39254 | 28794 | 47.82 | 52.18 |
| | | | | | | |

**Workforce Participation Rate**




## 2.7.8 Irrigation & Cropping Pattern

Though the area covered by irrigation stands at 76.53%, comparatively the net sown area is higher than irrigated area (81.12%). The area under multi crop is 43.87% of total land area while lands growing single crop is 37.25%. **Tables** together presents the irrigation & cropping profile of IR. Whereas, **Figures** thereafter presents the irrigation density (% of irrigated land to total area) and Net sown area (% of area sown to total area) within IR respectively.

**Irrigation & Crroping Profile**

| TEHSIL | Total Area | Land Not available for Cultivation | Land available for cultivation but not cultivated (Fallow/ cultivable waste land/ orchards) | Area Sown more than once | | |
|---|---|---|---|---|---|---|
| | | | | Irrigated | Un-irrigated | Total |
| **Behror** | 5928 | 1066 | 269 | 38 | 2117 | 2155 |
| **Mandawar** | 10185 | 1516 | 90 | 212 | 4664 | 4876 |
| **Total** | **16113** | **2582** | **359** | **250** | **6781** | **7031** |
| | | | | | | |

Source: Milan Khasra (Village Records), 2009.

**Irrigation Density**

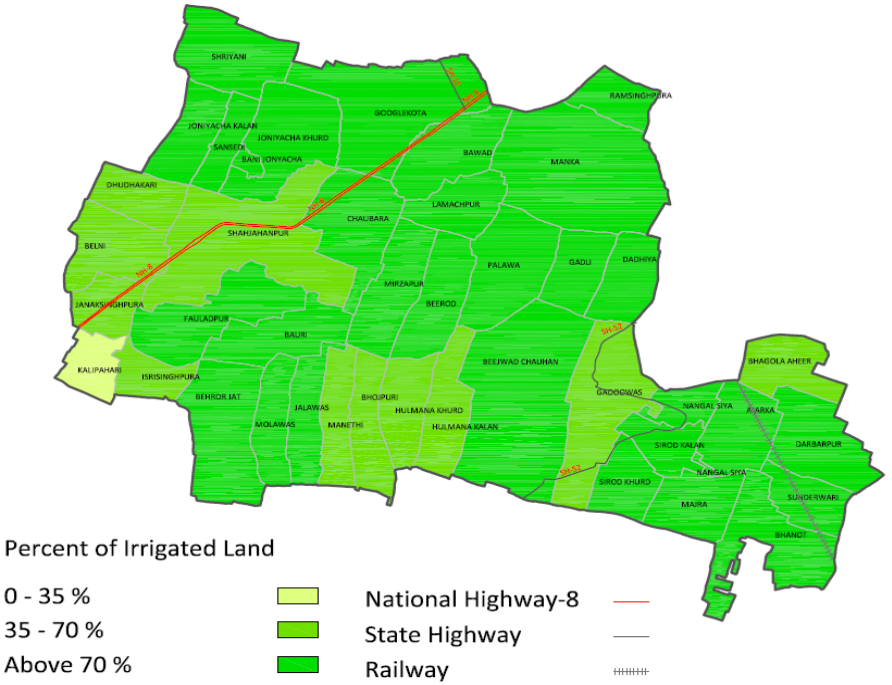
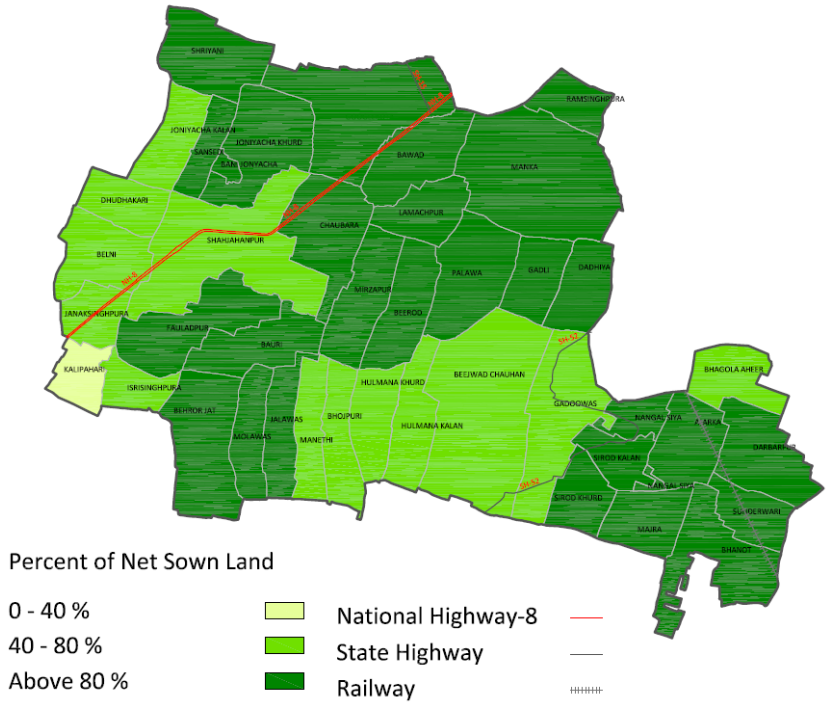


**Table 2.2: Irrigation & Crroping Profile**

| TEHSIL | Area | Gross Sown Area | | | Net sown Area | | |
|---|---|---|---|---|---|---|---|
| | | Irrigated | Un-irrigated | Total | Irrigated | Un-irrigated | Total |
| Behror | 5928 | 4310 | 2438 | 6748 | 4272 | 321 | 4593 |
| Mandawar | 10185 | 8410 | 5045 | 13455 | 8196 | 383 | 8579 |
| **Total** | **16113** | **12720** | **7483** | 20203 | 12468 | 704 | 13172 |

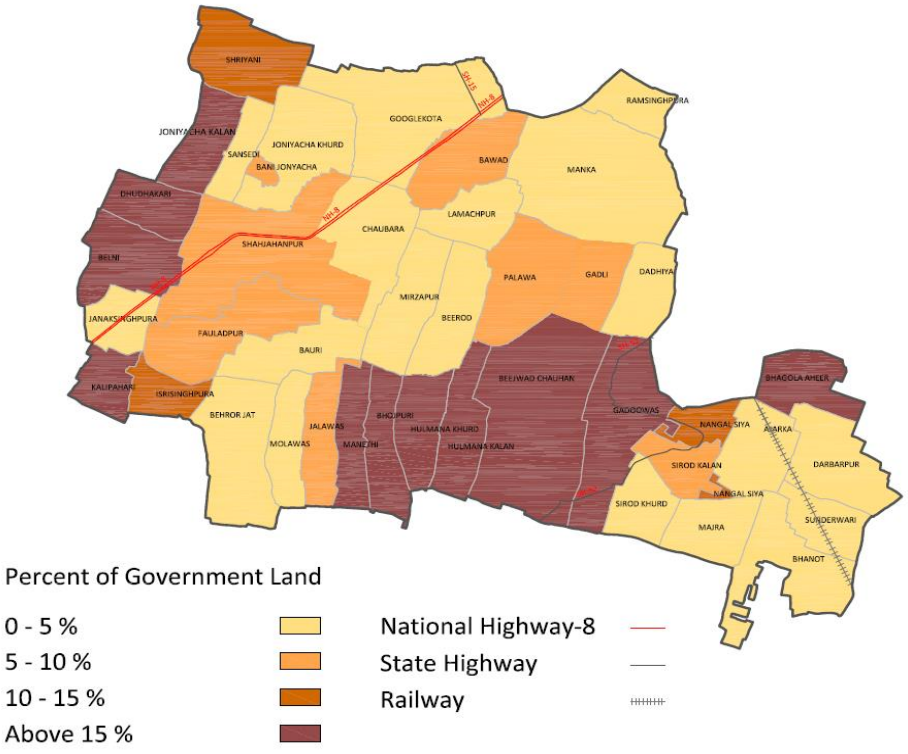
**Net Sown Areas**




## 2.7.9 Land Ownership

The total area under IR is around 16263 hectares (162.63 sqkm), out of which 10.5% is owned by government while rest of the land is privately owned. In Mandawar tehsil, government owns slightly more (10.74%) than in Behror tehsil (10.10%). ***Table 6.9*** presents the land ownership details at tehsil level, whereas **Figure 6-11** presents the share of land owned by government in IR.

**Figure 2-1: Government Land Ownership**



**IR Employment Profile**

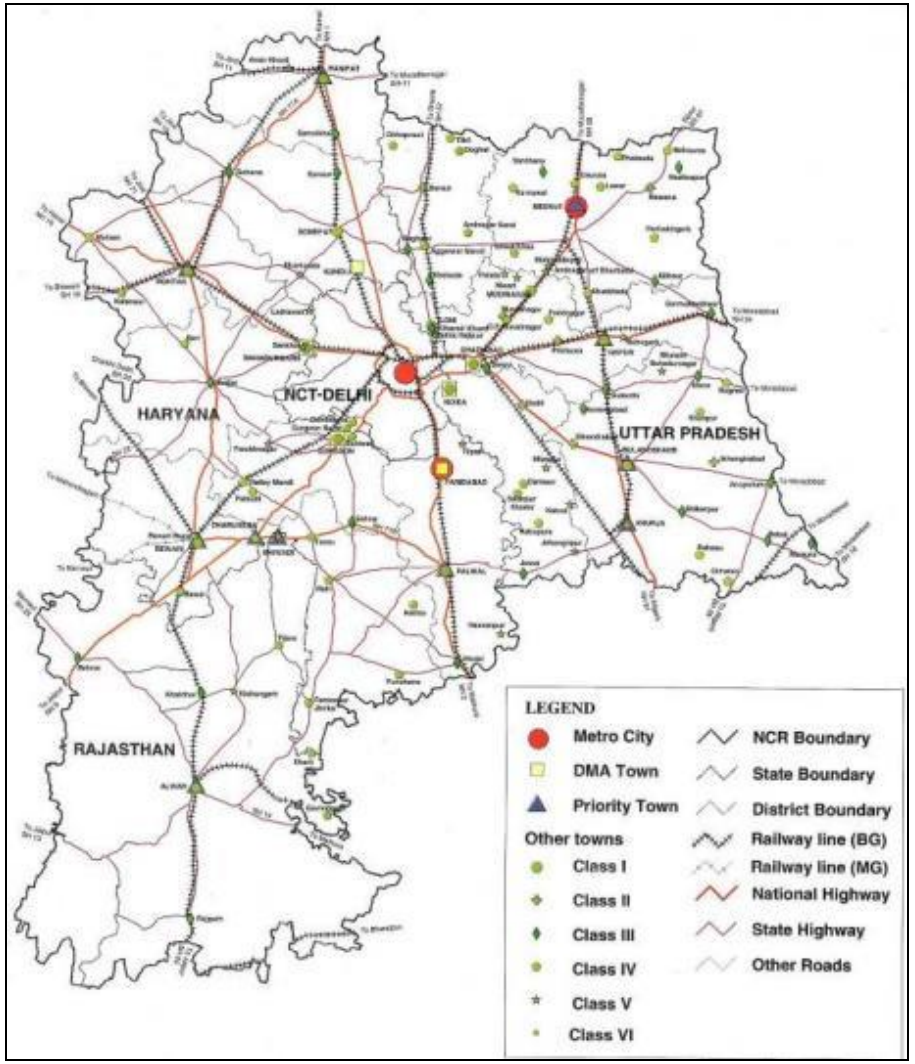
| TEHSIL | Total Area (Ha) | Govt Land (Ha) | Private Land (Ha) | % of Govt Land to total Land | % of Private land to total land |
|---|---|---|---|---|---|
| Behror | 5928 | 599 | 5329 | 10.10 | 89.90 |
| Mandawar | 10335 | 1109 | 9226 | 10.74 | 89.26 |
| **Total** | **16263** | **1708.12** | **14554.88** | **10.50** | **89.50** |

## 2.8 Regional Urban Settings

### 2.8.1 Review of NCR Regional Plan

The Alwar district thereby KBN IR fall within the National Capital Region; Rajasthan Sub Region of NCR**.** The role of Bhiwadi[1] towns was considered to be priority towns as per till 2001, (***Figure below***) which has been further increased and is expected to function as a regional centre with population range of 3-10 lakhs; as per proposed regional plan for NCR. Further, it is proposed to amalgamate Shahjahanpur, Nimrana and Behror towns to create Shahjhanapur- NImrana – Behror Urban Complex (SNB) and Rewari–Dharuhera–Bawal Urban Complex (RDBUC). The proposed land use (as per NCR Regional Plan 2021), for Alwar district is shown in **Figure below.**

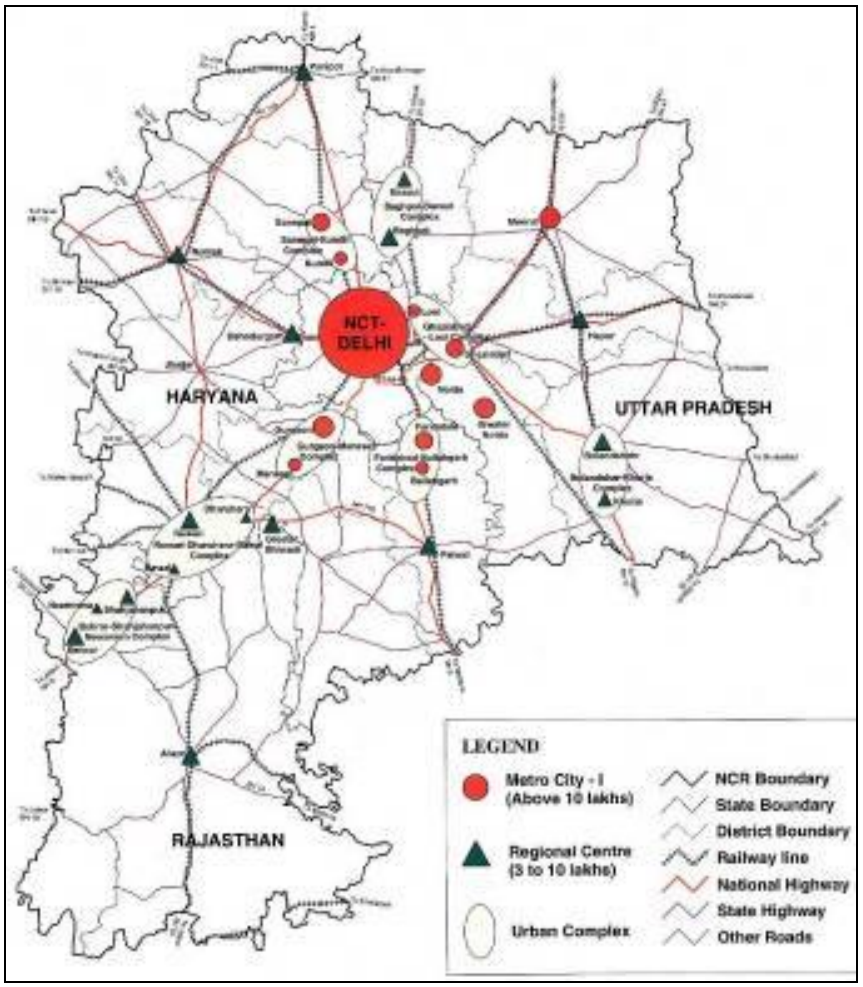
**Figure 2-2: NCR 2001 Settlement Pattern**




Source: NCR Regional Plan – 2021, NCR Planning Board.

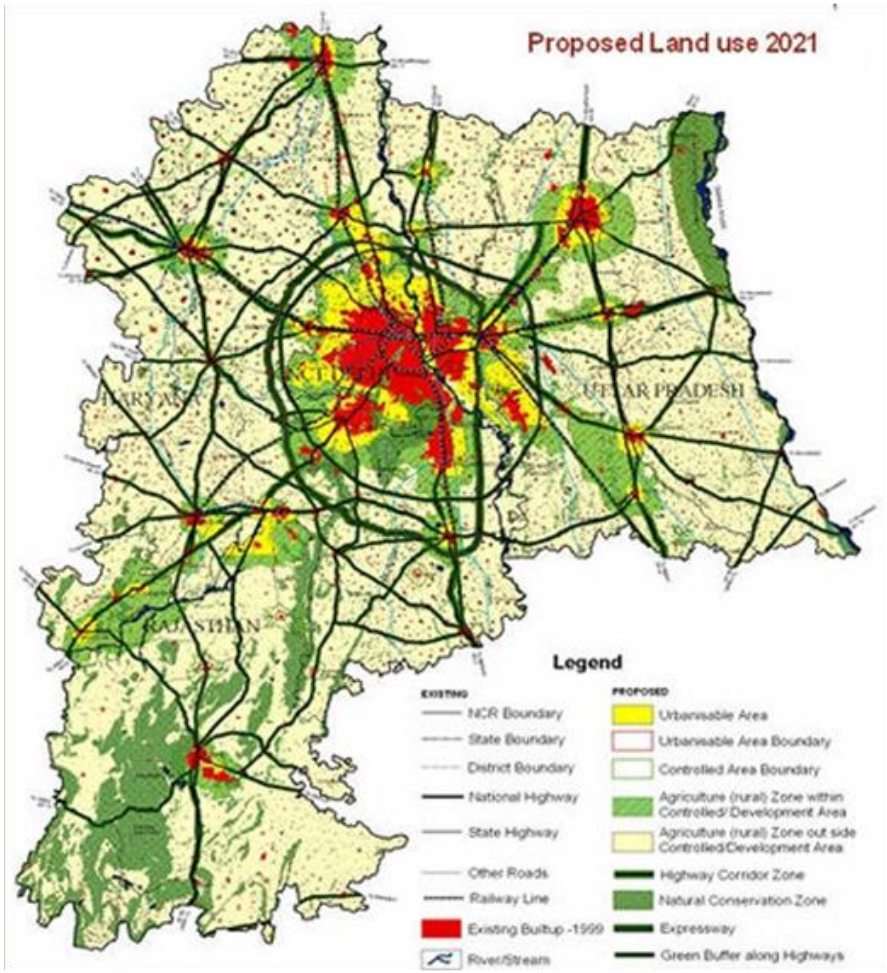
[1] *Bhiwadi City although located in Alwar District of Rajasthan and Rajasthan sub region of NCR and closely located to Dharuhera, the consultant is of the opinion that the growth of Bhiwadi would have impacts/ create need for additional infrastructure at Haryana side as well.*

**NCR Proposed Settlement Pattern-2021**




Source: NCR Regional Plan – 2021, NCR Planning Board.

**NCR Regional Plan Proposed Land use – 2021 for Alwar Region**

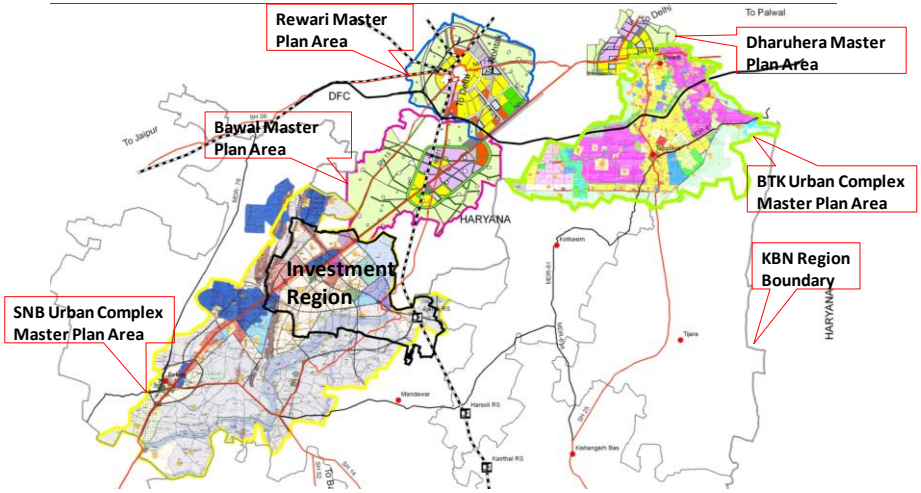



Source: NCR Regional Plan – 2021, NCR Planning Board.

### 2.8.2 Urban Settings

Delineated KBNIR is an extension to Shahjahanpur Industrial Town. Regionally it is located in between Behror (Rajasthan) & Bawal (Haryana) town. Shahjahanpur is ~108km from Nationl Captial – New Delhi [Connaught Place]. The KBNIR abuts the Manesary Bawal Investment Region (extension of Bawal town] under DMIC project along NH8 creating an urban continuum right from Gurgaon to Behror. Figure 6-15 presents the regional urban settings.

**Figure 2-3: Regional Urban Settings**

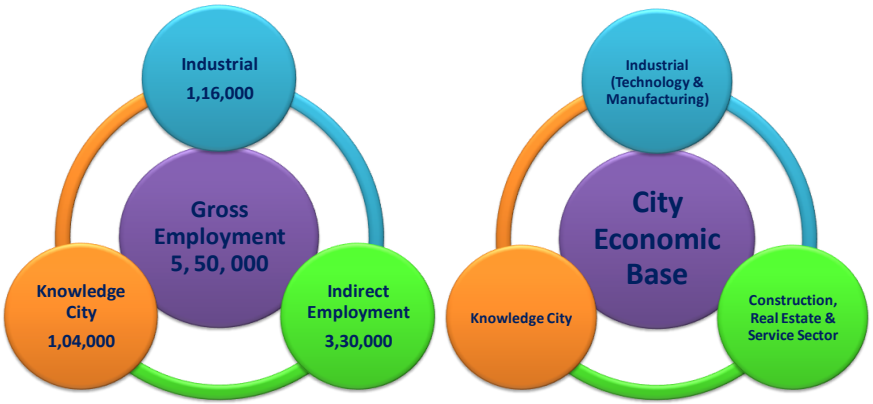


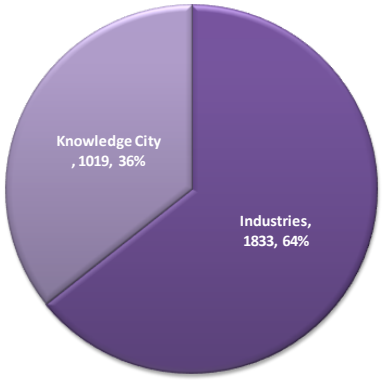
# 3 Industrial Land Demand, Employment & Population Projections for KBNIR

A detailed market research study, towards determining potential industry mix & sizing, analysis of the short listed industries was carried out based on a framework of 'Industry Attractiveness' and Availability of key 'factors of production'. Based on industry attractiveness and availability of factors of production for these industries there suitability in MBIR was evaluated and final list of industries that can potentially come in KBNIR was identified.

The Maket Research assessment suggests that the Industries & knowledge city along with services, construction, resal estates sectors together would for the economic base for the base for delineated KBN IR.

The potential industries for the KBN IR include High-tech industries, light and medium industries (Table Below). Knowledge based industries would be located in Knowledge city along with institutions and universities.




It is estimated that in KBN Study region (5 tehsils), by 2040, net land required for Industries shall be 6388 hectares and of which around 1832 hectares need to be provided in the delineated KBNIR. This is after deducting the estimated industrial land supply from Bhiwadi Tapookra Khuskhera Urban Complex, Industrial areas in SNB Urban Complexs, Gehlot Industrial Area and Japanesee Park. The Knowldege City along would required a net land area of 1019 hectares.

It is estimated that, by 2040, KBNIR would generate employment (gross) for almost half a million peoples. The direct employment would be around 220,000 (industries and Knowledge city contributing equally), while indirect employment would be around 330,000.

The ongoing section presents the assumptions and approaches adopted for projecting area, employment and population for KBNIR by 2040.

## 3.1 Economic Base and Employment Projections

1. As discussed in report on *Site Selection/ Area Delineation, Market Analysis & Gap Assessment for Investment Region,* the target set of Industry clusters, which are expected to be promoted within the KBN Investment Region include a) High-tech industries, b) Light Industries, c) Medium Industries and d) Air Cargo (logistics). Table below presents the industries grouped under each cluster.

**Table 3: Industry Clusters**

| Industry Cluster | Industries |
|---|---|
| High-tech industry Cluster | This cluster includes industries that have been classified by the CSO of India as knowledge based industries. They include; chemicals (NIC 24), metal products (NIC 28), machinery (NIC 29), office and accounting equipment (NIC 30), electrical equipment (NIC 31), televisions and radios (NIC 32), medical and optical goods (NIC 33), parts of motor vehicles and other transportation equipment (NIC 34 and 35). |
| Light industry Cluster | These are largely consumer-oriented industries based on already (partially) processed inputs, including textiles and weaving (NIC 17 and 18), leather products and footwear (NIC 19), printing and publishing (NIC 22), furniture and miscellaneous industries (NIC 39) and 80 percent of logistics services (NIC 630). |
| Medium Industry Cluster | Industries that are processing semi-fabricates, including wood products (NIC 20), paper products (NIC 21), rubber and plastic products (NIC 25), glass products and non-metallic minerals (NIC 26), iron and steel, and non-ferrous metals and precious products (NIC 27) |
| Air Cargo | Sector 630 includes supporting and auxiliary transport activities, including cargo handling, storage and warehousing and other supporting transport activities. We have assumed that 20 percent of employment in sector supporting and auxiliary transport activities will involve the handling and storage of air cargo. The remaining 80 percent has been included under light industries |
| | |

2. Report further discusses, two projection scenarios for industrial demand projections, which includes a) the most likely (base case) scenario and b) the high growth scenario. While computing projections (Land & employment) following assumptions were used:

| | Base case | High growth case |
|---|---|---|
| Output growth 2010-2040 | 8.9% | 12% |
| Average annual percentage increase in labour productivity (output per worker) | 2% | 2% |
| Share of IR in the growth of Alwar District | 50% (40-60%) | 50% |
| Workers per hectare | | |
| • Light industries | 55 | 55 |
| • Medium industries | 30 | 30 |
| • High tech industries | 40 | 40 |
| • Air cargo | 25 | 25 |

3. In base case scenario, it is estimated that the net industrial land demand and direct employment generation by 2040 would be 2501 hectares and 93142 peoples respectively. Whereas, in high growth scenario, it is 6388 hectares and 238800 peoples respectively.
4. It was after long deliberation and discussions agreed that the master plan shall be prepared for high growth scenario in context of induced development by DMIC as well as priority region for the State, in Rajasthan sub-region of NCR.
5. The scenario in consideration projects the net industrial land demand at 6388 hectares for entire KBN region. Table below provides land area estimates and employment generation for industry clusters over next three decades at the interval of 5 year.

**Table 4: Land Area Demand Estimates – KBN**

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| **Net land requirements (ha)** | | | | | | |
| High tech industries | 87 | 243 | 522 | 1011 | 1864 | 3339 |
| Light industries | 18 | 48 | 98 | 183 | 322 | 555 |
| Medium industries | 163 | 394 | 715 | 1151 | 1730 | 2468 |
| Air cargo (logistics) | 1 | 2 | 4 | 8 | 15 | 27 |
| Total net land requirements (ha) | 269 | 687 | 1339 | 2353 | 3932 | 6388 |

6. The existing (but yet to be allotted) and planned net industrial land supply within KBN region stands at 4321 hectares. This has been estimated at 60% of total planned/ existing industrial supply. Details are as given in Table below.

**Table 5: Land Area Supply Estimates – KBN**

| Description | Net Industrial Land Supply (Hectare) |
|---|---|
| BTK Master Plan | 2681.4 (@60% of Gross) |
| SNB Industrial Area | 1240.8 (@60% of Gross) |
| Gehlot Industrial Area | 471.6 (@60% of Gross) |
| Japanese Park | 163 (@100% of Gross) |
| Total Planned/ Existing Industrial Supply | 4556.8 |
| KBN IR Demand | 6388 (Market Research Demand) |
| To be Provided within IR | 1832 net industrial area |
| | |

Source: RIICO, BTK Master Plan - 2031 and SNB Master Plan - 2031

7. Thus the planned IR is expected to provide for 1832 hectare of net industrial land.

8. Apart from Industries, the IR is expected to house Knowledge City. It is estimated that the Knowledge City (excluding residential areas) would required gross area of ~1019 hectares and generate direct employment for 99516 people. The area break up for components of knowledge city as well as employment generation is as presented in Table below.

**Table 6: Land Area Estimates – Knowledge City**

| Gross Area Requirements | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| Educational Institutions | 57 | 124 | 199 | 349 | 593 | 726 |
| Corporate Institutions | 01 | 03 | 11 | 24 | 46 | 88 |
| Agricultural Research Institutes | 43 | | 87 | | 13 | 173 |
| Convention/ Cultural Centre/ Stadium | 06 | | 22 | | 28 | 32 |
| **Total Area (Hectare)** | **107** | **133** | **319** | **395** | **797** | **1019** |
| **Employment** | 1255 | 4319 | 13435 | 28604 | 55250 | 99516 |
| | | | | | | |

Source: Feasibility Study report on Knowledge City, August 2011.
Note: Further details on Knowledge City may be referred in Draft feasibility Study report on Knowledge City, August 2011, which is available with DMICDC.

9. Presently, the Investment Region is primarily an agriculturally intense rural area employing 25333 peoples (estimated based on census 2001). With the development of IR, employment generated by agriculture stands to reduce to 3800 by 2040.
10. Now, adding the direct employment generated by industries, knowledge city & agriculture in IR, by 2040, IR is expected to generated direct employment for 215716 peoples. Where industrial employment would contribute 52% followed by corporate institutes at 42%, while

rest of employment would be in educational institutes and agriculture sector.

11. It is assumed that creation of one direct employment would lead to generation of 1.5 indirect employments and create 321674 indirect employments within IR.

12. Thus, IR is expected to create total employment for ~537390 peoples. Table below presents the 5yearly employment projections for IR.

**Table 7: Employment Estimates for IR**

| Year | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| Employment from Corporate Institutions | 554 | 2802 | 11005 | 24344 | 47986 | 90627 |
| Employment of Industrial Workers (within IR) | 6646 | 11901 | 21303 | 37751 | 66475 | 112400 |
| Educational Institutions | 701 | 1517 | 2430 | 4260 | 7264 | 8889 |
| Agriculture | 25333 | 20266 | 15200 | 10133 | 5067 | 3800 |
| Direct Employment | 33234 | 36486 | 49937 | 76487 | 126792 | 215716 |
| Indirect Employment (excluding agriculture sector) | 37184 | 44596 | 67306 | 109665 | 187654 | 321674 |
| Total Workers | 70418 | 81082 | 117244 | 186152 | 314446 | 537390 |
| | | | | | | |

13. Summarising the analysis, the IR would required a gross area of 4180 hectare for industrial development and Knowledge city, which would enable creation of total employment (direct & indirect) for 537390 peoples.

## 3.2 Population Projections for Delineated Investment Region

Projecting population is quit a tricky task for Greenfield development/ project and particularly the ones with high industrial base. Similar is the case for IR. In particular when in order to promote the IR, the Govt has decided to freeze all developments (excluding Industrial Developments already planned/ being developed) within SNB region.

The Consultant has evolved a structured process to compute the target population size for IR over next three decades.

**a. The Process :**

a) Estimate resident workers out of total employment generation
b) Estimate number of workers outside IR (in other industrial areas of SNB)
c) Estimate number of workers outside IR (in other industrial areas of SNB) but would reside in IR; this is for the fact that all other developments would be frozen,
d) Sum the resident workers of IR and number of workers outside IR but staying in IR – this would give the total workforce for the IR. It is assumed that the sum shall equal to workforce participation rate within IR
e) Project Population by using following formula:

**Sum of workers residing in IR X 100 ÷ workforce participation rate (40%)**

[Note: Workforce Participation Rate is based on observed workforce participation rate in industrial towns like Ludhiana (42%), etc]

**b. Assumptions & Results:**

a) The share of workers, those who will commute to IR, out of total employment in IR shall initially be 20% and would reach 25% before

reducing to 15%. Table below provides the share of commuter worker of total workers employed in IR and the resident workers.

**Table 8: Residential Worker to total employment within IR**

| Year | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| **Share of Commuter Workers** | **20%** | **25%** | **25%** | **25%** | **20%** | **15%** |
| Total Workers | 70418 | 81082 | 117244 | 186152 | 314446 | 537390 |
| Commuter workforce (20%-25%-15%) from surrounding village areas | 14084 | 20270 | 29311 | 46538 | 62889 | 80608 |
| Resident Workers | 56334 | 60811 | 87933 | 139614 | 251557 | 456781 |
| | | | | | | |

b) As discussed earlier in allocating industrial land demand for IR, their exists industrial land supply of 7486 gross industrial land area in BTK, SNB Industrial Area, Gehlot Industrial Area and Japanese Park. The Government of Rajasthan, in the recently held meeting on August 25, 2011, in order to promote IR, has agreed to impose development freeze in SNB region. Hence the residential, commercial and other activities in the SNB region except for the permission already granted and industrial activities would remain in as is situation. The employment generated in industrial areas outside IR, but within KBN & excluding BTK, would primarily reside in delineated IR. It is assumed that 75% of employment generated outside IR would reside in IR. The gross industrial land supply outside KBN is estimated at 3017. Thus @ 40 workers per hectare, the employment generated outside IR would be around 1,20,680. Tables below provide the assumption for land supply and employment generated outside IR.

**Table 9: Industrial Land Development & Employment Generation outside IR**

| Industrial Areas | Gross Area | Expected Employment Generation (@40 persons per hectare) |
|---|---|---|
| SNB Industrial Area | 2068 | 82720 |
| Gehlot | 786 | 31440 |
| Japanese Park | 163 | 6520 |
| Total | 3017 | 120680 |
| Resident workers (@75% of total) | | 90510 |
| | | |

**Table 10 Industrial: Land Development & Employment outside IR- Phasing**

| Year | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| Industrial Area Outside IR within SNB | 949 | 1362 | 1775 | 2188 | 2601 | 3017 |
| Industrial Employment outside | 37960 | 54480 | 71000 | 87520 | 104040 | 120680 |

| IR within SNB | | | | | | |
|---|---|---|---|---|---|---|
| Resident workers (@75% of total) | 28470 | 40860 | 53250 | 65640 | 78030 | 90510 |
| | | | | | | |

Note: It is assumed that Gehlot Industrial Area and Japanese Park would be developed by 2015. The SNB industrial area would develop thereafter over next 25 years. i.e. adding 414 hectares after every 5th year.

c) The sum of resident workers employed in IR and employed outside IR is around 547291. Table below presents the total resident workers in IR.

**Table 11: Resident Workers within IR**

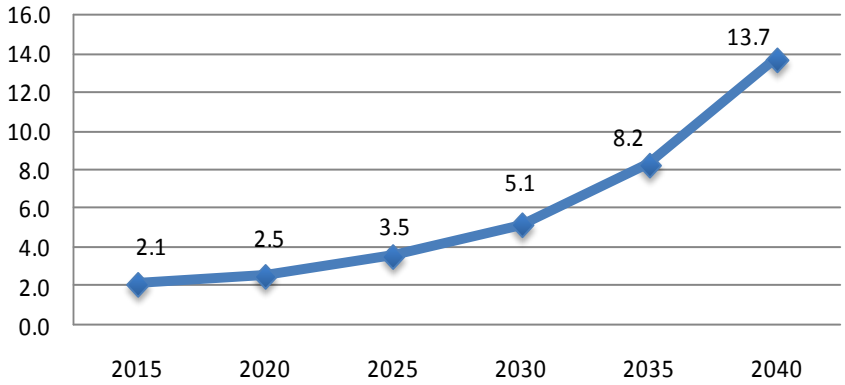
| Year | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| Resident Workers employed in IR | 56334 | 60811 | 87933 | 139614 | 251557 | 456781 |
| Resident Workers employed in other Industrial areas outside | 28470 | 40860 | 53250 | 65640 | 78030 | 90510 |
| Total Workers Residing in IR | 84804 | 101671 | 141183 | 205254 | 329587 | 547291 |
| | | | | | | |

d) Applying the assumption that total workers residing in IR shall equal to total workforce available in IR and workforce rate at 40% to derive the population. The estimated population, as per the formula discussed above, by 2040, for IR shall be around 1.37 million. Table & figure below presents the population projections for IR over next 30 year at 5 year interval.

**Table 12: Projected Population for IR**

| Year | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| Total Workers Residing in IR | 84804 | 101671 | 141183 | 205254 | 329587 | 547291 |
| Population @ total workers = 40% of total population | 212011 | 254178 | 352957 | 513135 | 823967 | 1368229 |
| | | | | | | |

Note: Student population residing within Knownledge City is in addition to 1.37 million populations residing in KBNIR. Thus total people residing within KBNIR would be close to 1.55 million by 2040.



# 4 List of Villages within KBNIR

| Sl. No. | Tehsil | Village Name |
|---|---|---|
| 1 | Behror | Googal Kota |
| 2 | Behror | Shriyani |
| 3 | Behror | Jonyacha Kalan |
| 4 | Behror | Sansedi |
| 5 | Behror | Jonyacha khurd |
| 6 | Behror | Bani Jonyacha |
| 7 | Behror | Chaubara |
| 8 | Behror | Shahjahanpr |
| 9 | Behror | Dhodhkari |
| 10 | Behror | Belni |
| 11 | Behror | Janaksinghpura |
| 12 | Behror | Fauladpur |
| 13 | Behror | Baori |
| 14 | Behror | Isrisinghpura |
| 15 | Behror | Kalipahari |
| 16 | Mandawar | Bawad |
| 17 | Mandawar | Ramsinghpura |
| 18 | Mandawar | Manka |
| 19 | Mandawar | Dadhiya |
| 20 | Mandawar | Gadli |
| 21 | Mandawar | Palawa |
| 22 | Mandawar | Lamachpura |
| 23 | Mandawar | Mirzapur |
| 24 | Mandawar | Beerod |
| 25 | Mandawar | Gadoowas |
| 26 | Mandawar | Beejwad Chauhan |
| 27 | Mandawar | Hulmana Kalan |
| 28 | Mandawar | Hulmana Khurd |
| 29 | Mandawar | Bhojpuri |
| 30 | Mandawar | Manethi |
| 31 | Mandawar | Jalawas |
| 32 | Mandawar | Molawas |
| 33 | Mandawar | Behror Jat |
| 34 | Mandawar | Sirod Khurd |
| 35 | Mandawar | Sirod Kalan |
| 36 | Mandawar | Nangal Siya |
| 37 | Mandawar | Ajarka |
| 38 | Mandawar | Bhagola Aheer |
| 39 | Mandawar | Darbarpur |
| 40 | Mandawar | Majra |
| 41 | * Mandawar | Bhanot |
| 42 | * Mandawar | Sunderwari |
| | | |

# 5 Planning Norms & Standards (Phase wise Estimates).

| Sl. No. | Facilities/ Amenities | Population Threshold (UDPFI) | Unit Area (Ha) | Phase 1 | | Phase 2 | | Phase 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Facility Required | Area Required | Facility Required | Area Required | Facility Required | Area Required |
| | **Project Population** | | | **254200** | | **513200** | | **1370000** | |
| **1** | **School Education Infrastructure** | | | | | | | | |
| 1a | Crèche | 10,000 | 0.08 | 26 | 2.08 | 52 | 4.16 | 138 | 11.04 |
| 1b | Pre-Primary, Nursery School | 2,500 | 0.08 | 102 | 8.16 | 206 | 16.48 | 552 | 44.16 |
| 1c | Primary School | 5,000 | 0.4 | 51 | 20.4 | 103 | 41.2 | 276 | 110.4 |
| 1d | Senior Secondary | 7,500 | 1.6 | 34 | 54.4 | 69 | 110.4 | 184 | 294.4 |
| 1e | Integrated School without hostel facility | 100,000 | 3.5 | 3 | 10.5 | 6 | 21 | 14 | 49 |
| 1f | Integrated School with hostel facility | 100,000 | 4 | 3 | 12 | 6 | 24 | 14 | 56 |
| 1g | School for Handicapped/ Mentally Challenged | 45,000 | 1 | 6 | 6 | 12 | 12 | 31 | 31 |
| **2** | **Higher & Technical Education** | | | | | | | | |
| 2a | College | 100,000 | 6 | 3 | 18 | 6 | 36 | 14 | 84 |
| 2b | University Campus | 1,000,000 | 60 | 1 | 60 | 1 | 60 | 2 | 120 |
| 2c | Teaching Institutes | 1,000,000 | 4 | 1 | 4 | 1 | 4 | 2 | 8 |
| 2d | Technical Education Centre (ITI + Polytechnic) | 1,000,000 | 4 | 1 | 4 | 1 | 4 | 2 | 8 |
| 2e | Engineering Colleges | 600,000 | 6 | 1 | 6 | 1 | 6 | 3 | 18 |
| **3** | **Health Care Facilities** | | | | 0 | | 0 | | 0 |
| 3a | Dispensary/ Health Centre | 15,000 | 0.1 | 17 | 1.7 | 35 | 3.5 | 92 | 9.2 |
| 3b | Nursing Homes, Child Welfare and Maternity Centre | 50,000 | 0.2 | 6 | 1.2 | 11 | 2.2 | 28 | 5.6 |
| 3c | Poly-Clinic with observation beds | 100,000 | 0.2 | 3 | 0.6 | 6 | 1.2 | 14 | 2.8 |
| 3d | Intermediate Hospital (Category B) | 100,000 | 0.6 | 3 | 1.8 | 6 | 3.6 | 14 | 8.4 |
| 3e | Intermediate Hospital (Category A) | 100000 | 2.7 | 3 | 8.1 | 6 | 16.2 | 14 | 37.8 |
| 3f | General Hospital | 250,000 | 4 | 2 | 8 | 3 | 12 | 6 | 24 |

| Sl. No. | Facilities/ Amenities | Population Threshold (UDPFI) | Unit Area (Ha) | Phase 1 | | Phase 2 | | Phase 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Facility Required | Area Required | Facility Required | Area Required | Facility Required | Area Required |
| | **Project Population** | | | **254200** | | **513200** | | **1370000** | |
| **4** | **Sheltering Facilities** | | | | 0 | | 0 | | 0 |
| 4a | Old Age Home | 500,000 | 0.2 | 1 | 0.2 | 2 | 0.4 | 3 | 0.6 |
| 4b | Orphanage | 250,000 | 0.2 | 2 | 0.4 | 3 | 0.6 | 6 | 1.2 |
| 4c | Night Shelter | 100,000 | 0.1 | 3 | 0.3 | 6 | 0.6 | 14 | 1.4 |
| 4d | Working Women's Hostel | 250,000 | 0.1 | 2 | 0.2 | 3 | 0.3 | 6 | 0.6 |
| **5** | **Security& Safety Infrastructure** | | | | | | | | |
| 5a | Police Station | 90,000 | 1.5 | 3 | 4.5 | 6 | 9 | 16 | 24 |
| 5b | Police Post | 50,000 | 0.16 | 6 | 0.96 | 11 | 1.76 | 28 | 4.48 |
| 5c | District Office & Battalion | 1,000,000 | 4.8 | 1 | 4.8 | 1 | 4.8 | 2 | 9.6 |
| 5d | Police Line | 2,000,000 | 6 | 1 | 6 | 1 | 6 | 1 | 6 |
| 5e | District Jail | 1,000,000 | 10 | 1 | 10 | 1 | 10 | 2 | 20 |
| 5f | Civil Defence & Home Guards | 1,000,000 | 10 | 1 | 10 | 1 | 10 | 2 | 20 |
| 5g | Fire Station/ Sub-Fire Station | 200,000 | 1.5 | 2 | 3 | 3 | 4.5 | 7 | 10.5 |
| **6** | **Telecommunication & Postal Infrastructure** | | | | | | | | |
| 6a | Head Post office | one per city | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6b | Post Office | 50,000 | 0.3 | 6 | 1.8 | 11 | 3.3 | 28 | 8.4 |
| 6c | Telephone Exchange | 100,000 | | 3 | 0 | 6 | 0 | 14 | 0 |
| **7** | **Socio-Cultural Facilities** | | | | | | | | |
| 7a | Recreational Club (Type-1) | 15,000 | 0.2 | 17 | 3.4 | 35 | 7 | 92 | 18.4 |
| 7b | Recreational Club (Type-2) | 50,000 | 0.5 | 6 | 3 | 11 | 5.5 | 28 | 14 |
| 7c | Recreational Club (Type-3) | 100,000 | 1 | 3 | 3 | 6 | 6 | 14 | 14 |
| 7d | Music, Dance, Drama Centre | 50,000 | | 6 | 0 | 11 | 0 | 28 | 0 |
| 7e | Meditation & Spiritual Centre | 50,000 | | 6 | 0 | 11 | 0 | 28 | 0 |
| 7f | Socio-Cultural Centre | 500,000 | | 1 | 0 | 2 | 0 | 3 | 0 |
| 7g | Electric Crematorium | 250000 | 1 | 2 | 2 | 3 | 3 | 6 | 6 |
| 7h | Crematorium Ground | 250000 | 1 | 2 | 2 | 3 | 3 | 6 | 6 |
| 7i | Burial Ground | 250000 | 1 | 2 | 2 | 3 | 3 | 6 | 6 |
| 7j | Religious Building | 50,000 | 0.1 | 6 | 0.6 | 11 | 1.1 | 28 | 2.8 |
| 7k | Multipurpose Community Hall | 100,000 | 0.2 | 3 | 0.6 | 6 | 1.2 | 14 | 2.8 |
| **8** | **Transportation Facilities** | | | | | | | | |
| 8a | Bus Terminal | 250000 | 1 | 1 | 1 | 2 | 2 | 6 | 6 |

| Sl. No. | Facilities/ Amenities | Population Threshold (UDPFI) | Unit Area (Ha) | Phase 1 | | Phase 2 | | Phase 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Facility Required | Area Required | Facility Required | Area Required | Facility Required | Area Required |
| | **Project Population** | | | **254200** | | **513200** | | **1370000** | |
| 8b | Inter State Bus Terminal | one for city | 4 | 1 | 4 | 1 | 4 | 1 | 4 |
| 8c | Bus Depot | 500,000 | 2 | 1 | 2 | 1 | 2 | 3 | 6 |
| 8d | Truck Terminal | 500,000 | 10 | 1 | 10 | 1 | 10 | 3 | 30 |
| **9** | **Commercial & Shopping Facilities** | | | | | | | | |
| 9a | Milk Booth | 5,000 | | 51 | 0 | 103 | 0 | 276 | 0 |
| 9b | Local Shopping/ Neighbourhood Centre | 10,000 | 2 | 26 | 52 | 52 | 104 | 138 | 276 |
| 9d | Community Centr/ Sub-Sector | 100,000 | 5 | 3 | 15 | 6 | 30 | 14 | 70 |
| 9e | Sector Centre | 250,000 | 8 | 2 | 16 | 3 | 24 | 6 | 48 |
| 9f | Sub-city Centre | 500,000 | 16 | 1 | 16 | 2 | 32 | 3 | 48 |
| 9g | Central Business District | 1,000,000 | 25 | 1 | 25 | 1 | 25 | 2 | 50 |
| 9h | Wholesale Market | 100,000 | 1 | 3 | 3 | 6 | 6 | 14 | 14 |
| 9i | LPG Godowns | 50,000 | 0.1 | 6 | 0.6 | 11 | 1.1 | 28 | 2.8 |
| 9j | Dhobi Ghat | 300,000 | 1 | 1 | 1 | 2 | 2 | 5 | 5 |
| 9k | Petrol Pump | 30,000 | 0.15 | 9 | 1.35 | 18 | 2.7 | 46 | 6.9 |
| **10** | **Playground/ Parks/ Open Spaces/ Sports Centre** | | | | | | | | |
| 10a | Community Park | 100,000 | 5 | 3 | 15 | 6 | 30 | 14 | 70 |
| 10b | Multipurpose Park | 100,000 | 2 | 3 | 6 | 6 | 12 | 14 | 28 |
| 10c | District Park | 250,000 | 25 | 2 | 50 | 3 | 75 | 6 | 150 |
| 10d | City Park | 1,000,000 | 20 | 1 | 20 | 1 | 20 | 2 | 40 |
| 10e | Community Sports Centre | 100,000 | 3 | 3 | 9 | 6 | 18 | 14 | 42 |
| 10f | Multipurpose ground | 500,000 | 4 | 1 | 4 | 2 | 8 | 3 | 12 |
| 10g | District Sports Centre | 500,000 | 10 | 1 | 10 | 2 | 20 | 3 | 30 |
| | | | | | **547.65** | | **887.8** | | **2038.28** |

# 6 Details of Reservoirs

| S.No | Name of Dams | Tehsil | FTL in Ft. | Capacity in MCFT | CCA in Ha. | Capacity in MCUM |
|---|---|---|---|---|---|---|
| 1 | Jaisamand | Alwar | 23'1" | 952 | 4790 | 26.96 |
| 2 | Siliserh | Alwar | 28'9" | 492 | 845 | 13.93 |
| 3 | Mangalsar | Rajgarh | 46'00" | 659 | 958 | 18.676 |
| 4 | Mansarovar | Rajgarh | 21'6" | 340 | 843 | 9.6 |
| 5 | Rampur | Thanagazi | 15'00" | 262 | 1052 | 7.4 |
| 6 | Jaisagar | Thanagazi | 30'4" | 232 | 949 | 6.569 |
| 7 | Deoti | Rajgarh | 13'00" | 214 | 1410 | 6.05 |
| 8 | Dhamrad | Rajgarh | 11'0" | 170 | 637 | 4.8 |
| 9 | Laxmangarh | Laxmangarh | 5'3" | 106 | 512 | 3 |
| 10 | Bhagarikhurd | Kishangarh | 11'3" | 125 | 316 | 3.54 |
| 11 | Jiroli | Kishangarh | 9'0" | 101.66 | 426 | 2.88 |
| 12 | Khanpur | Kishangarh | 13'9" | 203.6 | 920 | 5.765 |
| 13 | Harsora | Bansur | 16'3" | 137 | 1821 | 3.865 |
| 14 | Jaitpur | Thanagazi | 14'0" | 99 | 518 | 2.8 |
| 15 | Babriya | Bansur | 10'0" | 196 | 1852 | 5.55 |
| 16 | Silibari | Alwar | 20'0" | 199 | 836 | 5.6 |
| 17 | Bigota | Rajgarh | 19'0" | 55.02 | 410 | 1.56 |
| 18 | Tusari | Kathumar | 3'0" | 106 | 718 | 3 |
| 19 | Nimbhari | Tizara | 10'0" | 43.88 | 459 | 1.24 |
| 20 | Dhakwasan | Mundawar | 7'0" | 13.93 | 138 | 0.394 |
| 21 | Amka | Thanagazi | 23'5" | 50.5 | 288 | 1.43 |
| 22 | Sarankhurd | Tizara | 15'0" | 145 | 915 | 4.106 |
| 23 | Birtoli | Mundawar | 15'6" | 20.5 | 176 | 0.58 |
| 24 | Samarsarovar | Thanagazi | Damaged | 40 | 359 | 1.132 |
| 25 | Atriya | Ramgarh | Diversion | - | - | |

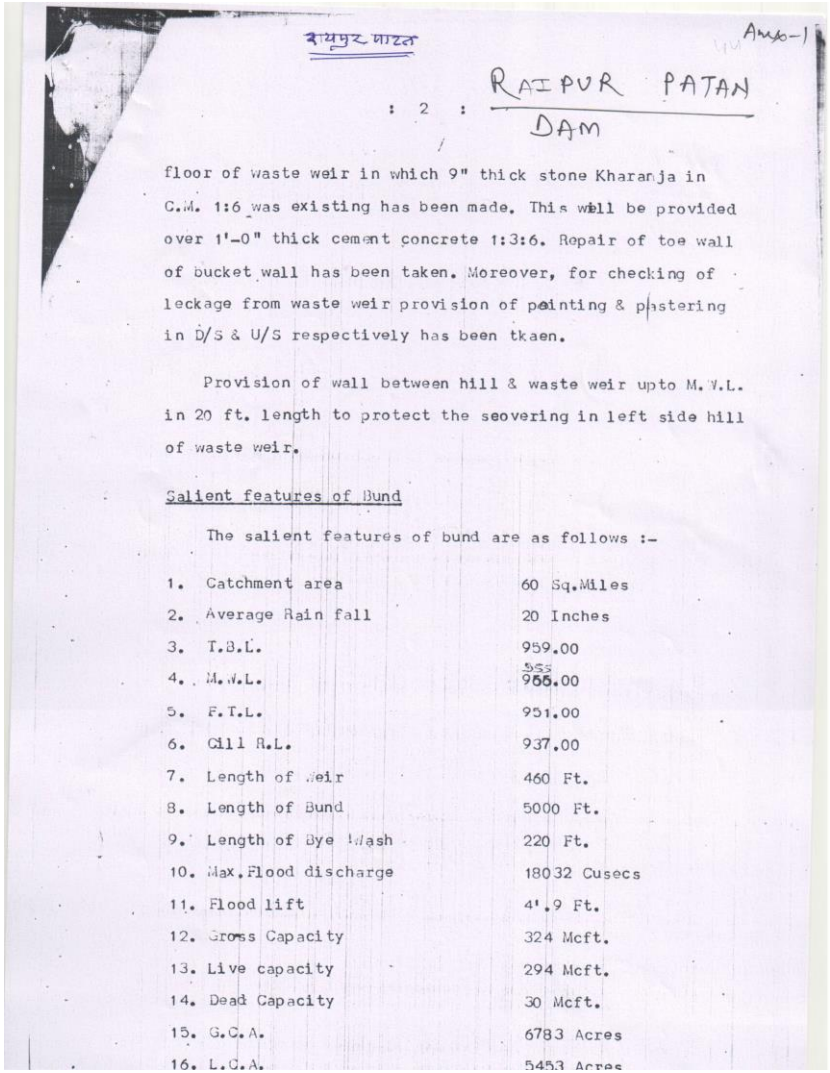
OFFICE OF EXECUTIVE ENGINEER WATER RESOURCES DIVISIN SIKAR

NAME OF WORK - RAIPUR PATAN
TEHSIL- NEEMKA THANA DISTRICT- SIKAR

**PRINCIPAL DATA**

| | | |
|---|---|---|
| 1- | Gross catchment area. | 60.00 s.q.MILES |
| 2- | Free catchment area. | 60.00 s.q.MILES |
| 3- | Type of catchment area. | GOOD |
| 4- | Average annual rainfall. | 20" |
| 5- | Average annual mansoon rainfall | 18" |
| 6- | Yield. | 5.23 MCFT/sqmile |
| 7- | Gross capacity. | 324 MCFT |
| 8- | Live storage capacity. | 294 MCFT |
| 9- | Dead storage capacity. | 30 MCFT |
| 10- | Expected average annual Irrig. | - |
| 11- | Tatal length of Dnm | 500' |
| 12- | Desigined flood little | 4.00 feet |
| 13- | Length of over flow(bye wash) | w.w.460' B.W.220' |
| 14- | Maximum flood discharge. | 18032 cusec |
| 15- | T.B.L. | 959' |
| 16- | M.W.L. | 956' |
| 17- | F.T.L. | 951' |
| 18- | Cill R.L. | 937' |
| 19- | Free board. | 4.0' |
| 20- | G.C.A. | 2745 Har. |
| 21- | C.C.A. | 2207 Har. |
| 22- | I.A. | 951 Har. |
| 23- | Bod cultivation. | - |
| 24- | Normal irraigation | 2350" |
| 25- | B.C. retion | - |
| 26- | Estimated cost. | 9.99 lacs (1967) |

Satyaveer/ 1



रायपुर पाटन

Amb-1

: 2 : RAIPUR PATAN DAM

floor of waste weir in which 9" thick stone Kharanja in C.M. 1:6 was existing has been made. This will be provided over 1'-0" thick cement concrete 1:3:6. Repair of toe wall of bucket wall has been taken. Moreover, for checking of leckage from waste weir provision of painting & plastering in D/S & U/S respectively has been tkaen.

Provision of wall between hill & waste weir upto M.W.L. in 20 ft. length to protect the seovering in left side hill of waste weir.

Salient features of Bund

The salient features of bund are as follows :-

| | | |
|---|---|---|
| 1. | Catchment area | 60 Sq.Miles |
| 2. | Average Rain fall | 20 Inches |
| 3. | T.B.L. | 959.00 |
| 4. | M.W.L. | 956.00 |
| 5. | F.T.L. | 951.00 |
| 6. | Cill R.L. | 937.00 |
| 7. | Length of Weir | 460 Ft. |
| 8. | Length of Bund | 5000 Ft. |
| 9. | Length of Bye Wash | 220 Ft. |
| 10. | Max.Flood discharge | 18032 Cusecs |
| 11. | Flood lift | 4'.9 Ft. |
| 12. | Gross Capacity | 324 Mcft. |
| 13. | Live capacity | 294 Mcft. |
| 14. | Dead Capacity | 30 Mcft. |
| 15. | G.C.A. | 6783 Acres |
| 16. | L.C.A. | 5453 Acres |

RAIPUR PATAN

Dam Annex

: 3 :

19. Length of Minors

| | | |
|---|---|---|
| (i) | Bewa Minor | 180 Chains |
| (ii) | Karjo Minor | 150 Chains |
| (iii) | Rajpura Minor | 100 Chains |

The estimate has been framed on current B.S.R. 1993 of Irrigation Circle, Jaipur.

Difference of cost of cement begs 38.94 per begs and estimate Ch to ~~₹245~~ flood.

An early sanction of estimate is requested please.

EXECUTIVE ENGINEER
IRRIGATION DN. SIKAR

ASSISTANT ENGINEER
IRRIGATION SUB.DN.
NEEMKATHANA.

2 SALIENT FEATURES

**Salient Features of BUCHARA Minor Irrigation Project**

| Sr. No. | Description | As per Original Project | Revised/Proposed after Assessment for Rehabilitation |
|---|---|---|---|
| 1. | **Location** | | |
| i | Tehsil | Kotputli | Kotputli |
| ii | District | Jaipur | Jaipur |
| iii | River Basin | Sabi | Sabi |
| iv | Name of River | Local Nalla | Local Nalla |
| v | Longitude | 75°53'17"E | 75°53'17"E |
| vi | Latitude | 25°35'33"N | 25°35'33"N |
| vii | Reference GT Sheet | | |
| 2. | **Access to the Project** | | |
| i | Rail head | 50 km | 50 km |
| ii | Road head | Approachable from road diverted from NH-8 to Taskola and buchara village | Approachable from road diverted from NH-8 to Taskola and buchara village |
| 3. | **Command Area** | | |
| i | Gross command area (GCA) | 3247.0 ha | 3247.0 ha |
| ii | Cultural command area (CCA) | 2023.0 ha | 1923.0 ha |
| iii | Design Intensity of Irrigation | 80.0% | 90.0% |
| iv | Design Irrigable command area (ICA) | 1623.0 ha | 1623.0 ha |
| 4. | **Hydrology** | | |
| i | Gross catchment area | 30976.0 ha | 30976.0 ha |
| ii | Intercepted catchment area | Nil ha | Nil ha |
| iii | Free catchment area | 30976.0 ha | 30976.0 ha |
| iv | Average annual rainfall | 482.03 Mm | 482.03 Mm |
| v | Mean yield at the dam site | 17.25 MCM | 17.25 MCM |
| vi | Dependability of Yield | 54.90 % | 54.90 % |
| vii | Design maximum flood | 731.0 $m^3/s$ | 1329.05 $m^3/s$ |
| 5. | **Dam/Reservoir Levels** | | |
| i | Top bank level (TBL) | 179.66 m | 179.70 m |
| ii | Maximum water level (MWL) | 178.13 m | 178.20 m |
| iii | Full tank level (FTL) | 176.60 m | 176.60 m |

3

| | | | |
|---|---|---|---|
| iv | Minimum draw-down level | 158.60 m | 158.60 m |
| v | Dead storage level | 158.60 m | 158.60 m |
| 6. | Freeboard | 1.50 m | 1.50 m |
| 7. | Reservoir Capacity | | |
| i | at Maximum water level | | |
| ii | at Full reservoir level | 16.36 MCM | 16.36 MCM |
| iii | at min. draw-down level | Nil MCM | Nil MCM |
| iv | Dead storage | Nil MCM | Nil MCM |
| 8. | Submergence Area | | |
| i | Government land | No new area is affected with rehabilitation | No new area is affected with rehabilitation |
| ii | Private land | Do | Do |
| iii | Building / houses | Do | Do |
| iv | Wells | Do | Do |
| v | Road / rail | Do | Do |
| vi | Number of families affected | Do | Do |
| vii | Number of persons affected | Do | Do |
| 9. | Dam Details | | |
| i | Type of dam | Earthen homogeneous cum Masonry dam | Two saddles, Earthen homogeneous and seven saddles of Masonry dam |
| ii | Length | 690 m / 510 m | 690 m / 570m |
| iii | Top width | 3.5 m | 4.5, m |
| iv | U/s slope | 2.5 :1 / 0 : 1 | 2.5:1 / 0 : 1 |
| v | D/s slope | 2 : 1 | 2 : 1 |
| vi | Max. height above G.L. | 29.0 m | 29.0 m |
| vii | Type of surplussing arrangement | Waste weir, Bye-wash | Waste weir, Bye-wash |
| viii | Length of waste weir / bye-wash | 306.36 m | 411.36 m |
| ix | Type of energy dissipation | None | At saddle no 7 side wall and guide wall provided |
| 10. | Canal System | | |
| i | Number of main canal(s and minors) | 1 | 1 |
| ii | Length main canal(s), of which lined | 6.99 km / 6.99Km | 6.99 km / 6.99Km |
| iii | Length of distribution system (lined) | 22.90 km / 6.30 km | 22.90 km / 6.30 km |
| iv | Design discharge at head of main canal | 3.854 $m^3/s$ | 2.565 $m^3/s$ |
| 11. | Design Cropping Intensity | 80 % | 90.0 % |

4

## SALIENT FEATURES OF SURFACE IRRIGATION SCHEME

**Name of Work :** Rehabilitation of main canal & minors of Chitoli Dam.

| | | |
|---|---|---|
| 1. | Name of local Nallah/River on which project located | Tributory of Sabi |
| 2. | River Basion | Sabi |
| 3. | Rehsil | Virat Nagar |
| 4. | District | Jaipur |
| 5. | (i) Latitude | $27^0$ 28' 47" N |
| | (ii) Longitude | $76^0$ 07 47" E |
| 6. | G.T.Sheet Nos. (seale 1:50.000 | $54^A/_2$ $54^A/_3$ and $54^A/_7$ |
| 7. | year of construction | 1950 |
| 8. | Catchment Area | 153.60 Sq.km. |
| 9. | Intercepted area | NIL |
| 10. | Gross storage capacity | 24.38 M.cum. |
| 11. | Live storage capacity | 22.23 M.cum. |
| 12. | Dead storage capacity | 2.05 M.Cum. |
| 13. | G.C.A. | 2539.41 Ha. |
| 14. | C.C.A. | 2280.13 Ha. |
| 15. | I.C.A. | 2036.95 Ha. |
| 16. | Top of dam | 51.05 Meter (167' - 6") |
| 17. | Maximum water level (M.W.L.) | 49.53 Meter (162' - 6") |
| 18. | Full Reservoir level (F.T.L.) | 48.00 Meter (157' - 6") |
| 19. | Free Board above (M.W.L.) | 1.52 Meter (5' - 0") |
| 20. | Spilway crest level | 48.00 Meter (157' - 0") |
| 21. | Dead storage level & sliuice level | 41.15 Meter (135' - 0") |

7

| | | |
|---|---|---|
| 22. | Submergence area at F.T.L. | 530.16 Ha./ Sq.Km |
| 23. | Maximum design flood discharge | 26.99 Cumes |
| 24. | Length of over flow | 9.15 Meter |
| 25. | Discharge of Head Main canal | 3.003 cumes (C.C.A. 857.44 Ha.) |
| 26. | Length of Main canal | 8660 Meter |
| 27. | Length of proposed Minor 1 | 3860 Meter |
| 28. | Length of proposed Minor 2 | 1520 Meter |
| 29. | Length of proposed Minor 3 | 4560 Meter |
| 30. | Length of proposed Minor 4 | 4410 Meter |
| 31. | Discharge Minor No. (1) | 0.3547 Cumecs (C.C.A. - 267.24 Ha ) |
| 32. | Discharge Minor No. (3) | 0.8078 Cumecs (C.C.A. - 638.37 Ha ) |
| 33. | Discharge Minor No. (4) | 0.487 Cumecs (C.C.A. - 371.12 Ha.) |

Executive Engineer
Irrigation Division
Jaipur.

Assistant Engineer
Irrigation Sub-Division
Shahpura.

# 7 Chambal Water Conveyance – Pipe Sizing Calculations

**Title :** **Design of Pumping Main for 88 MLD from Silisirah to Jaisamand and Deoti to Jaisamand**

***INPUT :***

| | | |
|---|---|---|
| 1. Average Flow | 1.019 | m3/sec |
| 2. Peak Factor | 1.2 | |
| 3. Static Lift | 77 | m |
| 4. Length of Main | 89000 | m |
| 5. Standby Pump Cap. | 50 | % |
| 6. Efficiency of Pump set | 75 | % |
| 7. Addl. Friction Losses | 10 | % |
| 8. No of Year | 30 | |
| 9. Discount Rate | 11 | % |
| 10. Cost of Pump | 10000 | Rs/Kw |
| 11. Power Tariff | 10 | Rs/Kwh |
| 12. ' C ' Value | 140 | |
| 13. Pipe Material | MS (lined) | |

| **Result :** | ***Optimum Diameter:*** | **1200** | mm |
|---|---|---|---|

| Diameter (mm) | Rate Rs/m | C Value | Diameter (mm) | Rate Rs/m | C Value |
|---|---|---|---|---|---|
| 800 | 21700 | 140 | | 0 | 140 |
| 900 | 24412 | 140 | | 0 | 140 |
| 1000 | 27162 | 140 | | 0 | 140 |
| 1100 | 29913 | 140 | | 0 | 140 |
| 1200 | 32638 | 140 | | 0 | 140 |
| 1300 | 35517 | 140 | | 0 | 140 |

| | | | | | |
|---|---|---|---|---|---|
| 1400 | 38991 | 140 | | 0 | 140 |
| 1500 | 40864 | 140 | | 0 | 140 |
| 1600 | 47947 | 140 | | 0 | 140 |
| 1800 | 56258 | 140 | | 0 | 140 |
| 2000 | 66010 | 140 | | 0 | 140 |

| Diameter (mm) | Velocity m/sec | Friction loss(m) | Pump Head (m) | Pump Power (Kw) | COST IN RUPEES (LACS) | | | | Result |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Pump | Pipe | Operation | Total | |
| 800 | 2.43 | 480.98 | 557.98 | 8920 | 1338 | 19313 | 56608 | 77538 | |
| 900 | 1.92 | 271.03 | 348.03 | 5563 | 835 | 19554 | 35308 | 55871 | |
| 1000 | 1.56 | 162.25 | 239.25 | 3824 | 574 | 24174 | 24272 | 49140 | |
| 1100 | 1.29 | 102.00 | 179.00 | 2861 | 429 | 26623 | 18160 | 45301 | |
| 1200 | 1.08 | 66.77 | 143.77 | 2298 | 345 | 29047 | 14585 | 44050 | Optimum |
| 1300 | 0.92 | 45.21 | 122.21 | 1954 | 293 | 31611 | 12399 | 44364 | |
| 1400 | 0.79 | 31.52 | 108.52 | 1735 | 260 | 34702 | 11009 | 46025 | |
| 1500 | 0.69 | 22.52 | 99.52 | 1591 | 239 | 36369 | 10097 | 46754 | |
| 1600 | 0.61 | 16.45 | 93.45 | 1494 | 224 | 42673 | 9480 | 52424 | |
| 1800 | 0.48 | 9.27 | 86.27 | 1379 | 207 | 50070 | 8752 | 59072 | |
| 2000 | 0.39 | 5.55 | 82.55 | 1320 | 198 | 58749 | 8375 | 67363 | |

**Note :**

Operation : Capitalised operation cost for **30** years.

Total : Present worth cost

Pump Kw : Excluding standby

Remark : MS rates valid for the period

Pump cost : Replacement of pumps considered after 15 years.

**Title :** **Design of Pumping Main for 260 MLD from Jaisamand to KBNIR (near Ajarka)**

***INPUT :***

| | | |
|---|---|---|
| 1. Average Flow | 3.009 | m3/sec |
| 2. Peak Factor | 1.2 | |
| 3. Static Lift | 77 | m |
| 4. Length of Main | 89000 | m |
| 5. Standby Pump Cap. | 50 | % |
| 6. Efficiency of Pump set | 75 | % |
| 7. Addl. Friction Losses | 10 | % |
| 8. No of Year | 30 | |
| 9. Discount Rate | 11 | % |
| 10. Cost of Pump | 10000 | Rs/Kw |
| 11. Power Tariff | 10 | Rs/Kwh |
| 12. ' C ' Value | 140 | |
| 13. Pipe Material | MS (lined) | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Result :** | ***Optimum Diameter:*** | **1800** | mm | | | | | |

| **Diameter (mm)** | **Rate Rs/m** | **C Value** | **Diameter (mm)** | **Rate Rs/m** | **C Value** |
|---|---|---|---|---|---|
| 800 | 21700 | 140 | | 0 | 140 |
| 900 | 24412 | 140 | | 0 | 140 |
| 1000 | 27162 | 140 | | 0 | 140 |
| 1100 | 29913 | 140 | | 0 | 140 |
| 1200 | 32638 | 140 | | 0 | 140 |
| 1300 | 35517 | 140 | | 0 | 140 |
| 1400 | 38991 | 140 | | 0 | 140 |
| 1500 | 40864 | 140 | | 0 | 140 |
| 1600 | 47947 | 140 | | 0 | 140 |
| 1800 | 56258 | 140 | | 0 | 140 |

| | | | | | |
|---|---|---|---|---|---|
| 2000 | 66010 | 140 | | 0 | 140 |

| Diameter (mm) | Velocity m/sec | Friction loss(m) | Pump Head (m) | Pump Power (Kw) | COST IN RUPEES (LACS) Pump | Pipe | Operation | Total | Result |
|---|---|---|---|---|---|---|---|---|---|
| 800 | 7.18 | 3576.64 | 3653.64 | 172561 | 25884 | 19313 | 1095150 | 1145757 | |
| 900 | 5.68 | 2015.40 | 2092.40 | 98824 | 14824 | 19554 | 627182 | 664658 | |
| 1000 | 4.60 | 1206.49 | 1283.49 | 60619 | 9093 | 24174 | 384716 | 419883 | |
| 1100 | 3.80 | 758.47 | 835.47 | 39459 | 5919 | 26623 | 250427 | 284206 | |
| 1200 | 3.19 | 496.49 | 573.49 | 27086 | 4063 | 29047 | 171899 | 205859 | |
| 1300 | 2.72 | 336.22 | 413.22 | 19516 | 2927 | 31611 | 123859 | 159008 | |
| 1400 | 2.35 | 234.36 | 311.36 | 14705 | 2206 | 34702 | 93327 | 130696 | |
| 1500 | 2.04 | 167.48 | 244.48 | 11547 | 1732 | 36369 | 73281 | 111744 | |
| 1600 | 1.80 | 122.31 | 199.31 | 9413 | 1412 | 42673 | 59741 | 104122 | |
| 1800 | 1.42 | 68.92 | 145.92 | 6892 | 1034 | 50070 | 43738 | 95058 | Optimum |
| 2000 | 1.15 | 41.26 | 118.26 | 5585 | 838 | 58749 | 35447 | 95208 | |

**Note :**

Operation : Capitalised operation cost for **30** years.
Total : Present worth cost
Pump Kw : Excluding standby
Remark : DI rates valid for the period
Pump cost : Replacement of pumps considered after 15 years.

# 8 Compost Plant & Sanitary Land Fill Size Sizing Calculations

**Average Load Scenario**

| Sl. No. | Parameters | Unit | Ph-I | | | Ph-II | | Ph-III | |
|---|---|---|---|---|---|---|---|---|---|
| | Commencement year | | 2012 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| 1 | Daily expected generation of solid waste in KBNIR area | MT/d | 17 | 52 | 73 | 112 | 196 | 339 | 612 |
| 2 | Daily coverage of waste generated | % | 80% | 90% | 95% | 95% | 95% | 95% | 95% |
| 3 | Rejects | % | 100% | 100% | 50% | 35% | 35% | 30% | 30% |
| 4 | Waste coming to the SLF in initial year | MT/d | 14 | 47 | 35 | 37 | 65 | 97 | 174 |
| 5 | Rate of increase of waste loads | % pa | 45.2% | 7.0% | 8.9% | 11.8% | 11.6% | 12.5% | 12.5% |
| 6 | Proposed life of the SLF phase | Years | 3 | 5 | 5 | 5 | 5 | 5 | 5 |
| 7 | Waste coming to the SLF in the final year | MT/d | 42 | 66 | 53 | 65 | 113 | 174 | 315 |
| 8 | Number of days of SLF operation | d/year | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| 9 | Total waste coming to the SLF in entire life span | MT | 30,222 | 102,656 | 80,186 | 93,449 | 162,322 | 247,319 | 446,488 |
| 10 | Density of waste in the SLF after compaction | MT/cum | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| 11 | Compacted volume of waste in the SLF | cum | 35,555 | 120,772 | 94,336 | 109,940 | 190,967 | 290,964 | 525,280 |
| 12 | Total volume of daily cover over the life of the SLF (10%) | cum | 3,556 | 12,077 | 9,434 | 10,994 | 19,097 | 29,096 | 52,528 |
| 13 | Volume required for the liner system and cover system (12.5%) | cum | 4,444 | 15,097 | 11,792 | 13,743 | 23,871 | 36,371 | 65,660 |
| 14 | Volume available due to settlement and biodegradation (5%) | cum | 3,556 | 6,039 | 4,717 | 5,497 | 9,548 | 14,548 | 26,264 |
| 15 | First estimate of SLF capacity | cum | 40,000 | 141,907 | 110,845 | 129,180 | 224,387 | 341,883 | 617,204 |
| 17 | Average height of the SLF | m | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| 18 | Area required for the filling of waste | sqm | 2,667 | 9,460 | 7,390 | 8,612 | 14,959 | 22,792 | 41,147 |
| 19 | Area required for infrastructure | sqm | 800 | 2,838 | 2,217 | 2,584 | 4,488 | 6,838 | 12,344 |
| 20 | Net area required for the SLF (incl. bunds, roads, etc.) | sqm | 3,467 | 12,299 | 9,607 | 11,196 | 19,447 | 29,630 | 53,491 |
| 21 | Area required for green belt development (15% or 10%) | sqm | 520 | 1,845 | 1,441 | 1,120 | 1,945 | 2,963 | 5,349 |
| 22 | Total area required for the SLF | sqm | 3,987 | 14,143 | 11,048 | 12,315 | 21,392 | 32,593 | 58,840 |
| | Area for the SLF | Ha | 15 | | | | | | |
| | Area for the compost plant | Ha | 2.43 | | | | | | |
| | Total | Ha | 18 | | | | | | |
| | | | | | | | | | |

| Sl. No. | Parameters | Unit | Ph-I | | | Ph-II | | Ph-III | |
|---|---|---|---|---|---|---|---|---|---|
| | Commencement year | | 2012 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| 1 | Daily expected generation of solid waste in KBNIR area | MT/d | MT/d | 19 | 57 | 85 | 140 | 241 | 436 |
| 2 | Daily coverage of waste generated | % | % | 80% | 90% | 95% | 95% | 95% | 95% |
| 3 | Rejects | % | % | 100% | 100% | 50% | 35% | 35% | 30% |
| 4 | Waste coming to the SLF in initial year | MT/d | MT/d | 15 | 51 | 40 | 47 | 80 | 124 |
| 5 | Rate of increase of waste loads | % pa | % pa | 44% | 8% | 10% | 11% | 13% | 13% |
| 6 | Proposed life of the SLF phase | Years | Years | 3 | 5 | 5 | 5 | 5 | 5 |
| 7 | Waste coming to the SLF in the final year | MT/d | MT/d | 46 | 77 | 67 | 80 | 145 | 230 |
| 8 | Number of days of SLF operation | d/year | d/year | 365 | 365 | 365 | 365 | 365 | 365 |
| 9 | Total waste coming to the SLF in entire life span | MT | MT | 33,288 | 116,618 | 97,523 | 115,598 | 205,406 | 323,258 |
| 10 | Density of waste in the SLF after compaction | MT/cum | MT/cum | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| 11 | Compacted volume of waste in the SLF | cum | cum | 39,162 | 137,197 | 114,733 | 135,997 | 241,654 | 380,303 |
| 12 | Total volume of daily cover over the life of the SLF (10%) | cum | cum | 3,916 | 13,720 | 11,473 | 13,600 | 24,165 | 38,030 |
| 13 | Volume required for the liner system and cover system (12.5%) | cum | cum | 4,895 | 17,150 | 14,342 | 17,000 | 30,207 | 47,538 |
| 14 | Volume available due to settlement and biodegradation (5%) | cum | cum | 3,916 | 6,860 | 5,737 | 6,800 | 12,083 | 19,015 |
| 15 | First estimate of SLF capacity | cum | cum | 44,058 | 161,207 | 134,812 | 159,797 | 283,944 | 446,856 |
| 17 | Average height of the SLF | m | m | 15 | 15 | 15 | 15 | 15 | 15 |
| 18 | Area required for the filling of waste | sqm | sqm | 2,937 | 10,747 | 8,987 | 10,653 | 18,930 | 29,790 |
| 19 | Area required for infrastructure | sqm | sqm | 881 | 3,224 | 2,696 | 3,196 | 5,679 | 8,937 |
| 20 | Net area required for the SLF (incl. bunds, roads, etc.) | sqm | sqm | 3,818 | 13,971 | 11,684 | 13,849 | 24,608 | 38,728 |
| 21 | Area required for green belt development (15% or 10%) | sqm | sqm | 573 | 2,096 | 1,753 | 1,385 | 2,461 | 3,873 |
| 22 | Total area required for the SLF | sqm | sqm | 4,391 | 16,067 | 13,436 | 15,234 | 27,069 | 42,600 |
| | Area for the SLF | Ha | Ha | 20 | | | | | |
| | Area for the compost plant | Ha | Ha | 2.43 | | | | | |
| | Total | Ha | Ha | 23 | | | | | |
| | | | | | | | | | |

# 9 Roads BoQ & Specs

**Table 1: Proposed Typical 80M Road with BRT - Cost For 1 Km**

| SN | Item | L (m) | W(m) | T (m) | Unit | Qty | Rate | Amount |
|---|---|---|---|---|---|---|---|---|
| 1 | Clearing and Grubbing | 1000 | 80 | | Sqm | 80000 | 3.85 | 308000 |
| 2 | Earth fill | 1000 | 80 | 0.5 | Cum | 40000 | 240 | 9600000 |
| 3 | Sub grade | 1000 | 80 | 0.5 | Cum | 40000 | 300 | 12000000 |
| 4 | GSB for BRT | 1000 | 7.5 | 0.2 | Cum | 1500 | 1430 | 2145000 |
| 5 | GSB for 2 lane Road | 1000 | 17 | 0.2 | Cum | 3400 | 1430 | 4862000 |
| 6 | GSB for Service Road | 1000 | 16 | 0.2 | Cum | 3200 | 1430 | 4576000 |
| 7 | GSB for Public facility | 1000 | 7 | 0.2 | Cum | 1400 | 1430 | 2002000 |
| 8 | WMM for BRT | 1000 | 7.5 | 0.25 | Cum | 1875 | 1980 | 3712500 |
| 9 | WMM for 2 lane Road | 1000 | 17 | 0.25 | Cum | 4250 | 1980 | 8415000 |
| 10 | WMM for Service Road | 1000 | 16 | 0.25 | Cum | 4000 | 1980 | 7920000 |
| 11 | WMM for Public Facility | 1000 | 10 | 0.15 | Cum | 1500 | 1980 | 2970000 |
| 12 | DBM for BRT | 1000 | 7.5 | 0.15 | Cum | 1125 | 9350 | 10518750 |
| 13 | DBM for 2 lane Road | 1000 | 17 | 0.15 | Cum | 2550 | 9350 | 23842500 |
| 14 | DBM for Service Road | 1000 | 16 | 0.05 | Cum | 800 | 9350 | 7480000 |
| 15 | BC for BRT | 1000 | 7.5 | 0.05 | Cum | 375 | 10450 | 3918750 |
| 16 | BC for 3 lane Road | 1000 | 17 | 0.05 | Cum | 850 | 10450 | 8882500 |
| 17 | BC for Service Road | 1000 | 16 | 0.04 | Cum | 640 | 10450 | 6688000 |
| 18 | Prime coat | 1000 | 40.5 | | Sqm | 40500 | 30 | 1215000 |
| 19 | Tack coat | 1000 | 81 | | Sqm | 81000 | 16 | 1296000 |
| 20 | Earth Fill in Median | 1000 | 24.5 | 0.5 | Cum | 12250 | 240 | 2940000 |
| 21 | Road Edge Marking | 5000 | 0.15 | | Sqm | 1500 | 385 | 577500 |
| 22 | Road Centre Marking | 2500 | 0.1 | 0.33 | Sqm | 165 | 385 | 63525 |
| 23 | Kerb stone ( M-20) | 10000 | | | Rmt | 10000 | 275 | 2750000 |
| 24 | Road Drainage | 2000 | | | Rmt | 2000 | 9900 | 19800000 |
| 25 | Street Lighting *(Providing and erecting street light mounted on a steel circular hollow pole of standard specifications for street lighting, 9 m high spaced 40 m apart, 1.8 m overhang on one side fitted with sodium vapour lamp and fixed firmly in* | 102 | | | Nr. | 102 | 44000 | 4488000 |

| SN | Item | L (m) | W(m) | T (m) | Unit | Qty | Rate | Amount |
|---|---|---|---|---|---|---|---|---|
| | *concrete foundation.)* | | | | | | | |
| 26 | Railing | 0 | | | Rmt | 0 | 3300 | 0 |
| 27 | Planting trees at a spacing of 6 m by grubbing and leveling the ground upto a depth of 150 mm, digging holes 0.9 m dia, 1 m deep, mixing farm yard/sludge manure with soil, planting of sapling 2 m high with 25 cm dia stem, backfilling the hole and watering) | 1006.00 | | | Nos. | 1006 | 385 | 387310 |
| 28 | Bus Sheltor ( @ 500 m C/c) | 1000 | 4 | | Nos. | 4 | 165000 | 660000 |
| 29 | Construction of footpath/separator by providing a 150 mm compacted sand fill and 25 mm thick cement concrete grade M15, over laid with precast concrete tiles in cement mortar 1:3 including all provision of drainage | 1000 | 15 | | Sqm | 15000 | 750 | 11250000 |
| | **Total Cost** | | | | | | | **165268335** |
| 30 | Traffic Sign and miscellaneous cost @ 1.5% of total cost | | | | | | | **2479025.** |
| | **Total Cost for Civil Works 80m with BRT (INR)/ km** | | | | | | | **16774736** |
| | | | | | | | **INR Cr/ km** | **16.775** |

**Table 2: Proposed Typical 60M Road with BRT - Cost For 1 Km**

| SN | Item | L (m) | W(m) | T (m) | Unit | Qty | Rate | Amount |
|---|---|---|---|---|---|---|---|---|
| 1 | Clearing and Grubbing | 1000 | 60 | | Sqm | 60000 | 3.85 | 231000 |
| 2 | Earth fill | 1000 | 60 | 0.5 | Cum | 30000 | 240 | 7200000 |
| 3 | Sub grade | 1000 | 60 | 0.5 | Cum | 30000 | 300 | 9000000 |
| 4 | GSB for BRT | 1000 | 7.5 | 0.2 | Cum | 1500 | 1430 | 2145000 |
| 5 | GSB for 2 lane Road | 1000 | 15 | 0.2 | Cum | 3000 | 1430 | 4290000 |
| 6 | GSB for Service Road | 1000 | 16 | 0.2 | Cum | 3200 | 1430 | 4576000 |
| 7 | GSB for Public facility | 1000 | 7 | 0.2 | Cum | 1400 | 1430 | 2002000 |
| 8 | WMM for BRT | 1000 | 7.5 | 0.25 | Cum | 1875 | 1980 | 3712500 |
| 9 | WMM for 2 lane Road | 1000 | 15 | 0.25 | Cum | 3750 | 1980 | 7425000 |
| 10 | WMM for Service Road | 1000 | 16 | 0.25 | Cum | 4000 | 1980 | 7920000 |
| 11 | WMM for Public Facility | 1000 | 7 | 0.15 | Cum | 1050 | 1980 | 2079000 |
| 12 | DBM for BRT | 1000 | 7.5 | 0.15 | Cum | 1125 | 9350 | 10518750 |
| 13 | DBM for 2 lane Road | 1000 | 15 | 0.15 | Cum | 2250 | 9350 | 21037500 |
| 14 | DBM for Service Road | 1000 | 16 | 0.05 | Cum | 800 | 9350 | 7480000 |
| 15 | BC for BRT | 1000 | 7.5 | 0.05 | Cum | 375 | 10450 | 3918750 |
| 16 | BC for 3 lane Road | 1000 | 15 | 0.05 | Cum | 750 | 10450 | 7837500 |
| 17 | BC for Service Road | 1000 | 16 | 0.04 | Cum | 640 | 10450 | 6688000 |
| 18 | Prime coat | 1000 | 38.5 | | Sqm | 38500 | 30 | 1155000 |
| 19 | Tack coat | 1000 | 77 | | Sqm | 77000 | 16 | 1232000 |
| 20 | Earth Fill in Median | 1000 | 8 | 0.5 | Cum | 4000 | 240 | 960000 |
| 21 | Road Edge Marking | 5000 | 0.15 | | Sqm | 1500 | 385 | 577500 |
| 22 | Road Centre Marking | 2500 | 0.1 | 0.33 | Sqm | 165 | 385 | 63525 |
| 23 | Kerb stone ( M-20) | 10000 | | | Rmt | 10000 | 275 | 2750000 |
| 24 | Road Drainage | 2000 | | | Rmt | 2000 | 9900 | 19800000 |
| 25 | Street Lighting *(Providing and erecting street light mounted on a steel circular hollow pole of standard specifications for street lighting, 9 m high spaced 40 m apart, 1.8 m overhang on one side fitted with sodium vapour lamp and fixed firmly in concrete foundation.)* | 52 | | | Nr. | 52 | 44000 | 2288000 |
| 26 | Railing | 0 | | | Rmt | 0 | 3300 | 0 |

| SN | Item | L (m) | W(m) | T (m) | Unit | Qty | Rate | Amount |
|---|---|---|---|---|---|---|---|---|
| 27 | Planting trees at a spacing of 6 m by grubbing and leveling the ground upto a depth of 150 mm, digging holes 0.9 m dia, 1 m deep, mixing farm yard/sludge manure with soil, planting of sapling 2 m high with 25 cm dia stem, backfilling the hole and watering) | 1006.00 | | | Nos. | 1006 | 385 | 387310 |
| 28 | Bus Sheltor ( @ 500 m C/c) | 1000 | 4 | | Nos. | 4 | 165000 | 660000 |
| 29 | Construction of footpath/separator by providing a 150 mm compacted sand fill and 25 mm thick cement concrete grade M15, over laid with precast concrete tiles in cement mortar 1:3 | 1000 | 10 | | Sqm | 10000 | 750 | 7500000 |
| | including all provision of drainage | | | | | | | |
| | **Total Cost** | | | | | | | **145434335** |
| 30 | Traffic Sign and miscellaneous cost @ 1.5% of total cost | | | | | | | **2181515** |
| | **Total Cost for Civil Works 80m with BRT (INR)/ km** | | | | | | | **147615850** |
| | | | | | | | **INR Cr/ km** | **14.76** |

**Table 3: Proposed Typical 45M Road - Cost For 1 Km**

| SN | Item | L (m) | W (m) | T (m) | Unit | Qty | Rate | Amount |
|---|---|---|---|---|---|---|---|---|
| 1 | Clearing and Grubbing | 1000 | 45 | | Sqm | 45000 | 3.85 | 173250 |
| 2 | Earth fill | 1000 | 45 | 0.5 | Cum | 22500 | 240 | 5400000 |
| 3 | Subgrade | 1000 | 45 | 0.5 | Cum | 22500 | 300 | 6750000 |
| 4 | GSB for 2 lane Road | 1000 | 22 | 0.2 | Cum | 4400 | 1430 | 6292000 |
| 5 | GSB for Public facility | 1000 | 7 | 0.2 | Cum | 1400 | 1430 | 2002000 |
| 6 | WMM for 2 lane Road | 1000 | 22 | 0.25 | Cum | 5500 | 1980 | 10890000 |
| 7 | WMM for Public Facility | 1000 | 7 | 0.15 | Cum | 1050 | 1980 | 2079000 |
| 8 | DBM for 2 lane Road | 1000 | 22 | 0.15 | Cum | 3300 | 9350 | 30855000 |
| 9 | BC for 2 lane Road | 1000 | 22 | 0.05 | Cum | 1100 | 10450 | 11495000 |
| 10 | Prime coat | 1000 | 22 | | Sqm | 22000 | 30 | 660000 |
| 11 | Tack coat | 1000 | 44 | | Sqm | 44000 | 16 | 704000 |
| 12 | Earth Fill in Median | 1000 | 14 | 0.5 | Cum | 7000 | 240 | 1680000 |
| 13 | Road Edge Marking | 2000 | 0.15 | | Sqm | 600 | 385 | 231000 |
| 14 | Road Centre Marking | 6000 | 0.1 | 0.33 | Sqm | 198 | 385 | 76230 |
| 15 | Kerb stone ( M-20) | 4000 | | | Rmt | 4000 | 275 | 1100000 |
| 16 | Road Drainage | 2000 | | | Rmt | 2000 | 9900 | 19800000 |
| 17 | Street Lighting *(Providing and erecting street light mounted on a steel circular hollow pole of standard specifications for street lighting, 9 m high spaced 40 m apart, 1.8 m overhang on one side fitted with sodium vapour lamp and fixed firmly in concrete foundation.)* | 52 | | | Nr. | 52 | 44000 | 2288000 |
| 18 | Railing | 0 | | | Rmt | 0 | 3300 | 0 |
| 19 | Planting trees at a spacing of 6 m by grubbing and leveling the ground upto a depth of 150 mm, digging holes 0.9 m dia, 1 m deep, mixing farm yard/sludge manure with soil, planting of sapling 2 m high with 25 cm dia stem, backfilling the hole and watering) | 503.00 | | | Nos. | 503 | 385 | 193655 |

| SN | Item | L (m) | W (m) | T (m) | Unit | Qty | Rate | Amount |
|---|---|---|---|---|---|---|---|---|
| 20 | Construction of footpath/separator by providing a 150 mm compacted sand fill and 25 mm thick cement concrete grade M15, over laid with precast concrete tiles in cement mortar 1:3 including all provision of drainage | 2000 | 14 | | Sqm | 28000 | 750 | 21000000 |
| | | | | | | | **Total Cost** | **123669135** |
| 21 | Traffic Sign and miscellaneous cost @ 1.5% of total cost | | | | | | | **1855037** |
| | **Total Cost for Civil Works per Km having width 45 m (INR)** | | | | | | | **125524172** |
| | **Total Cost for Civil Works per Km having width 45 m (INR CR)** | | | | | | | **12.552** |

**Table 3: Proposed Typical 45M Road - Cost For 1 Km**

| SN | Item | L (m) | W (m) | T (m) | Unit | Qty | Rate | Amount |
|---|---|---|---|---|---|---|---|---|
| 1 | Clearing and Grubbing | 1000 | 30 | | Sqm | 30000 | 3.85 | 115500 |
| 2 | Earth fill | 1000 | 30 | 0.5 | Cum | 15000 | 240 | 3600000 |
| 3 | Subgrade | 1000 | 30 | 0.5 | Cum | 15000 | 300 | 4500000 |
| 4 | GSB for 2 lane Road | 1000 | 16 | 0.2 | Cum | 3200 | 1430 | 4576000 |
| 5 | GSB for median | 1000 | 8 | 0.2 | Cum | 1600 | 1430 | 2288000 |
| 6 | WMM for 2 lane Road | 1000 | 16 | 0.25 | Cum | 4000 | 1980 | 7920000 |
| 7 | DBM for 2 lane Road | 1000 | 16 | 0.15 | Cum | 2400 | 9350 | 22440000 |
| 8 | BC for 2 lane Road | 1000 | 16 | 0.05 | Cum | 800 | 10450 | 8360000 |
| 9 | Prime coat | 1000 | 16 | | Sqm | 16000 | 30 | 480000 |
| 10 | Tack coat | 1000 | 32 | | Sqm | 32000 | 16 | 512000 |
| 11 | Earth Fill in Median | 1000 | 9 | 0.5 | Cum | 4500 | 240 | 1080000 |
| 12 | Road Edge Marking | 2000 | 0.15 | | Sqm | 600 | 385 | 231000 |
| 13 | Road Centre Marking | 2000 | 0.1 | 0.33 | Sqm | 66 | 385 | 25410 |
| 14 | Kerb stone ( M-20) | 4000 | | | Rmt | 4000 | 275 | 1100000 |
| 15 | Road Drainage | 2000 | | | Rmt | 2000 | 9900 | 19800000 |
| 16 | Street Lighting *(Providing and erecting street light mounted on a steel circular hollow pole of standard specifications for street lighting, 9 m high spaced 40 m apart, 1.8 m overhang on one side fitted with sodium vapour lamp and fixed firmly in concrete foundation.)* | 26 | | | Nr. | 26 | 44000 | 1144000 |
| 17 | Railing | 0 | | | Rmt | 0 | 3300 | 0 |
| 18 | Planting trees at a spacing of 6 m by grubbing and leveling the ground upto a depth of 150 mm, digging holes 0.9 m dia, 1 m deep, mixing farm yard/sludge manure with soil, planting of sapling 2 m high with 25 cm dia stem, backfilling the hole and watering) | 167.67 | | | Nos. | 167.67 | 385 | 64552 |
| | | | | | | | **Total Cost** | **78236462** |
| 19 | Traffic Sign and miscellaneous cost @ 1.5% of total cost | | | | | | | **1173547** |
| | **Total Cost for Civil Works per Km having width 30m road** | | | | | | | **79410009** |
| | **Total Cost for Civil Works per Km having width 30m road (INR Cr)** | | | | | | | **7.94** |

# 10 Assumptions (Rate & Specs) for Water Supply, Sewerage, and Recycled Water

**WATER SUPPLY SYSTEM**

| Sr. No | DSR-2013 Item Ref. no | Description of Item | Unit | Rate (Rs.) |
|---|---|---|---|---|
| 1 | 2.10 | Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth upto 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : | | |
| 1.1 | 2.10.1 | All kinds of soil | | |
| 1.1.1 | 2.10.1.2 | Pipes, cables etc. exceeding 80 mm dia. but not exceeding 300 mm dia | metre | 192.75 |
| 1.1.2 | 2.10.1.3 | Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm dia | metre | 300.90 |
| 1.1.3 | NS | Pipes, cables etc. exceeding 600 mm dia | metre | 641.00 |
| 2 | 2.11 | Extra for excavating trenches for pipes, cables etc. in all kinds of soil for depth exceeding 1.5 m, but not exceeding 3 m. | | |
| 2.1 | | Pipes, cables etc. exceeding 80 mm dia. but not exceeding 300 mm dia | metre | 452.96 |
| 2.2 | | Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm dia | metre | 707.12 |
| 2.3 | | Pipes, cables etc. exceeding 600 mm dia | metre | 1,506.35 |
| 3 | 18.72 | Providing and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS : 8329 : | | |
| 3.1 | 18.72.17 | 200 mm dia Ductile Iron Class K-9 pipes | Rmt | 1,968.80 |
| 3.2 | 18.72.18 | 250 mm dia Ductile Iron Class K-9 pipes | Rmt | 2,741.60 |
| 3.3 | 18.72.19 | 300 mm dia Ductile Iron Class K-9 pipes | Rmt | 3,410.05 |
| 3.4 | 18.72.20 | 350 mm dia Ductile Iron Class K-9 pipes | Rmt | 4,194.10 |
| 3.5 | 18.72.21 | 400 mm dia Ductile Iron Class K-9 pipes | Rmt | 5,369.30 |
| 3.6 | 18.72.22 | 450 mm dia Ductile Iron Class K-9 pipes | Rmt | 6,207.95 |
| 3.7 | 18.72.23 | 500 mm dia Ductile Iron Class K-9 pipes | Rmt | 7,833.85 |
| 3.8 | 18.72.24 | 600 mm dia Ductile Iron Class K-9 pipes | Rmt | 9,465.65 |
| 3.9 | 18.72.25 | 700 mm dia Ductile Iron Class K-9 pipes | Rmt | 13,077.20 |
| 3.10 | 18.72.27 | 800 mm dia Ductile Iron Class K-9 pipes | Rmt | 14,360.50 |
| 3.11 | 18.72.28 | 900 mm dia Ductile Iron Class K-9 pipes | Rmt | 17,331.70 |
| 3.12 | 18.72.29 | 1000 mm dia Ductile Iron Class K-9 pipes | Rmt | 19,495.70 |
| 4 | 18.70 | Providing push-on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and the cost of rubber gasket : | | |
| 4.1 | 18.70.3 | 200 mm dia pipes | Joint | 139.30 |

| Sr. No | DSR-2013 Item Ref. no | Description of Item | Unit | Rate (Rs.) |
|---|---|---|---|---|
| 4.2 | 18.70.4 | 250 mm dia pipes | Joint | 168.90 |
| 4.3 | 18.70.5 | 300 mm dia pipes | Joint | 227.50 |
| 4.4 | 18.70.6 | 350 mm dia pipes | Joint | 247.25 |
| 4.5 | 18.70.7 | 400 mm dia pipes | Joint | 404.00 |
| 4.6 | 18.70.8 | 450 mm dia pipes | Joint | 466.15 |
| 4.7 | 18.70.9 | 500 mm dia pipes | Joint | 503.00 |
| 4.8 | 18.70.10 | 600 mm dia pipes | Joint | 644.90 |
| 4.9 | 18.70.12 | 700 mm dia pipes | Joint | 1,042.55 |
| 4.10 | 18.70.13 | 800 mm dia pipes | Joint | 1,148.90 |
| 4.11 | 18.70.14 | 900 mm dia pipes | Joint | 1,474.65 |
| 4.12 | 18.70.15 | 1000 mm dia pipes | Joint | 1,738.25 |
| 5 | 18.68 | Providing and laying D.I. specials of class K-12 suitable for push-on jointing as per IS : 9523 : | | |
| 5.1 | 18.68.1 | Upto 600mm dia | quintal | 15,341.85 |
| 5.2 | 18.68.2 | Above 600 mm dia | quintal | 21,149.40 |
| 6 | 18.59 | Providing and fixing C.I. double acting air valve of approved quality with bolts, nuts, rubber insertions etc. complete (The tail pieces, tapers etc if required will be paid separately) : | | |
| 6.1 | 18.59.1 | 50mm dia | each | 4,773.30 |
| 6.2 | 18.59.2 | 80mm dia | each | 6,167.10 |
| 6.3 | 18.59.3 | 100mm dia | each | 8,103.20 |
| 7 | 18.31 | Providing and fixing C.I. sluice valves (with cap) complete with bolts, nuts, rubber insertions etc. (the tail pieces if required will be paid separately) : | | |
| 7.1 | 18.31.4 | 200 mm diameter | | |
| 7.1.1 | 18.31.4.2 | Class II | each | 11,529.00 |
| 7.2 | 18.31.5 | 250 mm diameter | | |
| 7.2.1 | 18.31.5.2 | Class II | each | 18,448.20 |
| 7.3 | 18.31.6 | 300 mm diameter | | |
| 7.3.1 | 18.31.6.2 | Class II | each | 22,935.50 |
| 7.4 | NS | 350 mm diameter PN-10 | each | 105,694.00 |
| 7.5 | NS | 400 mm diameter PN-10 | each | 144,237.00 |
| 7.6 | NS | 450 mm diameter PN-10 | each | 206,374.00 |
| 7.7 | NS | 500 mm diameter PN-10 | each | 245,969.00 |
| 7.8 | NS | 600 mm diameter PN-10 | each | 327,378.00 |
| 7.9 | | 700 mm diameter PN-10 | each | 381,941.00 |

| Sr. No | DSR-2013 Item Ref. no | Description of Item | Unit | Rate (Rs.) |
|---|---|---|---|---|
| 7.10 | | 800 mm diameter PN-10 | each | 436,503.00 |
| 7.11 | | 900 mm diameter PN-10 | each | 491,068.00 |
| 7.12 | | 1000 mm diameter PN-10 | each | 545,630.00 |
| 8 | 18.34 | Constructing masonry Chamber 90x90x100 cm inside, in brick work in cement mortar 1:4 (1 cement : 4 coarse sand) for sluice valve, with C.I. surface box 100 mm top diameter, 160 mm bottom diameter and 180 mm deep (inside) with chained lid and RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size ), i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size ) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12 mm thick, finished with a floating coat of neat cement complete as per standard design : | | |
| 8.1 | 18.34.1 | With common burnt clay F.P.S.(non modular) bricks of class designation 7.5 | Each | 11,128.55 |
| 9 | 18.35 | Constructing masonry Chamber 120x120x100 cm inside, in brick work in cement mortar 1:4 (1 cement : 4 coarse sand) for sluice valve, with C.I. surface box 100 mm top diameter, 160 mm bottom diameter and 180 mm deep ( inside) with chained lid and RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) , i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12 mm thick, finished with a floating coat of neat cement complete as per standard design : | | |
| 9.1 | 18.35.1 | With common burnt clay F.P.S.(non modular) bricks of class designation 7.5 | Each | 15,305.40 |

**SEWERAGE SYSTEM**

| Sr. No | DSR Ref No | Description | Unit | Rate (INR) |
|---|---|---|---|---|
| 1 | NS | Earth Work in Excavation including backfilling | | |
| 1.1 | | Upto 1.5m depth | Cum | 120 |
| 1.2 | | Beyond 1.5m upto 3.0m depth | Cum | 160 |
| 1.3 | | Beyond 3.0m upto 4.5m depth | Cum | 200 |
| 1.4 | | Beyond 4.5m upto 6.0m depth | Cum | 240 |
| 1.5 | | Beyond 6.0m upto 7.5m depth | Cum | 280 |
| 2 | NS | Proviidng and laying R.C.C NP-3 Pipe of following dia | | |
| 2.1 | | 200mm dia | Rmt | 679 |
| 2.2 | | 250mm dia | Rmt | 870 |
| 2.3 | | 300mm dia | Rmt | 1222 |
| 2.4 | | 350mm dia | Rmt | 1316 |

| | | | | |
|---|---|---|---|---|
| 2.5 | | 400mm dia | Rmt | 1766 |
| 2.6 | | 450mm dia | Rmt | 2000 |
| 2.7 | | 500mm dia | Rmt | 2224 |
| 2.8 | | 600mm dia | Rmt | 2718 |
| 2.9 | | 700mm dia | Rmt | 3205 |
| 2.10 | | 800mm dia | Rmt | 3997 |
| 2.11 | | 900mm dia | Rmt | 4988 |
| 2.12 | | 1000mm dia | Rmt | 5820 |
| 2.13 | | 1100mm dia | Rmt | 7058 |
| 2.14 | | 1200mm dia | Rmt | 8521 |
| 2.15 | | 1600mm dia | Rmt | 16478 |
| 3 | NS | Providing and constructing brick masonry manhole | | |
| 3.1 | | 0.9m dia and 0.91m depth | Each | 11324 |
| 3.1.1 | | Extra Depth beyond 0.91m upto 1.6m depth | Rmt | 5037 |
| 3.2 | | 1.22m dia and 1.6m depth | Each | 21911 |
| 3.2.1 | | Extra Depth beyond 1.6m upto 2.3m depth | Rmt | 5682 |
| 3.3 | | 1.52m dia and 2.3m depth | Each | 42414 |
| 3.3.1 | | Extra Depth beyond 2.3m | Rmt | 15830 |
| 4 | | Providing and laying PCC as pipe bedding/encasing, excluding shuttering | | |
| 4.1 | 4.1.6 | 1:3:6 grade concrete | Cum | 4000 |
| 4.2 | 4.1.4 | 1:2:4 grade concrete | Cum | 4500 |
| 5 | 5.9 | Providing and laying Shuttering | Sqm | 250 |
| 6 | 19.16 | Providing and fixing PVC coated foot rest | Each | 350 |
| 7 | NS | Providing and fixing RCC vent shaft | Each | 30000 |

**RECYCLED WATER**

| Sr. No | DSR-2013 Item Ref. no | Description of Item | Unit | Rate (Rs.) |
|---|---|---|---|---|
| 1 | 2.10 | Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth upto 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : | | |
| 1.1 | 2.10.1 | All kinds of soil | | |
| 1.1.1 | 2.10.1.2 | Pipes, cables etc. exceeding 80 mm dia. but not exceeding 300 mm dia | metre | 192.75 |
| 1.1.2 | 2.10.1.3 | Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm dia | metre | 300.90 |
| 1.1.3 | NS | Pipes, cables etc. exceeding 600 mm dia | metre | 641.00 |
| 2 | 2.11 | Extra for excavating trenches for pipes, cables etc. in all kinds of soil for depth exceeding 1.5 m, but not exceeding 3 m. | | |
| 2.1 | | Pipes, cables etc. exceeding 80 mm dia. but not exceeding 300 mm dia | metre | 452.96 |
| 2.2 | | Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm dia | metre | 707.12 |
| 2.3 | | Pipes, cables etc. exceeding 600 mm dia | metre | 1,506.35 |
| 3 | 18.72 | Providing and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS : 8329 : | | |
| 3.1 | 18.72.17 | 200 mm dia Ductile Iron Class K-9 pipes | Rmt | 1,968.80 |
| 3.2 | 18.72.18 | 250 mm dia Ductile Iron Class K-9 pipes | Rmt | 2,741.60 |
| 3.3 | 18.72.19 | 300 mm dia Ductile Iron Class K-9 pipes | Rmt | 3,410.05 |
| 3.4 | 18.72.20 | 350 mm dia Ductile Iron Class K-9 pipes | Rmt | 4,194.10 |
| 3.5 | 18.72.21 | 400 mm dia Ductile Iron Class K-9 pipes | Rmt | 5,369.30 |
| 3.6 | 18.72.22 | 450 mm dia Ductile Iron Class K-9 pipes | Rmt | 6,207.95 |
| 3.7 | 18.72.23 | 500 mm dia Ductile Iron Class K-9 pipes | Rmt | 7,833.85 |
| 3.8 | 18.72.24 | 600 mm dia Ductile Iron Class K-9 pipes | Rmt | 9,465.65 |
| 3.9 | 18.72.25 | 700 mm dia Ductile Iron Class K-9 pipes | Rmt | 13,077.20 |
| 3.10 | 18.72.27 | 800 mm dia Ductile Iron Class K-9 pipes | Rmt | 14,360.50 |
| 3.11 | 18.72.28 | 900 mm dia Ductile Iron Class K-9 pipes | Rmt | 17,331.70 |
| 3.12 | 18.72.29 | 1000 mm dia Ductile Iron Class K-9 pipes | Rmt | 19,495.70 |
| 4 | 18.70 | Providing push-on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and the cost of rubber gasket : | | |

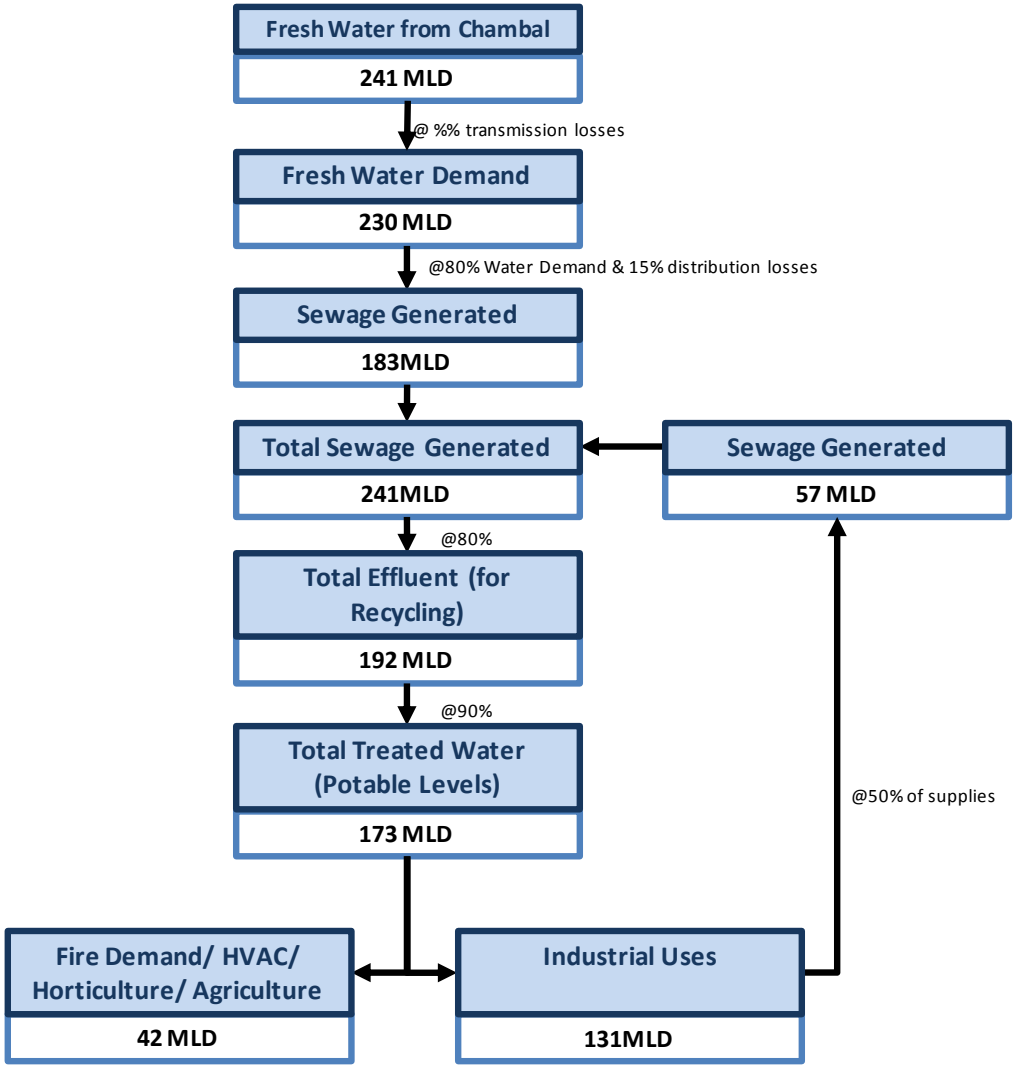
| Sr. No | DSR-2013 Item Ref. no | Description of Item | Unit | Rate (Rs.) |
|---|---|---|---|---|
| 4.1 | 18.70.3 | 200 mm dia pipes | Joint | 139.30 |
| 4.2 | 18.70.4 | 250 mm dia pipes | Joint | 168.90 |
| 4.3 | 18.70.5 | 300 mm dia pipes | Joint | 227.50 |
| 4.4 | 18.70.6 | 350 mm dia pipes | Joint | 247.25 |
| 4.5 | 18.70.7 | 400 mm dia pipes | Joint | 404.00 |
| 4.6 | 18.70.8 | 450 mm dia pipes | Joint | 466.15 |
| 4.7 | 18.70.9 | 500 mm dia pipes | Joint | 503.00 |
| 4.8 | 18.70.10 | 600 mm dia pipes | Joint | 644.90 |
| 4.9 | 18.70.12 | 700 mm dia pipes | Joint | 1,042.55 |
| 4.10 | 18.70.13 | 800 mm dia pipes | Joint | 1,148.90 |
| 4.11 | 18.70.14 | 900 mm dia pipes | Joint | 1,474.65 |
| 4.12 | 18.70.15 | 1000 mm dia pipes | Joint | 1,738.25 |
| 5 | 18.68 | Providing and laying D.I. specials of class K-12 suitable for push-on jointing as per IS : 9523 : | | |
| 5.1 | 18.68.1 | Upto 600mm dia | quintal | 15,341.85 |
| 5.2 | 18.68.2 | Above 600 mm dia | quintal | 21,149.40 |
| 6 | 18.59 | Providing and fixing C.I. double acting air valve of approved quality with bolts, nuts, rubber insertions etc. complete (The tail pieces, tapers etc if required will be paid separately) : | | |
| 6.1 | 18.59.1 | 50mm dia | each | 4,773.30 |
| 6.2 | 18.59.2 | 80mm dia | each | 6,167.10 |
| 6.3 | 18.59.3 | 100mm dia | each | 8,103.20 |
| 7 | 18.31 | Providing and fixing C.I. sluice valves (with cap) complete with bolts, nuts, rubber insertions etc. (the tail pieces if required will be paid separately) : | | |
| 7.1 | 18.31.4 | 200 mm diameter | | |
| 7.1.1 | 18.31.4.2 | Class II | each | 11,529.00 |
| 7.2 | 18.31.5 | 250 mm diameter | | |
| 7.2.1 | 18.31.5.2 | Class II | each | 18,448.20 |
| 7.3 | 18.31.6 | 300 mm diameter | | |
| 7.3.1 | 18.31.6.2 | Class II | each | 22,935.50 |
| 7.4 | NS | 350 mm diameter PN-10 | each | 105,694.00 |
| 7.5 | NS | 400 mm diameter PN-10 | each | 144,237.00 |
| 7.6 | NS | 450 mm diameter PN-10 | each | 206,374.00 |

| Sr. No | DSR-2013 Item Ref. no | Description of Item | Unit | Rate (Rs.) |
|---|---|---|---|---|
| 7.7 | NS | 500 mm diameter PN-10 | each | 245,969.00 |
| 7.8 | NS | 600 mm diameter PN-10 | each | 327,378.00 |
| 7.9 | NS | 700 mm diameter PN-10 | each | 381,941.00 |
| 7.10 | NS | 800 mm diameter PN-10 | each | 436,503.00 |
| 7.11 | NS | 900 mm diameter PN-10 | each | 491,068.00 |
| 7.12 | NS | 1000 mm diameter PN-10 | each | 545,630.00 |
| 8 | 18.34 | Constructing masonry Chamber 90x90x100 cm inside, in brick work in cement mortar 1:4 (1 cement : 4 coarse sand) for sluice valve, with C.I. surface box 100 mm top diameter, 160 mm bottom diameter and 180 mm deep (inside) with chained lid and RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size ), i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size ) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12 mm thick, finished with a floating coat of neat cement complete as per standard design : | | |
| 8.1 | 18.34.1 | With common burnt clay F.P.S.(non modular) bricks of class designation 7.5 | Each | 11,128.55 |
| 9 | 18.35 | Constructing masonry Chamber 120x120x100 cm inside, in brick work in cement mortar 1:4 (1 cement : 4 coarse sand) for sluice valve, with C.I. surface box 100 mm top diameter, 160 mm bottom diameter and 180 mm deep ( inside) with chained lid and RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) , i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12 mm thick, finished with a floating coat of neat cement complete as per standard design : | | |
| 9.1 | 18.35.1 | With common burnt clay F.P.S.(non modular) bricks of class designation 7.5 | Each | 15,305.40 |

**DRAINAGE**

| Sr. No | Description | Unit | Rate (Rs.) |
|---|---|---|---|
| 1 | Earth Work in excavation for drain including backfilling of the same with excavated earth and disposal of excess earth as directed complete for all kinds of soil including hard moorum | | |
| 1.1 | Upto 1.5 m depth | Cum | 120 |
| 1.2 | Beyond 1.5m depth upto 3.0m depth | Cum | 160 |
| 1.3 | Beyond 3.0m depth upto 4.5m depth | Cum | 210 |
| 2 | Providing and laying of P.C.C with 1:3:6 grade concrete, excluding neccesory shuttering | Cum | 4000 |
| 3 | Providing and laying of R.C.C with M-25 grade of concrete, Excluding the cost of shuttering and reinforcement. | Cum | 6500 |
| 4 | Providing, cutting, bending and binding of reinforcement steel | MT | 60000 |
| 5 | Providing neccesory shuttering for all works | Sqm | 250 |
| 6 | Providing & Fixing of SFRC Cover of HD-20 | Each | 1390 |
| 7 | Preoviding and fixing of PVC coated footrest | Each | 256 |
| 8 | Construction of Brick masonry drain | L/s | |

# 11 Water Balance Diagram for KBNIR





VAN NELLE ONTWERPFABRIEK
SCHIEGEBOUW
VAN NELLEWEG 6060
3044 BC ROTTERDAM THE NETHERLANDS
P.O. BOX 13060
3004 HB ROTTERDAM THE NETHERLANDS
P +31 (0)10 433 00 99
F +31 (0)10 404 56 69
E-MAIL: KUIPER@KUIPER.NL
WWW.KUIPER.NL

**KuiperCompagnons**

Ruimtelijke Ordening, Stedenbouw, Architectuur, Landschap

City & Regional Planning, Urban Design, Architecture, Landscape