DRAFT COMPREHENSIVE DEVELOPMENT PLAN-2031

Puri Konark Development Authority (PKDA) Area

January 2013



Volume II-B

Submitted to:
Puri Konark Development Authority (PKDA)

Submitted by:
Centre for Environmental Planning and Technology (CEPT)
K. L. Campus, Navrangpura, Ahmedabad

In association with:
Orissa Remote Sensing Application Centre (ORSAC)
Govt. Of Orissa, Bhubaneshwar

Volume – I

- PKDA Area Overview
- Sector Wise Situation Analysis
- Demand Assessment
- Summary of issues

Volume – II

- Proposed Land use
- Infrastructure Proposals
- Tourism Proposals & Special Projects
- Institutional Framework
- Cost Estimation
- Implementation Mechanism

ACKNOWLEDGEMENTS

We sincerely acknowledge the valuable inputs and support rendered by the following individuals during the course of this exercise:

Sri. Naveen Patnaik, Hon'ble Chief Minister, Orissa
Sri Sarada Prasad Nayak, Minister of Housing & Urban Development, Orissa
Sri. Gajapati Maharaja Dibyasingha Deb, Chairman, Sri Jagannath Temple Managing Committee, Puri
Mr. Maheshwar Mahanty, MLA, Puri
Dr. Saurabh Garg (IAS), Commissioner cum Principal Secretary, H & UD Department, Govt. of Orissa
Dr. P. K. Mohanty(IAS), Joint Secretary, JnNURM, Govt. of India
Mr. Arvind Agrawal (IAS), Collector, Puri and Vice Chairman, Puri Konark Development Authority
Mr. Sanjib Mishra, Joint Secretary, H & UD Department, Govt. of Orissa
Ms. Santilata Pradhan, Chairperson, Puri Municipality
Mr. Prasanta Kumar Patnaik, Director, Directorate of Town Planning, Orissa Bhubaneswar
Mr. J. B. Kshirsagar, Chief Town Planner, Town & Country Planning Office, New Delhi
Dr. U.C. Majhi, Sub collector, Revenue Department, Puri
Mr. Ram Mohan Mishra, Secretary, Puri Konark Development Authority
Mr. P C Gochikar, Tech, Asst., Puri Konark Development Authority
Mr. P.K. Senapati, Additional district magistrate, collectorate
Mr. P.K. Mohapatra, Project engineer, project management unit, Puri,OWSSB
Mr. A. K. Mohapatra, IFS, Chief Executive, Orissa Remote Sensing Application Centre (ORSAC), Bhubaneswar
Dr. Debajit Mishra, Sr. Scientist, Orissa Remote Sensing Application Centre, Bhubaneswar
Mr. D.K.Raut, Scientist, Orissa Remote Sensing Application Centre, Bhubaneswar
Mr. Sitanath Rath, Ex. Executive officer, Puri Municipality, Puri
Mr. Rajat Mishra, Municipal Engineer, Puri Municipality, puri
Mr. Bindeshwar Patra, Temple Administration Trust, puri
Mr. Lalbahadur Sahoo, Chairman, Konark NAC
Mr. S.N. Pratihari, Executive officer, Konark NAC
Mr. B.K. Jena, Tourist officer, PKDA
Mr. Bhagaban Sahu, Executive Engineer, PHD and engineer member PKDA, Puri
Mr. Bharatchandra Dadi, Executive Engineer, RWSSB, Puri
Mr. Manojkumar Das, Executive Engineer, Irrigatioin Div., Puri
Mr. B. Sahoo, Directorate of Census, Bhubaneswar
Dr. C. B. Patel, Superintendent, State archeology department, Bhubaneswar

TABLE OF CONTENTS

6. Physical infrastructure Proposals 182

6.1 Background 182

6.1.1 Vision 183

6.1.2 Objectives for infrastructure development in PKDA region 184

6.2 Mobility Plan 184

6.2.1 Inter-Regional Connectivity- PKDA with its Hinterland 185

6.2.2 Intra Region Connectivity 187

6.2.3 Mobility Plan Proposal 188

6.3 Water Supply 210

6.3.1 Water Demand Assessment 210

6.3.2 Proposed Interventions 211

6.3.3 Cost Estimates 215

6.4 Waste Water Management 217

6.4.1 Sewage Generation 217

6.4.2 Strategies for Sewage Management 218

6.4.3 Cost Estimates 226

6.5 Access to Toilets 227

6.5.1 Sanitation Hot Spots 227

6.5.2 Proposed Toilet Layout 231

6.5.3 Feasible Location for toilets 235

6.5.4 Policy Interventions 244

6.5.5 Financial Mechanisms 245

6.5.6 Awareness Programs 245

6.5.7 Cost Estimates 247

6.6 Storm Water Management 248

6.6.1 Drainage Proposals for Puri and Konark under JnNURM 248

6.6.2 Strategies for Storm Water Management 249

6.6.3 Cost Estimates 253

6.7 Solid Waste Management 254

6.7.1 Solid waste generation- Demand Assessment 254

6.7.2 Proposed Solid Waste Management Interventions 256
6.7.3 Cost Estimates of MSWM 276
6.7.4 Bio-Medical Waste Management 280
6.7.5 Plastic Waste Management 280
6.8 Power Supply 283
6.8.1 Street Lighting 284
6.9 Summary of Cost Estimates of Physical Infrastructure 285

7. Social Infrastructure 287
7.1 Background 287
7.2 Proposed Educational Infrastructure 287
7.2.1 Suggested Policies and Strategies for Education 289
7.3 Proposed Health Infrastructure 290
7.3.1 Suggested Policies and Strategies for Health Facilities 291
7.4 Spatial Allocation of Proposed Community Facilities 292
7.5 Mobile Health and Education Facilities for Rural PKDA 294
7.6 Housing Strategies for PKDA-2031 296
7.7 Vision for Housing Development 296
7.8 Housing Objectives 296
7.9 Housing Demand Assessment, PKDA-2031 297
7.10 Housing development in Greenfield Sites 298
7.10.1 Case Studies for Planning Strategy 298
7.10.2 Strategies Adopted for Greenfield Development in PKDA Region 300
7.10.3 Redevelopment strategies of Slums and Old Housing Stock 307
7.10.4 Slum Development Policy proposed for PKDA Region/Area 311
7.10.5 Proposed Housing/Rental Policy for PKDA Region (Ensuring Interests for EWS & LIG Category) 316
7.10.6 FDI in Townships as a Model for Housing Development in PKDA 317
7.10.7 Development Concept of SRZ and SRC for PKDA 317
7.11 Cost Outlay for Social Infrastructure Development in PKDA Region 318

8. Heritage Conservation & Tourism Development Plan 321
8.1 Opportunities of Tourism in PKDA 321
8.2 Issues and Concerns in heritage Management and Promotion of Tourism 322
8.3 Proposed Heritage Conservation Zones 324
8.4 Proposed Tourism Management Plan 326
8.5 Proposed Tourism Interventions 328
8.5.1 Shamukha 328
8.5.2 Special Tourism Zone: Ramchandi (Block A) 329
8.5.3 Chandrabhaga Beach Front 331
8.5.4 Special Tourism Zone: Konark 332
8.5.5 Nuanai Riverfront 337
8.5.6 Proposed Development of Eco-village in Konark NAC Area 339
8.5.7 Proposal for Sea link (Ferry Service) and Trails & Treks in PKDA region 342
8.6 Identified Special Projects for Promotion of Heritage & Tourism 344
8.6.1 Heritage Walk 344
8.6.2 Parikrama Marg 352
8.6.3 Atharnala Revitalisation 358
8.6.4 Grand Road Revitalization 362
8.6.5 Marine Drive Improvement 379
8.6.6 Proposal for Development of Tourism Village at Beleswar Temple area: 384
8.6.7 UD Guidelines and Street Furniture (Signage's, Bollards, Lights etc) 392
8.7 Cost Estimates 399
8.7.1 Heritage Walk 399
8.7.2 Parikrama Marg 400
8.7.3 Atharnala Revitalisation 401
8.7.4 Grand road & Marine drive revitalisation 402
8.7.5 Signage Development 403
8.7.6 Total Cost Outlay 405

9. Environment and Disaster Management 407
9.1 Introduction 407
9.2 Environmental Issues with Disaster Linkages in PKDA region 407

9.3 Disaster Management Plan for PKDA 409
9.3.1 Disaster Management Plan: Components 409
9.3.2 Planning for Disaster Preparedness and Mitigation 410
9.3.3 Policy level instruments & Institutional linkage suggested for Disaster Management in PKDA region 414
9.4 Linking DMP PKDA to National Programs 418
9.4.1 Eco City 418
9.4.2 Urban Disaster Risk Reduction 419
9.4.3 National Mission for Sustainable Habitat 420

10. Institutional Set Up 423
10.1 Existing Institutional Mechanism – PKDA Region 423
10.1.1 Institutional Overlaps in Service Delivery: PKDA 426
10.1.2 Existing Organization Structure and Staffing Pattern in PKDA 427
10.1.3 Organogram Mapping for two ULB's in the Region: Puri Municipality & Konark NAC 428
10.1.4 Temple Administration Organization Structure 429
10.1.5 Key Issues Observed from Existing Institutional Set up 430
10.2 Analysing Possible Options for Strengthening Institutional Structure and Linkages 430
10.2.1 Objectives 430
10.2.2 Need for strengthening of Organization Structure, Departmentalization & Staffing for PKDA Based on 12th FY Capacity Development Report 430
10.2.3 Possible Options for Changes in Status and Structure in the ULB's of PKDA Region: Puri Municipality & Konark NAC 433
10.2.4 Possible Model for Interlinkage between Institutions for Implementation of CDP & Other Development Proposals: PKDA Communication Plan 437
10.3 Institutional Capacity Building 438
10.3.1 Need for Capacity Building 439
10.3.2 Handholding Support for CDP Implementation and Sequencing of the Activities 440
10.3.3 Pre Training Consultation for Nomination of Participants 441
10.3.4 Selection of Target Groups 441
10.3.5 Strategy Framework for Capacity Building 442
10.3.6 Preparation of Training Calendar 442
10.3.7 Capacity Enhancement Action Plan 443

11. Implementation Mechanism 445
11.1 Phasing and Implementation of CDP PKDA 446
11.1.1 Phase I – Short Term (2012-2021) 447
11.1.2 Phase II – Medium Term (2022-2027) 453
11.1.3 Phase III – Long Term (2028-2031) 454
11.1.4 Project Prioritization 456
11.1.5 Project Prioritization for Puri 457
11.1.6 Funding Mechanisms: PPP Options / Infrastructure and Special Project Finance 461
11.1.7 Implementation mechanism of proposed projects in CDP PKDA 462
11.1.8 Innovative Project Financing Mechanism 466

Annex-1: The implementation History of Ahmedabad 469

LIST OF TABLES

Table 31: Distance between Puri Konark to the other important places in the region 186
Table 32: Existing road lengths in PKDA 187
Table 33: Proposed Road lengths in PKDA 190
Table 34: Block cost estimates for the proposed New Road 191
Table 35: Block Cost Estimates for Up-gradation of Existing Road Width 191
Table 36: Block cost Estimate of BRTS Road 197
Table 37: Components of Proposed Shuttle service 198
Table 38: Initial Indicative Cost Estimates for Bus Shuttle Services 199
Table 39: Features of proposed solar ferry system 200
Table 40: Initial Indicative Cost Estimates for Ferry Services 201
Table 41: Proposed activity in the Bus terminal 204
Table 42: Cost estimates for proposed Bus terminus 205
Table 43: Proposed Parking areas in PKDA region 206
Table 44: Cost estimates for parking facilities 208
Table 45: Summary of Block Cost Estimation of Proposed Mobility Plan 209
Table 46: Water Demand estimation for PKDA-2031 210
Table 47: Key Water Supply Demand Supply Gap in CDP Area 211
Table 48: Components of NRW 213
Table 49: Projects under PURA 215
Table 50: Estimated Capital Cost for Water Supply for Proposed Area of CDP 216
Table 51: Sewerage- Demand Supply Gap in CDP Area 217
Table 52: Comparative analysis of sanitation system 219
Table 53: Reuse of Treated Sewage 220
Table 54: Case study for DEWATS development planning 224
Table 55: Sample Description for DEWATS planning 225
Table 56: Estimated Capital Cost for Collection, Conveyance & Treatment of Sewage in Proposed CDP Area 226
Table 57: Monthly tourist influx 229

Table 58: Tourist public toilet requirement calculation 230
Table 59: Estimated Capital Cost for Toilets Facilities in Proposed Area of CDP Area 247
Table 60: Estimated Cost of Storm Water Drainage in PKDA CDP 253
Table 61: Proposed waste collection methods 259
Table 62: Cross Requirement of SWM Collection & Transportation Vehicles/ Equipment Requirements by 2031 261
Table 63: Requirement of Sanitary Workers (D to D Collection & Sweeping) by 2031 261
Table 64: SWM management proposal in slum areas: PKDA 265
Table 65: Area Requirements for Waste disposal and management facility 268
Table 66: Scheduling of proposed landfill system 274
Table 67: Details of Processing & Disposal Facility 274
Table 68: Estimated Block Cost of SWM Collection & Transportation Vehicles/Equipment Requirements for the year 2030 277
Table 69: Phasing of Estimated Cost for Solid Waste Management 279
Table 70: Power Supply Demand and Sub Stations requirements in the PKDA Area 283
Table 71:Illumination Criteria For Street Lighting 284
Table 72: Capital Cost for Provision of Street Lights in Existing and Proposed Areas 284
Table 73: Summary of cost estimates for physical infrastructure development PKDA 285
Table 74: Demand VS Gap in Education Facilities in PKDA-2011 288
Table 75: Proposed Educational infrastructure for PKDA-2021 288
Table 76: Proposed Educational infrastructure for PKDA-2031 288
Table 77: Demand VS Gap in Health Facilities in PKDA-2011 290
Table 78: Proposed Health infrastructure for PKDA-2021 290
Table 79: Proposed Health infrastructure for PKDA-2031 290
Table 80: Housing Demand assessment for PKDA-2031 297
Table 81: Cost sharing structure for SNP project 309
Table 82: Cost estimates for social infrastructure development in PKDA-2031 318
Table 83: Summary of Block Cost estimation of Social Facilities 319
Table 84: Road details along Parikrama Marg 354
Table 85: Selected monuments, roads and locations for street furniture 393
Table 86: Total cost outlay for heritage conservation and tourism development 405

Table 87: Possible Disaster Management Policy & Institutional Mechanism 415
Table 88: Existing Roles & Responsibilities performed by Various Institutions in PKDA Region 423
Table 89: Overlapping responsibilities in service delivery within PKDA region 426
Table 90: Staffing Inventory for PKDA 427
Table 91: Possible Staffing Pattern for PKDA 432
Table 92: Suggested Staffing Pattern for Puri Municipal Corporation 435
Table 93: Sequence of capacity building exercise 440
Table 94: Target Groups for Capacity Building 441
Table 95: Phasing Development of PKDA Area till 2031 455
Table 96: Shortlisted Projects of Project Prioritization for Puri 458
Table 97: Summary of cost estimates for CDP PKDA 468

LIST OF MAPS

Map 42: PKDA connectivity with Hinterland 185
Map 43: Proposed regional mobility Plan 189
Map 44: Proposed New and Road widening in PKDA 192
Map 45: Road Phasing 193
Map 46: Proposed BRTS plan 195
Map 47: Case example of DEWATS development in PKDA 225
Map 48: Critical areas with respect to sanitation in Puri town 228
Map 49- Identified location for proposed toilets 243
Map 50- Waste streams of Puri 257
Map 51: Suggested Solid waste Management Sites 270
Map 52: Location of Puri Sadar SWM Site 271
Map 53: Solid waste management Site for Konark 272
Map 54: Spatial Allocation of Community Facilities in the Proposed Land use Plan, PKDA- 2031 293
Map 55: Alignment of Mobile health and Education Infrastructure for PKDA- 2031 295
Map 56: Proposed Housing Plan, PKDA- 2031 301
Map 57: Proposes land use for plotted development 304
Map 58: Tourism Opportunities in PKDA 321
Map 59: Roadblocks to Tourism Development PKDA 323
Map 60: Proposed Heritage conservation zones in PKDA 325
Map 61: Proposed special tourism zone in PKDA 327
Map 62: Site Plan Proposed for development of Konark area (OTDC & IOC) 333
Map 63: Suggested sites for Eco village development 340
Map 64: Proposed ferry route and trails through forest in PKDA region 343
Map 65: Heritage Route, Zone-1 345
Map 66: Heritage Route, Zone-2 346
Map 67: Heritage Brochure: Option-1 349
Map 68: Heritage Brochure: Option-2 350

Map 69: Route landmarks and religious points on Parikrama route 353
Map 70 Heritage Path for tourists 355
Map 71: Proposed Spiritual trail 356
Map 72: Design elements of Atharnala proposal 359
Map 73: Location of Beleshwar Temple in PKDA region 384
Map 74: Proposed Plan for development of tourism village in Beleswar temple area 386
Map 75: Identified location for signage's 392
Map 76: Multi-Hazard Map of the Study Region 408
Map 77: Cyclone Shelter Map (Existing & Proposed) 413
Map 79: Proposed Location of Watch Towers with the Forest within PKDA Region 414

LIST OF FIGURES

Figure 21- Vrindavan garden development and multi storey parking proposal 207
Figure 22: Conceptual framework for DEWATS 222
Figure 23 System design for DEWATS 223
Figure 24- Existing condition of Storm water drains 248
Figure 25- Status of MSW rules 2000 compliance in Urban areas of PKDA 255
Figure 26- Location of the existing compost plant in Puri 256
Figure 27-Proposed waste collection from narrow lanes 260
Figure 28- Proposed waste transfers 260
Figure 29: Construction waste management 262
Figure 30- Regional Landfill concept 267
Figure 31- Treatment and End disposal system of solid waste in PKDA 268
Figure 32: Landfill schematic design 273
Figure 33- Stabilization of existing dumps 276
Figure 34: Inclusive Township design: Udayan, Kolkata 299
Figure 35: Existing and proposed residential composition: PKDA 300
Figure 36: Design for plotted development units 305
Figure 37: Aranya Housing Project Concept 307
Figure 38: Elements of cluster design for affordable housing 308
Figure 39: Unit, cluster and neighborhood design strategy for Pentakota slum redevelopment 315
Figure 40: Summery of Issues in heritage conservation and tourism 322
Figure 41: Components of tourism development in Shamuka area 328
Figure 42: Activities in the Chandrabhaga area 332
Figure 43: Design elements in Proposed Visitors Place 334
Figure 44: Design options proposed for Drop out point 335
Figure 45: Elevation of Interpretation centre proposed in the plan 336
Figure 46: Design elements of sit out spaces in the plan 336
Figure 47: Rest room elevations 336

Figure 48: Existing set up at Nuanai Riverfront 337
Figure 49: Suggested options for usage of space 338
Figure 50- Eco village visualizations 341
Figure 51: Proposed Heritage Route 344
Figure 52: Salient features of Heritage Brochure contents 348
Figure 53: Sample view of rickshaw for heritage tour 351
Figure 54: proposed locations for Signage in heritage route 394
Figure 55: Disaster Mitigation Tools and Programs 410
Figure 56: Rescue Operations after Cyclones/ Hurricanes 411
Figure 57: Different Signage used for Emergencies 411
Figure 58: Existing Organizational set up: PKDA 427
Figure 59: Existing Organisational Structure of Konark NAC 428
Figure 60: Existing Organisational Structure of Puri Municipality 428
Figure 61: Suggested Organizational Framework for PKDA 431
Figure 62: Possible Organisation Structure for Puri Municipal Corporation 433
Figure 63: Possible Model for demarcation of role of PKDA and linkage with other agencies for various sectoral developments 437
Figure 64: Capacity building strategy for CDP-PKDA 439
Figure 65- Implementation mechanism structure 445
Figure 66: Workshop Sessions at a Glance 459
Figure 67: Summary sheet for prioritized projects 460
Figure 68: Different PPP Arrangements 465
Figure 69: Town planning schemes in Ahmedabad over years 469

ABBREVIATIONS

CEPT: Centre for Environmental Planning & Technology
PKDA: Puri Konark Development Authority
CDP: Comprehensive Development Plan
OTDC: Orissa Tourism Development Corporation
DoT: Department of Tourism
GoO: Government of Orissa
IDCO: Orissa Industrial Infrastructure Development Corporation
ORSAC: Orissa Remote Sensing Application Centre
UNESCO: United Nations Educational, Scientific and Cultural Organization
CPHEEO: Central Public Health and Environmental Engineering Organization
NBO: National Building Organisation
IRC: Indian Road Congress
CPCB: Central Pollution Control Board
CTP: Chief Town Planner
NH: National Highway
SH: State Highway
HTL: High Tide Line
RoW: Width of Road
MLD: Million liter per day
LPCD: Liter per capita per day
PCU: Passenger Car Unit
EIC: Engineer in Chief
EWS: Economical Weaker Section
C.C.: Cement Concrete
R.C.C.: Reinforcement Cement Concrete
OWSSB: Orissa Water Supply and Sewerage Board
RWSSB: Rural Water Supply and Sewerage Board
PKRIT: Puri Konark Regional Improvement Trust
PS: Police Station

ANCGR: Annual Compounded Growth Rate
CESS: Centre for Earth Science Studies
SPCBO: Central Pollution Control Board Orissa
CMZ: Coastal Management Zone
CZMP: Coastal Zone Management Plan
DCR: Development Control Rules
DP: Development Plan
ELU: Existing Land Use
Govt.: Government
Ha: Hectare
HH: Household
HP: Horse Power
Kmph: Kilometer per hour
LU Plan: Land Use Plan
NAC: Notified Area Council
NDZ: No Development Zone
NGO: Non-Governmental Organisation
RTZ: Recreation and Tourism Zone
S. No: Survey Number
SOI: Survey of India
SPA: Special Planning Authority
Sq.km: Square Kilometer
Sq.m: Square Meter
SW: Solid Waste
TCPO: Town and Country Planning Organisation
TPVD: Town Planning and Valuation Department
WB: Water Body
WFPR: Work Force Participation Rate
GP: Gram Panchayat

6. Physical Infrastructure Proposals



6. PHYSICAL INFRASTRUCTURE PROPOSALS

Infrastructure is one of the key drivers of growth of any region. For the Puri Konark region it is attempted to provide and improve infrastructure at two levels - improving the infrastructure standards in the existing development and also laying of infrastructure prior to the new developments in the region, till 2031. Since the region is made up of both rural and urban settlements, the demand calculation and the various suggested interventions are based on the ease of implementation and the aptness of the suggested technology/policy to the context.

The phasing programme for implementing the Comprehensive Development Plan has been developed considering the locations, present development pattern, direction of growth, availability of public lands, priority, nature and scale of facilities and the overall vision envisaged for the effective development of Development Plan. The programme proposes the plan implementation in three phases till 2031 years.

Phase	Year	Zone	Name of Zones
Phase I	2012-2014	Zone-1	Puri
Phase II	2015-2021	Zone-2, Zone-6	Puri Sadar, Konark
Phase III	2022-2027	Zone-3, Zone-4	Block-A, Block-A
Phase IV	2028-2031	Zone-5, Zone-7	Block-A, Block-B

6.1 Background

While planning for the infrastructure services it was observed that the major infrastructure demand as well as stress areas were those of the urban areas of Puri and Konark. On a regional scale the demand generated from the rural areas put together is very less compared to that of Puri. Hence the proposals need to be oriented and planned such as to cater to the various user groups and concentrations. A combination of centralized and decentralized systems needs to be planned to meet the varying demands. Different proposals for the end disposal of wastes have been examined. The urban areas of PKDA have high tourist influx. Amenities for the same have been provided with. The various sub components of environmental infrastructure like water supply, sewage and solid waste have been given attention to improve the life and living of the residents. The access to toilets has been given special attention to improve the sanitary conditions both for the tourists and the residents, and to strive for a better image of the city.

The various physical infrastructure sub sections that have been taken dealt with in this chapter are as described in the attached figure:

6.1.1 *Vision*

The vision for infrastructure plan is -"To provide quality, affordable and accessible infrastructure provision for residents and the tourists of PKDA, contributing to the enhancement of their quality of life"

6.1.2 *Objectives for infrastructure development in PKDA region*

The infrastructure proposal for PKDA region has been formulated to achieve the following objectives:

- To provide equal access to infrastructure facilities for residents in various parts of the region and across class.
- To develop adequate sanitation infrastructure in the region for ensuring safe living environment in the region especially urban areas.
- To ensure provision of standard and affordable infrastructure and services in the informal settlements in various part of the urban areas in the region.
- To enhance quality of life through provision of adequate social infrastructure services and facilities in the form education, health and other required components.

6.2 Mobility Plan

Transport is one of the key drivers of development. The proposed land use of PKDA incorporates the tenets of transport land use integration for the proposed areas and also for the developed areas proposes better and more integrated public transport proposals. The proposed land use clearly integrates and incorporates the hierarchies of the transport carriers and transport options from the neighborhood level to the larger region. The transport system and its components have been studied at three level and relevant proposals have been forwarded. The three hierarchal levels are those of

1. Inter regional- PKDA with its hinterland
2. Intra- regional – wherein the mobility concerns have been studied within the PKDA region
3. Neighbourhood level- The mobility needs at a neighbourhood level and the connectivity to the public transport corridor has been studied

The major thrust areas while planning for the mobility in the PKDA region has been taken from the National Urban Transport Policy as well the detailed site understanding for the existing and proposed land uses, connecting the various growth nodes identified for 2031.

The various objectives of the proposed mobility plan are those of

- Promoting and developing Public transport in the region, and create opportunities for smooth intermodal integration
- Improving and augmenting access to the various business and market zones to substantiate the economic opportunities
- Improving the quality and capacity of the transport carriers to sustain smooth and safe traffic flow
- Creating equitable and efficient allocations for road space and transit modes in the region
- Promotion and development of greener transport alternatives and reduced dependency on private motorized modes of transit

6.2.1 *Inter-Regional Connectivity- PKDA with its Hinterland*

Map 1: PKDA connectivity with Hinterland

Table 1: Distance between Puri Konark to the other important places in the region

Places	Distance (Kms) from Puri	Distance (Kms) from Konark	Major roads
Bhubaneshwar	64.6	70.7	NH 203, and SH- 60 from Konark
Cuttack	81.8	81.3	
Brahmagiri	21.4	56.6	NH 203A
Chilika lake	47.5	82.8	
Khurda	60	67.4	NH 203
Pipli	36.1	44.3	NH 203, SH 60, SH-13 from Konark
Gop	30.9	14.2	SH- 60 from Puri, SH-13 from Konark

It may be observed that the major towns are almost equidistant from Puri and Konark. Bhubneshwar and Cuttack are at a distance of 60 - 80 kms from Puri and Konark. Pipli is a beautiful village on the main road that falls between Puri and Bhubaneswar, which is known for handicraft and appliqué works. It is almost midway, the SH13 and SH60 meet at Pipli with the NH 203 from Puri and continue towards Bhubaneshwar. There are busses from Puri to Pipli and often the tourist take private vehicles for visiting the same. Gop is another town midway between Konark and Pipli, where the SH 60 from Puri joins the SH 13 from Konark. The Chilika Lake located at a distance of almost 50 Kms from Puri is one of the major points in the tourism circuit of Orissa.

The preferred mode of regional travel in is bus and intermediate public transportation systems (IPTs) which run between the various towns. The IPT's are privately owned and are often seen carrying more passengers than permitted. They also do not have a regulated fare system and the fare usually depend on the number of passengers the vehicle is carrying.

Bhubaneshwar is the nearest airport to Puri. Puri is also connected to Bhubaneshwar by the rail. However Konark needs to be reached by road from Puri.




Road between Puri and Bhubaneshwar

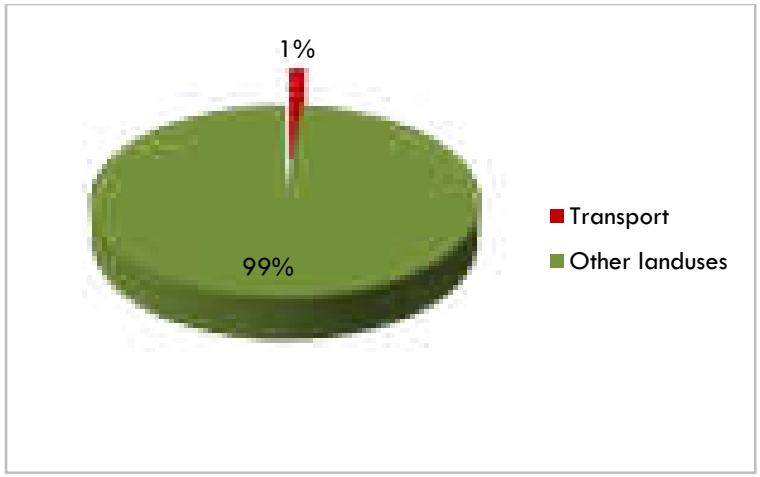
6.2.2 *Intra Region Connectivity*

After having understood the Regional connections of PKDA with its hinterland the intra-regional connectivity may be studied. The attached table indicates the lengths and other details of the existing roads in PKDA region.

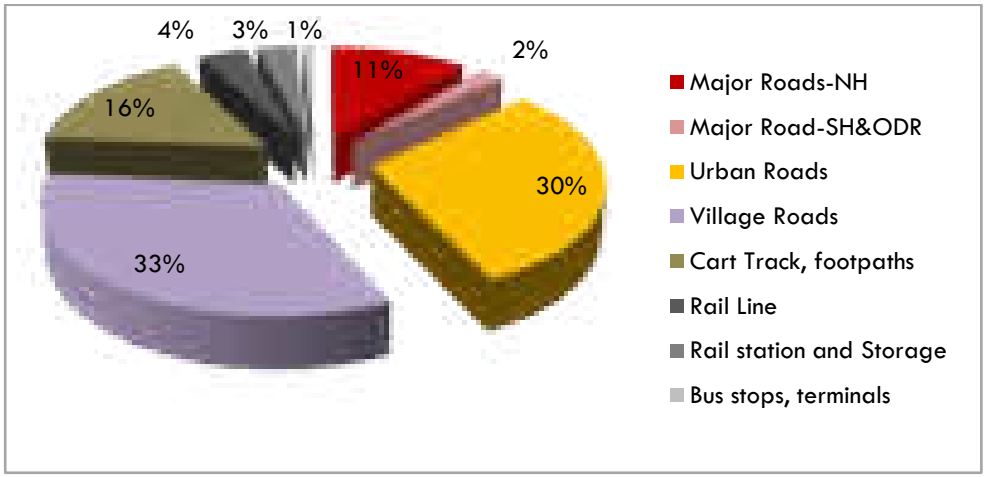
Table 2: Existing road lengths in PKDA

Road Category	Length (km)	Percentage of total road length	Area (km2)	Percentage of total road Area	Average Width (m)
National Highway	44.79	7.91	0.49	14.50	8.42
State highway and ODR	9.00	1.59	.09	2.66	7.79
Urban Roads	252.65	44.59	1.32	39.05	2.7
Village roads	260.15	45.92	1.48	43.79	5.44
Total	**566.59**		**3.38**		

PKDA has a road network of 566.59 kms of roadway, including NH, SH, ODR, urban and village roads. The categories of length, area and the percentage have been taken from the existing land use and the average widths have been calculated. The attached chart indicates the share of the transport components in the total road area under PKDA.



Share of Transport in existing Land use PKDA



Breakup of transportation components

The calculation of the average widths of the various categories of roads indicates the insufficiency. While the national highway averages to just 8.42m, the state highways and the other district roads fare a meager 7.79m. The greatest concern is that of the urban roads which are as less as 2.7m on an average. The village roads better off at 5.44m.

The proposed comprehensive development plan of PKDA has been driven by the concept of brining the two towns of Konark and Puri close to each other, through relevant interventions. The mobility plan also substantiates these initiatives in improving the road capacities and condition between the two urban centers in the region.

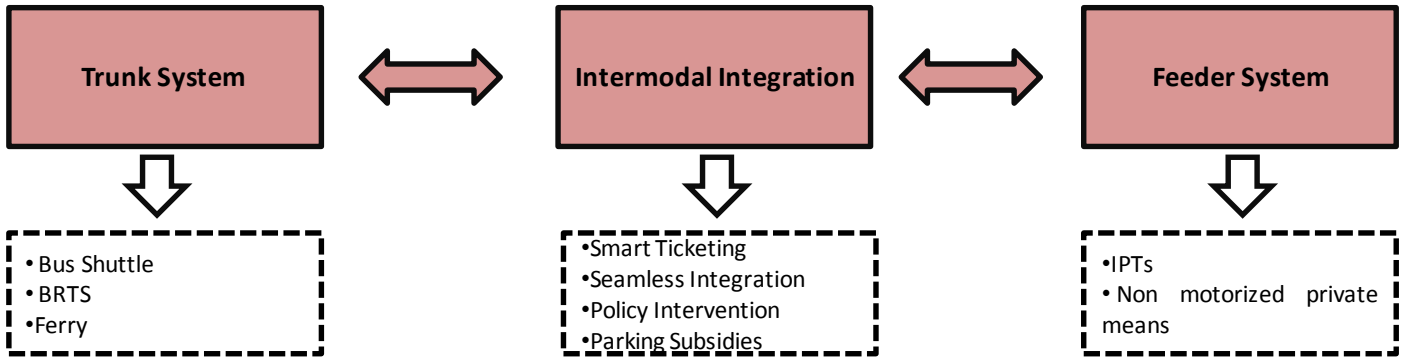
6.2.3 *Mobility Plan Proposal*

To improve the mobility in PKDA region, various hierarchies of roads, water transport and related infrastructure have been proposed.

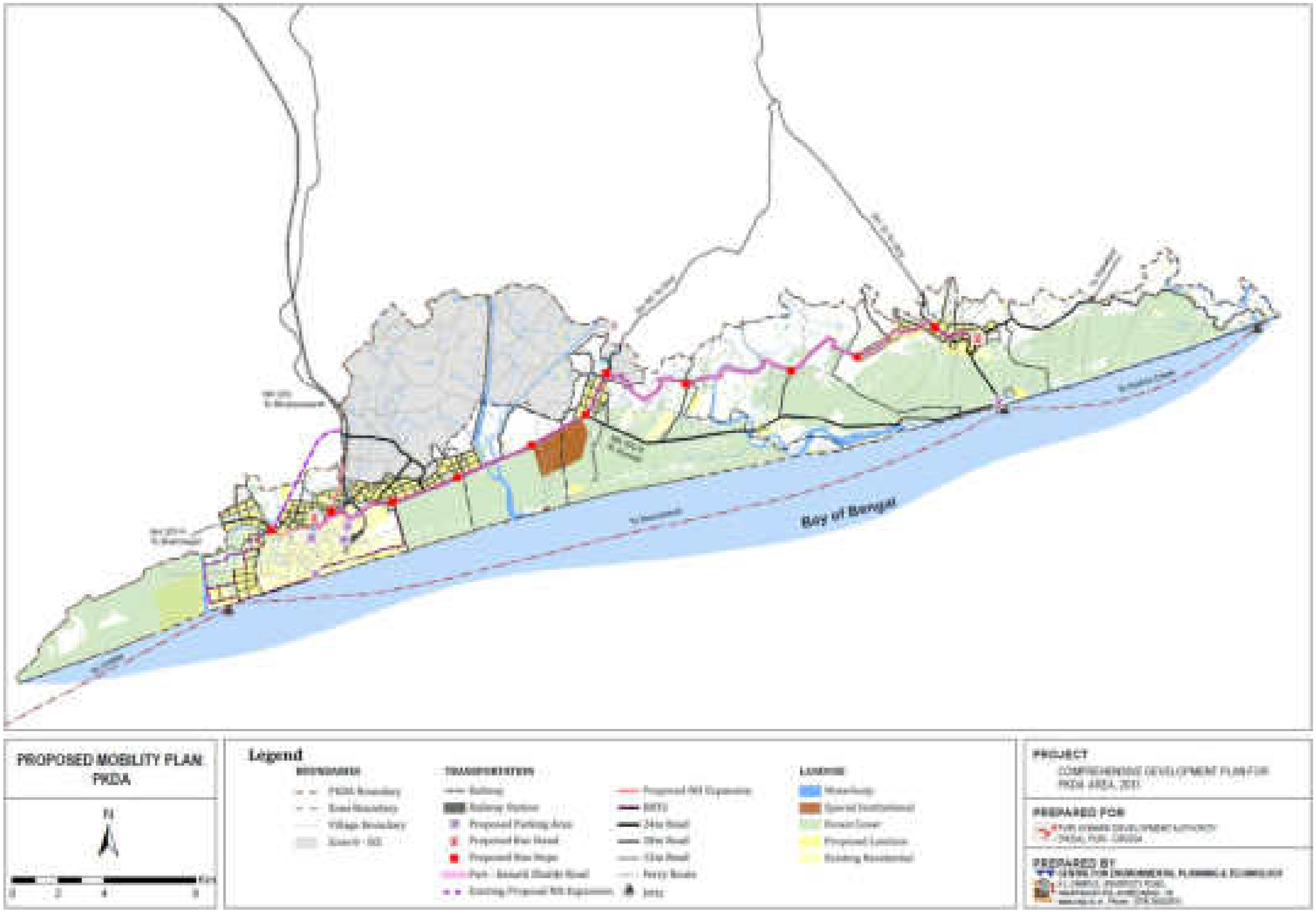
A. Improvement of roads
1. 24.00 m wide road
2. 18.00 m wide road
3. 12.00 m wide road

B. Bus Rapid Transit System
C. Puri Konark Shuttle service
D. Solar Ferry Service
E. Proposed Bus Stand and Terminal facilities
F. Parking Proposals

The mobility plan of PKDA has been sub divided into two sections, the trunk and the feeder systems.



PKDA Mobility hierarchy



Map 2: Proposed regional mobility Plan

6.2.3.1 Improvement in the Roads

With respect to the poor condition of the roads in the region, in the comprehensive development plan, new roads in the road deficient areas and improvement of existing road with 24.00 m, 18.00 m and 12.00 m width has been proposed to improve the connectivity at regional, zonal and neighbourhood level respectively. The road network has been proposed with the integration of land use, and considering disasters like cyclone, earthquake, fire etc.

The length of the proposed roads has been mentioned in the following table.

Table 3: Proposed Road lengths in PKDA

Sr.No.	Name	Length (kms)		
		New Roads	Road Widening	Total
1	24.00 m	3.41	65.28	68.68
2	18.00 m	38.79	55.59	94.37
3	12.00 m	59.95	28.06	88.01
	Total	**102.14**	**148.93**	**251.07**

Total 251.07 kms of road has been proposed as improvement of road, out of which 102.14 kms is proposed as new roads and 148.93 kms is proposed as the up-gradation of existing roads.

The Major spine, 24.00 m wide road in PKDA area has been proposed to connect Puri, Konark and other major urban areas outside. This proposed road is mainly the widening of the NH-203, NH-203A, NH-203E, SH-60, SH-13 and a road going towards Kakatpur. About 95% of 24.00 m road has been proposed as road widening of existing NH and SH. Bypasses have been proposed in Puri Sadar & SIZ area to divert heavy traffic from Puri.

The second hierarchy of road, 18.00 m wide has been proposed to improve the rural area and zonal connectivity. About 60% of 18.00 m road is under widening of existing roads. An alternate 18.00 m road has been proposed to the Konark Puri Marine drive road, along all the village settlements in the region. This shall improve the connectivity between these villages of Block A to the urban centers. A bus shuttle services is proposed along this alternate road, such as to increase the comparative advantage of the same. It has been calculated that the travel time in the bus shuttle shall be lesser that that of the marine drive road through the Bus services. This has been indicated in the attached mobility map. The marine drive road is picturesque and hence shall be preferred by the tourists. The alternate route is suggested for the local residents of PKDA. The bus stops along this route have been suggested based on the settlement pattern of the region.

The third hierarchy of road, 12.00 m wide has been proposed to improve the connectivity/walkability at neighborhood level. About 68% of 12.00 m road has been proposed as new road. Improvement of Grand road, VIP and stations road has been proposed in Puri with detailed sections (refer chapter 5: development regulations).

The block cost estimates for proposed new road and existing road up-gradation are mentioned in attached table:

Table 4: Block cost estimates for the proposed New Road

RoW	Total Length (Km.)					Unit Rate (Rs. Lakhs/ km)	Estimated Block Cost (Rs. Lakhs/km.)				
	Phase I	Phase II	Phase III	Phase IV	Total		Phase I	Phase II	Phase III	Phase IV	Total
12.00 m	0	52.02	7.94	0	59.95	200	0	10403	1588	0	11991
18.00 m	0	23.69	2.20	12.82	38.71	250	0	5923	550	3205	9678
24.00 m	2.23	1.18	0	0	3.406	300	669	353	0	0	1022
TOTAL							**669**	**16679**	**2138**	**3205**	**22691**

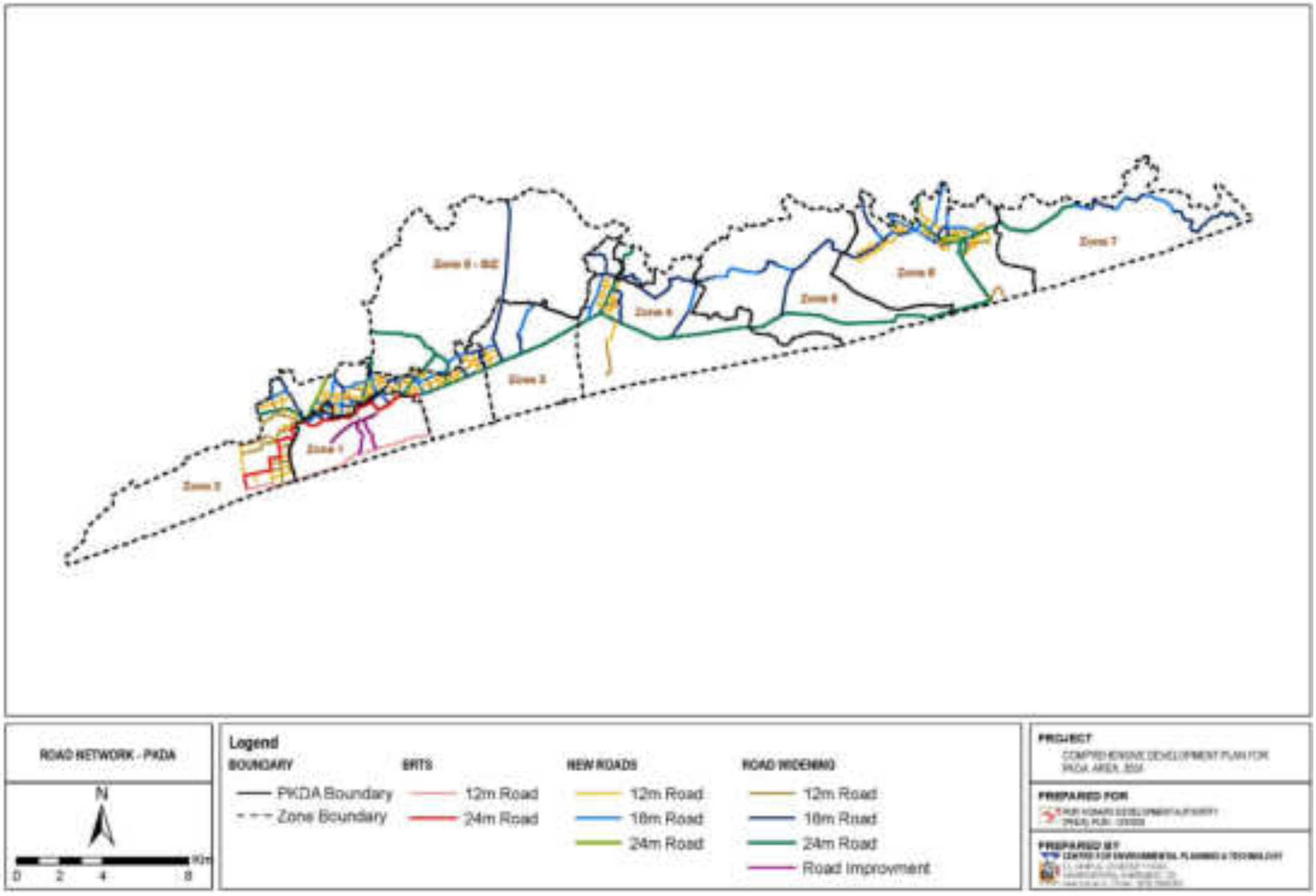
Table 5: Block Cost Estimates for Up-gradation of Existing Road Width

RoW	Total Length (Km.)					Unit Rate (Rs. Lakhs/ km)	Estimated Block Cost (Rs. Lakhs/km.)				
	Phase I	Phase II	Phase III	Phase IV	Total		Phase I	Phase II	Phase III	Phase IV	Total
12 m	0.00	25.65	2.42	0.00	28.06	50	0	1282	121	0	1403
18 m	0.00	19.46	17.74	18.40	55.59	100	0	1946	1774	1840	5559
24 m	4.70	9.26	43.20	4.99	62.14	150	705	1389	6480	748	9321
TOTAL							**705**	**4617**	**8375**	**2587**	**16284**

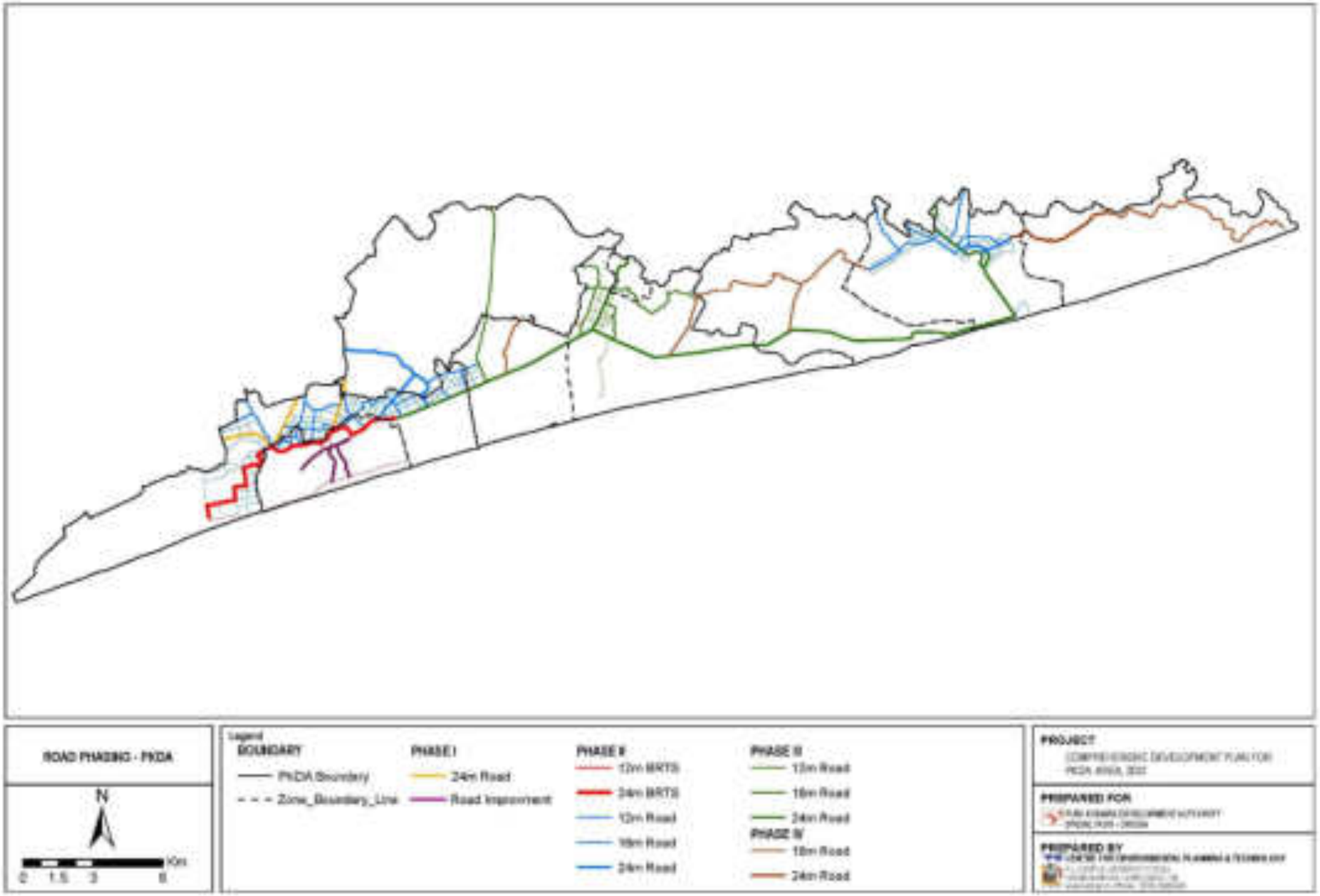
Note: Assumption for Up gradation of Roads are Rs. 1.5 crore/Km for upgrading 9 to 24 m width, Rs. 1 crore/ km for 9 to 18 m width and Rs. 0.5 crore for 6/9 m to 12 m width

The total block cost estimates for the new road and road up-gradation are 22691 and 16284 lakhs respectively.

The attached maps show the proposed new road and road widening/improvement and phase wise development in PKDA.



Map 3: Proposed New and Road widening in PKDA



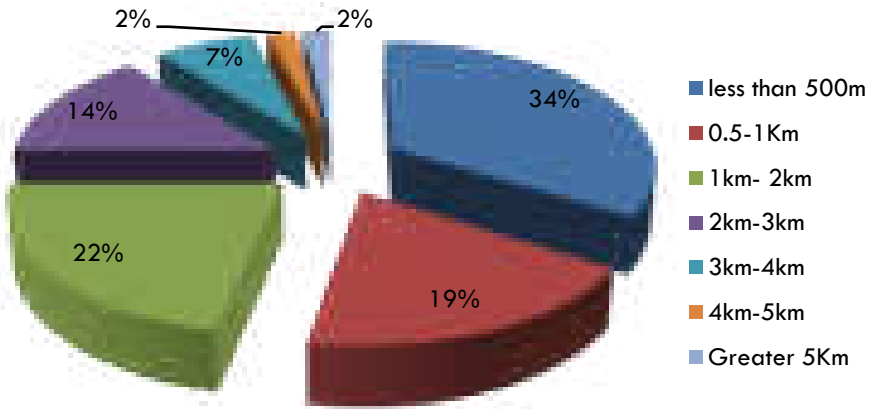
Map 4: Road Phasing

6.2.3.2 *Puri Bus Rapid Transit System (BRTS)*

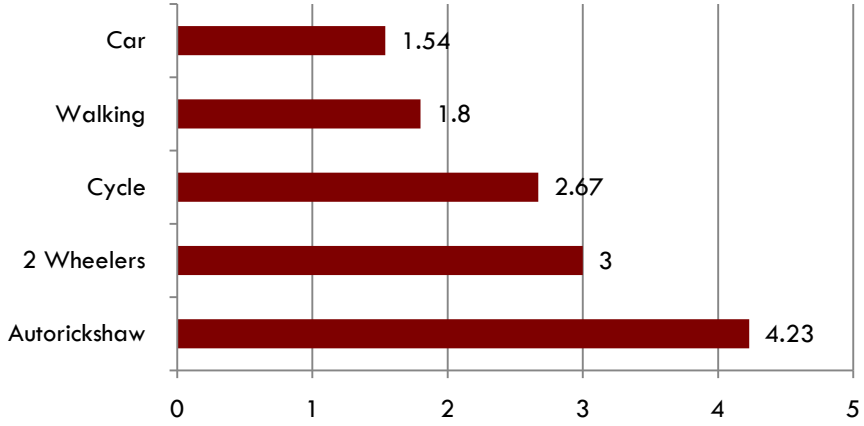
BRTS is the most cost effective mode of Public Rapid trait best suited to the Indian cities. Being the prime urban centre of the region and a tourist place Puri town faces a lot of congestion due to mixing of tourist traffic and domestic traffic. Hence, Puri Bus Rapid Transit System (BRTS) has been proposed to increase the mobility in Puri and Puri Sadar.

The attached figures indicate the travel patterns and the trip characteristics of the temple town of Puri. It might be inferred that the more than 50% of the trips in the town are within 1km. The presence of cars and two wheelers is still not as dominant as in the other cities of India.

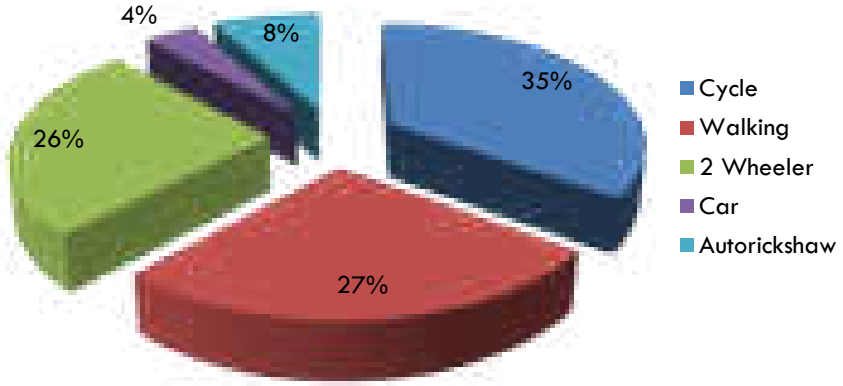
Hence this is the apt time for intervention of City Public transport. It might be noticed from the modal choice and the trip patterns that the dependency on auto rickshaws is the highest for the trip lengths that cannot be covered by walking ar



Average trip length in Puri



Mode wise average trip length in Puri



Mode wise distribution of trips

In Puri, the need of a BRT was realized based on the traffic pattern and the trip patterns of the city. The city pattern and the growth scenario envisaged call for the provision of an outer ring road based BRTS corridor. This also shall act as a sprawl and growth regulator for the town. The bus stop locations have been decided on the basis of existing and proposed land uses. The average PPHPD has been calculated to be 2000-2500, and the average headway to be 5 minutes.

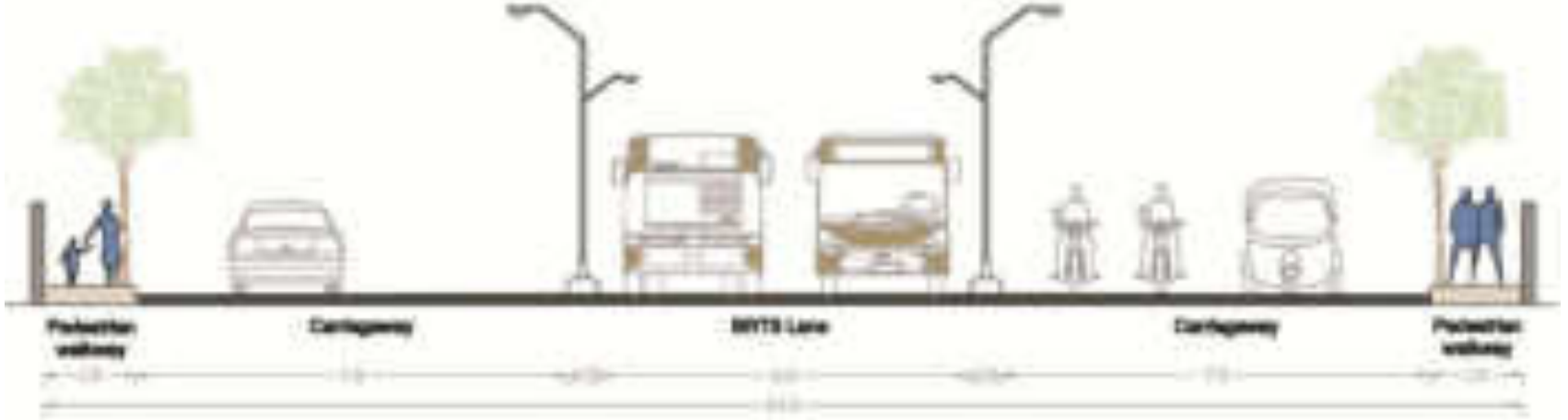
Map 5: Proposed BRTS plan

The proposed BRT is hydrid of 24.00 m and 12.00 m road width. However on studying the road widths and the possibility to upgrade the roads it may be noticed that the marine drive road is almost 12.00 m in width the possibility of expansion is difficult. Hence, the proposed BRT is hybrid in a way that the stretch of the BRT along the marine drive road is that of mixed BRT wherein the busses do not have a dedicated lane, but mix with the general traffic. On the northern part of the town along the Puri Konark road the possibility of a dedicated median lane BRT should be explored. The images indicate the roads with mixed and dedicated BRT for Puri.

Dedicated Median lane BRT

Mixed BRT

The road sections for the proposed BRT have been indicated in the following sections.



The cost components of the BRTS shall depend on the creation/up-gradation of roads, bus stops, rolling stock, Signaling system, PIS system and ticketing system. The revenue heads of BRT include the ticketing and advertisement rights on the corridor.

Table 6: Block cost Estimate of BRTS Road

Sr. No.	Width (m)	Length (in Km)	Unit Rate (Rs. Lakhs/ km)	Block Cost Estimates (in Lakhs)
1	24.00 m	15.47	1000	15471
2	12.00 m	11.36	500	5680
	TOTAL	23.07		**21151**

Note: Assumption for cost Estimate is Rs. 5 Crore/ km for 12 width & Rs. 10 Crore/km for 24 m Width BRTS roads

The total estimated cost for BRTS is 21151 lakhs. Detailed study can be done in Phase I and implementation of the project should be done in Phase II. The revenue heads need to be calculated based on the case studies. The BRTS should be taken up on a DPR approach.

6.2.3.3 Puri Konark Shuttle Service

The Puri Konark corridor is the busiest transport corridor in the PKDA region. In the proposed development plan, with the creation of new economic opportunities this shall only increase. Hence the proposed Bus shuttle has been proposed to improve the connectivity between the two towns and to permeate public transport dependency in the citizens. Through supplementing policies like smart ticketing and parking concessions this can be made more lucrative and a greener option for the people of PKDA region. The key features of the system as follows

Table 7: Components of Proposed Shuttle service

Features	
Travel distance	36 Kms - Puri Urban- 3.72 Kms - 24 m – 14.16 Kms - 18m- 18.01Kms
Average Travel Speed	30 Kmph
Average Travel time	1.25 hours
Number of bus stops	11
Facilities at bus stops	- Refreshments – Tea and snacks - Toilets – 1 man +1 woman - Bus shed - Parking in the terminals- free parking for daily commuters
Average distance between stops	3.27 Kms
Features of the Bus	- Seating capacity – 30 - Bus frequency- every hour - Operation time- 8:00am- 8:00pm - On board TV - On board PIS
Key Merits	- Smart Ticketing - Reliability - All season - Subsidized pricing
Mode of Operation	Public Private partnerships

The following sections show some illustration of the shuttle system

City Bus Shuttle Cost Estimates:

Table 8: Initial Indicative Cost Estimates for Bus Shuttle Services

Sr. no.	Description	Estimated Amount (Rs. Lakhs)
1	City/ Mini Bus Shuttle purchase (Purchase of eight bus)	120
2	Registration (Tax, Title and Tag) and insurance	7
4	Signage on Bus (identifying the Bus as Bus Shuttle vehicle)	16
5	Gas/ Diesel Expenses for operating the vehicles for one year	18
6	Salaries of staff who are engaged in driving the vehicles for one year	9
7	Development of Intermediate Stations with refreshment facilities	110
	Total	**280**

Note: O & M is not included

6.2.3.4 Solar Ferry Service

A tourist ferry service has been proposed along the Puri coast, connecting Puri and Konark (at Chandrabhaga). The intermediate stations are those of Baleshwar, Ramchadi Beach and the Kadua creek. It is suggested that the ferry may be taken till the Chilika Lake.

The ferry system is to be powered by solar cells for a greener transport alternative. Expensive on the capital costs the solar ferry based on the case studies indicate that is cheaper on the life cycle costing. The picturesque beaches of the PKDA region may be seen from the ferry. A guide may accompany the tourist for the same. The journey between Puri to Konark along the coast is that of 35 kms. The average speed of these boats is that of 25Kmph and the average journey time will be that of 1.5 hours.

The main objectives of using the solar ferry service is that of

- Promote tourism
- Reduce the tourist stress on the roads by providing an alternate and scenic route
- Provide job opportunities to the local

Features of the solar ferry system

Table 9: Features of proposed solar ferry system

Features	
Travel distance	- Chilika to Puri - 30 Kms - Puri to Ramchandi- 27 kms - Ramchandi to Konark – 6 Kms - Konark to Kadua creek- 30 kms
Average Travel Speed	25 Kmph
Intermediate stops	Chilika, Puri, Ramchandee, Konark and Kadua Creek
Average distance between stops	3.27 Kms
Features on the ferry	- Guide - On board Music - On board snacks
Key Merits	- Emission free - Noise free - Beaches of the PKDA region which cant be assessed otherwise can be enjoyed
Mode of Operation	Public Private partnerships



Ferry Services Cost Estimates:

Table 10: Initial Indicative Cost Estimates for Ferry Services

Sr. no.	Description	Estimated Amount (Rs. Lakhs)
1	Procurement/Purchase of eight no. of Ferry Boats (Capacity 20 to 25 passengers)	80
2	Development of Ferry Terminals/Jetty/Pier at Puri, Chilika Lake, Baleshwar Lake, Ranchandee, Kauda Creek & Konark	70
5	Management fees	5
	Total	**155**

Note: O & M is not included

- The revenue heads include tickets and advertisements and grants for using sustainable technology

6.2.3.5 Proposed Bus Stand and Terminal Facilities

From the study it has been understood that the demand for terminal and parking facilities is increasing at a rapid pace. Under the context of rapid growth in Puri Sadar area due to spillover effects of Puri town the demand is rising abruptly. On the other hand due to new NH proposal in the shown area the demand will be again be increased. Hence a multipurpose terminal and bus stop has been proposed at the origin point of new NH alignment from existing NH-203. The formulated proposal is highly justified due to proposed TP Scheme on the other side of NH around the proposed terminal.

The concept proposal shown in the map beside looks to achieve the following objectives:

- Develop modern and efficient bus terminal facilities with modern technology adaptation.
- Provision for commercial and other associated facilities within the proposed site.
- Development of petrol pump and service station in the site area.
- Conserve the natural features of the proposal site and safe provision for environmental development and infrastructure development.
- The plan and design for the terminal development has been shown in the map in the following page which shows that multipurpose facilities and use has been proposed to be developed under the site in the form of entertainment zone, green spaces, bus stops, petrol pump, shopping areas, commercial spaces etc. all of this can cater as city level facilities.

Conceptual plan for proposed bus stop and terminal

Design of spaces within bus terminal

Various activities have been suggested in below table for the bus terminal. This will lead to better management and utilization of infrastructure and services.

Table 11: Proposed activity in the Bus terminal

Proposed Use	Suggested Activities	Proposed Use	Suggested Activities
Bus Station	• Administrative Office • Staff offices • Bus owners Association office • Utilities and services	Shopping area	• Local shopping • Vegetable and fruit market • General stores • Super market
Passenger area	• Ticket counter • Lost and found counters • Waiting areas • Information booth • Reservation and inquiry • Customer care • Luggage locker	Public utility	• Post office • Police station
Eateries zone	• Restaurants • Cafeterias • Semi open food joints • Low cost / street food	Green/Open space	• Playfield/Garden • Community zones
Entertainment zone	• Shopping mall • Cinema • Auditorium • Gaming zone • Children's play area • Indoor sports	**Petrol Pump**	• Gas station • Garages • Mechanics • Cleaning and maintenance of busses • Small vehicle repair • Spare parts shops

Cost estimates for the proposed terminal facilities are indicated in the attached table.

Table 12: Cost estimates for proposed Bus terminus

Sr. No.	Description of Proposed Bus Terminal	Area (Sq. km.)	Block Cost Estimates (in Lakhs)
1	City Bus Terminal Puri (PBT - 1) Near Narendra Pokhari Tirtha	0.23	2100
2	City Bus Terminal (PBT - 2) , near medical square Konark	0.05	500
	TOTAL	**0.28**	**2600**

6.2.3.6 Parking Areas Proposals

From CEPTs assessment it has been found that lack of parking spaces and resulting congestion is the key problem in Puri town especially at the grand road. During tourist season on street parking effects traffic situation very badly impacting the urban environment and image of the town. Hence, there are five major locations identified for the parking areas in PKDA (refer mobility map).

There are four major locations identified in Puri town for parking. Presently, these locations are used for parking and other transportation uses. The total area under each parking is mentioned in the following table.

The detail of multilevel parking at Jagannath Vallab & Vrindavan Park Proposals has been detailed out in this chapter.

Proposed parking locations, Puri Town

Table 13: Proposed Parking areas in PKDA region

Sr. No.	Description of Proposed Parking Area	Location	Area (in ha)	Floors (Nos.)	Capacity (Nos.)	Type of Vehicles Allowed	Remarks (Current Status)
1	PPA –1 Multilevel car park at Jagannath Vallabh Math	Puri Town	0.64	4	1536	Cars	visitors parking
2	PPA – 2: Near Puri Railway Station	Puri Town	2.63	Ground Floor	1578	Auto, Cars	Encroached by slums
3	PPA – 3: Gundicha Bus Stand	Puri Town	1.15	Ground Floor	532	Heavy Vehicles [187], Cars [345	Bus Stand
4	PPA – 4 Multilevel car park at Puri Marine drive road	Puri Town	0.6	4	1440	Cars	Visitors parking
5	PPA – 5: Chadrabahga, Konark	Konark	0.95	Ground Floor	439	Heavy Vehicles [154], Cars [285]	Tourist parking
	TOTAL		**5.97**				

Parking At Jagannath Vallab & Vrindavn Park Proposals

The Jagannath Vallab Matha garden constituting of an area of 35 acres has been undertaken for development of green space and Multi level parking space which will improve the traffic situation and urban environment at large in the town area.

The basic components that have been aimed to achieve through this proposal are:

- Development of adequate parking facilities with high standard of services
- Both way access for entry and exist into the parking space
- Use of modern technology for multi level parking development
- Improvement of garden and water bodies within the park
- Development of community meeting space within the compound of proposal and
- Enhancement of tourism prospects in the temple area of Puri town.

The proposed parking space which is spreaded over 35 acres will house to more than 300 cars at a time at different floors. The parking space has main access form Grand road which is the main arterial road around the site. The other access given is from the Narendra Tank side which will work as second option for access due to lesser width of the road. only small part of the site is used for developed of parking

space where as the other major share has been designed for water bodies development and green space and community centre development which will influence more interaction.

Through the implementation of the proposal basic problem of lack of parking lots will be effectively reduced and in turn that will improve traffic and transpiration scenario during tourist season. Also development of central green scope space in the town will lead to better environmental quality of the neighborhood which is currently degrading due to several reasons.

The design concept for the parking facility and associated infrastructure has been shown in the map above which are detailed out in the next page:

The cost estimates for the proposed Parking facilities are indicated in the attached table

Table 14: Cost estimates for parking facilities

Sr. No.	Description of Proposed Parking Area	Location	Area (ha.)	Block Cost Estimates (in Lakhs)
1	PPA – 1 Multilevel car park at Jagannath Vallabh Math	Puri Town	0.64	90
2	PPA – 2 Near Puri Railway Station	Puri Town	2.63	50
3	PPA – 3 Gundicha Bust Stand	Puri Town	1.15	35
4	PPA – 4 Multilevel car park at Puri Marine drive road	Puri Town	0.6	90
5	PPA – 5 Chadrabahga, Konark	Konark	0.95	30
	TOTAL			**295**

6.2.3.7 Mobility Plan Phasing

Mobility plan phasing has been done in four phases. The total estimated block cost for the PKDA region is around 665.55 crores.

Table 15: Summary of Block Cost Estimation of Proposed Mobility Plan

Sr.No.	Description	Block Cost Estimate (Rs. Lakhs)				
		Phase I	Phase II	Phase III	Phase IV	Total
1	Proposed New Road	669	16679	2138	3205	22691
2	Up gradation of Existing Roads	705	4617	8375	2587	16284
3	BRTS Road	0	21151	0	0	21151
4	Puri – Konark Bus Shuttle Service	0	280	0	0	280
5	Solar Ferry Service	155	0	0	0	155
6	Proposed Bus Stand & Terminal Facilities	0	2600	0	0	2600
7	Parking	265	30	0	0	295
8	Street Lighting	578	2521	0	0	3099
	Total	**2372**	**47878**	**10513**	**5792**	**66555**

6.3 Water Supply

Water Supply is the most necessary element of the infrastructure. A sustainable water supply infrastructure involves source augmentation, demand management, management of losses, metering of piped supply and most importantly the cost recovery mechanism.

In Puri and Konark, piped water supply at present meets only 60% and 10 % of the required demand respectively. The NRW in both Puri and Konark again is a concern since in both the cases it is higher than 40%. The rural PKDA on the other hand is mainly dependent on wells, hand-pumps and tanks. The following sections present recommendations for water supply infrastructure.

6.3.1 *Water Demand Assessment*

The demand water demand assessment has been done using CPHEEO manual. For the urban areas the water demand has been assessed at the rate of 135 lpcd (Puri town, Zone-1 & Zone- 5). For the rural areas the demand has been assessed at the rate of 70 lpcd.

The attached table indicates the water demand from the different land use zones of the region. It may be noted that in the assumptions of the population projections, it was understood that the population growth of Puri town till the year of 2031, shall be distributed in Puri Sadar and Puri. The water demand calculations for the intermediate horizon years of 2011, 2021 and 2031 have been calculated to reflect the same.

Table 16: Water Demand estimation for PKDA-2031

Name of Zone	Location	Water Supply Standards	Water Demand (MLD)		
			2011	2021	2031
Puri town	Puri	135	33.2	35.6	38.0
Zone 1	Puri Sadar	135	14.1	24.8	35.4
Zone 2	Block A	70	0.2	0.2	0.3
Zone 3	Block A	70	0.8	1.2	1.6
Zone 4	Block A	70	0.9	0.9	0.9
Zone 5	Konark	135	5.9	8.7	11.5
Zone 6	Block B	70	0.8	0.9	1.0

In Puri proposals to augment the present water supply have already been sanctioned under JnNURM. The project includes source augmentation and 24*7 water supply. The table below presents the deficit in water demand and supply for the PKDA region. The demand projections are compared with the present capacity of the water supply systems along with the future proposals under the DPRs.

Table 17: Key Water Supply Demand Supply Gap in CDP Area

Name of Zone	Location	Water Supply[1]			Supply Deficit (MLD)		
		2011	2021	2031	2011	2021	2031
Puri town	Puri	34	41	50	-0.8	-5.4	-12.0
Zone 1	Puri Sadar	0	0	0	14.1	24.8	35.4
Zone 2	Block A	0	0	0	0.2	0.2	0.3
Zone 3	Block A	0	0	0	0.2	1.2	1.6
Zone 4	Block A	0	0	0	0.9	0.9	0.9
Zone 5	Konark	0.66	0	0	5.9	8.7	11.5
Zone 6	Block B	0	0	0	0.8	0.9	1.0

In the table above the deficit in the Puri town is negative. However, we understand that the water supply as in case of the population needs to be redistributed between Puri and Puri Sadar since the latter would experience a surge in population owing to the spillover from Puri town. This phenomenon infact calls for immediate measures in water supply in the Puri Sadar region. The other zones as stated earlier are dependent mainly on handpumps, wells and tanks and hence a sustainable water supply management of the rural areas also needs to be formulated.

6.3.2 *Proposed Interventions*

6.3.2.1 Source Augmentation

The PKDA area is mainly dependent on Ground Water resources. The proximity of PKDA to the sea hence poses a risk of salt water intrusion in the ground water resources. Source augmentation hence becomes very essential. An Integrated Watershed Management Program (IWMP) under the Department of Land Resources (MoRD) provides guidelines for planning of watershed management schemes with an objective to to restore the ecological balance by harnessing, conserving and developing degraded natural resources such as soil, vegetative cover and water. The outcomes are prevention of soil run-off, regeneration of natural vegetation, rain water harvesting and recharging of the ground water table. In addition, Puri has a good system of tanks which may be revitalized and interconnected to augment the ground water. Again, the strategy for water supply should be such that when fresh-water flows towards the sea are more in monsoon season, wells near the sea are to be used for most of the supply and withdrawal compared to the inland pump wells. The situation is to be reversed in summer season due to lesser flow of fresh water towards the sea. It is suggested that any additional pumping should be practiced in the middle of the water field to minimize the adverse impacts.

[1] Includes present capacity of 24 MLD and proposed expansions under 24X7 W/S DPR

6.3.2.2 Water Supply in Urban Areas

Storage Requirements

The present storage capacity in Puri is 3.8 ML with underground storage capacity of 1.8 ML and above ground storage capacity of 2 ML. At present the daily demand of water in Puri 33.2 MLD. As per the CPHEEO norms the present storage capacity needs to be enhanced and an additional capacity of 20 ML for underground storage and 5 ML for overhead storage is required.

Similarly in Konark the present storage capacity is only 0.37 with underground storage of 0.25 ML and above ground storage of 0.12 ML which collectively comprise of only 6% of the daily water demand. In case of Konark also at the present demand itself as per the CPHEEO norms an additional capacity of 3.7 ML for underground storage and 1.2 ML for above ground storage is required.

Additional Storage Required	Puri	Konark
Underground (ML)	20	3.7
Above Ground (ML)	5	1.2

Increasing coverage of Piped Water Supply

Following action plan may be followed for supply side water supply management and to increase the coverage of piped water supply for PKDA region:

- Planning and implementation of water distribution systems based on available sub-surface and ground water sources
- Covering the entire PKDA urban and rural areas with a continuous water supply system assuring 24 hr supply with adequate pressure in the distribution system even at the tail ends.
- Public awareness against misuse of water
- Adequate reforms so as to balance the O & M cost with the revenue out of the water supply distribution.

Reduction in NRW

In case of Puri and Konark the extent of NRW is as high as 71% and 57%. The components of NRW are:

1. Unbilled metered and Non Metered Connections
2. Apparent Losses due to thefts and metering inaccuracies
3. Real losses- Leakages

In case of Puri and Konark the high NRW is a resultant of cumulative effects of all the three components. To reduce the NRW hence measures are required for all the three components. Reducing NRW and cost recovery in fact are also the mandates of the 13th Finance commission.

Billing and legalizing all connections is the first and foremost initiative to reduce NRW. In some cities, the water charges are calculated as a percentage of property tax assuming all properties paying the property tax have water connections. This in fact encourages the citizens to legalize connections since a water

charge is already being paid. However, the best and the most preferred alternative is mapping. The distribution systems of most Indian cities are very poorly mapped. Only when these are well mapped can the hydraulics be properly calculated and limitations on extensions to the distribution systems be properly controlled. Now, with global imaging tools and computerization, this work can be more easily accomplished and maintained. Mapping also reduces illegal connections directly affecting the NRW.

Table 18: Components of NRW

Authorized Consumption	Billed Authorized Consumption	Billed Metered Consumption (including water exported)	Revenue Water
		Billed Non-metered Consumption	
	Unbilled Authorized Consumption	Unbilled Metered Consumption	Non-Revenue Water
		Unbilled Non-metered Consumption	
Water Losses	Apparent Losses	Unauthorized Consumption	
		Metering Inaccuracies	
	Real Losses	Leakage on Transmission and/or Distribution Mains	
		Leakage and Overflows at Utility's Storage Tanks	
		Leakage on Service Connections up to Customers' Meters	

While reduction of unbilled connections is one dimension the reduction in physical losses needs also attention. Methods of controlling leakage include passive control, regular sounding, district metering, waste metering, combined district and waste metering, and pressure control. Selecting the most appropriate method would depend on the level of leakage, the cost of leakage, and the cost-effectiveness of each method.

Good Practices- Cost Recovery

I. **BANGALORE – Karnataka – Use of Information Technology**

The Bangalore Water Supply and Sewerage Board (BWSSB) responsible for the supply of drinking water, conveying, treating and disposal of sewage to the silicon valley of India "Bangalore city", has achieved 99% bill collection efficiency with the adoption of latest technologies. The board had successfully leveraged Information Technology for the last five years such as implementation of SCADA and Telemetry, developing Geographic Information System (GIS) of Water Supply pipelines and Sewerage lines of the entire city, maintenance and updating of the same by an independent management system, Computerization of Revenue Billing and Collection, spot billing system with hand held computers, Payment of Water Bills through unmanned 'KIOSK' working 24 x 7 hours, Water Auditing to control Leaks, computerized and consolidated all accounts in Central Office, usage of LAN-WAN to facilitate transfer of data pertaining to revenue billing, connections to the poor through effective communication strategy. These initiatives resulted in significant cost savings and also enhanced the bill collection efficiency to 99%.

II. **NAGPUR – Maharashtra-Developing Innovative Measures to Reduce Unaccounted for Water**

As part of its effort to achieve cost recovery, Nagpur Municipal Corporation (NMC) has developed several innovative measures to reduce unaccounted for water. Motivated by the requirement to augment revenues, NMC came out with innovative idea of unearthing illegal water connections by using the same plumbers who fixed these in the first place. The corporation declared a time-bound programme aimed both at regularizing illegal water connections and also applying a universal metering policy. The incentive of Rs 100 for every illegal connection motivated about 200 plumbers. With insignificant expenses of about Rs 0.2 million as incentives for plumbers and a minimum amount spent on publicity drive, the programme achieved regularization of about 25,000 (71%) connections within a short period of four months. There was significant and evident increase in revenue generation. The simplified and rationalized procedures, transparency, accountability of the corporation and the participatory mechanisms adopted have generated enormous citizen co-operation and revenue to the corporation.

III. **ANDHRA PRADESH -The Social / Affordability Dimension of Full Cost Pricing**

Compared to other cities, Indian cities do not enjoy high levels of access to both water supply and sanitation. Central to the issue of affordability are high connection charges and low willingness to pay for water services. Connection charges often represent the greatest barrier to affordability of water services for the unconnected poor, while customer willingness to pay remains low in areas with intermittent water supply and poor water quality. To tackle these affordability issues, the government of Andhra Pradesh decided to extend individual connection to BPL families at Rs.1200 with the option to pay the cost in twelve equal installments. About one lakh eligible BPL households applied for individual connections under the scheme and over two-thirds of the applications were sanctioned by the local bodies and four-fifth got installed.

6.3.2.3 Rural Areas

In the study area all rural areas lack piped water supply. The water supply in the rural areas of PKDA may be provided in line with the principles of Provision of Urban Amenities in Rural Areas, the scheme re-launched by the MoRD. The primary objectives of the scheme are the provision of livelihood opportunities and urban amenities in rural areas to bridge the rural – urban divide. The PURA projects are formulated in a cluster of geographically contiguous gram panchayats with a total population ranging from 25000-40000. For water supply projects a clustered approach for supply of water from surface water may be a preferred option since a central intake and treatment works may reduce cost due to economies of scale. However, for piped water supply distribution from ground water, decentralized approach may also be utilized. The table below presents the list of projects which can be taken up in PURA along with water supply projects.

Table 19: Projects under PURA

(a) Amenities/Activities to be provided under MoRD Schemes (Mandatory)	(b) Amenities to be provided under Schemes of other Ministries (non-MoRD Schemes) – illustrative list	(c) Add-on Projects (Revenue earning, people centric projects) – illustrative list
Water and Sewerage	Village Street Lighting	Village linked tourism
Construction and maintenance of Village	Telecom	Integrated Rural Hub, Rural
Streets	Electricity generation, etc.	Market.
Drainage		Agri – Common Services Centre and Warehousing
Solid Waste Management		Any other rural – economy based project
Skill Development		
Development of Economic Activities		

6.3.3 Cost Estimates

The cost estimate is done by taking the following assumptions:

- Material for water supply pipe - CI/DI & Estimate is prepared for CI material
- 100% accessibility at household
- All ESR are located in the plot near Highway connection of the Village & ESR height – 12 m
- Distribution Pipe Materais - CI LA class 12 Kg/cm^2
- Rural Water Supply – 70 lpcd and Urban Water Supply -135 lpcd
- Water Treatment Plant – 25 Lakhs/MLD

- Water Treatment Plant, ESR, SUMP, Pumping Stations, Rising Mains & Distribution Network Cost – 150 Lakhs / MLD

The following shows the cost of water supply network for the deficit area covered in the CDP. This water supply network includes the Elevated Storage Reservoir, Underground Sump, pumping machinery and the pipe distribution network.

Table 20: Estimated Capital Cost for Water Supply for Proposed Area of CDP

Name of Zone	Location	Deficit for the year 2031	Estimated Cost (Rs. Lakhs)				
			Phase I	Phase II	Phase III	Phase IV	Total
Puri town	Puri	-	-	-	-	-	-
Zone 1	Puri Sadar	23.4	-	3510	-	-	3510
Zone 2	Block A	0.3	-	-	45	-	45
Zone 3	Block A	1.6	-	-	240	-	240
Zone 4	Block A	0.9	-	-	-	135	135
Zone 5	Konark	11.5	-	1725	-	-	1725
Zone 6	Block B	1.0	-	-	-	150	150
TOTAL			**0**	**5235**	**285**	**285**	**5805**

6.4 Waste Water Management

Sanitation and sewerage are directly related to public health. Hence management, effective treatment and disposal of sewage are very essential. The entire region of the PKDA does not have a fully functioning and organized public sewerage system. Storm water drains carry both rain water as well as waste water in many parts of the Puri town and Konark. The population in these urban areas is also largely dependent on septic tanks. Septage management hence also becomes necessary in PKDA.

The Proposals in this sector are derived from the demand supply gaps in the area. Both centralized and decentralized sewage treatment options have been examined for the PKDA area. For slums in Puri and Konark, decentralized treatment may be a feasible option while for the core urban areas a centralized sewerage system may be implemented.

6.4.1 *Sewage Generation*

Sewage Generation is estimated based on 80% of water demand as per CPHEEO Manual. As in the case with water demand, the sewage generation for Puri Sadar (Zone-2) has been estimated assuming the growth of population in Puri till the year of 2031, shall be distributed in Puri Sadar and Puri. The sewage generation for the intermediate horizon years of 2011, 2021 and 2031 have been calculated to reflect the same. The table below presents the estimations of sewage generation.

Table 21: Sewerage- Demand Supply Gap in CDP Area

Name of Zone	Location	Water Demand (MLD)			Sewage Generation (MLD) (@80%)			Present Facility with Proposed Expansions[2]			Deficit		
		2011	2021	2031	2011	2021	2031	2011	2021	2031	2011	2021	2031
Zone 1	Puri	33.2	35.6	38.0	26.6	28.5	30.4	0	28	28	26.6	0.5	2.4
Zone 2	Puri Sadar	14.1	24.8	35.4	11.3	19.9	28.4	0	0	0	11.3	19.9	28.4
Zone 3	Block A	0.2	0.2	0.3	0.2	0.2	0.2	0	0	0	0.2	0.2	0.2
Zone 4	Block A	0.8	1.2	1.6	0.7	1.0	1.3	0	0	0	0.7	1	1.3
Zone 5	Block A	0.9	0.9	0.9	0.7	0.7	0.7	0	0	0	0.7	0.7	0.7
Zone 6	Konark	5.9	8.7	11.5	4.7	7.0	9.2	0	0	0	4.7	7	9.2
Zone 7	Block B	0.8	0.9	1.0	0.7	0.7	0.8	0	0	0	0.7	0.7	0.8

[2] Includes present capacity and proposed expansions of 28 MLD under JnNURM

In the estimation of deficits the proposed expansions under the JNNURM have also been considered. As presented in the table with the implementation of the proposed schemes also there positive deficits for all zones including Puri town. Again since the Puri Sadar (Zone-2) would experience a spillover of population from Puri an immediate action plan for sewage treatment would be required.

6.4.2 *Strategies for Sewage Management*

The objective of a public waste water collection and disposal system is to ensure that sewage or excreta and sullage discharged from communities is properly collected, transported, treated to the required degree and finally disposed off without causing any health or environmental problems.

Waste water disposal systems can be either the on-site type or the kind where water –borne wastes are disposed off-site into a water body or on land. The options for sanitation for PKDA area would differ for rural and urban areas. In the urban areas a mix of centralized and decentralized technologies is preferred whereas for rural areas on-site technologies in conjunction with decentralized technologies would be a preferred system of sewage management.

6.4.2.1 Urban Areas

Centralized Sewerage System

In designing sewage collection, treatment, and disposal systems, for urban areas planning generally begins from the final disposal point going backwards to give an integrated and optimum design to suit the topography and the available hydraulic head, supplemented by pumping if essential. Once the disposal points are tentatively selected, further design is guided by the following design considerations:

- Design period, stage wise population to be served and expected sewage flow and fluctuations.
- Topography of the general area to be served, its slope and terrain. Tentative sites available for treatment plant, pumping stations and disposal works.
- Available hydraulic head in the system upto high flood level in case of disposal to a nearby river or high tide level in case of coastal discharge or then level of the irrigation area to be commanded in case of land disposal.
- Ground water depth and its seasonal variation affecting construction, sewer infiltration, and structural design (uplift).
- Soil bearing capacity and type of strata expected to be met at the time of construction.
- Onsite disposal facilities, including the possibilities of segregating the sullage water and sewage and reuse or recycle sullage water within the households.
- Soil bearing capacity and type of strata expected to be met at the time of construction.
- Onsite disposal facilities, including the possibilities of segregating the sullage water and sewage and reuse or recycle sullage water within the households

Environmental Considerations

- Surface water hydrology and quality.
- Ground water quality.
- Coastal water quality
- Odor and Mosquito nuisance
- Public Health
- Landscaping

Process Considerations

- Waste water flow and Characteristics
- Degree of treatment required
- Performance characteristics
- Other process requirements
- Cost considerations

The table below presents the comparative analysis of various treatment systems for sewage. In India, at present mostly conventional activated sludge treatment is used for treatment of sewage. However, for treating the sewage to the level of reuse the process is made robust by extended aeration and other tertiary treatment processes.

Table 22: Comparative analysis of sanitation system

Sr. No.	Item	Conventional Activated Sludge Process	Conventional Trickling Filter	Oxidation Ditch	Facultative Aerated Lagoon	Waste Stabilisation Pond	UASB Reactor Process
1	**Performance**						
	BoD Removal (%)	85-92	80-90	95-98	75-85	75-85	75-85
	Clliform Removal (%)	60-90	60-90	60-90	60-90	60-99.9	insignificant
2	Land requirement (Sq. Mt./capita excludingpost treatment)	0.18-0.25	0.20-0.30	0.15-0.20	0.30-0.40	2.0-2.8	0.15-0.20
3	Energy requirement KWH/Person/Year	12-15	7-11	16-19	12-15	nil	-
4	Equipment required (Excluding Screen and greet chamber)	Aerators, recycle pumps scrapper, thickeners digestors, dryers gas equipment	Trickling filter arms, recycle pumps sludge scrappers, thickeners, directors equipment	Aerators, recycle pump	Aerators only pump	nil	Pumps, gas, collection equipment

Sr. No.	Item	Conventional Activated Sludge Process	Conventional Trickling Filter	Oxidation Ditch	Facultative Aerated Lagoon	Waste Stabilisation Pond	UASB Reactor Process
5	**Level of Supervision**	Skilled	Skilled			Simplest	Simpler than activated sludge
6	**Cost (Rs. In Lakh)**						
	Capita cost/MLD O&M	35	25	NA	15	9	24
	Cost/MLD/Year	1.5	0.75	NA	1.25	1.25	0.72

Reuse of Treated Sewage

The reuse of sewage in PKDA becomes much more important because of the pressure on ground water and the threat of salinity ingress. Sewage when treated effectively may be utilized in many ways as presented in the table below.

Table 23: Reuse of Treated Sewage

Category of reuse	Examples of Applications
Urban Uses	Landscape irrigation of parks, playgrounds, golf courses, green belts, fire protection, construction
Agriculture	Irrigation for fodder, fibre, flowers, seed crops, pastures, commercial nurseries, sod farms
Environmental enhancement	Artificial wetlands creation, natural wetland enhancement
Industrial reuse	Cooling system water, process water, boiler feed water, construction wash-down water.

Best Practices in Sewage Reuse

Agriculture and Landscaping: In Hyderabad, along the Musi River about 12,100 ha of land is irrigated with wastewater out of which 2100 ha is used to cultivate paddy (Mekala 2006) and 10,000 ha of land to cultivate para grass, a kind of fodder grass (Mekala 2006). Treated waste water in the city is also used for jasmine cultivation and to irrigate public parks and avenue trees.

Aquaculture: The Eat Kolkata Wetland has a settling pond, where sewage water flows in every 6-7 days. The sewage present in the water is allowed to settle in these ponds. After that, it passes through bamboo sticks installed by the local fishermen at the mouth of the fishing waters to filter out plastics and other floating material. Once the water flows into the fishing water, the degradable material is consumed by the fish. For bacterial removal, the fishermen add Calcium

Carbonate and Alum as a coagulant to clean water. The sunlight and phytoplanktons also helps in disinfection of water. The East Calcutta sewage fisheries are the largest single wastewater use system in aquaculture in the world (Pescod 1992). The wetland ecosystem of Kolkata supports 100,000 direct stakeholders and 5,100 ha of cultivation. Annually, it provides direct employment for about 70,000 people, produces 128,000 quintals of paddy, 69,000 quintals of fish and 7.3 quintals of vegetables (Chattopadhyay 2004).

Septage Management

At present PKDA area has a high dependency on treatment of sewage through septic tanks. This dependency is further anticipated to grow even with the planning of sewerage network in Puri. In absence of any formal septage management infrastructure the present system poses risk to both environment and human health. A septage management infrastructure hence is required to ensure safe and environmentally sound disposal of septage.

Depending on the design of septic tanks they are to be cleaned at a regular interval of 2-3 years. The cleaning should be done through vacuum pumps and as much as possible human interface needs to be minimized. The septage management infrastructure has to include vacuum pump mounted auto rickshaws and trucks. The rickshaws would ensure wide reach in narrow lanes. Manual handling of septage should altogether be banned. The treatment of septage may be done by drying and a centralized facility may be provided for this purpose. The dried sludge has good manure quality and may be sold to farmers. The whole septage management may be privately operated and the cleaning fees can be charged to the households.

Sewage Treatment in Slums

An effective way of reaching the slums is through exploring decentralized yet of site treatment technologies like DEWATS. Such technologies are cost effective and a better process control is achieved as the volume handled is less and the network is less complicated. Such technologies may be looked upon as intermediate options till the time the centralized sewerage system is planned and operational. The DEWATS networks are also very simple. The sewerage networks in DEWATS are either shallow or small bore systems and as compared to the centralized sewers they are relatively very cheap. Other than DEWATS many other technologies may be incorporated and explored for treatment of sewage and the same small bore or shallow conveyance system may be used. Such technologies include Submerged Immobilized Bio-filters (SIBF), Skid mounted Activated Sludge Plants etc. Applications of DEWATS are also discussed in the following sections.

Rural Areas in PKDA

Sanitation is key infrastructure for overall development of the region. The sanitation ranking of Puri is 89 and falls in the dark category needing immediate action. As per the study conducted by CEPT the sanitation technologies practiced in the region include pit latrines and septic tanks. Puri Municipal Corporation has proposed a complete underground sewerage network and treatment of the sewage. Hence an emphasis has been given on the other regions which have still a long way to go in the sanitation sector.

The chart below shows the requirements of ideal pit or vault latrines and septic tank latrines. Both these systems require safe and environmentally sound disposal of sewage. In the absence of proper septage management and given the low depth of the ground water, it is anticipated to cause environmental pollution. Hence, a proposal to explore the technologies like Decentralised Waste Water Treatment systems may be explored.

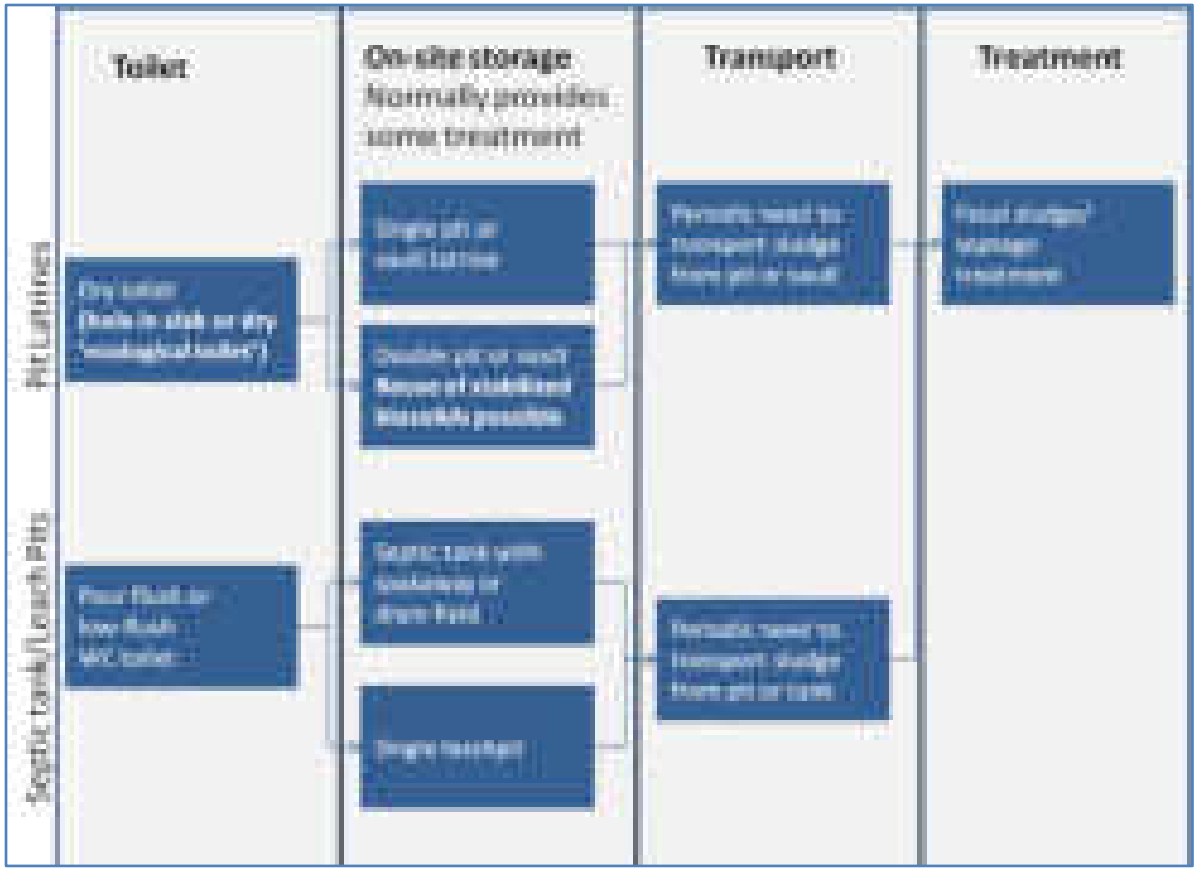


Figure 2: Conceptual framework for DEWATS

DEWATS is an approach, rather than just a technical hardware package. It provides treatment for wastewater flows from ***1 - 500 m³ per day***, from both domestic and industrial sources. DEWATS is based on a set of treatment principles the selection of which has been determined by their reliability, longevity, tolerance towards inflow fluctuation, and most importantly, because these treatment principles dispense with the need for sophisticated control and maintenance.

DEWATS work without technical energy, and thus cannot be switched off intentionally. Hence, it guarantees permanent and continuous operation; however, fluctuation in effluent quality may occur temporarily. DEWATS is not everywhere the best solution. However, where skilled and responsible operation and maintenance cannot be guaranteed, DEWATS technologies are undoubtedly the best choice available

The DEWATS is based on four treatment systems:

- Sedimentation and primary treatment in sedimentation ponds, septic tanks or Imhoff tanks
- Secondary anaerobic treatment in fixed bed filters or baffled septic tanks (baffled reactors)
- Secondary and tertiary aerobic / anaerobic treatment in constructed wetlands (subsurface flow filters)
- Secondary and tertiary aerobic / anaerobic treatment in ponds

The above four systems are combined in accordance with the wastewater influent and the required effluent quality. Hybrid systems or a combination of secondary on-site treatment and tertiary co-operative treatment is also possible. The Imhoff tank is slightly more complicated to construct than a septic tank, but provides a fresher effluent when de-sludged at designed intervals. The Imhoff tank is used preferably when post-treatment takes place near residential houses, in open ponds or constructed wetlands of vertical flow type. Deep anaerobic ponds and shallow polishing ponds are also considered being DEWATS.

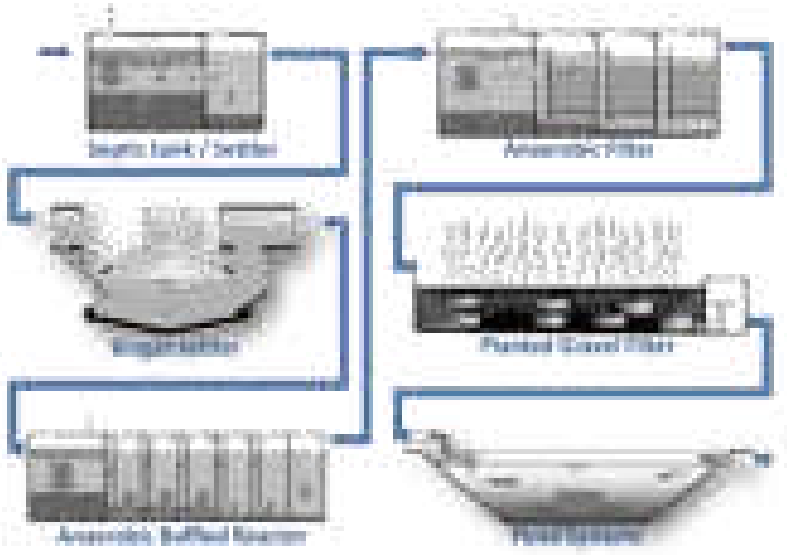


Figure 3 System design for DEWATS

Application of DEWATS: A case study

DEWATS is a very cost effective mechanism to initiate community based sanitation. In case of the PKDA region the applicability of DEWATS becomes much more prominent because of the high ground water level. A case study sheet is presented below:

Table 24: Case study for DEWATS development planning

<table>
<tr><th colspan="3">CBS DEWATS for Rajendra Nagar</th></tr>
<tr><td colspan="2">Project Background</td><td></td></tr>
<tr><td colspan="2" rowspan="5">Rajendra Nagar is a peri-urban slum, located in Kolhapur with a population about 5000 people of different ethnic groups. It is a settlement of displaced or migrant persons. The community has organized for some basic amenities for the colony.</td><td colspan="2">Salient Features</td></tr>
<tr><td>Design Capacity</td><td>10 m^3/d</td></tr>
<tr><td>No. of Users</td><td>1000</td></tr>
<tr><td>Influent Quality</td><td>BOD- 300mg/L</td></tr>
<tr><td>Peak Flow</td><td>8 h</td></tr>
<tr><td colspan="3">Purpose</td></tr>
<tr><td colspan="2">• Safe disposal of wastewater.
• To improve deteriorating environmental and hygienic conditions due to absence of wastewater treatment or appropriate disposal.
• Reuse for gardening/discharge in to open drain.
• To reduce the environmental pollution</td><td>  </td></tr>
<tr><td colspan="3">System in brief</td></tr>
<tr><td colspan="2">The wastewater streams are channeled from all the sources and collected in a common register near the treatment system, which consists of 4 modules: Settler, Baffled reactor, Planted gravel filter and Collection tank.
1. Settler is a sedimentation tank for retaining particles by settling over a specific time frame.
2. Baffle reactor ensures anaerobic degradation of suspended and dissolved solids by mixing fresh wastewater with an active sludge blanket.
3. Planted gravel filter is used as tertiary treatment unit where aerobic and facultative degradation of dissolved organic occurs.
4. The collection tank is used to store the treated water</td><td>  </td></tr>
</table>

Proposal for Pilot DEWATS in Sutana village

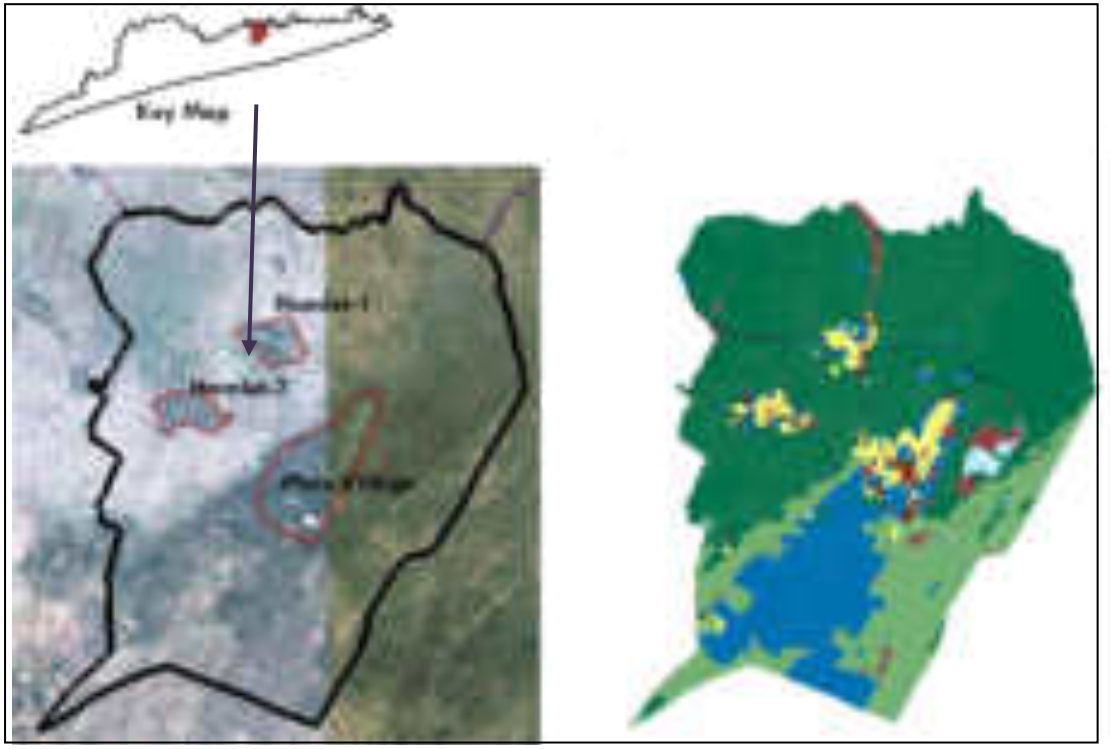
In this section, the application of DEWATS in one of the areas of PKDA has been demonstrated. For this purpose the village Sutana in Block-A has been selected. The village has a population of 2515 and 482 households as per census 2001. The village has three settlements- two hamlets and the main village settlement. The map below shows the location and the present land use in the village.

DEWATS can be applied in any of these hamlets and main village settlement. Calculations for area requirement and the approximate cost of the DEWATS system have been calculated separately for these hamlets and presented below.

Table 25: Sample Description for DEWATS planning

Parameters	Hamlet-1	Hamlet-2	Main Village
Approximate HHs	282	100	100
Wastewater generation (m3/d)	92	39	39
Area requirement for DEWATS plant (m2)	92.4	38.5	38.5

Map 6: Case example of DEWATS development in PKDA



6.4.3 *Cost Estimates*

Under the Plan for sewerage network a network for sewerage lines and a sewerage treatment plant has been proposed. Total of about 66.7 MLD is estimated sewerage generation in proposed CDP area.

The Assumptions taken for calculations:

- Standard Domestic Demand 135 lpcd for urban area and 70 lpcd for rural area
- All Sewage will be collected and the flow towards the Highway
- All connections are made in Man holes placed at 30 mt interval; Estimated cost of one manhole is (Circular type depth up to 1.5 mt) - Rs. 6500/Manhole
- Flow velocity is considered as 0.9 m.sec
- Waste Water Generation – 80% of Water Supply
- Sewerage Treatment Plant– 35 Lakhs/MLD
- Collection, Conveyance, Pumping stations and Sewerage Treatment Plant Cost – Rs. 95 Lakhs/ MLD

Table 26: Estimated Capital Cost for Collection, Conveyance & Treatment of Sewage in Proposed CDP Area

Name of Zone	Location	Deficit for the year 2031	Estimated Cost (Rs. Lakhs)				
			Phase I	Phase II	Phase III	Phase IV	Total
Zone 1	Puri	2.4	228	-	-	-	228
Zone 2	Puri Sadar	28.4	-	2698	-	-	2698
Zone 3	Block A	0.2	-	-	19	-	19
Zone 4	Block A	1.3	-	-	123	-	123
Zone 5	Block A	0.7	-	-	-	67	67
Zone 6	Konark	9.2	-	874		-	874
Zone 7	Block B	0.8	-	-	-	76	76
TOTAL			**228**	**3572**	**142**	**143**	**4085**

6.5 Access to Toilets

Puri and Konark are one of the most important landmarks in India's tourism map. It is visited by lakhs of Indian and Foreign tourist every year. Toilet facilities are the cornerstone for environment protection, health and well being of citizens as well as the visitors of these historic towns. It has been observed that the toilets in these towns are in a state of extreme despair and neglect. As an outcome of which there are high instances of open defecation and open urination not only by the locals but also the tourists. This impacts not only the environmental conditions but also the image of the towns. The various issues that were studied and observed in the case of toilets in Puri and Konark are as under:

Public toilets are insufficient to cater to the demands of the locals as well as the tourists.

- Improper maintenance of the existing toilets, leads to reduced usage and redundant infrastructure
- Poor design – improper flushing mechanisms, ventilation and poor layout.
- Gender Insensitivity
- Lack of signages
- Lack of public awareness
- Lack of community toilets in the slums
- Rampant open defecation and open urination

6.5.1 *Sanitation Hot Spots*

Having studied the existing land uses and the location of the existing toilets and their condition in the town, the areas which were critical in terms of the access to toilets were identified. The attached map indicates such areas in Puri. The land use is a combination of heritage and cultural importance, commercial and residential uses. Open urination and open defecation is another pressing sanitation issue in Puri. While stretches of Swargadwar road, railway station road and marine drive road have been observed as the hotspots for open urination, the sweet water zones of Talbania and Baliapanda are the open defecation hotspots of the nearby slums in the region. Inadequate sanitation facilities mar the scenic and architectural beauty of areas such as Atharnala, Narendra Tank and Swetganga tank. This identification of critical areas in terms of public toilets and urinals shall assist in designing the spatial interventions in these areas. The gap in the number of toilets required is proposed to be substantiated by the community toilets, public toilets and public urinals.

Map 7: Critical areas with respect to sanitation in Puri town

The provision of public toilets in the city is usually met by three means. Provision of Public toilets and urinals, meant of the floating population and catering typically to the areas with high commercial and tourist activities, usually with user charges and the provision of community toilets with bathing and washing areas charged as monthly user cards. The following section details the number of public toilets and urinals and the community toilets required for Puri Town.

Table 27: Monthly tourist influx

YEAR	2007		2008		2009		2010	
Month	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
January	354750	1826	360000	1780	382500	1432	405250	1797
February	265500	1976	275250	1770	298400	1642	304250	1208
March	263000	1077	265500	1403	472250	878	275000	1012
April	355000	609	357250	622	360500	494	365000	453
May	330500	364	332200	384	185555	285	190000	288
June	285555	230	280250	268	1174515	545	162500	322
July	1210500	560	1122500	446	615500	337	1338268	465
August	175000	511	180250	567	240500	450	295550	564
September	205500	437	210000	304	315500	327	355000	650
October	265400	732	308425	735	318200	539	380000	739
November	502000	1488	512200	1151	513500	904	452000	1185
December	540500	1336	542300	1234	545850	912	555500	1183

Source: OTDC, 2011

The attached table indicates the number of tourists in Puri town for the years of 2007, 2008, 2009 and 2010. The average number of tourists per month can be calculated as 42,415. Thus the average numbers of tourists per day are 14,133. However in Puri as it can be observed that there is a considerable fluctuation between the tourists throughout the year. Hence with discussions with the city officials it has been estimated that the proposed number of toilets should cater to a daily tourist influx of 20, 000 tourists per day. Based on the standards the number of toilets has been calculated to be 200 public toilet seats and 100 urinals. The attached table sums up the toilet requirement calculation. These are to be distributed in various design modules based on the need of the area.

Table 28: Tourist public toilet requirement calculation

Tourist population per day	250,000
Standards for public toilets	1 seat for 100 users
Standards for Urinals	1 seat for 200 users
Total number of Toilet seats required	**200**
Total number of urinals required	**100**

A detailed feasibility study for evaluating the exact number of toilets along with their location is required. The surges in the tourist population may be supplemented through the provision of mobile toilets. The existing toilets need to be refurbished and maintained such as to make them more usable and increase the toilet stock of the city.

The community toilets are usually equipped with bathing and washing areas along with the toilets and urinals. The number of slum dwellers in Puri town is 12822 (2004). For the community toilets the standards are taken as under

Two scenarios have been taken for calculating the toilet demand

High Access: 1 latrine seat can serve 25 people.

National Norms: For estimation of community toilets, national level most documents and policy schemes suggest that 1 latrine seat can serve 50 people.

Hence in a high access scenario the required number of toilet seats is that of 512 seats and that according to the national norms is that of 257 seats. It si suggested that the national norms may be taken as the immediate goal in the first phase and eventually this may be escalated to 1 seat for 25 users.

Further to the number norm the community toilet should be essentially dispersed such as that no toilet is farther than 250m from any household. This ensures that sufficient access to all the identified households. The following sections indicate the possible toilet designs and the feasible locations for the proposed public toilets.

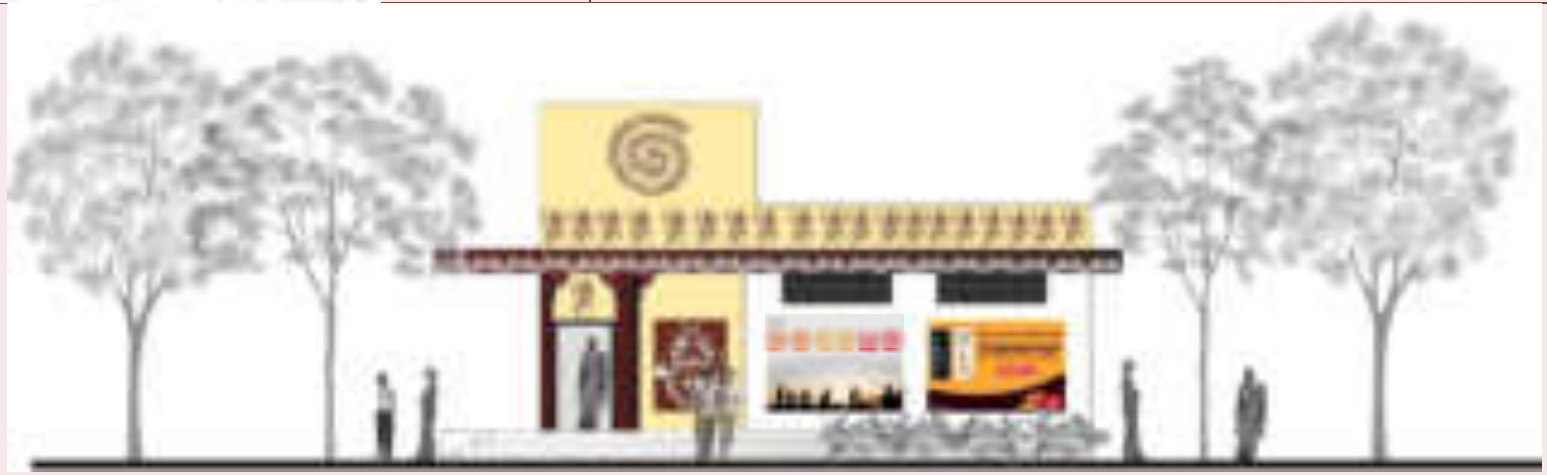
6.5.2 *Proposed Toilet Layout*

Public toilet

- Building footprint of the public toilet – 132 sq m or 1420.836 sq ft
- One toilet seat caters to 100 users and one urinal caters to 200 users.
- Therefore this public toilet serves 400 women and 1300 men.

For public toilets there is a close relationship between design and management. Design choices should be made such that they allow for easy cleaning and management, resistance to vandalism, and low maintenance requirements. These blocks should have proper light and ventilation, for proper working and use.

Plan of Public toilets



Front Elevation (graphics for illustration purpose only)

Community Toilet

Section AA

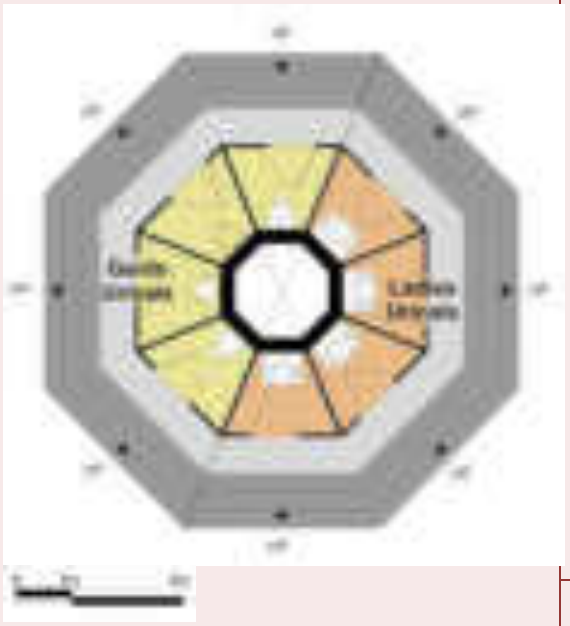
Plan

- Building footprint of the public toilet – 151 sq m or 16250.350 sq ft
- One toilet seat caters to 50 users in case of community toilets
- Therefore this public toilet serves 250 women and 250 men.

The community toilets operate in the slum areas. They need to have bathing facilities in addition to the W.C. Broad circulation areas are proposed to accommodate sizable user group.

Front Elevation (graphics for illustration purpose only)

Urinal



Plan

Front Elevation
(graphics for illustration purpose only)

- Building footprint of the public urinal – 51 sq m or 548.959 sq ft
- One urinal caters to 200 people
- Therefore this urinal serves 800 women and 800 men

It has been observed that the number of facilities for women is lesser than those for men. Hence this design simulation tries to reduce this difference. This block uses some prefabricated elements for easy execution of the urinal blocks.

It has been observed that the public toilets are of poor workmanship, use sub standard materials and are ill located. CEPT believes that the design and construction of the public toilets should adhere to basic minimum technical standards. A guideline for the same had been postulated by the Ministry of Urban Affairs and Employment. It specifies the following

- Detailed toilet specifications
- Certain suggested design options
- Lighting standards
- Technical specifications
- Process of identifying the right location for the toilets based on Access, Safety and Inclusivity
- Right signage
- Operation and maintenance schedule and standards
- Suggested treatment systems
- Suggested business models for public toilets
- PQ for selection of the private parties

These guidelines were drafted during 1995. This should be revised and then institutionalized by the urban local body, such that all new toilet design and construction should comply with the manual.

To ensure better design and workmanship of the Public toilets, community toilets and the Public urinals CEPT recommends that the design and construction of should be taken up through the DPR approach such that the private party is aware of the standards to adhere to, and can allow higher monitoring and better management as per the design document. Gradually the urban local bodies should look to develop an ideal DPR which has the design as well and the operations and maintenance specifications, which can become a model for public/community toilet design.

6.5.3 *Feasible Location for toilets*

Area/Stretch	Toilets /Urinals	Feasible Locations
Fisherman Slum areas – Puri and Konark The fisherman slums located in the coastal areas of Puri and Konark lack any sanitation facilities. They have high tourism potential due to the presence of beach as well as the life of fishermen community and their crafts. The community toilets with water supply facilities and shower area are proposed in common community areas. The settlement pattern of the slums allows the construction of community toilets within close proximity of the residential quarters. Situated close to the sea and also located on the sweet water zone in case of Puri the design of the toilets specifically the transfer of the grey and black water should ensure no contamination of the aquifers. Involving community during planning and implementation phase for their inputs as the community would be the final user group.	There are few existing public toilets but there is absence of community toilets in this area. The community toilets should be proposed depending on the population of slums and also considering the access distance. Proposed public toilet caters to the area within the radius of 100m.	  Within the Pentakota area there are number of waste dump sites, these areas are feasible for community toilets   Beach area is used as dump sites and for open urination and defecation. Therefore community toilets are essential along the beach to improve the beach area as beach area is important to the fisherman residing (drying of fish, repairing of nets and boats). The beach area is picturesque owing to the fisherman boats in the sea and therefore can be a potential tourist spot.

Atharnala

Atharnala is the entrance to Puri. Since it is an entry point to Puri, an information center, eatery is proposed by CEPT. Sanitation facilities would be an integral part of this proposed structure. These public utilities can be used by tourists as well as the hawkers, roadside shops etc.

Proposed public utilities would be an integral part of information center.

Existing area around condition around Atharnala

CEPT University's proposal for Atharnala

Talbania

It is a sweet water recharge zone and is not a desired location for proposing toilet block. But it is necessary to avoid open defecation and bathing. In this area open defecation and bathing happens throughout the year indicating a grave need for community and public toilets.

This is also used as a bus stop for outstation buses arriving from Kolkata and Andhra Pradesh, therefore a number of drivers, service and maintenance staff stays in this area. Therefore it is essential to propose a public toilet with bathing facilities to improve the environment in that area.

The proposed toilet block has to sensitively plan for the waste disposal and on site treatment, and not contaminate the sweet water zone.

Public toilets with bathing facilities.

Areas where public toilets can be proposed, since there are existing water facilities at these locations.

Baliapanda

Baliapanda is water recharge zone for Puri town. This area is critical in terms of ecology and therefore open urination and defeccation should be avoided in this area. Proposed BRTS bus stand is located in the proximity of this area.

The proposed toilet block has to be compact with easy access and signages and should be integrated with commercial activities.

This illustration shows Public toilets as part of commercial building

Marine Drive Road

There are two existing Sulabh public toilet blocks on the marine drive road. They are in comparatively better condition apart from slight design problem (dry and wet areas are not segregated) and are used extensively. Both the Sulabh blocks have shower areas for both men and women. The marine drive area is quite large with considerable tourist population visiting the beaches footfall.

Existing Sulabh toilet blocks on marine drive road

There are existing urinals along the beach, but due to deficient design and lack of proper enclosure, they are not in use.

Both public toilets and urinals should be proposed in this area.

There is a need to plan for both shower/changing rooms as well as toilet areas in the proposed toilet blocks.

The toilets design should reciprocate the existing character of the area, and should have appropriate signage to announce their location to the tourists .

The proposed toilets can be located along the beach. Sanitation facilities should be about 350m center to center, for tourists to have easy access .

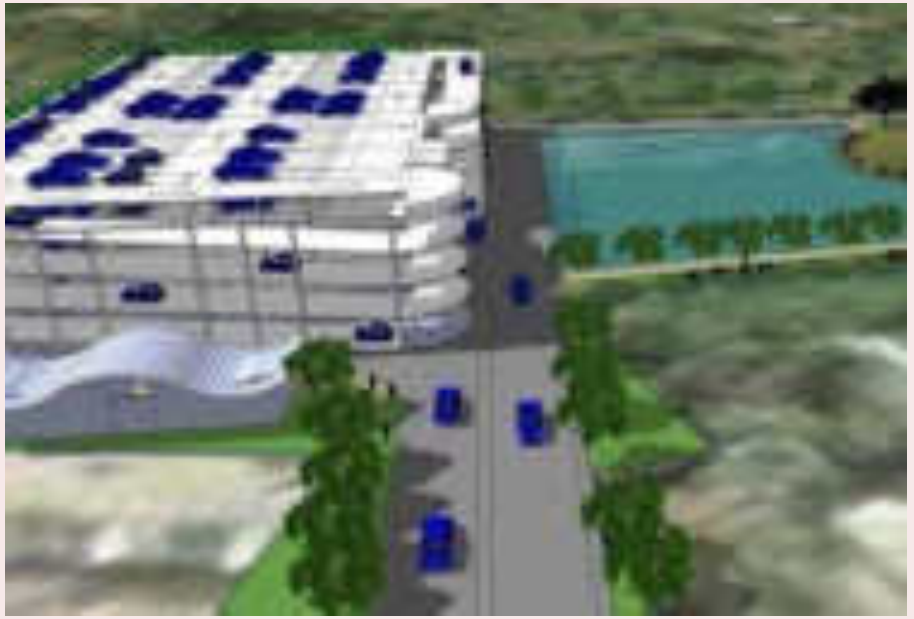
Existing urinals on the beach are not in use and are in dilapidated condition.

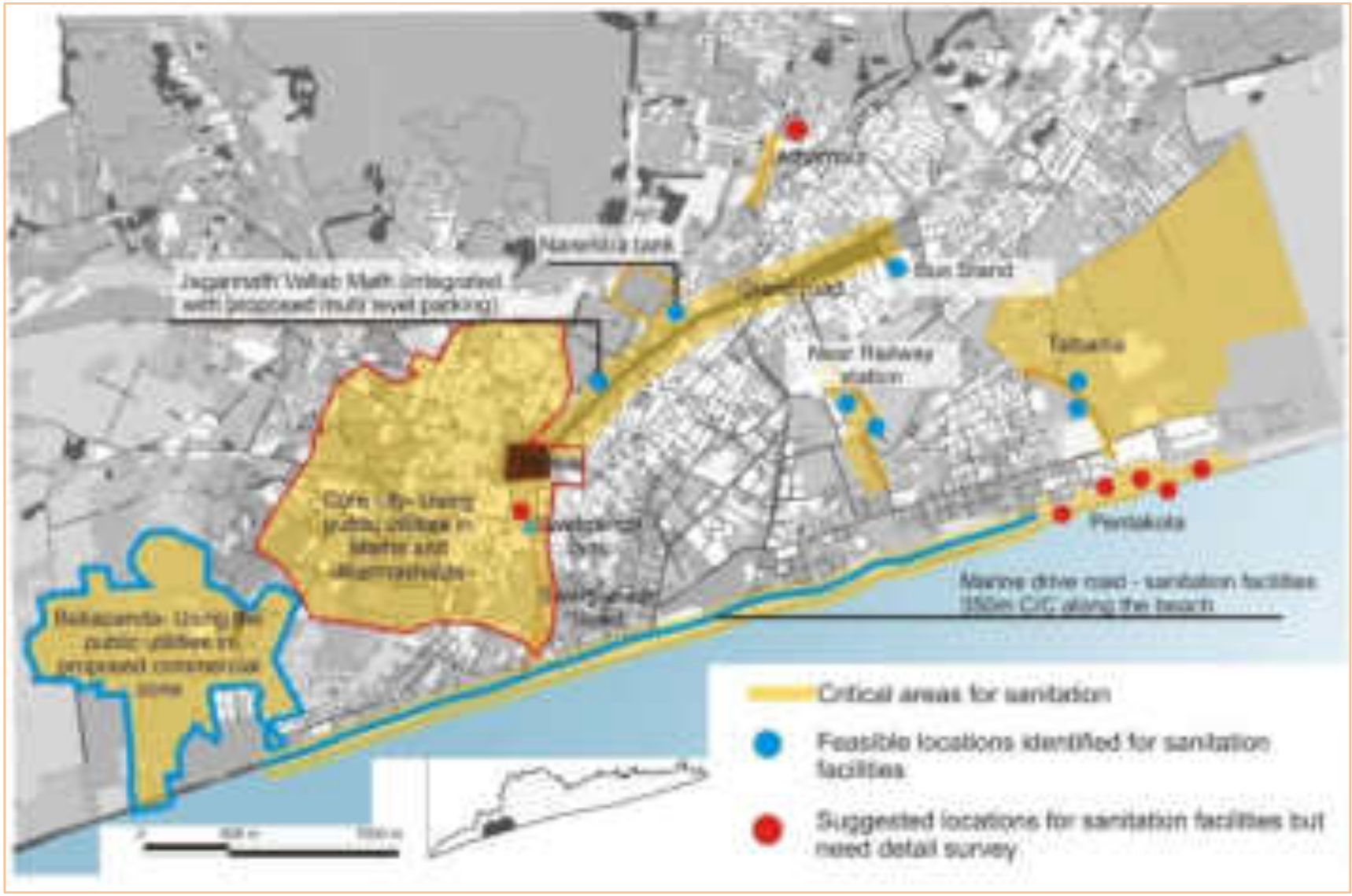
A simulation showing a urinal module that can be proposed along the beach.

Narendra Tank Narendra tank is a big tourist attraction especially important during chandanyatra festival. It is a holy tank where people take dips. It is also used for domestic purpose by the people in the vicinity. The area around the tank is used for open defecation and urination, thus affecting the water quality in the holy tank and also the aesthetics of the tank.	Public toilets with changing rooms water facilities and bathing area (as required from detailed surveys). Since Narendra tank is surrounded by maths, the proposed public utilities should visually relate to the existing character.		The vacant area around Narendra Tank, along the Atharnala road is a feasible location for public toilet block.

Swetganga Tank Swetganga tank is a holy tank and two small temples – Sweta Madhava and Matsya Madhava are located on the banks of the tank. This tank is near the Jagannath temple and is surrounded by historically significant Mathas. Currently the tank is in deplorable condition, the tank has no water. The area around the tank is site for open defection and urination. There are existing sanitation services near tank but in very bad condition and not in use. Swetganga tank is part of the heritage walk proposed by CEPT university, proposing sanitation facilities would improve the area. The sanitation facilities would also benefit the residents in that area.	Proposing public toilet and also encouraging people to use these sanitation facilities is essential. These facilities would be used by both tourist (heritage walk) and the residents.	The green area marked around the tank has temple, therefore proposing public utilities is not feasible. This area has high density and also there are existing Maths around the tank. Therefore public utility should maintain the sanctity of the area. The proposed public utiulities should blend with the existing fabric of the area. The exact location for public utilities requires detailed survey of that area.  **Swetganga Tank**
Gundicha bus stand It is located in the proximity of Jagannath temple therefore has huge influx of tourists and also has bus association offices. There are currently some sanitation facilities that are inadequate for tourists and the service and maintenance staff for the buses. Presently open urination and defecation can be witnessed in this area. CEPT university has proposed parking and open space for the city in this area.	Improving the existing sanitation facilities and proposing new toilet blocks depending on the requirement.	 **Feasible locations for public utilities** In case of Gundicha bus stand, space is not a constrain as there is space to accommodate public utilities. The Public utilies can be combined with water facilities.

Station Road Along with travelers and tourists frequenting this road, there are number of allied activities (autos, taxis, small shops, etc) along this road. One can find number of open urination spots in this area due to presence of open drains and linear compound walls.	Proposing toilet blocks or urinals that are compact in nature.	  Public utilities near the railway station are essential and can be located opposite the railway station along with water facilities and in the parking area near railway station
Core City (Heritage area) Proposing sanitation facilities in core city is a complex situation due to the presence of religious activities and ASI regulations. Jagannath temple and Emar Math are ASI protected; therefore it is difficult to propose any development 100m around these structures. There are around two toilet blocks in this area; these facilities are inadequate to cater to the large amount of visitors and the existing households. Proposing of new toilet blocks in this area is difficult; therefore the existing utilities in maths and dharmashalas can be opened for visitors. These facilities can be 'pay and use' type. In case of Dakhina Parshwa public utility is located in the courtyard and therefore the visitors can use these facilities without disturbing the activities in the math.	Public toilets can be proposed in maths or dharmashalas with large open space or the ones that are abandoned with their respective consent. The people owning small businesses can use sanitation facilities in hotels or residences. For this task a detailed and meticulous survey is necessary along with public consultation	  Raghavdas Math Kaushlya Math These are the two maths that are identified, that can be opened for visitors to use public utilities.

Jagannath Vallabh Math Jagannath Vallabh Math is located in the close vicinity of Jagannath Temple. CEPT university has proposed multi level parking and garden in this area; therefore public utilities can be combined with the proposed parking space.	Proposing public toilets that are compact in nature and also an integral part of multi level parking is essential.	Public utilities can be provided on the ground floor of the multi level parking.
Proposed multi level parking in Jagannath Vallab Math  Along with parking facility, public utilities, kiosks, garden, management and service staff offices are provided as a part of multilevel parking proposal.		

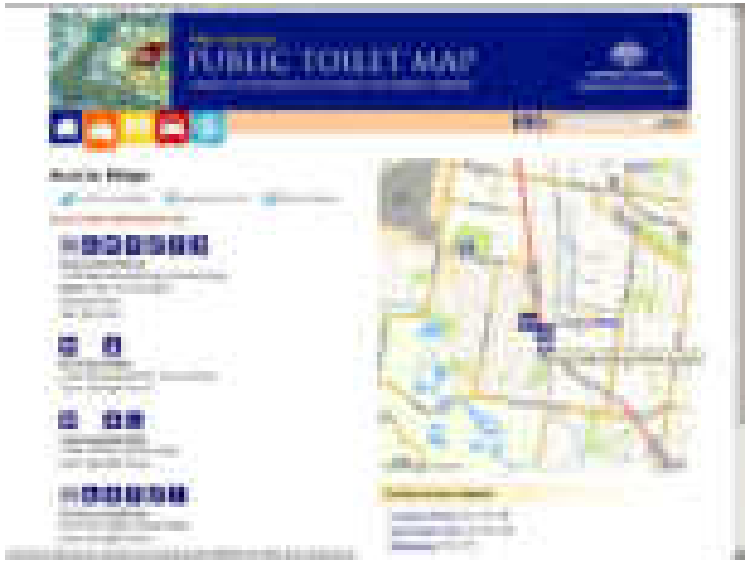


Map 8- Identified location for proposed toilets

6.5.4 *Policy Interventions*

The sanitation system in Puri requires integrated approaches to deal with the multi pronged problems. The following steps have been suggested:

- A city sanitation plan should be developed to deal with the sanitation issues in a comprehensive manner.
- Undertake feasibility studies to identify the exact number of seats required and the actual location of the toilets, based on the suggested guidelines.
- Development of design specifications and manuals for design, construction and maintenance of the toilets
- Develop the system of user cards for the community toilets
- Develop a strong monitoring system for the operation and maintenance of the toilets.
- Enhance synergy among the actors in sanitation development, including municipal government agencies, the private sector, NGOs, and others.
- Employ appropriate technologies that are suitable to user needs - differential technology choices based on location (core city, outer growth areas), slums etc
- Promote awareness of health and hygiene behaviour which is important for Puri since the issues of open defecation have a strong bearing on the socio-cultural habits of the people.
- Develop a public toilet map of the city and link it to the various tourist areas in the town. This may be uploaded in the municipality website, an illustration is attached.



Online toilet map developed for australian cities

An illustration showing public utilities as a part of puri tourism website

6.5.5 *Financial Mechanisms*

In case of toilets the operation and maintenance costs are high. Therefore for proper maintenance of toilets revenues are essential. Some of the means for revenue generation are:

- User charges
- Advertising rights on the blank wall of toilets
- Providing additional facilities or commercial area with the toilet blocks
- Collection of maintenance funds from the commercial establishments

User charge for use of public toilet is a workable option as well maintained Sulabhs are extensively used. User charges for community toilets is not a feasible option as the user group would belong to low income. In that case monthly passes for community toilets can be introduced. The top portion or the water tank area can be used for advertisement in case of community toilets blocks. The urinals would not have user charges, but since they would be located in vital areas advertisements would be the main source of revenue.

6.5.6 *Awareness Programs*

Name of program	Outreach program design	Temple area rejuvenation	Clean Beach area initiative
Target group	Municipal School, Educational institutions, colleges etc.	Temple association, Pandas, tourists, shop keepers etc.	Tourists, mobile vendors, informal stall owners, Hotel owners etc.
Purpose	For a sustained awareness generation, the programme design for awareness strategies has to be designed by the people of PKDA. Schools are an appropriate location for sanitation awareness generation, as it gets effectively translated to their families.	Jagannath temple is the symbol and identity for the PKDA region. Hence clean environment by improving sanitation and solid waste facilities around the temple would create increased awareness. This would be replicated elsewhere as the people follow The Jagannath culture symbolically.	Major attraction for tourists in the region is naturally beautiful beach on Bay of Bengal coast which is polluted area due to lack of sanitation and solid waste management services in the town. Therefore effective awareness among tourists and informal workers will lead to clean environment

Name of program	Outreach program design	Temple area rejuvenation	Clean Beach area initiative
Mode of delivery	- Major rallies and discussions can be held on different important occasions. - Design competition can be undertaken for designing posters, mascots and jingles for sanitation awareness - Inclusion of environment awareness in major colleges and educational institutions can be a useful tool.	- Since the temple is the most visited places in Puri, they are important locations for putting up the information kiosks and signs related to sanitation to spread the message. - The Pandas and shop owners can be used as volunteers for spreading the message of clean Puri among the tourists and residing communities.	- Beach walk, Sahara Parkirama can be initiated by involving tourists as well as local residents for awareness creation. - Hotel owners and informal vendors can be involved in the programme through training and illustration of the problems existing and the opportunities the region can gain.
Illustration	 	 	 

6.5.7 Cost Estimates

Assumptions:

- Community Toilet: Rs. 25 Lakhs for 10 Seater facility
- Public Toilet: Rs. 20 Lakhs for 8 Seater Facility
- Urinals: Rs. 5 Lakhs for 8 Block Facility

Table 29: Estimated Capital Cost for Toilets Facilities in Proposed Area of CDP Area

Name of Zone	Location	Tentative No. of Facilities Required			Estimated Cost (Rs. Lakhs)			
		Community Toilets	Public Toilets	Urinals	Community Toilets	Public Toilets	Urinals	Total
Zone 1	Puri	25	20	17	625	400	85	1110
Zone 6	Konark	8	7	5	200	140	25	365
					825	**540**	**110**	**1475**

Note: Toilet facilities are most essential for Puri and Konark. Therefore the proposed facilities should be implemented in Phase- I.

6.6 Storm Water Management

Storm Water Management is the urban areas of PKDA is very critical. The location of the study region is on a strong monsoon route which results in heavy downpour during rainy season and hence the component gets added priority in the context. Planned drainage infrastructure development therefore is a must for the region.

The major issues with storm water situation in urban areas of PKDA are as follows:

- Storm water drains function as a conveyance channel for untreated sewage from the partially laid/incomplete interceptor sewer network.
- Drains are also significantly silted and collapsed in some sections reducing the effective cross-section and resulting in inundation problems during the monsoon periods which were not prevalent during earlier times owing to the prevalent natural gradient and nature of sub-soil.

Figure 4- Existing condition of Storm water drains

6.6.1 *Drainage Proposals for Puri and Konark under JnNURM*

Under JnNURM in both Puri and Konark storm water drainage has been proposed. However, the proposals are limited to the development of storm water drainage and do not take into account the linkages and development of the tanks. The tanks and ponds in both the urban centres hold a huge religious importance. In the sections that follow, hence, the emphasis is mainly given to development of tanks and their linkages to the overall storm water management.

6.6.2 *Strategies for Storm Water Management*

6.6.2.1 Restoration of Tanks

The tank restoration requires source control, treatment of the tank, public participation and policy level interventions. These are discussed in detail in the following sections.

Source Control: Treatment of watershed or catchment of tanks which not only brings in substantial improvements in the water environment (reduction of silt, control of chemicals, and nutrients) but also results in the overall development of the community living in the catchment. Soil conservation measures, bank/slope erosion control measures, afforestation, landscaping, drainage improvements, diversion of silt carrying channels away from the tank, control of sewage wastes, sewage interceptions and diversions and participation of people in watershed management measures have been widely adopted as effective management tools in all the tank and lake restoration projects.

Narendra Tank Restoration

Ministry of Environment and Forests has been implementing the National Lake Conservation Plan (NLCP) since 2001 for conservation and management of polluted and degraded lakes in urban and semi-urban areas. The major objectives of NLCP include encouraging and assisting state Governments for sustainable management and conservation of lakes. The scheme was approved by Government of India during IX Plan (June 2001) as 100% Central Grant. Funding pattern under NLCP has since been changed w.e.f. February, 2002 from 100% central funding to 70:30 costs sharing between the Central and the concerned State

Government. The various suggested activities under the NLCP[3] are

- In situ measures of lake cleaning such as de-silting, de-weeding, bioremediation, aeration, bio-manipulation, nutrient reduction, withdrawal of anoxic hypolimn ion, constructed wetland approach or any other successfully tested eco-technologies etc, depending upon the site conditions.
- Catchment area treatment which may include afforestation, storm water drainage, silt traps etc.
- Strengthening of bund, lake fencing, shoreline development etc.
- Lake front eco-development including public interface.
- Solid waste management & provision of dhobi ghats is generally not covered under NLCP.
- Prevention of pollution from non-point sources by providing low cost sanitation.
- Public awareness and public participation.
- Capacity building, training and research in the area of Lake Conservation.
- Any other activity depending upon location specific requirements.

CEPT suggests that Narendra Tank should be taken up for the NLCP, since it qualifies in terms of the area and that of its socio- cultural and religious significance. A 30m buffer for controlled development is suggested. Lake cleaning, beautification and sanitation planning of the area are suggested. Development of seating areas and information kiosks shall help in uplifting the image of the city. Regulation of the wastes, both solid wand waste water , that are being thrown into the water should be controlled.



Control of Eutrophication

The following are several palliative measures under taken to remove eutrophication and improve quality of water.

- Dredging and de-silting

[3] Guidelines for National lake conservation Plan , MoEF, National River conservation Directorate

- De-weeding/hyacinth control or removal (biological, chemical, mechanical and manual measures, bio-composting) – as in the Loktak, Bhoj Wetlands, Harike and Kanjli lakes.
- Bio-remediation (Clean up with bio-products - natural bacteria breakdown, and aerators)
- Introduction of composite fish culture/larvivorous fish species to control mosquitoes

Peoples' participation

This very effective management method is becoming increasingly popular in conserving Lake Environments in Urban areas. Non-Governmental organizations have acted as catalysts. In major urban centres, people have organized themselves e.g 'Peoples Group' (Hyderabad), 'Jheel Sanrakshan Samithi (JSS)' (Udaipur), 'Society of Appeal for Vanishing Environments' (SAVE) (Nainital), Howrah Ganatantrik Nagarik Samiti (HGNS) (Howrah), 'Green Kashmir'(J&K), 'Ecological Task Force' (Harike), 'User's Committee' (Pushkar), and similar other groups. They have also moved the Judiciary (the Supreme Court and the High Courts) through Public Interest Litigations (PILs) seeking directives of the courts to restore lakes/tanks. Information Centres - cum - watch towers for Mass awareness and promoting public participation in the conservation programme have been established in many states and urban centres.

Best Practices- A case of Tanks in Andra Pradesh:
To capture and store more monsoon runoff, 73,000 tons of silt was removed from the tanks. The increased water supply and groundwater recharge resulted in less groundwater pumping. Water tables rose, reactivating some wells that had dried up, wells worth an average US$2,330 each. The silt comprised 60-70% clay rich in carbon and nutrients, and was spread over 602 ha. Village committees were established to maintain the tanks and manage water use. Following the success of this project, the state government has started a tank de-silting program.

6.6.2.2 Managing Storm Water Drains

Strom water drains are a crucial component of the Storm water management system. In Puri the major issues are of solid wastes being dumped into the open storm water drains and the lack of dedicated storm water drains in the city. The existing storm water drains are open, which leads to the clogging of the same with solid waste. This reduces the capacity of these drains to carry off the rain water and results in flooding of the surroundings. It is suggested that the storm water drains be covered such that the solid waste does not enter them and reduce the capacity of the same. The images show the existing conditions vis-à-vis the suggested options. For the new developments it is recommended that the storm water drains should be under the ground. The drain covers can be branded such as to educate people, not to throw solid waste into the same

Existing condition of Drains

Suggested covered drains

Over concreting of the urban fabric, has been identified as one of the major causes of urban flooding. CEPT proposes that this needs to be regulated. The parking lots and the footpaths are important places of rain water recharge. The paving should allow the percolation of water into the ground. In Puri specific standards for softscape to hardscape ratio must be set. The attached images display the various options of paving, which allow the rain water to percolate through the open joints.

6.6.3 *Cost Estimates*

The capital cost for Storm Water Drainage is estimated to be 31.15 Crores. (refer following table)

Table 30: Estimated Cost of Storm Water Drainage in PKDA CDP

RoW	Pipe Dia (in mm)	Pipe material	Unit Rate (Rs. Lakhs/ km)	Total Length (Km.)					Estimated Block Cost (Rs. Lakhs/km.)				
				Phase I	Phase II	Phase III	Phase IV	Total	Phase I	Phase II	Phase III	Phase IV	Total
12 m	600	RCC Class P-3 (Test Pressure 6 Kg/cm^2) (IS-458/)1989	20	2.37	66.1	10.2	0.0	78.7	47	1323	203	0	1574
18 m	600	-do-	20	5.49	29.7	8.8	0.0	44.0	110	594	177	0	881
24 m	900	-do-	25	5.64	13.4	7.4	0.0	26.4	141	335	185	0	661
								TOTAL	**298**	**2252**	**565**	**0**	**3115**

6.7 Solid Waste Management

To ensure quality health, hygiene of the urban environment solid waste and sanitation management must be planned efficiently. It is an obligatory function of the urban local body. Municipal Solid Waste Management involves the application of the principle of Integrated Solid Waste Management (ISWM) to municipal waste. ISWM is the application of suitable techniques, and management programs covering all types of solid wastes from all sources to achieve the twin objectives of (a) waste reduction (b) effective management of waste still produced after waste reduction (c) recovery of valuables from the waste.

The practice of solid waste management as pursued by the urban local bodies of Puri and Konark are clearly inadequate, posing health and environment risks. Being areas of tourist importance the mismanagement of solid waste leads to unaesthetic conditions. The proposed interventions have been suggested suiting the local needs, tending to the capacity building needs and also to the awareness strategies that are required to sensitize the citizens and hence become more participative in the waste management processes.

The solid waste management of the region under PKDA has been segregated in two broad parts, one pertaining to the rural areas and the second pertaining to the twin urban areas of Puri and Konark. The following sections detail the proposed strategies.

6.7.1 *Solid waste generation- Demand Assessment*

The calculation of solid waste generation is based on the CPHEEO norms. For the urban areas the standard has been taken at 350 grams per capita per day, compounded at 1% annually, due to the lifestyle changes. For the rural areas the solid waste standards have been taken at 250 grams per capita per day, compounded at 0.5% annually. To include the waste generation due to the tourist influx an additional 0.5% increase in the waste generated from the urban areas (Puri, Puri Sadar and Konark) has been considered.

The attached table indicates the waste generation from the different land use zones of the region. It may be noted that in the assumptions of the population projections, it was understood that the population growth of Puri town till the year of 2031, shall be distributed in Puri Sadar and Puri. The solid waste calculations for the intermediate horizon years of 2011, 2021 and 2031 have been calculated accordingly.

Name of Zone	Location	SWM Standards			SWM Generated in MT		
		2011	2021	2031	2011	2021	2031
Puri town	Puri	0.35	0.41	0.47	59.6	74.3	92.1
Zone 1	Puri Sadar	0.35	0.41	0.47	24.7	51.3	85.8
Zone 2	Block A	0.25	0.26	0.28	0.5	0.7	0.8
Zone 3	Block A	0.25	0.26	0.28	2.2	3.4	4.6

Name of Zone	Location	SWM Standards			SWM Generated in MT		
		2011	2021	2031	2011	2021	2031
Zone 4	Block A	0.25	0.26	0.28	2.3	2.4	2.6
Zone 5	Konark	0.35	0.41	0.47	11.1	18.9	29.0
Zone 6	Block B	0.25	0.26	0.28	2.1	2.4	2.8

It might be noted that in the Puri Town the solid waste generated increases by 55%, while the same for the Puri Sadar region is as much as 247%. This is attributed to the spillover from Puri town to Puri Sadar. This indicates that solid waste management as a municipal service should be extended to the peripheral areas of Puri. In Konark the Solid waste generation increases by 160% from the present generation. This suggests that the options for waste reduction and better management should be looked into. The present system of the solid waste management in Puri and Konark has been studied under the tenets of the MSW rules of 2000. The attached illustration indicates the high percentage of Non compliance to the rules.

Figure 5- Status of MSW rules 2000 compliance in Urban areas of PKDA

Both Puri and Konark have not been able to initiate door to door collection in their jurisdiction. The system of waste collection is that of street sweepings and collection of the wastes from the municipal dustbins.

Burning of solid waste has been observed in many areas by the sanitary workers. Solid waste management in the slums is almost nonexistent, with the people staying in extremely unsanitary conditions.

In Puri the solid waste is collected from 7 SWM Zones. Both Puri and Konark generate a considerable percentage of recyclable plastic wastes; however there is no system of separate collection for the same.

6.7.2 Proposed Solid Waste Management Interventions

The following sections detail the proposed interventions in the urban areas of PKDA consisting of Puri and Konark

6.7.2.1 Shifting of the Compost facility from Baliapanda, Puri

Figure 6- Location of the existing compost plant in Puri

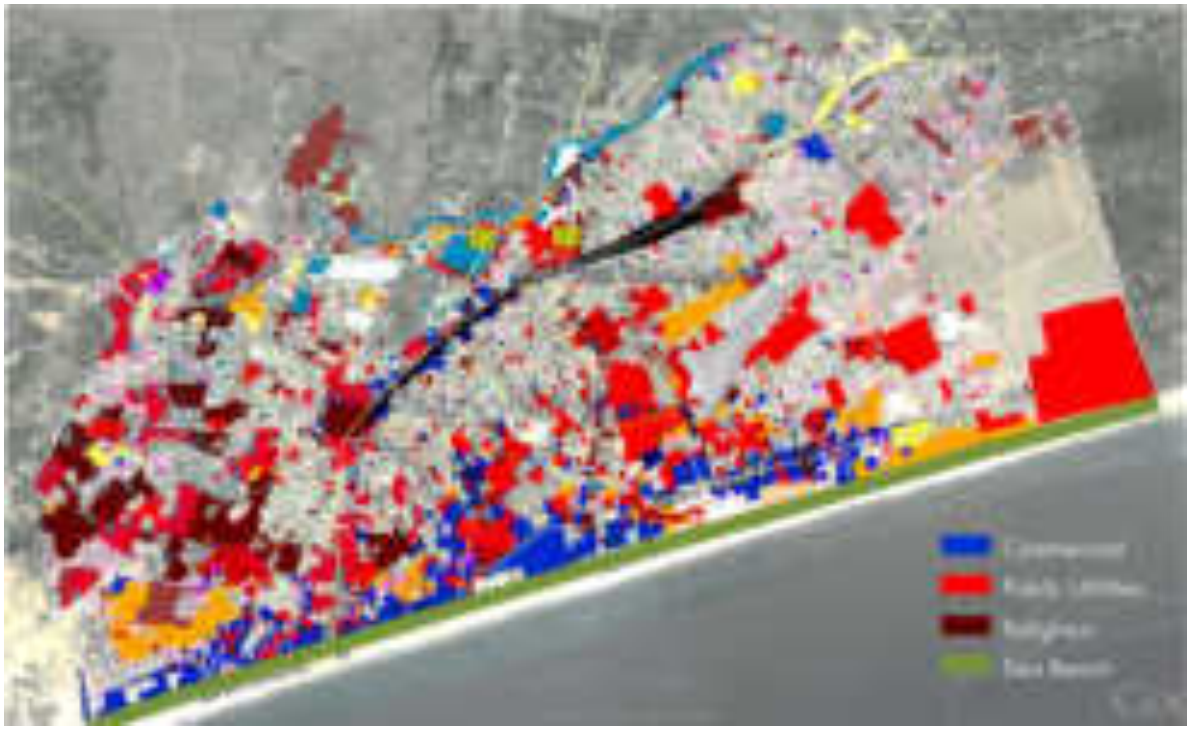
Puri has depended on the compost and landfill facility at Baliapanda for its waste disposal since 1998. While the compost plant has been partially successful owing to the lack of coordination between the ULB and the private operators, the landfill facility has been nonexistent, with the compost rejects being dumped in the low lying areas. The area has high water table and this poses severe health risk emerging from the possible water contamination. Also it is located in close proximity to the sweet water zones. The attached illustration indicates the same.

When the plant was commissioned the area was sparsely populated, however unplanned development patterns and the market forces have led to residential and commercial development around the plant. This is not desirable and there is an immediate requirement of shifting the facility and adopt scientific closure of the waste dumps.

Konark has identified a waste dump location close to the present helipad. This is a dump facility and does not have a scientific disposal system. It is suggested to integrate the solid waste management systems of Konark and Puri both efficient and more economic waste recovery. The shifting of the waste management facility and the creation of a regional landfill site has been suggested in the Puri Sadar area. A compost plant has been suggested for the Konark urban area.

6.7.2.2 Source Segregation of Wastes

There is no segregation of wastes, and the wastes collected from the temples, construction sites, vegetable markets, beach areas, which are pretty much segregated in them are finally mixed during transport. Studying the existing land use of Puri it may be understood that the source of organic and recyclable wastes in particular are usually clustered. The attached map indicates the same.



Map 9- Waste streams of Puri

The religious centers and the commercial areas near the grand road predominantly generate organic wastes. The waste collection inside the temple premises is through the temple administration. These are usually dumped outside the temple complex.

The flower wastes and Pooja wastes from the temples are also mixed with the packaging material. These need to be segregated. The PMC may coordinate with the temple authorities for the same. The packaging material may also be promoted to be organic in coordination with the shop keepers.

The wastes from the commercial areas located along the sea beach are from the hotels. These are predominantly recyclable in nature. It is suggested that the hotels should be motivated for the adoption of the reducing the amount of wastes they generate. Voluntary targets may be promoted and successful parties may be felicitated. The hotel also generate a lot of organic wastes from their kitchens, these may be collected separately and transported accordingly.

The sea beach area is the zone which generates probably the maximum amount of recyclables in the form of plastics, bottles, cans etc. The attached illustrations indicate the provision of segregated dustbins for the disposal of these wastes.

A strong awareness campaign followed by punitive measures should be initiated to segregate the wastes from sources like religious institutions, commercial areas and markets, sea beach, hotels etc.

The wastes from the institutional areas are majorly composed of paper wastes. These are recyclable or compostable in nature and hence the wasted collected from these streams should not be mixed with the wastes from other areas.

To induce source segregation in residential areas is difficult owing to the traditional waste storage practices.

For illustartion purpose only

However it is suggested that with time source segregation should be initiated in the residential areas as well. The same may be attached to the waste collection rounds, where waste would not be collected unless the waste is segregated.

6.7.2.3 Waste Collection across Major Roads

The major roads in the urban areas namely the grand road, VIP road, Marine Drive road, Konark temple area roads essentially form the face of these towns. These roads are flanked with commercial establishments. Discussions with the municipal engineers of Puri indicate that the attempts at waste collections from the Grand Road has met with little success, owing to the conflicts of timing of waste collection and the shop operations. It has been also observed that the wastes are being burnt along the roads by the sweepers. This practice should be completely avoided, through punitive measures on the workers. The citizens should be sensitized to report such mal practices.

There is clearly a need for people's participation in regulating and better managing solid wastes in the city. The wastes from the commercial areas may be collected in the night after the shops have been closed. This has to be enforced with punitive measures on the shop owners. Fine may be collected if the shop fronts are not clean by next day.

There is a need to declare **Zero Garbage Tolerance Zones** across the major streets of the two towns. Relevant hoardings should be put up by the urban local bodies, to initiate the campaigns.

In areas such as the Marine Drive road, where in the maximum percentage of the wastes is that of plastics and bottles, the percentage of recyclable wastes is high. There is a requirement of separate waste collection, and the

mixing of these to the wastes from other areas. These can be taken directly for recycling. This shall also induce higher waste segregation in the municipal areas.

Attempts at waste reduction should also be undertaken at these areas. Greener packaging alternatives should be considered. The plastic rules of 2011 should be enforced strongly. The attached images illustrate the possible signage that can be used for enforcing no litter zones in the major roads.

6.7.2.4 Waste Collection in Narrow Lanes

Table 31: Proposed waste collection methods

Area	Waste collection	Remarks
Narrow lanes	Handcarts and cycle rickshaws	The waste from the handcarts may be thrown into the larger vehicles as shown in the image. The timings are to be regulated through drills
Collector roads	Small tempos	These shall ply from neighborhood to neighborhood, wherein people can throw their wastes at fixed times of the day.
Major roads	Large trucks cum compactors	These ply on the major roads and collect the wastes from the interiors. They also reduce the volume of the wastes en route.

Puri is characterized by the presence of narrow lanes, which makes door to door mechanized waste collection difficult. The traditional system of street sweepings and waste being collected from the dustbins has been resorted to since long in the town. Konark on the other hand has lots of urban hamlets, where waste collection by the NAC is nonexistent. In the core city the streets are swept and the wastes are dumped close by near the helipad.

CEPT suggests the following waste collection mechanism for the HH located in the narrow lanes. The waste collection beats may be regulated through drills. Tri-cycle mounted handcarts may be used for the narrow lanes, and smaller tempo driven vehicles may be used to transfer the wastes to the final treatment site. The segregation of the wastes should also be promoted simultaneously.

The attached illustrations indicate these waste collection practices.

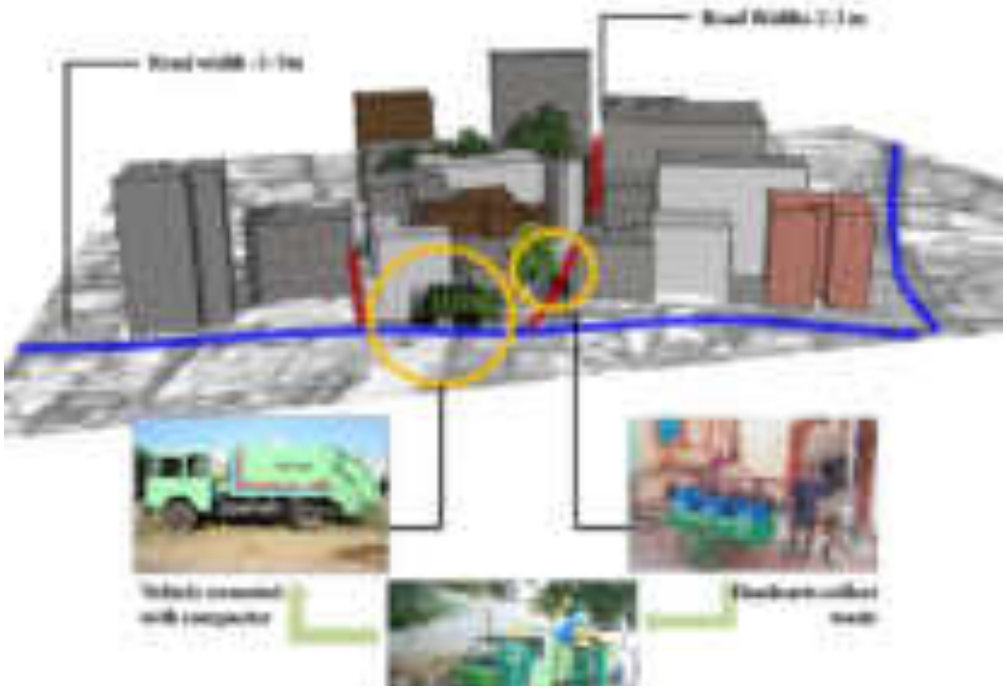


Figure 7-Proposed waste collection from narrow lanes

Figure 8- Proposed waste transfers

The attached table indicates requirement of machinery and sanitary workers for waste collection and management in the urban areas of PKDA.

Table 32: Cross Requirement of SWM Collection & Transportation Vehicles/ Equipment Requirements by 2031

Vehicles/Equipment in Numbers	Puri+ Puri Sadar	Konark
Containerized Push Carts for D2D Collection	31	6
Auto Tippers for D2D Collection	15	3
Push Carts for Street sweeping	287	82
Litter Bins	2009	635
Closed Containers (3 m^3 capacity)	36	5
Dumper Placers (twin containers of 3 m^3)	3	1
Closed Containers (4.5 m^3 capacity)	36	5
Dumper Placers (twin containers of 4.5 m^3)	3	1

Table 33: Requirement of Sanitary Workers (D to D Collection & Sweeping) by 2031

Particulars	Puri+ Puri Sadar	Konark
For Sweeping & Drain Cleaning	269	77
For D-2-D collection (Auto Tipper)	36	7
For D-2-D collection (Push Carts)	32	6
Total (collection & street sweeping)	337	90

6.7.2.5 Collection of Construction Wastes

Construction, demolition and land clearing debris are all non-hazardous solid waste. These wastes can be salvaged, reused or recycled, minimizing the ultimate waste that reaches the landfill. Through discussions with the stakeholders of Solid waste management in Puri it was understood that the mixing of the construction wastes into the municipal wastes inflated the quantum of wastes, and also lead to reduction in the efficiency of the waste management techniques employed by the urban local body. It is hence suggested that the wastes emerging from the construction sites should be treated separately and may not be mixed with the municipal wastes. CEPT suggests the following methodology for dealing with the construction wastes.

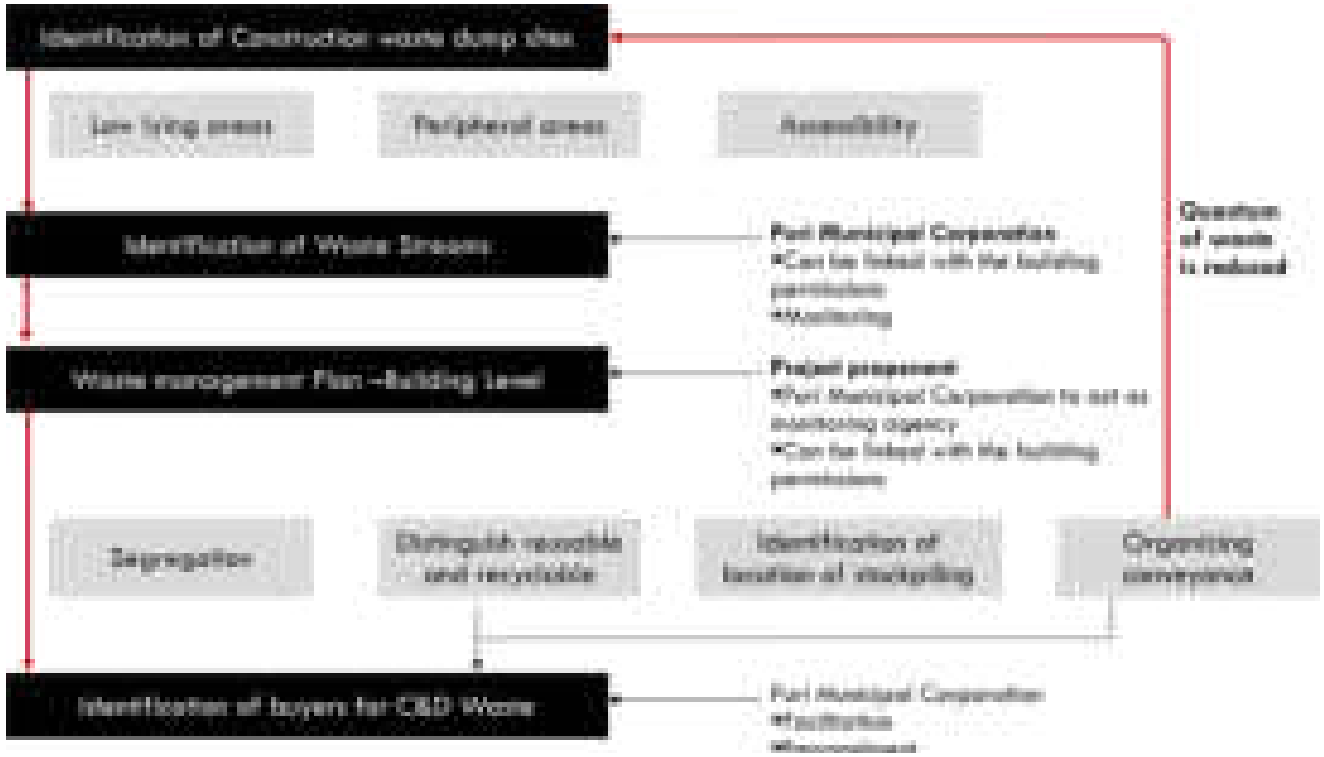


Figure 9: Construction waste management

Construction waste has a strong component of reuse and recycling which should be considered before the wastes are finally disposed. It is suggested to maintain construction salvage material banks in the form of structural members that are carefully removed, door and windows, grills etc. Private bodies may be involved in the same. The municipal bodies should play the role of facilitators in such endeavours. Puri municipality might also consider empanelling the buyers of such wastes, hence facilitating the interaction between the buyers and sellers.

There is a need for monitoring the waste streams and their sources to plan for the waste transfer from the source. Once these are identified efforts should be directed at separate transfer of these wastes to the sites identified by the Puri Municipality. The cost of transfer and the procurement of the vehicles should be borne by the private parties engaged in the waste generation. The urban local body is to act as the monitoring agency and the facilitator in such cases. The urban local bodies may also identify the construction waste transfer operators who might be contacted and paid by the private players. Punitive actions for leaving the debris unattended and the mixing of the same with the MSW should be adopted.

For large scale developments CEPT suggest that the construction and demolition wastes should be handled and managed, till the disposal to the end sites, by the project proponents. The following criteria may be used for the identification of such projects.

Involvement of the Private authorities for construction waste management

- New residential development of 10 houses or more
- New developments, including institutional, educational, health and other public facilities, with an aggregate floor area in excess of 1,250 m^2
- Demolition/renovation/refurbishment projects generating in excess of 100m3 in volume, of C&D waste;

- Civil Engineering projects producing in excess of 500m3 of waste, excluding waste materials used for development works on the site

6.7.2.6 Waste Management in the Beach Areas

The beaches of Puri and Konark are its most celebrated tourist attractions of the state of Orissa. Tourist activities over time have led to the accumulation of the wastes on the beaches. Tourist activities are coupled with the high usage of the plastics, in the form of bottled waters, disposable utensils and food packets. In the absence of dustbins and awareness, a considerable percentage of the wastes generated from the beaches find their way into the sea. The terrain poses constraints in collecting the wastes from them.

Urban design interventions have been suggested in the CDP for the beach areas. Along with the same there is a need for waste management along these areas. CEPT suggests the following interventions for management of the beach areas.

Public awareness and Education

The hazards of Marine pollutions range from the unaesthetic beaches which might lead to the dwindling of the tourists as well as impacts on the marine life. These need to be precipitated in the people, for higher responsiveness and awareness in the masses. It is suggested to merge the awareness drives with school education which can be transmitted from the students to their wards. Street plays and awareness campaigns may be designed through the local educational institutions which may be used for higher outreach. Greener packaging alternatives should be resorted to in the beach areas. The plastics packaging should be gradually phased out.

Beach cleaning drives

Beach cleaning drives may be organized through the help of various target groups such as the tourists, the shop keepers, the fishermen and the local schools. These interventions may be institutionalized, through registration of the volunteers, identification through badges and registration numbers, procurement of protective gears and assembling in the stipulated time and day. They may be felicitated through participation souvenirs. Local newspapers, radio and TV channels may be roped in the process of propagation of the cleanliness drive. Social networking sites like Facebook may also be used. The local schools are an important target group in such interventions. Their parents may accompany them to the beach on weekend and participate in the cleanliness drives. Furthermore it is suggested that these activities should be documented, announcing the next dates and the activities in the Puri and Konark urban local body website.

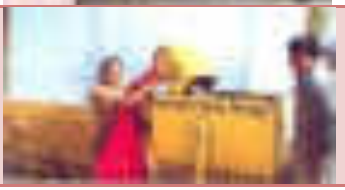
The beach areas have an important and dominating presence of the shopkeepers association, the fishermen and the hotel owners along the marine drive roads. These are important stakeholders and should be roped in for organizing the cleanliness drives.

The rag pickers may also be regularized for collection of the wastes from the beaches. Being primarily plastics and glasses there is a substantial component that may be salvaged from these wastes. These may be used as a motivation to "employ" rag pickers by the local bodies to collect wastes from the beaches on a day to day basis.

6.7.2.7 *Solid Waste Management for Slum Areas*

As per our study it has been observed that waste collection and management practice in slum areas in PKDA region is very weak, almost nonexistent. The fisherman slums are in extremely unsanitary conditions. The fish wastes and the household wastes lie scattered in the beach areas, which finally ends up in the water. Community participation in the slums is an effective way of sanitation service delivery .CEPT suggests the following strategies for the management of the wastes in the Slum areas of PKDA.

Table 34: SWM management proposal in slum areas: PKDA

Steps	Activities	
Organization of the task force	- The target group for each slum has to be identified who shall be involved in the waste management. - They might be the members of the CDS, *Sakhi Mandals* and the youth.	
Observation of sanitation week	- This shall include mass awareness programs, followed by mass cleanliness drive. - The NGO and the youth association of the city have to take initiatives. - This shall be a kind of induction program for the slum dwellers.	
Deployment of community dustbins	- The tilt and dump dustbins at community levels may be used in cases of extremely narrow wand congested areas of the slums. - The attached image shows the community dustbins, which are low cost and simple in design & operations.	
Distribution of HH dustbins	- The simple tins may be used as dustbins. - These should be advocated as sanitation symbols, and each threshold shall have a dustbin. This shall have a symbolic significance.	
Organizing door to door collection	- Door to door collection should then be organized by the group identified above. A minimal user fees may be collected per household at the range of Rs. 5-10 per month. - A user fee ensures higher ownership and enforceability.	

6.7.2.8 Solid Waste Management for Rural Areas

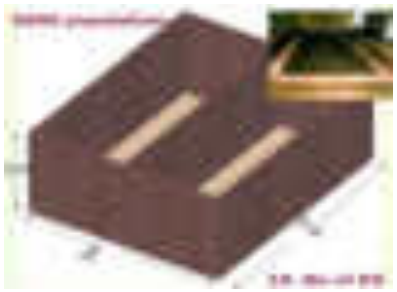
The waste generation in rural is sporadic and hence a decentralized MSWM system could help solve the seemingly viable, socially desirable and environmentally sound manner.

Types of Decentralization

- **Decentralized Solid Waste Management (DESWAM)**
- **Composting**
- **Windrow Composting**

Aerobic composting

Vermi compost pit



Twin-Pit Composting

Decentralized Solid Waste Management (DESWAM)

The Objective of DESWAM is to introduce s Self sustaining Community based Solid Waste System with minimum maintenance through scientific management. The DESWAM results in the civic body handling lesser quantity of waste, lesser dependence of labor, less transportation resulting in reduced air and noise pollution and wear and tear. Recovery of recyclable Wastes and disposal of compost would also generate livelihood and sustained source of income.

The waste generated in rural areas is mostly organic in nature and hence easily compostable. Compost again is a natural fertilizer and hence the fertility of the soil is also enhanced. Hence composting of waste in rural areas is a feasible option considering the market of fertilizers in rural areas. Effective marketing strategies to encourage use of compost in farming should be taken up. IEC campaigns emphasizing the same would be required for effective composting and utilization of compost.

Different techniques for waste composting at site are discussed as below:

Vermi-composting

The Vermi-composting are the best natural compost and are essentially require to revive the agricultural land's fertility, which has been eroded due to constant use of chemical fertilizers over the last 50 years. The earthworms are very sensitive and have to be handled very delicately and carefully. Vermi-composting can be taken up at the household level by rearing the earthworms in container.

Daily waste can be introduced and the worms would start consuming them immediately. Even foul smell from the waste is eliminated within 10 minutes of introduction of waste into the bin. The crate can be kept in kitchen or in the balcony.

Aerobic Composting

In this treatment waste can be composted using cow dung, paddy hay or leaves, manure, wood shavings, chopped weeds (picked before going to seed), vegetable and fruit scrapes, nut and eggshells. This can be done for household waste having high organic content. Composting can be done at household level as well as community level.

Twin Pit Composting

The time period for composting of solid waste collected is 21 days. The size of the pit is so designed that is get filled up within 21 days. Once this occurred the pit is sealed and fresh is dumped. By the time 2nd pit is filled up compost is formed in first pit. Thus the time cycle is of 21 days in this process.

6.7.2.9 Regional Landfill

Landfill is the most feasible option for the scientific disposal of the inert wastes. In the PKDA area there are the two urban areas of Puri and Konark. Developing a regional landfill for the entire PKDA region would bring economic efficiency in the system. It would also prevent the sporadic development of waste dumps and unsanitary landfills and would resulting more coordinated and maintained waste disposal facility for the region. Regional landfills have emerged as a practical and economic solution in the recent times. In Kerala, six regional landfills are proposed for 14 districts. Similarly in Maharashtra, Municipal Council of Navghar, Manikpur, Vasi, Virar and Nala Sopara have initiated regional land fill by bringing in a private service provider on BOT terms. The attached figure illustrates the concept of regional landfill.

The distance between Puri and Konark is 33 kms. The CPHEEO suggests that the landfill should be located preferably within 5kms from the urban area. However the land suitability analysis and the distance criteria suggest that the creation of a centralized waste management facility for the two urban centres would not be feasible.

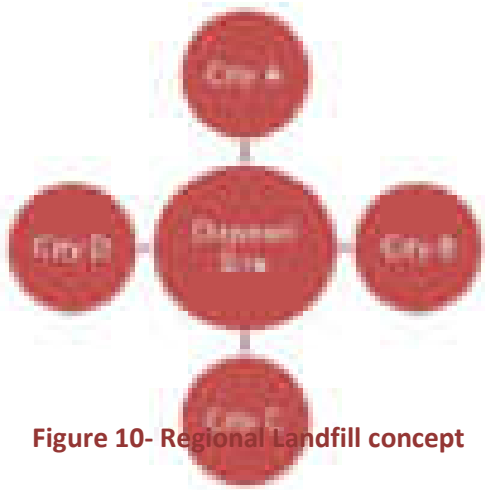
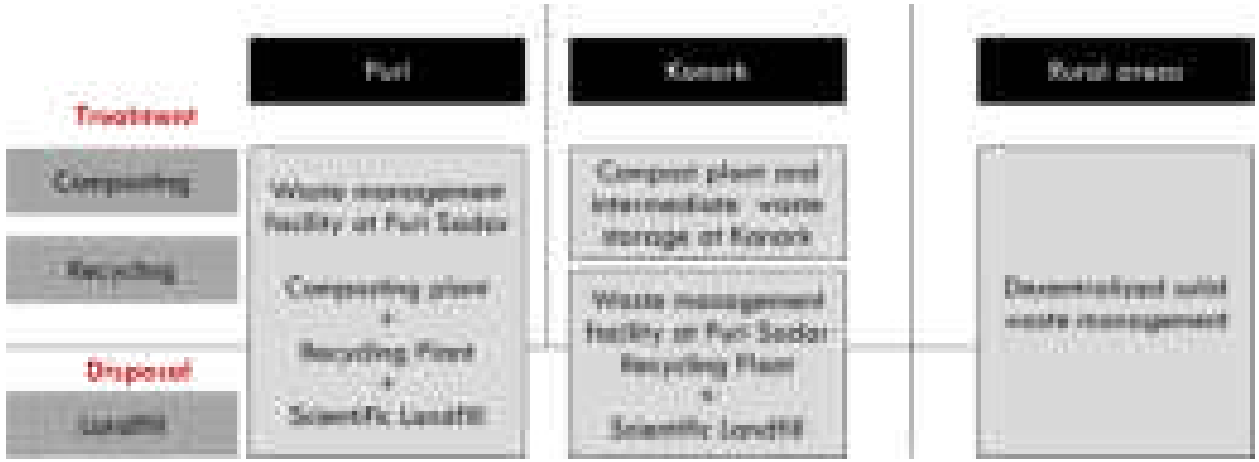


Figure 10- Regional Landfill concept



Hence CEPT suggests the following mechanism of end disposal and treatment of solid wastes for the PKDA region.

An integrated solid waste treatment and disposal facility has been suggested in Puri Sadar. This shall constitute of a Compost Plan, A recycling plant and the Landfill facility. Since the location of this facility is almost 40 kms from Konark the transfer of wastes on a daily basis from Konark is not possible.

Hence an intermediate waste storage and compost plant is suggested for Konark, since organic waste would putrefy. The inorganic and dry wastes may be transported to the facility located in Puri Sadar on a weekly basis.

Figure 11- Treatment and End disposal system of solid waste in PKDA

Having analyzed the waste generation quantum and the waste composition the area requirements for the two waste management facilities were calculated. They are as under.

Table 35: Area Requirements for Waste disposal and management facility

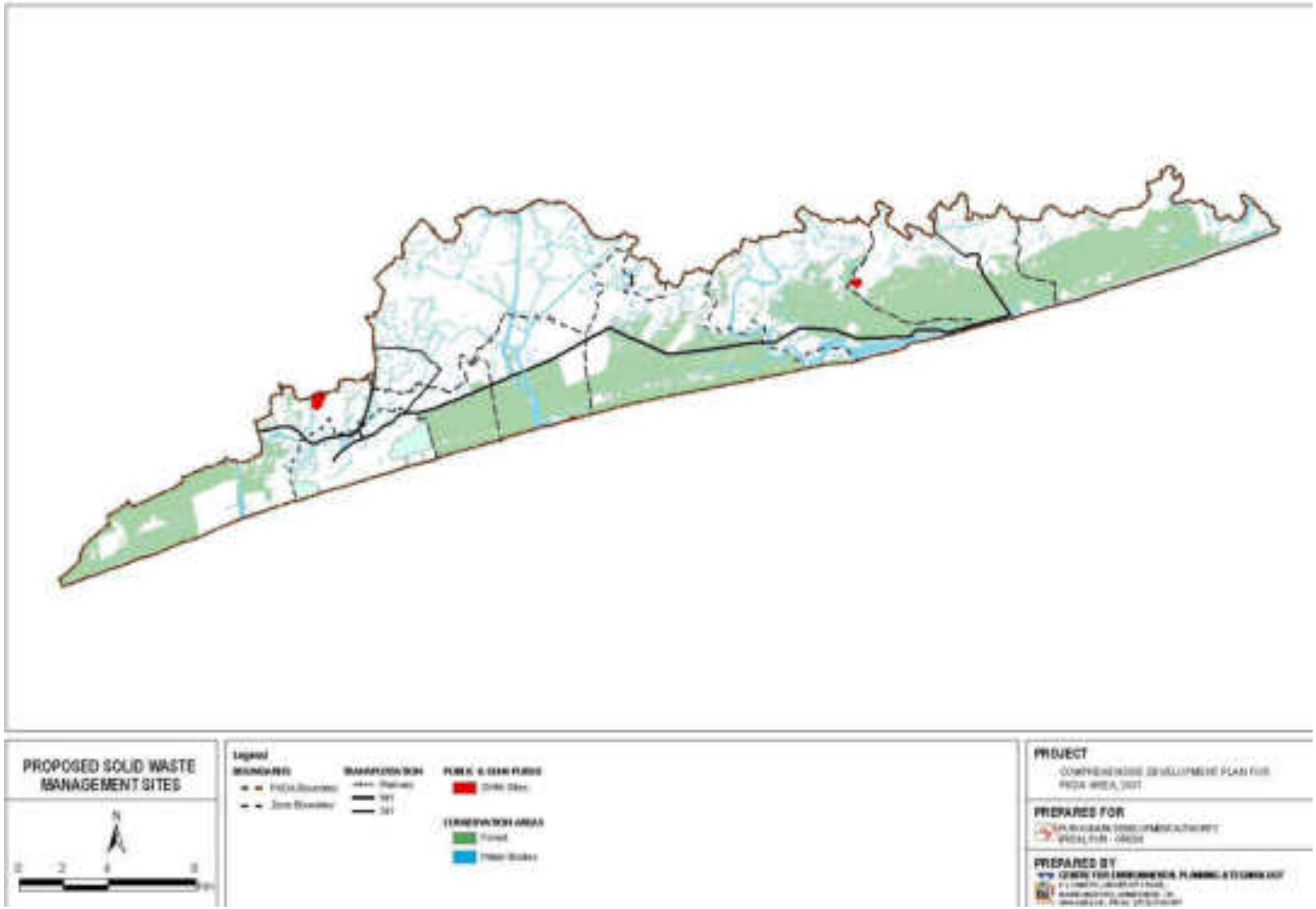
Facility	Area Requirement	Functions
Waste management and disposal facility in Puri Sadar	12 Ha	Sanitary landfill (Puri, Puri Sadar and Konark)+ Compost Plant (Puri and Puri Sadar) +Recycling plant (Puri, Puri Sadar and Konark)
Waste management facility in Konark	2 Ha	Intermediate storage and Compost plant (Konark)

The identification of the facilities in Puri and Konark has been suggested based on the following criteria:

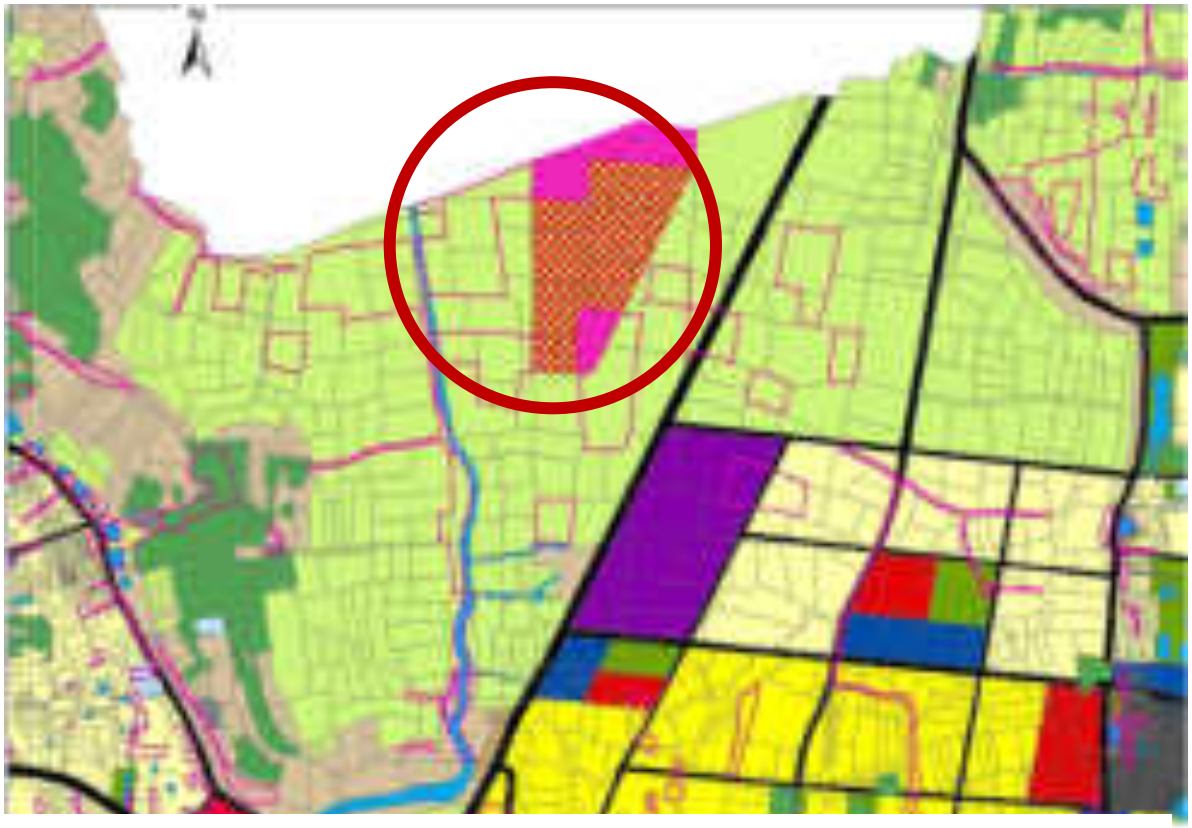
- Large enough to last for till 2031.
- Located at a minimum distance of 500 m from habitation clusters, forest areas, monuments, National Parks, Wetlands and places of important cultural, historical or religious interest.
- Located at a minimum distance of 200 m of any lake or pond.
- Located at a minimum distance of 100 m of a navigable river.
- Located at a minimum distance of 200 m of the right of way of any state or national highway.
- Located at a minimum distance of 500 m away from a notified habitat area.
- No development zone of 500 m around the landfill boundary would be declared
- No landfill site should be constructed within critical habitat areas.
- Transportation and linkages will be clearly defined for waste movement from the city. The influence of increased heavy vehicle traffic due to land filling should be taken care in order to avoid nuisance.
- The landfill should not be constructed within 500m of any water supply.

Further to these conditions CEPT suggests that the ground water table should be studied such as it is not less than 2m in the suggested locations. Also the topographical and geographical features such as contour, slope, soil type of the site should be carefully analyzed in order to prevent soil contamination and disturbance of drainage pattern.

The attached map illustrates the various options of the identified waste management sites in the PKDA region.



Map 10: Suggested Solid waste Management Sites



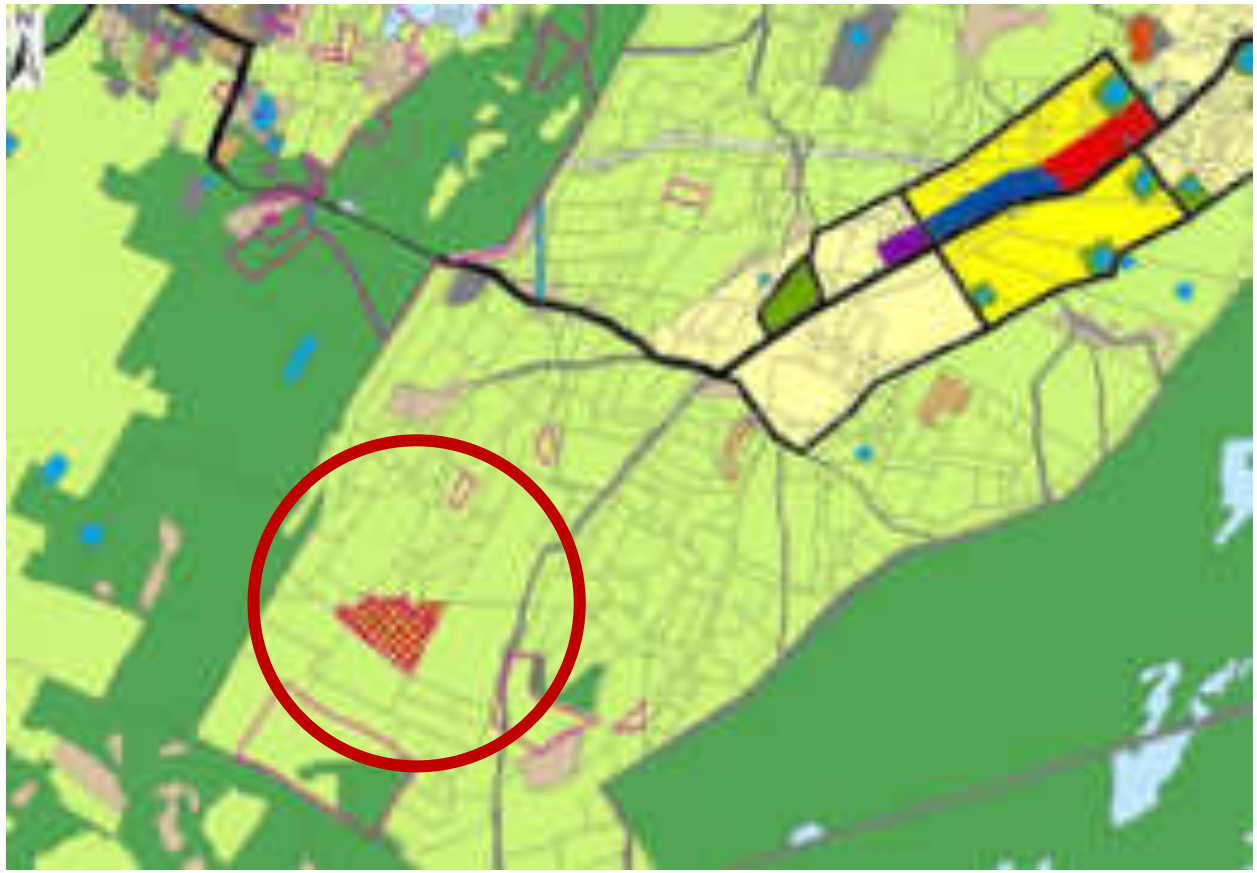
Map 11: Location of Puri Sadar SWM Site

Solid waste management site-Puri Sadar

The attached map illustrates the location of the Solid waste management Site in Puri Sadar. This facility is constituted of the Sanitary landfill and the recycling plant for the region and the compost plant from Puri.

This compost facility has to be shifted from the existing location of Baliapanda, Puri. While the criteria based on CPHEEO have been studied to locate the site, the availability of government land also has been considered.

The total site area for the facility is 14 Ha, within which 4Ha is owned by the government. This calls for the acquisition of 10 Ha. The distance of the site from Puri municipal limits as it exists today is 2 Kms. Its distance from the Konark NAC boundary is 35 Kms. An alternate site with higher percentage of government land and in compliance with the CPHEEO is not possible within the PKDA region.



Map 12: Solid waste management Site for Konark

Konark Solid waste management Facility

The solid waste management facility for Konark is located in the periphery of the NAC boundary. This would house the temporary storage and the compost plant for the solid waste of Konark. The site is located within the NAC boundary. The area of the site is 2 Ha within which as much 1.7 Ha of land is owned by the government.

It is suggested that the Solid Waste Management as a holistic activity should be undertaken under PPP. From initiating door to door collection, waste segregation, waste transfer to final disposal and recovery from the solid waste, should be privatized for higher efficiency in operations. Both Puri and Konark should be given as package under PPP.

Since Puri Municipality already has the experience of operating a compost plant under PPP, it is suggested that the tipping fee may be optimized accordingly. Land availability should be undertaken by the urban local bodies and they should act as facilitators for the same.

Landfill Design

Until recently, the concept of land filling was used to dump waste material for disposal. Therefore, not much care was taken about their construction. Placing the waste in the Earth's upper crust was considered as the safest practice of waste disposal. But with rapid industrialization and urbanization, land filling has metamorphosed, since uncontrolled landfills have the potential of polluting various parts of the environment. Thus the need for regulations regarding the

location, design and their preparation and maintenance has been suggested. Conducting an EIA (Environment Impact Assessment) is mandatory for the siting and the construction of the landfill. The attached figure indicates the schematic representation of a landfill.

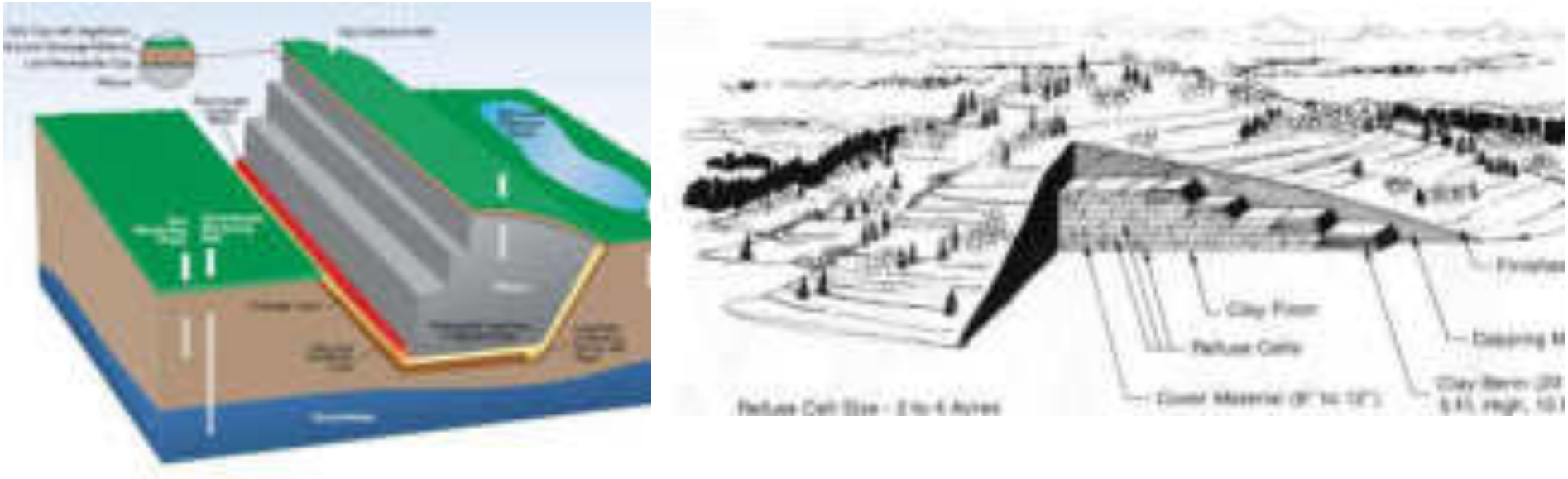


Figure 12: Landfill schematic design

Mechanisms to tap the gases and the leachate from the landfills should be undertaken. While the gases a source of energy, in case of not being tapped they contribute to the GHG emissions. The leachate on the other hand would lead to land pollution and also may contaminate the ground water if not carefully removed.

It must be noted that the Landfill efficiency depends on the compaction factor, damping factor, shredding factor, etc. which improves the performance of landfill both in handling the quantity of waste and the "environment" within the landfill. The suggested landfill areas are for a design period of 20 years from 2012-2031. However CEPT suggests that the same may be scaled up for 30 years within the same area. For that the waste stabilization and landfill planning

should be undertaken. The landfill design should be taken up in the form of modular cells, which increases the efficiency of the landfill and also optimizes the land requirement. The attached table indicates the same. [4]

Table 36: Scheduling of proposed landfill system

Year	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5
One	**Active**	-	-	-	-
Two	Closed	**Active**	-	-	-
Three	Methane Recovery	Closed	**Active**	-	-
Four	Methane Recovery	Methane Recovery	Closed	**Active**	
Five	Mining	Methane Recovery	Methane Recovery	Closed	**Active**
Six	**Active**	Mining	Methane Recovery	Methane Recovery	Closed

The attached table indicates the details of the proposed processing and the disposal facility

Table 37: Details of Processing & Disposal Facility

Particulars	Puri+ Puri Sadar	Konark
A. Compost Plant		
Design Life (Years)	20	20
Waste Fraction Composted (%)	50%	50%
Ultimate Design Capacity (ton/d)	38	7
Land Required for compost (ha)	1.5	1.5

[4] Modified landfill design for sustainable waste management- Sudhakar Yedla - Indira Gandhi Institute of Development Research

Particulars	Puri+ Puri Sadar	Konark
Equipment required	Backhoe Loader-1, Tipper Truck-2, Tipper Tractor -2, Water Tanker (3000 lt)-1, Weight Bridge (20 MT)-1, Plant & Machinery-1	Backhoe Loader-1, Tipper Truck-2, Tipper Tractor -2, Water Tanker (3000 lt)-1, Weight Bridge (20 MT)-1, Plant & Machinery-1
B. Landfill Facility		
Design Life (years)	20	20
Waste Fraction Land filled (%)	44%	44%
Equipment required	Backhoe Loader-1, Bull Dozer-1	Backhoe Loader-1, Bull Dozer-1

The MSW 2000 mandates the following aspects of the sanitary landfill whish should be adhered to

- Landfill site shall be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.
- The landfill site shall be well protected to prevent entry of unauthorized persons and stray animals.
- Approach and other internal roads for free movement of vehicles and other machinery shall exist at the landfill site.
- The landfill site shall have wastes inspection facility to monitor wastes brought in for landfill, office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipments.
- Provisions like weigh bridge to measure quantity of waste brought at landfill site, fire protection equipments and other facilities as may be required shall be provided.
- Utilities such as drinking water (preferably bathing facilities for workers) and lighting arrangements for easy landfill operations when carried out in night hours shall be provided.
- Safety provisions including health inspections of workers at landfill site shall be periodically made.

In addition to the above CEPT suggest the following measures to safeguard the health of the workers involved in solid waste management.

- Provision of regular health checkups and medicine.
- Provision of protective gear as per the MSW rules
- Minimizing manual handling of the wastes
- Workers insurance to be provided against health disorders and accidents

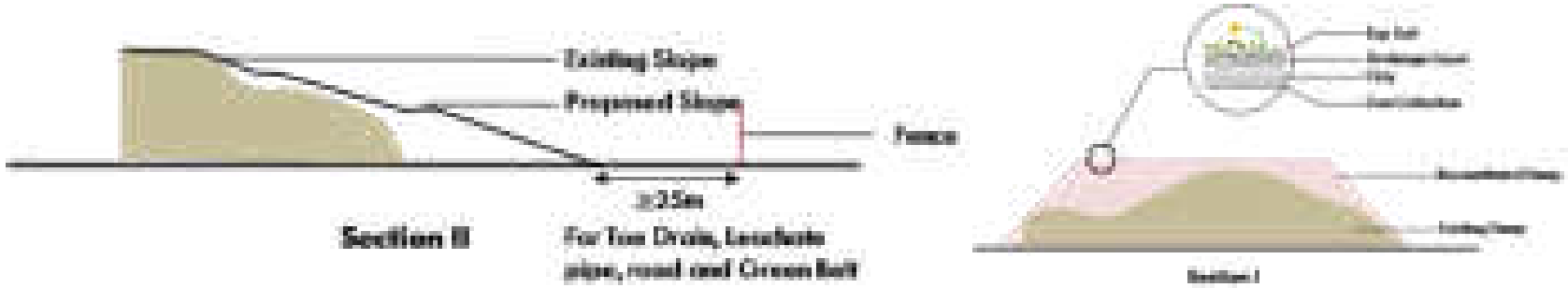
Stabilization of Existing Dump Sites

The existing solid waste dump sites in Puri and Konark have to be stabilized once the Sanitary landfill has been resorted to. This is done for the following purposes

- These can be the future land banks of the government
- Deal with the foul odour and the unaesthetic appeal
- To avoid fire hazards
- The slopes of the dumps need to be stabilized

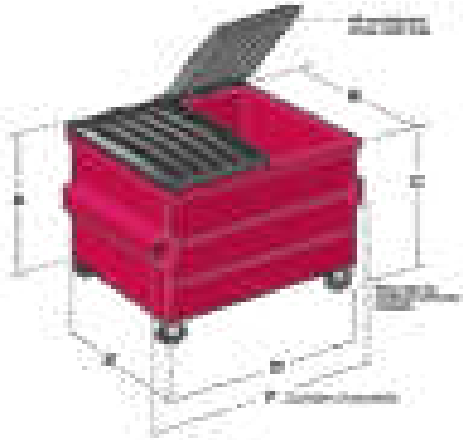
The side of the waste dumps need to be stabilized and reconstituted for effective waste closure. The attached figures indicate the same.

Figure 13- Stabilization of existing dumps



6.7.3 *Cost Estimates of MSWM*

(A) For Puri, Puri Sadar and Konark Area

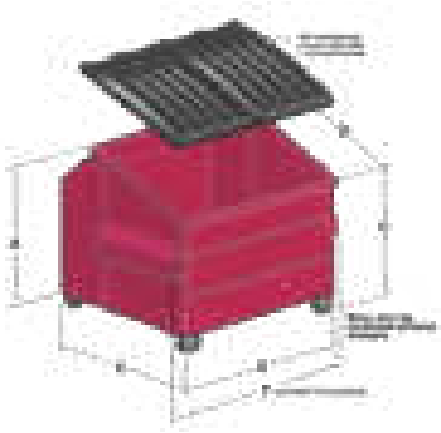


The solid waste management of any area revolves around the quantity and quality of solid wastes. The quantity decides the magnitudes of the problems of storage, transportation and disposal operations which have to be undertaken for disposal or any such other purposes whereas the quality hints at the precautions to be carried out in any such operations.

For Puri, Puri Sadar and Konark area, following Assumptions are used for solid waste management:

- Solid waste Generation
  - Urban area (Puri, Puri Sadar and Konark) – 352 gm/capita/day

- Appropriate size of container bins for Puri, Puri Sadar and Konark
  - 60% - 4.5 m^3 containers
  - 40% - 3.0 m^3 containers
- Door to Door Collection
  - % households covered by Auto Tipper – 80%
  - % households covered by Push Carts – 20%
- SWM Vehicles & Equipment : Market Rates



  - Auto Tipper – Rs. 250,000 /-
  - Containerised Push Cart – Rs. 10,000/-
  - Litter Bins- Rs. 5000/-
  - Metal Container (3 m^3) – Rs. 50,000/-
  - Metal Container (4.5 m^3) – Rs. 900,000/-
  - Bachoe Loader – Rs. 900,000/-
  - Bull Dozer – Rs. 6,000,000/-
  - Tipper Truck – Rs. 1,200,000/-
  - Tipper tractor – Rs. 800,000/-
  - Plant & Machinery (Lump Sum) – Rs. 10,000,000/-
  - Compost Plant Civil works, Sq. m. – Rs. 500/-
  - Land fill cell development, sq. m. – Rs. 1,000/-
  - Landfill Infrastructure Development, Sq. m. – Rs 250/-

Cost outlay for solid waste management infrastructure development have been worked out for Puri town area, Puri Sadar and Konark NAC area which are already urbanised or proposed to be as urban areas.

Table 38: Estimated Block Cost of SWM Collection & Transportation Vehicles/Equipment Requirements for the year 2030

PARTICULARS	Puri+ Puri Sadar	Konark
Equipment & Vehicles (Collection & Transportation)		
Containerized Push Carts for D2D Collection	11.90	1.9
Auto Tippers for D2D Collection	72.50	12.5
Push Carts for Street sweeping	114.60	32.60
Litter Bins	400.90	125.95

PARTICULARS	Puri+ Puri Sadar	Konark
Closed Containers (3 m³ capacity)	33.00	4.50
Dumper Placers (twin containers of 3 m³)	30.00	12.00
Closed Containers (4.5 m³ capacity)	42.90	5.85
Dumper Placers (twin containers of 4.5 m³)	45.00	18.00
Total - Collection & Transportation	*750.80*	*213.20*
Landfill Facility		
Equipment		
Backhoe Loader	20	20
Bull Dozer	60	60
Sub-total	**80**	***80***
Civil Works		
Landfill Cell Development	385.65	49.11
Other infrastructure (roads, drains, fencing, building, etc	42.18	5.37
Sub-total	427.83	*54.48*
Total - Landfill Facility	*507.83*	*134.48*
Compost Plant		
Equipment		
Backhoe Loader	20	20
Tipper Truck	24	24

PARTICULARS	Puri+ Puri Sadar	Konark
Tipper Tractor	16	16
Water Tanker (3000 lt)	3	3
Weight Bridge (20 MT)	10	10
Plant & Machinery	100	100
Sub-total	*173*	*173*
Civil Works		
Internal roads, drains, tipping floor, office building, store, etc	*75*	*75*
Total - Compost Plant	***248***	***248***
TOTAL	**1506.63**	**595.78**

Table 39: Phasing of Estimated Cost for Solid Waste Management

Sr. No.	Description	Estimated Cost (in Rs. Lakhs)				
		Phase I	Phase II	Phase III	Phase IV	Total
1	Puri + Puri Sadar	750	757	-	-	1507
2	Konark	-	596	-	-	596
3	Decentralized SWM of Block A	-	-	70		70
4	Decentralized SWM of Block B	-	-	-	50	50
Total		**750**	**1353**	**70**	**50**	**2223**

6.7.4 Bio-Medical Waste Management

"Bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological. Biomedical waste poses a huge risk to health owing to its inherent infectious nature. The Municipal Solid Wastes (Management and Handling) Rules, 2000 hence, recommend separate collection, handling and treatment of biomedical waste. It becomes essential hence to identify sources of biomedical waste. In each such facility generating bio-medical waste, the waste should be segregated and collected in earmarked and color coded bins, in accordance of the Bio Medical Waste (Management & Handling) Rules, 1998. The transportation and disposal of the biomedical waste should be accordance to the category of the waste in accordance with the rules.

The various treatment technologies available for disposal of biomedical waste are incineration, disinfection, sterilization, Plasma arc technology and landfill of the inert wastes. The bio medical waste (Management & Handling) Rules, 1998, mandates that the generator of the bio-medical waste including hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank by whatever name called to take all steps to ensure that such waste is handled without any adverse effect to human health and the environment.

The urban local bodies will be the monitoring agency for the identification of the numbers and location of the generators of the Bio medical wastes in their jurisdiction and oversee the annual report that has to submitted as a part of the compliance of the bio medical waste (Management & Handling) Rules, 1998.

6.7.5 Plastic Waste Management

The quantum of solid waste is ever increasing due to increase in population, developmental activities, changes in life style, and socio-economic conditions, Plastics waste is a significant portion of the total municipal solid waste (MSW). The plastics waste constitutes two major category of plastics; (i) Thermoplastics and (ii) Thermoset plastics. Thermoplastics, constitutes 80% and thermoset constitutes approximately 20% of total post-consumer plastics waste generated.

The environmental hazards due to mismanagement of plastics waste include the following aspects:

- Littered plastics spoils beauty of the city and choke drains and make important public places filthy;
- Garbage containing plastics, when burnt may cause air pollution by emitting polluting gases;
- Garbage mixed with plastics interferes in waste processing facilities and may also cause problems in landfill operations;
- Recycling industries operating in non-conforming areas are posing unhygienic problems to the environment.

In 2011, Plastic Waste (Management and Handling) Rules were notified by the Ministry of Environment and Forests. The rules empower the municipal authority to determine minimum price of carry bags depending upon their quality and size to cover the waste management costs in order to encourage their re-use and minimization of plastic bags.Since the PKDA area has two major tourist attractions, the generation of plastic waste is very high in the region. Management of the this waste is an important challenge for the PKDA.

The various strategies for Plastic waste management are as under

- Creation of No plastic zones

Location	Components	Remarks
Grand road	Shops facing the grand road- Hawkers and other commercial establishments	Signages for no plastic usage, monitoring, Mathas and Jagannath temple administration may be the monitoring authorities, paper and jute bags to be used.
Marine Drive road	All commercial establishments, Hawkers and food vendors on the sea beach areas.	Awareness and information campaigns, stress of jute bags
Jagannath Temple	Packaging material used by the vendors and the *pooja* items being carried by the devotees to be transferred to paper bags.	It should be stressed that all the *pooja* items to be packed/transferred into paper bags, to be provide by the temple administration.
Konark Sun Temple	Tourists carrying plastic food wrapper and water bottles	The ASI should physically check the presence of plastics and provide for lockers to keep the same. Clean water should be provided as a substitute for bottled water.

- Charging the distribution of the plastic bags
- Extended producers responsibility for the disposal and management of the plastic wastes
- Engagement of the rag pickers for the collection of the plastic wastes.
- Plastic Waste Collection Centres

Waste collection centres to collect the plastic waste separately from municipal solid waste may also be set up wherever feasible. As per the Plastic Waste (Management and Handling) Rules' 2011, the municipal authority has power to ask the manufacturers in line with extended producer's responsibility to provide finance to establish waste collection centres

- Recycling Of Plastics through Environmentally Sound Manner

Recycling of plastics should be carried in such a manner to minimize the pollution during the process and as a result to enhance the efficiency of the process and conserve the energy. Plastics recycling technologies have been historically divided into four general types -primary, secondary, tertiary and quaternary.

- **Primary** recycling involves processing of a waste/scrap into a product with characteristics similar to those of original product.

- **Secondary** recycling involves processing of waste/scrap plastics into materials that have characteristics different from those of original plastics product.
- **Tertiary** recycling involves the production of basic chemicals and fuels from plastics waste/scrap as part of the municipal waste stream or as a segregated waste.
- **Quaternary** recycling retrieves the energy content of waste/scrap plastics by burning / incineration. This process is not in use in India.

The following steps are involved in recycling of plastics-

- **Selection:** The recyclers / reprocesses have to select the waste / scrap which are suitable for recycling /reprocessing.
- **Segregation:** The plastics waste shall be segregated as per the Codes 1-7 mentioned in the BIS guidelines (IS:14534:1998).
- **Processing:** After selection and segregation of the pre-consumer waste (factory waste) shall be directly recycled. The post consumer waste (used plastic waste) shall be washed, shredded, agglomerated, extruded and granulated

6.8 Power Supply

The PKDA covers Geographical area of about 296.33 sq.km covering of Puri Municipality limits, Puri Sadar Area, Konark NAC area and rural areas of Block A and Block B. As per the UDPFI, the power supply requirement of PKDA covering area has been estimated at 107 MW for year 2011. As per the population projection, an additional demand of approximately 80 MW would be generated in the year 2031. As such there is an immediate necessity to for scaling up energy infrastructure by suitably constructing EHT Transmission net work and sub-transmission net work and LT to cater the power supply requirement in PKDA jurisdiction. In addition to building up the capacity, it is required to refurbish the existing network in the areas of the PKDA.

Keeping in view the existing power supply available and future need of PKDA, it is required to provide the following additional infrastructure. To facilitate below, it is required to make provision for adequate land availability as per following

Table 40: Power Supply Demand and Sub Stations requirements in the PKDA Area

Block	Total No. of Dwelling Unit Required			Power Requirement (MW)[3]			Requirement of Substations[5]	Area Requirement for Sub-stations (Ha)	Indicative Cost (Rs. Lakhs)				
	2011	2021	2031	2011	2021	2031			Phase I	Phase II	Phase III	Phase IV	Total
Puri Town	40129	52034	67470	80	104	135	3 Nos. of 33 KV	1.2	500	-	-	-	500
Puri Sadar	3527	4615	6037	7	9	12	1 Nos. of 11 KV	0.2	-	75	-	-	75
Block A	3703	4407	5244	7	9	10	1 Nos. of 11 KV	0.2	-	-	75	-	75
Konark	4382	6729	10333	9	13	21	2 Nos. of 11 KV	0.4	-	150	-	-	150
Block B	1833	2077	2354	4	4	5	1 Nos. of 11 KV	0.2	-	-	-	75	75
PKDA (TOTAL)	**53574**	**69862**	**91438**	**107**	**140**	**183**		**2.2**	**500**	**225**	**75**	**75**	**875**

It is suggested to make provisions for 2.2 Ha of land requirement for establishment of substations in Comprehensive Development Plan of PKDA

[5] Calculated as per UDPFI Guidelines

6.8.1 *Street Lighting*

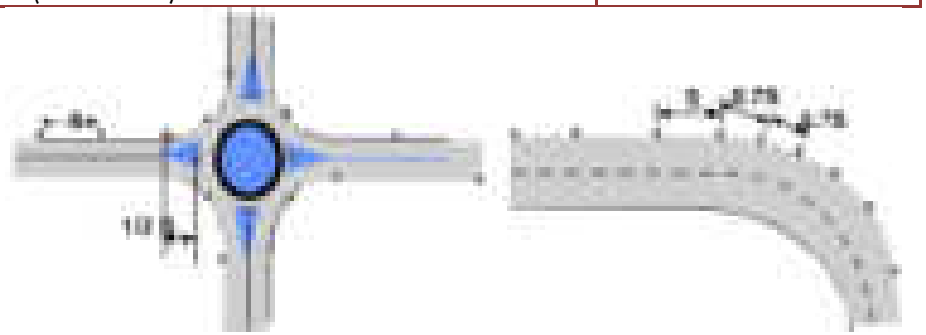
At present there is very poor and inadequate provision of street lights. Street Lights will be given to internal urban roads only. The summary of Capital Cost for the Provision of Street Lighting in the existing and proposed CDP areas is shown in table. The light poles are proposed at every 30 to 40 m on roads and assumption of cost estimation of light pole is Rs. 35000/ pole. The specifications for Street lighting are mentioned in the attached table

Table 41:Illumination Criteria For Street Lighting

Type of road	Illumination criteria (lux)
Dual /Single Carriage Way(greater than 12 m)	35
Single Carriageway	25
Single Carriageway with Slow Speed Traffic	20
Pedestrian Walkways/ Cyclist Pathway	15
Pedestrian Crossing	50
Bus Bays & bus alighting points	50
Junction (30- 50m dia)	50
Junction (15-20m dia)	30

The technical criteria for lighting are as follows

- An Overall Maintenance factor of 0.75
- For Curves and bends, spacing should be 70% of the normal spacing
- Automatic Control and Remote Operation from Central Control Station to be provided with SCADA software
- Remote operation through mobile phones at zonal level.
- Status indication of the operation at central location and to Maintenance Staff on their mobiles through SMS message



Spacing of Street lights in curves and bends

Table 42: Capital Cost for Provision of Street Lights in Existing and Proposed Areas

Sr. No.	Description	Road length (Km)	No. of Light Poles	Block Cost Estimates of Street Light (Rs. Lakhs)
1	Puri	33	1650	578
2	Puri Sadar	93	4650	1628
3	Konark	51	2550	893
			TOTAL	**3099**

6.9 Summary of Cost Estimates of Physical Infrastructure

The table below presents the indicative costs of infrastructure- transport and urban. The total cost has been spread over a horizon of 20 years phasing the infrastructure costs in four distinct groups for immediate and long term planning. It is however, recommended to carry a project prioritization exercise for the PKDA for effective financial management.

Table 43: Summary of cost estimates for physical infrastructure development PKDA

Sr. No	Facility	Estimated Cost (Lakhs)				
		Phase I	Phase II	Phase III	Phase IV	Total
1	Transportation	2372	47878	10513	5792	66555
3	Water Supply	0	5235	285	285	5805
4	Waste Water Management	228	3572	142	143	4085
5	Access to Toilets	1475	0	0	0	1475
6	Strom Water Drainage	298	2252	565	0	3115
7	SWM	750	1353	70	50	2223
8	Power Supply	500	225	75	75	875
	Total	**5623**	**60515**	**11650**	**6345**	**84133**

7. Social Infrastructure



7. SOCIAL INFRASTRUCTURE

This section will try to identify various social infrastructure proposals in consonance with arising demand for various social infrastructure services. Education facility, health system as well as housing facilities will be emphasized in the proposals which have maximum impact on the community fabric.

7.1 Background

The major issues identified from the analysis of social infrastructure sector in Volume-1are as follows:

- Although number of primary school is currently sufficient except Konark availability of Secondary and higher secondary schooling facilities is very limited in the region.
- There is a need for college education in the region especially technical education institution to promote higher education in the region.
- There is acute shortage of health facilities in Puri Sadar, Block-B etc areas. Most importantly there is acute need felt for adequate facilities in growing areas around Puri town.
- Planned housing development and redevelopment of slum areas needs to be emphasized in the CDP which is the current area of concern.

7.2 Proposed Educational Infrastructure

Education is the backbone for development of any community and region as a whole as it enhances the potential human resources available. Providing education facility is the basic responsibility of the state and the ULB. This section will propose the future requirement according to UDPFI guidelines. Major strategies and interventions will also be formulated for the sector. The highlights of the proposed facility are as follows:

- Due to the fact that majority of future development is proposed in Puri Sadar area the proposal for educational institutions is maximum in the area. 70 no's of Primary school, 49 no's of middle school, 24 no's of higher secondary school etc have been proposed in the block.
- Konark NAC area which is proposed as next higher level of development hub have been provided with 25 no's of primary school, 17 no's of middle school and 8 no's of high school etc.

The details of proposed educational facility for different blocks in various horizon years are shown in below tables:

Table 44: Demand VS Gap in Education Facilities in PKDA-2011

Block	Primary School		Middle School		Higher Secondary School		Technical College		School for physically challenged		Adult Literacy Centre	
	Demand	Current Gap	Demand	Current Gap	Demand	Current Gap	Demand	Current Gap	Demand	Gap	Demand	Gap
Puri Sadar	6	0	10	7	2	2	0	0	1	1	2	2
Block A	8	0	12	5	3	0	0	0	1	1	2	2
Konark	7	4	11	7	2	2	0	0	1	1	2	2
Block B	3	0	4	2	1	0	0	0	1	1	1	1

Source: Census data, CEPT analysis

Table 45: Proposed Educational infrastructure for PKDA-2021

Block	Primary School	Middle School	Higher Secondary School	Technical College	School for physically challenged	Adult Literacy Centre
Puri Sadar	35	25	12	1	2	9
Block A	10	7	3	1	1	2
Konark	16	11	5	0	1	4
Block B	4	3	2	0	0	1

Source: Census data, CEPT analysis

Table 46: Proposed Educational infrastructure for PKDA-2031

Block	Primary School	Middle School	Higher Secondary School	Technical College	School for physically challenged	Adult Literacy Centre
Puri Sadar	70	49	24	1	4	15
Block A	12	8	4	1	1	3
Konark	25	17	8	0	1	6
Block B	4	3	2	0	1	1

Source: Census data, CEPT analysis

7.2.1 *Suggested Policies and Strategies for Education*

Institutional Arrangements:

- The Government should work very closely with the private and public sector to form an advisory committee comprising representatives from all concerned parties and form up-to date courses only to ensure that its education and training system would meet the tertiary needs, now and in the future.
- Close collaboration with international reputed institutions in the development of various training courses could form part of the Government's HRD policy. The Government, along with National Productivity Council, Technical
- Education Board and other appropriate organizations should also develop extensive programs to upgrade the skills of the existing workforce under the overall guidance of experienced and well qualified national and overseas personnel. Only then could we identify their best practices and suitably modify them for developing the present education and training system.
- The Government could promote the adoption of the city's municipal schools by NGO's and communities to reduce dropout rates

Improving Quality of Education:

Introduce Institutions of Technical, Medical and Management and Vocational Training Education. The supply of skilled man power is the key factor in the process of managing the future urban development. It is important to develop new initiatives in management training outside the formal education and training system to provide the adequate skill required for running operation and maintenance of various old and new industrial institutions.

Capacity Building:

A. Release of land for setting up of high quality day schools in the model of DPS in different villages.
B. Formation of teachers' training institute for improvement in the qualification and experience of the teachers at all levels, especially the secondary and higher secondary level.
C. Augmentation of infrastructural support such as text books, furniture, storage in classrooms, playgrounds, libraries, laboratories etc; with a stress on extra-curricular and recreational activities especially in the primary sections. Introduction of mid-day meal would enhance the effort in this direction.

7.3 Proposed Health Infrastructure

Development of Health facilities is one of the key components of habitat planning. In case of the study region very little availability of the same facility makes it more challenging to respond to rising demand. Proposed health facilities have been illustrated in the tables below, which clearly shows Puri Sadar area needs immediate attention as excess population from Puri town needs to be accommodated in the same area.

Table 47: Demand VS Gap in Health Facilities in PKDA-2011

Block	General Hospital		Health Centre		Primary Health Centre		Poly Clinic		Mother and Child Care		Dispensary	
	Demand	Gap	Demand	Gap	Demand	Gap	Demand	Gap	Demand	Gap	Demand	Gap
Puri Sadar	0	0	10	7	2	2	0	0	1	1	2	2
Block A	0	0	12	5	3	0	0	0	1	1	2	2
Konark	0	0	11	7	2	2	0	0	1	1	2	2
Block B	0	0	4	2	1	0	0	0	1	1	1	1

Source: Census data, CEPT analysis

Table 48: Proposed Health infrastructure for PKDA-2021

Block	General Hospital	Health Centre	Primary Health Centre	Poly Clinic	Mother and Child Care	Dispensary
Puri Sadar	0	1	1	1	2	6
Block A	0	0	0	0	1	2
Konark	0	0	0	0	1	3
Block B	0	0	0	0	0	1

Source: Census data, CEPT analysis

Table 49: Proposed Health infrastructure for PKDA-2031

Block	General Hospital	Health Centre	Primary Health Centre	Poly Clinic	Mother and Child Care	Dispensary
Puri Sadar	1	2	2	2	4	12
Block A	0	0	0	0	1	2
Konark	0	1	1	1	1	4
Block B	0	0	0	0	0	1

Source: Census data, CEPT analysis

7.3.1 *Suggested Policies and Strategies for Health Facilities*

The various strategies proposed for improving the standard of health facilities in the region are as following:

Raising the level of medical services:

The existing standard of health facility should be upgraded in compatible with new trends of health care services such as tele-medicine, setting up of health intranet, patient information centre through internet, and related computerization should be actively encouraged in the PKDA region. Specific focus should be given to development rural health facility development in the region.

Community based approach

- The motto for tomorrow's health care should be "help at the doorstep". Preventive practices coupled with medical help provided by community health officers will ensure that the number of patients with critical diseases will decrease. All categories of citizens including government workers are to be brought under the medical insurance coverage to avail the facilities in the major hospitals.
- The strategy for community based approach will be to increase the participation of the people, especially womenfolk in semi-urban, industrial and rural areas. A system of health card has to be introduced to each individual by the NGO's and CBO's.
- Introduce a system of appropriate user fees in all the state-run hospitals without withdrawing the sanctioned fund.

Public Private Partnership:

- Encourage public–private partnership in the creation of new kinds of hospitals for ensuring specialized kinds of medical facilities for the people at more affordable prices.
- The private sector in healthcare should cater to the referral hospital like that of VMC, Tata memorial etc. while improving the medical equipment and laboratories. However some form of cross subsidy may be worked out so that the private sector could provide services to people at more affordable prices.

Capacity Building:

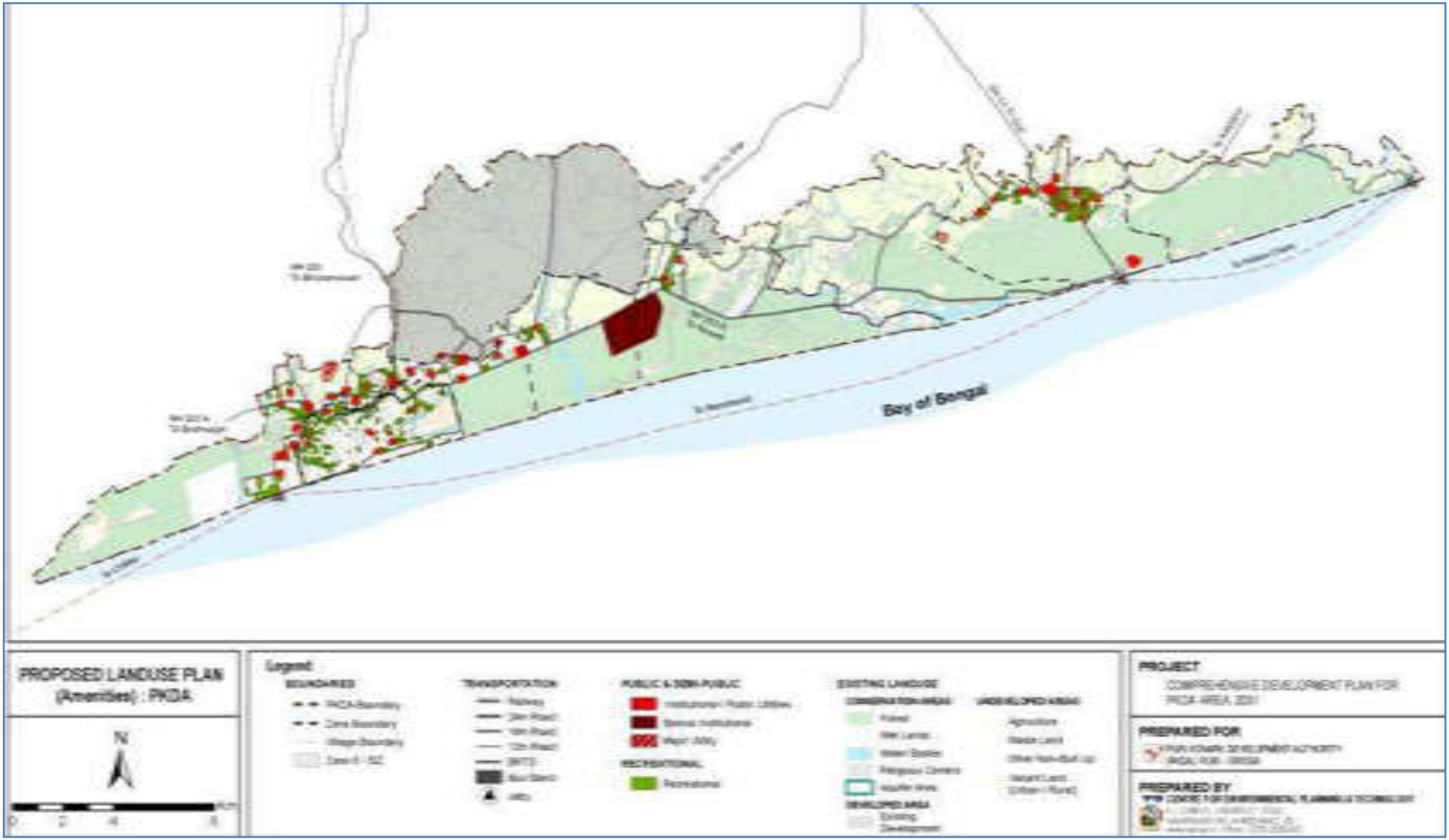
- There is an immediate need to increase the number of qualified doctors as well as the para-medical staff in hospitals.
- There is an immediate need for upgrading all basic and diagnostic equipments in all primary health centers and sub-centers mainly in the rural areas which lack these facilities.

7.4 Spatial Allocation of Proposed Community Facilities

Proposed community facilities in the form of education facilities, health infrastructure, socio-cultural facilities, financial and other uses has been proposed to be allocated in the public and semi public spaces as provided in the map no- .Major allocations have been show in three broad development zones which are: Puri Sadar area, Block-A area and Konark NAC Area. Due to the fact that these areas will accommodate majority of the population in coming future provisions have been given for the same. Whereas for rural areas of the region locations for such facilities needs to be identified by concerned authorities and necessary proposed social infrastructure needs to be build.

Identified special institutional area has been marked as puncture in the forest areas. This is envisaged to develop into a knowledge hub of the region and not confined to PKDA but state and national level. Theme based education entrepreneurship training; traditional studies and art forms are suggested to be developed in the earmarked area.

The map below shows the overall spatial allocation of proposed community facilities in PKDA region



Map 13: Spatial Allocation of Community Facilities in the Proposed Land use Plan, PKDA- 2031

7.5 Mobile Health and Education Facilities for Rural PKDA

Along with conventional proposal for health and education facilities alternative rural facilities have been identified in the form of mobile health and education infrastructure for efficient and affordable provision of social infrastructure for rural PKDA.

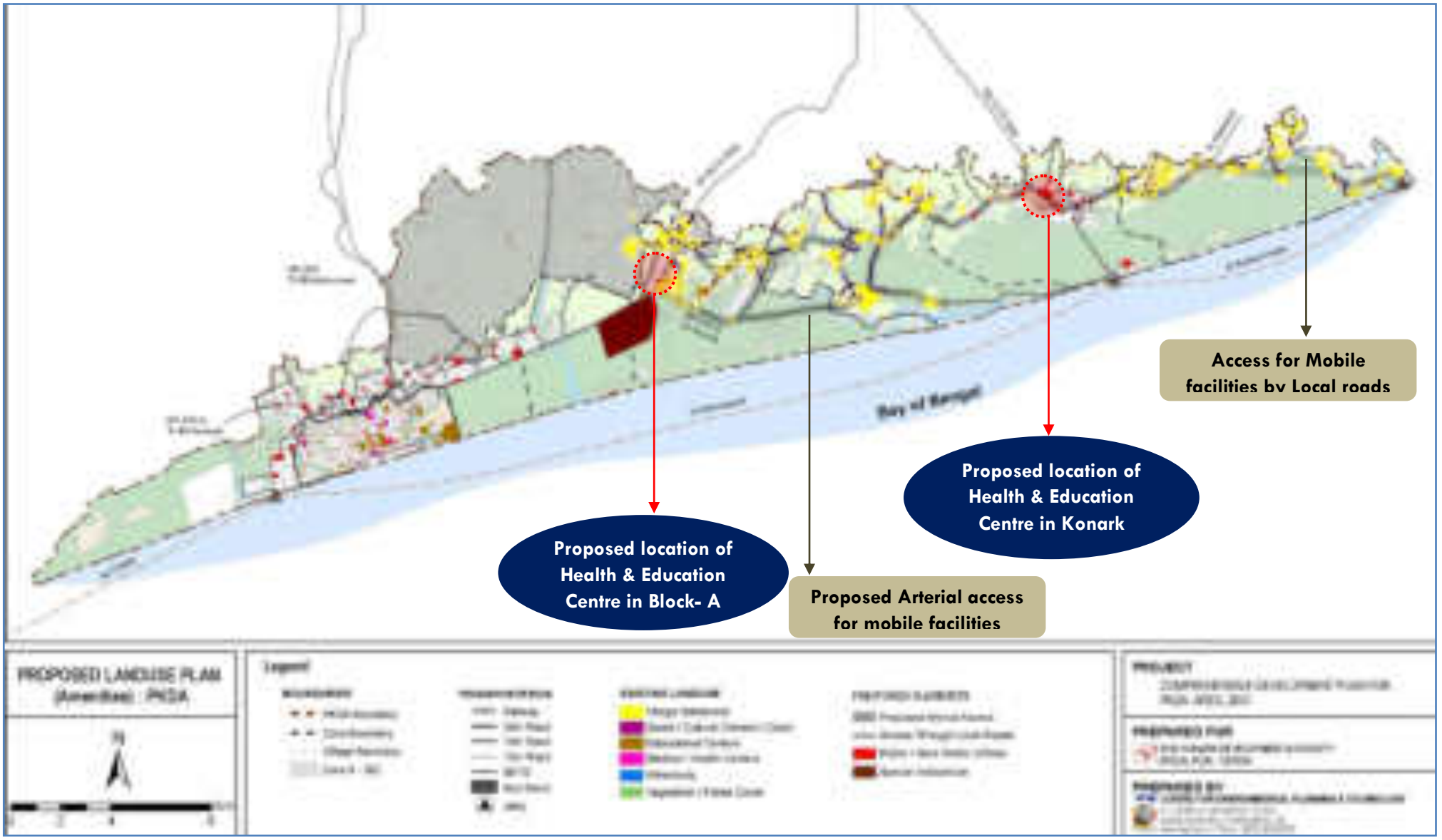
Broad objectives of the proposal are:

- Help the health care & educational system to reach the remote areas serving primarily the underprivileged and economically backward communities.
- Generation of research data on health & literacy profile will help to understand the long-term preventive action.
- Finding out alternative affordable service provision for rural population in efficient manner.
- Serve as a unique model to be replicated in other parts of the state of Orissa, which severely lack the basic health care and educational services in vast rural tracts.

The map shown in the preceding page shows arterial routes and local access for movement of mobile facilities in rural parts of the region. Majority of villages in remote areas have been covered under the identified proposal. Location of centre for trunk infrastructure of health and education has been identified at two locations, Block-A and Konark area. The mobile facilities will be generated and controlled by the two centers.

Activities proposed and facilities to be provided through mobile facilities are as follows:

- DIAGNOSTIC FACILITIES – Quick, on the spot.
- CURATIVE – Prescription and on the spot dispensing of medicines for common ailments and referral to hospitals for other cases.
- DATA COLLECTION & ANALYSIS ON HEALTH PROFILES.
- EDUCATIONAL RESEARCH LABS.
- EDUCATIONAL AND HEALTH AWARENESS PROGRAMS.
- EFFCIENT & AFFODABLE SOLUTIONS- Affordable medical checkup and medicines.



Map 14: Alignment of Mobile health and Education Infrastructure for PKDA- 2031

7.6 Housing Strategies for PKDA-2031

From the existing scenario analysis and demand assessment in volume-I it has been felt that the demand for residential units and land is increasing at a very steady rate in the areas nearby Puri town and Konark NAC due to rural to urban migration flow. Therefore a strict land policy and smartly designed housing strategy is the key for regional development in PKDA. This section will assess housing demand as well as explore various successful case studies and propose suitable strategies for land and housing development in PKDA region.

7.7 Vision for Housing Development

The housing strategy for PKDA region has been formulated with a vision to achieve the following components:

- Decongestion of Puri town area.
- Inclusive community housing development in the region.
- Affordable housing supply especially in the urban centres.
- Special emphasis on housing for the poor, backward classes in the region.
- Maintaining identity of the region via common cultural, architectural elements, style of housing.
- Regulations to control development and preservation of natural resources.

7.8 Housing Objectives

The land and housing development strategy for PKDA region will look to achieve the following objectives:

- To achieve optimum social use of urban land,
- To make available land in adequate quantity at right time and at reasonable price to both public authorities and individuals,
- To encourage cooperative community effort and bona fide individual builders in the field of land development, housing and construction, and
- To prevent concentration of land in a few private hands and especially to safeguard the interests of the poor and under-privileged.

7.9 Housing Demand Assessment, PKDA-2031

The future housing requirements for the PKDA region has been calculated in the below table. Population projection has been done with applying Geometric method of population increase. The assumption that has been used to calculate the household is that the household size will remain same for 2030 as was on 2001due to the fact that over the last two decades household size has been apparently not been changing considerably.

Basically at the first step demand for dwelling units has been calculated for each block. The submission of the same identifies the total housing requirement for PKDA in the year 2030. The existing housing shortage has been calculated by deducting the number of households and occupied houses in 2001. The next stage is to determine the number of dilapidated houses needs to be reconstructed at 2030. It was assumed to be 5% of the existing stock on 2001. The final requirement has been calculated by adding three components namely fresh demand in 2030, existing shortage and the dilapidated stock shown in table.

From the projection it can be observed that more than 72% of the housing demand will be generated from Puri town area. Proposals need to be formulated for planned development of housing units in Puri Sadar area as the town is already congested.

Table 50: Housing Demand assessment for PKDA-2031

Block	Area	Decadal Growth Rate (%)	Population 2001	Projected Population 2031	No of HH	HH Size	Total No of DU required
			2001	2031	2001	2001	2031
Puri Town	5253	30	1,57,837	3,44,098	30969	5.1	67470
Puri Sadar	1684	32	14,880	33,328	2819	5.52	6037
Block A	9883	19	17,238	29,054	3272	5.54	5244
Konark	3510	34	16,979	61,487	2853	5.95	10333
Block B	3486	20	6,872	10,005	1598	4.25	2354
PKDA (TOTAL)	**23816**	**29**	**2,13,806**	**4,77,972**	**41511.00**	**5.04**	**93469**
						Existing Total occupied Houses: PKDA	37329
						Total new Housing demand	56140
						Existing Housing Shortage (41511- 37329)	4182
						Existing No. of Dilapidated Houses (Assuming 5% of the total stock)	1866
						Total Demand for 2031 (Total new demand+ Shortage + Dilapidated stock)	**62188**

Source: Census data, CEPT analysis

7.10 Housing development in Greenfield Sites

This section encompasses housing proposal in newly developed and future proposed residential areas over existing green field sites or very scarcely developed areas. First of all we will look at some of the successful models of Greenfield development strategies undertaken in various parts of Indian cities. We will incorporate the suitable strategies for housing development in the region accordingly and go forward for detailed design proposals.

7.10.1 *Case Studies for Planning Strategy*

For proposing housing development strategies in Greenfield sites first let us go through various case studies where various mechanisms and instruments have been applied for efficient development of Greenfield sites. After that we will incorporate suitable strategies for housing development in PKDA region. Urban centers as well as rural settlements will be taken under arena of the proposals.

7.10.1.1 Gujarat Town Planning Schemes

Most state town planning acts inherited provisions for land assembly, plot reconstitution and infrastructure provision. Historically these precede the legal provisions for preparation of mater plans. The law also provided for recovering part of the land value gains on account of plot reconstitutions and infrastructure. These are called Town Planning or Improvement Schemes. However Gujarat is the only state that is actively pursuing town planning schemes.

Town Planning Schemes have following three interrelated objectives.

1. Expanding the supply of urban land in a planned manner with infrastructure
2. Equitably appropriating land for public purposes
3. Recouping part of the land value gains for financing infrastructure investments.

Under this provision agricultural plots are assembled in a scheme of about 100 to 200 hectares. Layout is prepared for reconstituting plots by provision of roads and public facilities like schools, open spaces etc. Additional land is reserved for low-income housing and as land bank for planning authority. The incidence of public purpose land (about 40%) is uniformly distributed over all landowners. The value of surrendered land and cost of development is considered as the cost of the scheme. The difference between the value of the Final Plots and the cost of the scheme is calculated as the betterment and 50% of the betterment is recovered as the betterment levy. Gujarat has made the process more participatory and also practical through many procedural innovations.

Assessing the value of final plot is a contentious issue. In Maharashtra TP Schemes have been inordinately delayed on account of ownership disputes and valuation). However Gujarat seems to have adopted a practical approach where area under roads vests in planning authority pending final settlement of betterment. TPS is thus used as an expeditious way of appropriating land for infrastructure – particularly roads. But the other two objectives seem to have not been achieved in a timely manner.

7.10.1.2 Dealing with Illegal Sub-Divisions

Peri-urban areas of cities have been experiencing large scale illegal sub-divisions. In order to deal with this problem The Maharashtra Gunthewari Developments (Regulation, Upgradation and Control) Act, 2001 was enacted. (Guntha is 1/40th Acre, most plots in such sub-divisions are 1 Guntha hence the phrase Gunthewari.) The conditions of regularization include surrendering 10 percent of plots (vacant and unsold) free of cost, payment of compounding fee and development charge. The planning authorities are obliged to spend such charges for developing on-site infrastructure. The effectiveness of this measure in particularly in terms of raising funds for infusion of infrastructure in such layouts does not seem to have been evaluated.

7.10.1.3 Township Development and PPP Model

Many states have formulated schemes for allowing land assembly and town development by private developers notwithstanding the zoning provisions. Examples are Special Townships and Megacities in Maharashtra and Integrated Township Development in Gujarat. These policies essentially facilitate assembly of agricultural land with minimum area being 40 ha in case of Special Townships and 100 ha in case of Megacities. The incentives offered are automatic permission for non-agricultural use, allotment of government land within the assembly area etc. The obligations of the developer include provisions of both on-site and off-site infrastructure. The key intervention is that of not allowing non-agricultural use to individual farmer-landowners unless their land is assembled to a minimum size. This necessitates 'developers' intervention that is many times seen as iniquitous.

HUDA model and KMDA models are the two successful case studies for private-public partnership in land development process. In HUDA model for land development developer has to acquire/purchase land directly from the land owners through negotiated market price. Once the developer has acquired 100 acres of land if he is interested in developing land can apply to the Director Town and Country Planning Department, Haryana for granting him the license to develop the purchased land. The developer would be entitled to develop maximum 55% of the land area as residential plotted area and the remaining 45% has to be compulsorily developed for public use and social infrastructure. Out of the 55% plotted area the developer would be required to reserve land equal to 20% of the total number of planned plots for the E.W.S and another 25% plots for the N.P.N.L category of sizes as per HUDA rules and standards. These plots would be sold under the supervision of HUDA. The developer would be responsible for providing all the internal infrastructure facilities where as the planning authority will provide the eternal trunk infrastructure for which the developer will pay accordingly.

Figure 14: Inclusive Township design: Udayan, Kolkata

7.10.2 Strategies Adopted for Greenfield Development in PKDA Region

Providing housing for growing population will be the major challenge for PKDA in coming years. Due to constraints in developable land and compact Puri town the new developments has to be planned accordingly for better management and development of the region. For planned housing development in PKDA region three residential development zones have been identified as shown in map below. First development zone is proposed in Puri Sadar area and some parts of Puri town peripheries which will be primarily high density mix use development. Town Planning schemes needs to be prepared for development in the proposed zone. The second development zone is proposed for development of plotted residential units and villas which is located in Block-A area and in central to the PKDA region. Low density traditional form of residential development has been proposed in Konark area. All of these developments have been formulated with consonance to local development characteristics and potential.

The residential zones of PKDA have been divided into R1 (Planned plotted houses, Project housing schemes, irregular layout and scattered houses), R2 (Clustered settlements, slums & squatters) and R3 (Multi storied housing). These have been developed based on the existing nature of development and the proposed scenarios. A comparison between the existing and proposed residential composition has been shown in the below diagram:

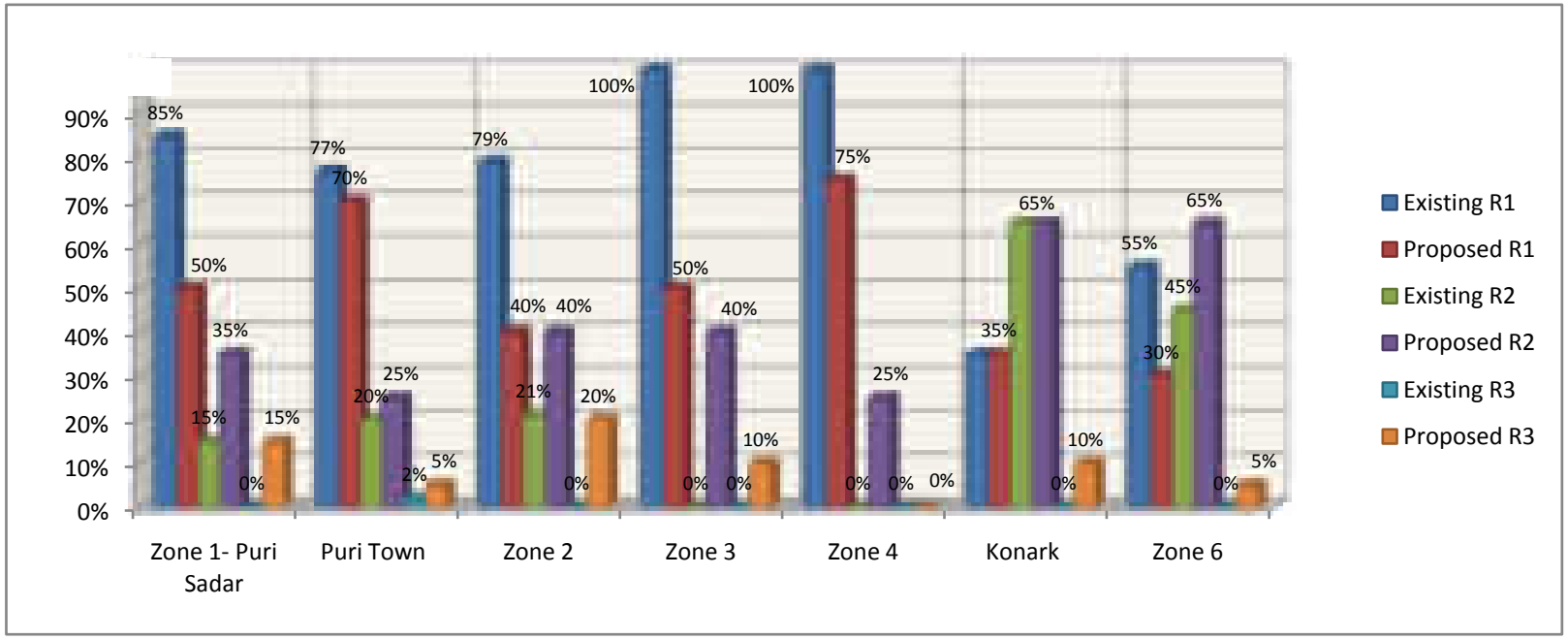
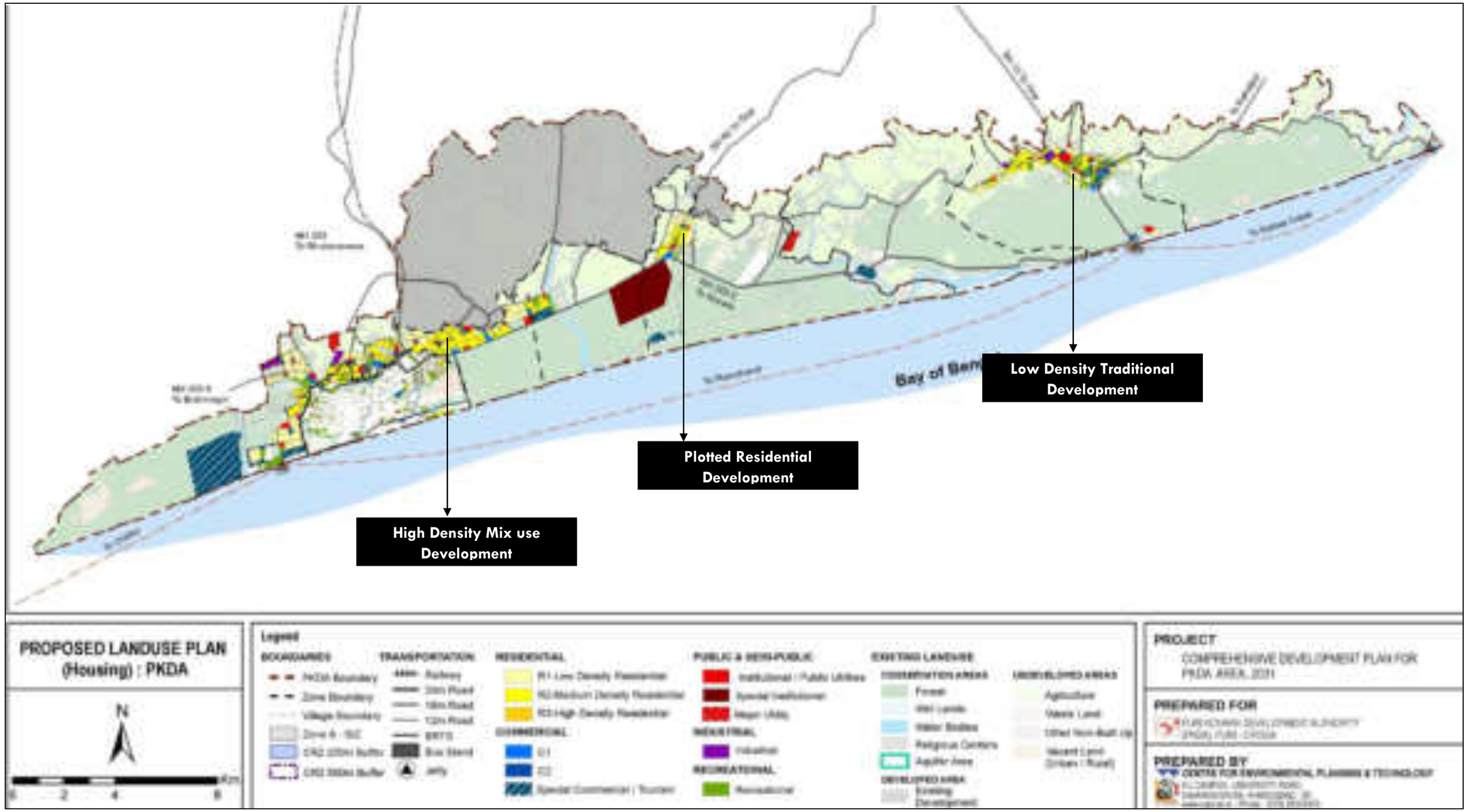


Figure 15: Existing and proposed residential composition: PKDA



Map 15: Proposed Housing Plan, PKDA- 2031

The potential housing development zones have been identified and demarcated for development keeping in mind the following criteria's:

1) Population concentration in various blocks and at the town/village level.
2) Levels of existing services and facilities in the region and the existing disparities.
3) Distance from existing urban centres to the proposal areas.
4) Communication linkages between proposal areas to nodes of development existing or proposed.
5) Functional, economic, and logistics characteristics of the region.

7.10.2.1 High Density Mixed Residential Development

This zone basically constructs of part of Puri Sadar block and very small area of Puri town. Although the area is sparsely populated still it has a lot of potential for development in future as it is located in the Puri- Bhubaneswar growth corridor. The terrain is partly flat and partly low lying areas in the proposed zone suitable for residential development.

The main reason why it has been taken for high density mix development is that Puri town is almost saturated and cannot grow west ward and hence this is the only direction where urban sprawl will take place. Therefore planning measures is the need of the hour to induce planned housing development which will lead to better quality of life in the area.

There exists some institutional and commercial development owing to the link between the two cities of Bhubaneswar and Puri. Furthermore, commercial activity is bound to increase in this area once the main bus stand is shifted and the area provides as an important link between Puri and Bhubaneswar.

The land suitability analysis categorizes this area as suitable for development thus reflecting that the area does not comprise any water bodies or forest areas to be conserved and protected. As proposed, part of the agricultural land in this area would have to be allotted for development, on basis of the crop yield and production in this area. This zone is a potential growth corridor as commercial and residential development can take place without having any effect on the environment.

Town Planning schemes can be prepared for sectors of an area of 100-m 200 hectares comprising of an average of 150 land owners in the area following the Gujarat and Maharashtra model. The method of TP Scheme is basically a product of land reconstitution model which helps in eexpanding the supply of urban land in a planned manner with infrastructure development for suggested amount of area. Along with that it results equitable and appropriating land for public purposes to supply adequate services and amenities and infrastructure to residents. At the same time it results in rrecouping part of the land value gains for financing infrastructure investments which is major cause of concern elsewhere.

7.10.2.2 Rural Settlement Reconstruction/Plotted Development/Gated community Housing

This zone is located in a strategic position in-between Puri town and Konark NAC. The proposed zone is aligned to State Highway no 60 running towards GOP makes it well linked with inside urban centers and outside major nodes and hence worth developing as a residential cum recreational hub.

This area is rich in natural resources owing to the Brahmani that meanders through the forest area. The land suitability analysis reveals a patch of area here that can be developed for residential and commercial activities that are planned keeping the environment in mind. There already exists some scattered residential development in this area.

The proposed university complex would facilitate the development of commercial activity in this area. Residential development in this zone would be controlled in terms of architectural elements so that the essence of the area as a cultural hub of the PKDA region would be reflected. Housing here would be of villa type preferably in gated communities owing to the location. Multi-storeyed construction must be avoided here as this area acts a potential access to the sea. The skyline here thus must be maintained.

The type of residential development proposed in this zone is of following type:

- Villas for locals, tourists, and gated communities for rent
- Apartment type housing with restriction on height, façade and skyline

Due to its strategic location and natural richness this zone in future can become one of the most attractive zones for development and economy generating scope will also be higher in the case.

7.10.2.3 Case design for Plotted Development

This section has been formulated to explain a case study undertaken for plotted development implementation in the proposed residential area in PKDA.

Site Description: The conceptual plan for plotted development is proposed at the intersection of Puri – Konark Marine Drive and State Highway 60 over an area of 40 hectares. Currently the area is predominantly agricultural. Small residential hamlets can be seen around that area.

Design concept: Integrated development of a neighborhood which can facilitate recreational aspirations of residing population has been emphasized in the planning concept in this case. Also conservation of natural features and utilisation of the same has also been taken care off to plan an environmental friendly settlement

The salient features of the proposal are as follows:

- The area is predominantly designed to showcase residential development in that area with necessary commercial and institutional uses supporting the residential development.
- Integrated urban development supporting required commercial and institutional access within 5 – 10 mins distance from residential plots.
- Green areas / buffers around lakes to facilitate greater recreation and enjoyable environment.
- Accessibility to common green area for almost all the housing plots in the development zone.
- Ample open space and green areas with proportionate share for each unit.
- Locational advantage due to enhanced inter circulation and greater linkage with the region.

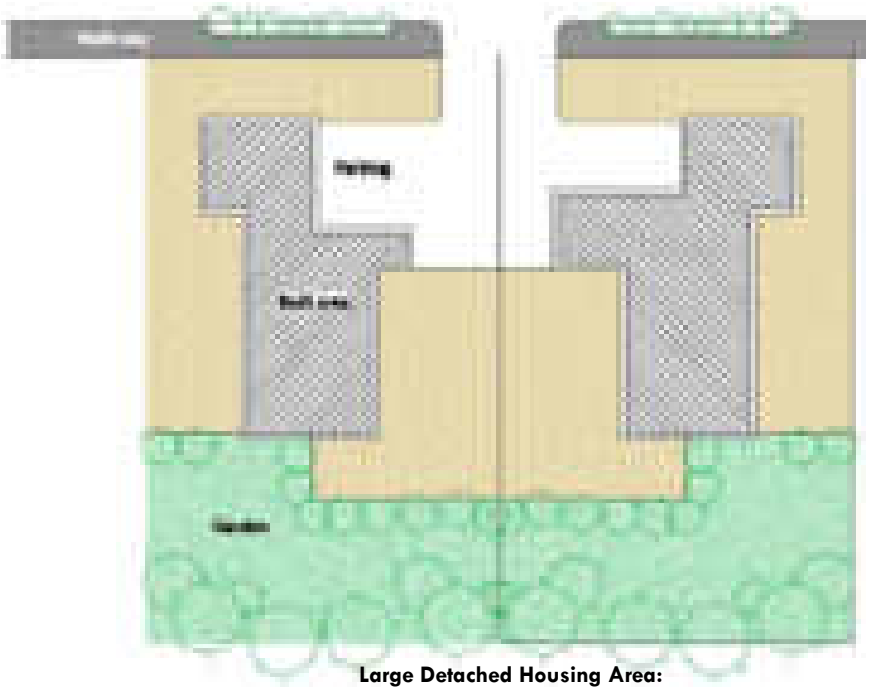
Map 16: Proposes land use for plotted development

The plotted development layout comprises of

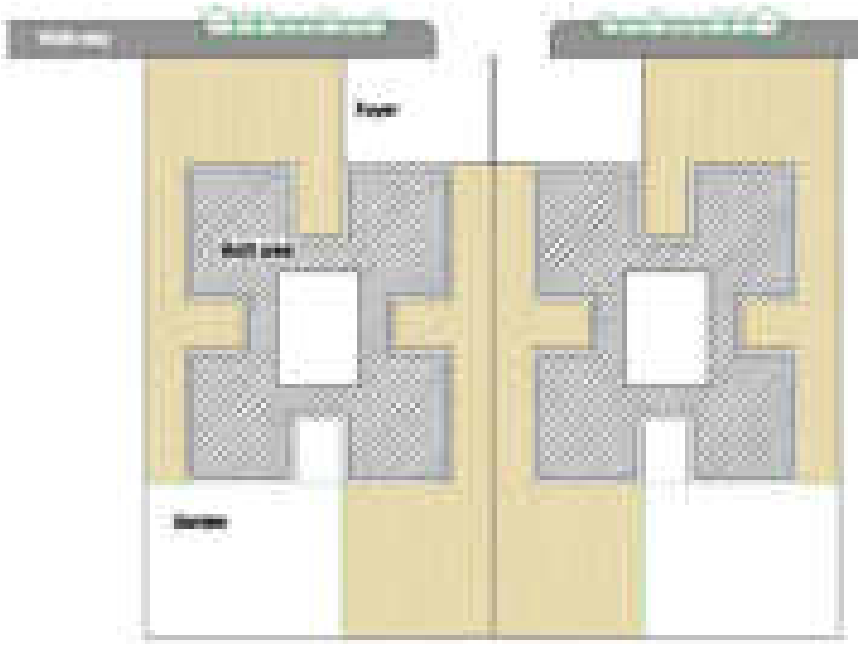
- Average plot size is about 1200 sq. mts. Some of the plots along the road are about 600 sq.mts.
- High density residential development - smaller

plots for G+3 apartment buildings along the major road (Max:100 – 125 sq mts / apartment)

- Low density - larger plots for single dethatched housing (Max: 200 – 300 sq.mts).
- Light commercial development to cater to the housing development around
  - convenience shopping (household, supermarket, general stores, laundry, saloons, parlours, dry cleaning, cyber café and other small retail businesses)
- Institutional development
  - medical clinics, dispensaries, nursing and public and private health centres (maximum of 15 beds)
  - educational building (preschool, nursery, primary - high school



Large Detached Housing Area: 200-300 sq mts.

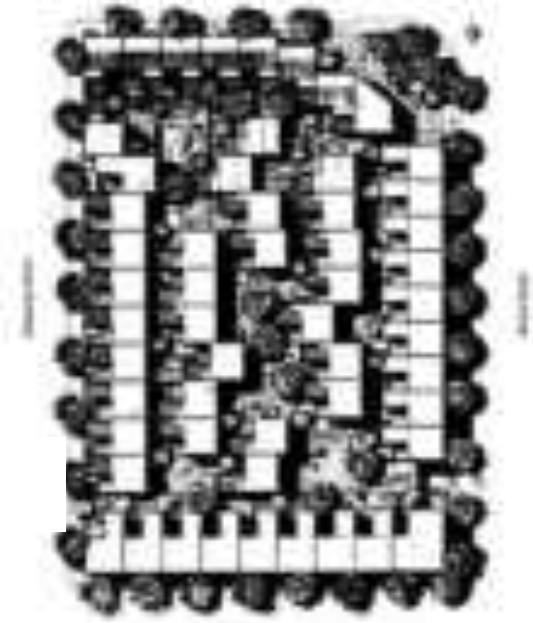


Apartment Buildings Area: 100-125 sq. mts

Figure 16: Design for plotted development units

7.10.2.4 Low Density Residential Development/Craft Village:

Due to its world heritage site status ritual spirits of the locals Konark sun Temple will be a attractive site for tourists and this can be tapped for residential and commercial development around the area. This zone of development comprises of the part village located in the peripheral parts of Konark NAC area. The core area of Konark is mostly recreational and institutional and hence this area surrounding to that can be developed as major residential hub in the region. But the development should be low density low rise and well incorporated structure with the image of the area.



Agricultural land area occupies 11.68 sq.km of the Konark NAC area and hence can be easily acquired for development. Also the land suitability analysis shows that the land here is highly suitable for development and hence taken for planned housing development zone.

The commercial activities are concentrated around the Konark Temple. These commercial activities include Hotels, Dharmasala, community centres etc. apart from these there are vendors or the market complex. There is a small concentration of hotels near the beach area. Apart from the commercial activities, there are also a few godowns/storage places, found near the sea coast. This market can be used as service points for the proposed residential areas. Also renting accommodation can be provided for tourists in the zone which can create night stay accommodation facility in Konark which is currently unavailable.

There are a very few public and semi public utilities at Konark. They have a scattered pattern of arrangement, around the existing residential areas. There are two major educational institutions situated on the highway connecting Konark and Pipli. This poor infrastructure status can hamper the development potential. Hence it is proposed that for formal housing to take place adequate provisions of infrastructure should be provided in the region.The basic principle followed in the above three proposals for housing development is clear linkage between housing and employment generating opportunities. Clear set of activities in different zones should be followed for economic and social development along with housing.





7.10.3 Redevelopment strategies of Slums and Old Housing Stock

This section encompasses strategies for affordable housing development and upgradation of slums as well as old and dilapidated stock in core areas of Puri town. First of all we will look at some of the successful models of redevelopment strategies undertaken in various parts of Indian cities. We will incorporate the suitable strategies for affordable housing development in the region accordingly and go forward for detailed design proposals.

7.10.3.1 Case studies for Affordable Housing Strategy

For proposing housing development strategies for slum areas first let us go through various case studies where various mechanisms and instruments have been applied for efficient development of slums and squatters. After that we will incorporate suitable strategies for affordable housing development in PKDA region. Slums, squatters and dilapidated housing areas will be targeted in the proposal and strategies.

Aranya Housing Project: Indore

Situated 6 km from Indore, Madhya Pradesh, 'Aranya' is a housing project for the middle and lower income groups of Indian population. Designed by architect B. V. Doshi of Vastu-Shilp Foundation, 'Aranya', was awarded the Aga Khan Award for Architecture in 1995. The main aim of the project was to evolve a framework within the design where incremental physical development can take place within legal, economical and organisational framework. The structural plan of the township was informal and emphasised enrichment of spatial quality in the plot layout plan with inter-linked space of cultural context and maintenance of hierarchy of road with open and commercial spaces.

Figure 17: Aranya Housing Project Concept

The project was divided into six sectors, each with population of 7,000–12,000, diagonally bisecting linear parks. The lowest income groups were located in the middle of each sector, while the middle income groups were placed on the periphery.

House plans included two rooms, a living area and a kitchen. The lavatory was constructed between the front extension and the multi-use courtyard at the back. Most houses were provided with an additional access at the back, which allowed for keeping animals, a vehicle or even renting out part of the house to provide income. Ten houses formed a cluster that opened into the street. The courtyard at the back opened into the open space of the cluster and was used as a play area. For rainwater drainage, a combination of an underground storm water system in wider roads and surface drainage on internal roads, where the ground sloped, was effectively used. The road section dropped below ground level by six inches, allowing it to act as a drain.

The road network was designed according to topography, allowing the smooth gravitational flow of water. Three reservoirs, each serving two sectors, were located at higher points of sector and were interconnected in such a way that any two could cover the entire population.

Conventional and locally available building materials and construction techniques were adopted. The structures were constructed with load-bearing brick walls, which were plastered and painted. Cement concrete was used in the flooring. Low cost hand-made under reamed CRC piles were built for the core house (latrine, wash room) and the residents were provided with ready-built foundations. The doors, windows and grills were made on site. The CRC roof was constructed at a later stage because it was a high investment item. The black cotton soil of the site made it necessary to pile foundations even for simple and two-storey buildings. Railings, parapets and cornices were made to ornament the house.

A conventional sewage system was developed for the township, keeping in view the general contour of available ground slope and the road network. A well and lift station were provided near the final manhole that discharged the waste-water into the treatment plant. The treatment plant, an oxidation pond on the north-west corner of the site where the natural slope helped in the collecting of sewage, was pre-dominantly suitable for the south-west wind direction to avoid odour pollution. The architect used a computer aided design programme to research the most efficient, cost effective and low maintenance technology for all utilities.

Figure 18: Elements of cluster design for affordable housing

Slum Networking Project (SNP): Ahmedabad

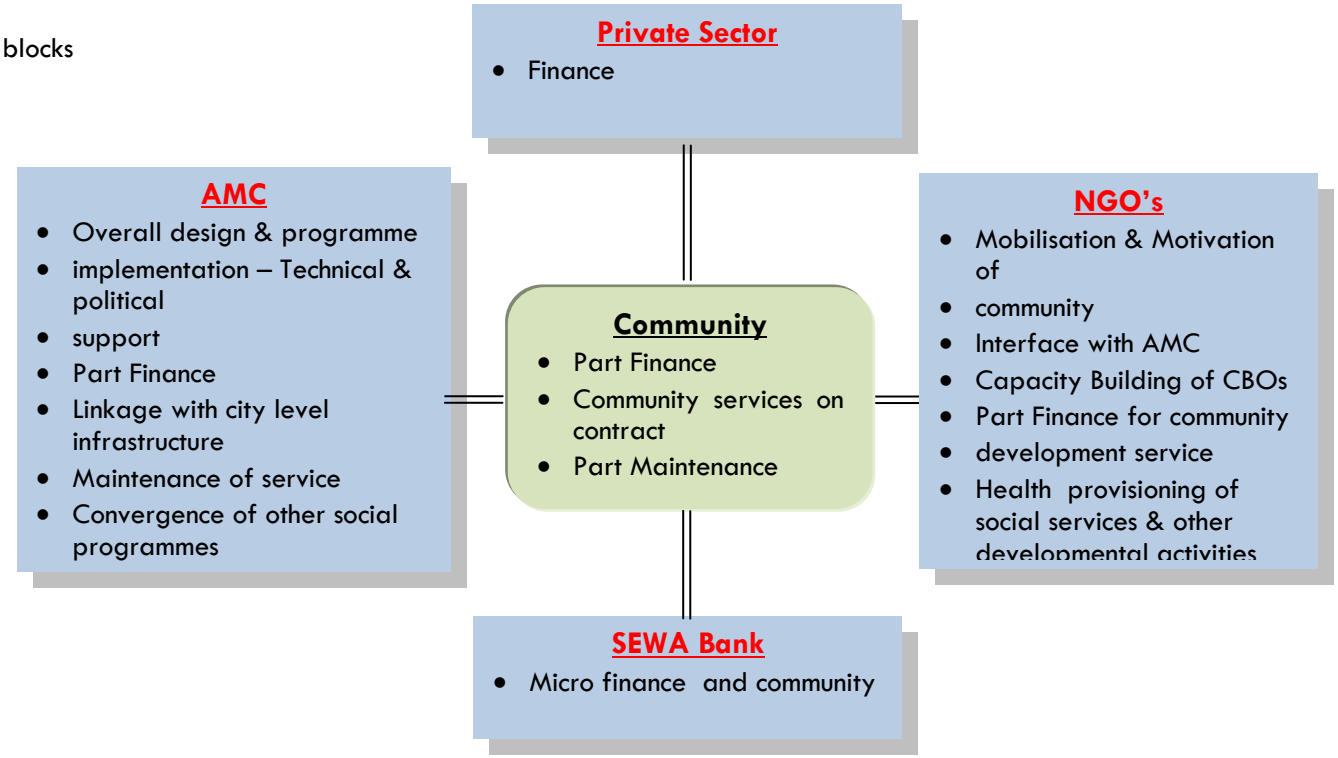
'Parivartan' meaning 'Transformation' is the objective of an ongoing program in the city of Ahmedabad in Gujarat. Ahmedabad Parivartan (also known as the Slum Networking Project) brings basic infrastructure services, including water and sanitation, in an affordable and sustainable way to the slums and chawls of the city. Led by the Ahmedabad Municipal Corporation (AMC), the project motivates and facilitates the target communities, local non- governmental organizations and the private sector to work together in a unique partnership. UNDP-World Bank Water and Sanitation Program - South Asia (WSP-SA) provided conceptual design support. Parivartan was developed in response to an earlier joint initiative of the private sector (Arvind Mills) and the AMC, to provide basic services to urban poor people living in a slum community called Sanjaynagar.

Under the Slum Networking Project there was various activities taken up which included Physical Development as one of the component. This component involved the provision of essential basic infrastructure service. This included the following:

- Individual water supply
- Individual sewerage connection & Individual toilet blocks
- Storm water disposal arrangement
- Paved roads
- Street lighting
- Tree plantation & Solid waste management

Table 51: Cost sharing structure for SNP project

Component	NGO	Industry	AMC	Household	Total
Physical Development		2000	2000	2000	6000
Community Development	300		700		1000
External linkages with city Infrastructure			3000		3000
Toilet cost			5800		5800
Total	**300**	**2000**	**11500**	**2000**	**15800**



Mumbai: Slum Rehabilitation

From early 70s till 1995 the thrust of the policy was on *in situ* upgrading of services in slums. In the World Bank assisted project BUDP (1985-1994) transfer of land tenure, provision of optional home improvement loans and cost recovery were added elements. "Decongestion" was the most dominating theme of Mumbai's planning from 1970. Strict control of Floor Space Index (FSI) was seen as the way of achieving decongestion. 1991 Development Control Regulations (DCRs) prescribed uniformly low FSI of 1.33 and 1.0. At the same time the environmental regulations prohibited development of coastal wetland. Increasing incomes and improved access to housing finance substantially increased the price of development rights that were made scarce by the FSI regime. State in 1995 decided to make use of the latent value of development rights. It introduced a policy of "Slum Rehabilitation" in which an investor who is ready to build 100 sq.m. (for 4 slum dwellers) and allot them to slum dwellers free of cost was entitled to 100 sq.m. of incentive floor space for sale in the market. The investor can build at the site of the slum till he reaches FSI of 2.5 and uses remainder as Transfer of Development Rights (TDR). At the receiving site normally permissible FSI of 1 could be exceeded up to 2 by way of TDR. The policy is considered to be off budget for government, but in fact it taxes the new homebuyers.

The Slum Rehabilitation Authority (SRA) was established in 1995. Six years later in census 2001, 54% of 11.9 million of Mumbai's population was counted in slums. By 2011 nearly 500,000 persons have benefited from SRA schemes. Additional 200,000 slum dwellers have been resettled as the project affected persons under similar schemes. However, it is estimated that nearly 60 % of 12.45 million people still live in slums. In fact now there is reason to believe that formal housing market of Mumbai caters to very rich and the informal market caters to the poor (and also not so poor) in slums.

Land Sharing for Slum Upgrading under TNUDP in Tamilnadu

Tamil Nadu has adopted a programme-specific approach towards regularization. Under the Madras Urban Development Project (MUDP) and Tamil Nadu Urban Development Project (TNUDP) - both World Bank funded programmes – pattas have been issued in the form of lease/sale deeds. Unlike in other parts of the country, home-based economic activities are permitted by the deed. Additionally, upgrading of the slums is undertaken and the costs incurred are recovered from the beneficiaries. These programmes have covered 150000 households.

One innovative approach adopted by the state government relates to regularization of unapproved layouts. Chennai, for instance, has a large number of illegal layouts in scattered locations, particularly on its periphery. The guided urban development (GUD) component of the TNUDP aims at checking these layouts by increasing competition in the supply of cheap plots. Small developers are encouraged to develop layouts in accordance with guidelines issued by the Chennai Metropolitan Development Authority (CMDA). The CMDA buys land reserved for common facilities and roads as well as plots for low income

housing, while the developer can sell the remaining plots for housing and shops in the market. However the scheme has not attracted a great response, probably on account of lengthy procedures, lower profit margins, and higher plot prices compared to unapproved layouts.

Redevelopment of Old buildings in core areas

Mumbai had a very pernicious rent control. This caused deterioration of the housing stock. In 1969 state accepted the responsibility of carrying out structural repairs of such buildings or reconstructing them when that is not feasible. To finance this activity a 'Repair Cess" was levied on such buildings. (Hence called 'Cessed Buildings'). This could not satisfactorily address the problem. In 1999 state decided to use FSI incentive. An investor ready to rebuild a cessed building and offer new dwelling units to existing tenants fee of cost could get 50% extra floor space for use at the same site. Additional incentive is available for assembly of multiple cessed buildings for redevelopment.

The policy essentially addresses the reconstruction of individual cessed buildings. However though initially introduced in 1999, the scheme was embroiled in litigation. Though cessed buildings in relatively high priced areas have attracted investors, it is too early to assess its impact on nearly 17000 buildings.

7.10.4 Slum Development Policy proposed for PKDA Region/Area

It has to be appreciated that neither a mono strategic approach, nor a top-down strategy, for settlement up gradation, will work. There can be no absolute choice of strategy and it has to be situation specific. Experience from across the cities shows that the people have to be involved in the entire process of planning, implementing and maintenance.

A detailed project report on the slum population needs to be prepared to study the various factors such as the slum population, location, the residential status, occupational pattern and the income levels etc. in order to implement the various slum rehabilitation schemes.

The entire proposal will be feasible only on implementation by the government authorities either in the public, private or PPP mode. An integrated slum development policy for PKDA region has been derived in lines with National Slum Policy.

7.10.4.1 Objectives:

i. Integration of slum and their communities into the urban area

ii. Strengthening of legal and policy framework

iii. Establishing of a framework for smooth implementation of policy

7.10.4.2 Governing Principles:

i. Up gradation and improvement of slums instead of slum clearance

ii. Access to minimum services in all urban informal settlements

iii. Goal of city without slums

7.10.4.3 Strategy:

❑ **Inclusive Approach to Definition of Slum/Informal Settlement:**

In general, all under-serviced settlements, be they unauthorized occupation of land, congested inner-city built up areas, fringe area unauthorized developments, villages within urban areas and in the periphery, irrespective of tenure or ownership or land use shall be covered under the definition of a slum/informal settlement.

❑ **Comprehensive Listing of Slums/Informal Settlements:**

For the purpose of providing basic urban services, all under-serviced settlements characterized by poor physical and socio-economic conditions, should be identified and demarcated from regular planned neighborhoods. These settlements should be listed by the urban local body.

❑ **Registration of Slum Dwellers:**

All people residing in such listed settlements should then be registered with the ULB in order to prevent ineligible beneficiaries being included in development programmes.

❑ **Identity Card:**

A suitable identity card shall be issued to all households in listed slums. The identity card may contain a few details such as household name, address, details of family members etc.

❑ **De-listing**

The urban local bodies should de-list those settlements which have been provided with a sustainable level of basic services and where socioeconomic indicators have reached defined acceptable norms.

❑ **Classification of Land Status / Tenability**

The land status of all listed slums/informal settlements should be classified by the ULB as either Tenable or Untenable in order to determine whether or not regular planned service provision will be undertaken on an in-situ or re-settlement basis.

❑ **Granting of tenure**

- Tenure on Government Owned Land: Tenure to all residents on tenable sites owned government. Full property rights shall resettlement and/or rehabilitation sites.
- Tenure on Privately owned lands
- Land Acquisition: All Tenable settlements should be acquired unless the ULB resolution otherwise.
- Negotiated Compensation: The acquisition parties should be undertaken on a negotiated stakeholders (residents, urban local bodies, others) may be invited to participate in promote transparency and equity.

❑ **Resettlement and rehabilitation**

Draw up comprehensive resettlement and relocation guidelines for urban dwellers and all relocation or resettlement of dwellers residing in untenable sites shall be implemented strictly in accordance with such guidelines which should ensure that:

- Alternatives to resettlement should be fully explored before any decision is taken to move people.
- Relocation distances should be minimised to reduce the impact on livelihoods.
- Resident dwellers must be provided with some choice of alternative sites and where feasible, an alternative rehabilitation package.
- All resettlement sites should be adequately serviced and provision should be made for public transportation prior to settlement.
- The livelihoods of affected people must be sufficiently compensated within a fixed period.
- Participation of primary stakeholders, particularly women, in planning and decision making is a pre-requisite for any resettlement process.
- Women's particular needs and constraints must be specifically addressed.

- Any urban development project that leads to the involuntary resettlement of communities must make provision to cover the costs of R & R.
- All stages of the resettlement process including the transition and follow-up periods should be closely monitored and supervised by the ULB with community representatives.

❑ **Environmental improvement**

The Provision of physical infrastructure components such as water supply, drainage, sanitation, improved access, electricity etc, should support the ultimate objective of improved quality of life. The evidence from existing slum improvement projects clearly shows that an improved physical environment greatly facilitates the integration of the settlement in the wider urban area and at the same time, contributes to improved livelihoods and health and well being of the community.

❑ **Improving access to social services**

It will be desirable to bring Municipal Services under the Consumer Protection Act to monitor quality and reliability of basic infrastructure services delivered at settlement level. This should be uniformly applied irrespective of tenure and land status of the settlement, with a specific mandate to monitor absolute levels of service coverage and differential levels of service availability throughout the ULB area.

❑ **Economic empowerment**

There is a need for ULBs to support interventions designed to address livelihood needs of the urban poor. This will include:

- The provision of vocational training facilities
- Implementation of savings and credit schemes for self-employment
- Addressing constraints in the labour market
- Providing improved access to raw materials and marketing support
- Legal rights and redressal systems

It would be desirable for the ULB to involve the private sector in such initiatives wherever possible.

7.10.4.4 Slum Development choice and design options (Pentakota Redevelopment options)

From the existing situation analysis of the characteristics of the slums in Puri town and Konark NAC areas it is clear that the livelihood of slum residents is clearly linked with their living space as most of them are fisherman and carries out their activities within their neighborhoods. Therefore relocation option can not be undertaken in the context where as in-situ slum Upgradation option should be implemented in the slum areas of the region. Development of permanent houses and infrastructure should be emphasised to improve the living condition in the slums.

Various schemes available for slum development can be undertaken especially upcoming Rajiv Awas Yojana can be implemented for Upgradation of slum in the area incorporating peoples participation in the process. Development of slums and unit designs should on the basis of proposed policies as explained above.

Figure 19: Unit, cluster and neighborhood design strategy for Pentakota slum redevelopment

The above design options have been worked out for slum redevelopment in Pentakota slum area. Basic unit design has been proposed to have a built up space of about 35sq. mt. which will include various open, semi open and private spaces as shown in option-1. The second design shows basic unit cluster having 4 units clubbed together having same space distribution as mentioned. The last one shows design option at a small neighborhood level comprising of 12 or more units. The toilet facilities as shown are proposed at the neighborhood level as the space is very limited in the slum area. The same design options can be worked out with moderate changes if plot size changes applying the same concept of space distribution.

7.10.5 *Proposed Housing/Rental Policy for PKDA Region (Ensuring Interests for EWS & LIG Category)*

The housing policies will focus on augmenting affordable housing supply which is a major area of concern in the region. For the reason the following policy guidelines should be followed in consonance with Affordable Housing Policy, 2009

a. Mandatory provisions:

- Housing board to provide 50% of housing units in its schemes for EWS and LIG. 20% for MIG
- Local bodies to allot 25% of plots to EWS in their housing schemes
- Private developers – mandatory percentage to be decided

b. Private developers on land owned by them:

- Selected developers to allot 40% of total land for housing to EWS/LIG
- To be handed over to the nodal agencies at pre-defined prices
- Several incentives offered to developers like double of the normal FAR, TDR facility, waiver of EDC, Building plan approval fee, conversion charges, 10% of the total land allowed for commercial use, fast track approval etc.

c. Private developers on acquired land

- Developer to pay compensation charges (Land acquisition fee + 10% administration charges)
- Rest can be followed as per the model B discussed above.

d. Private developers on Government land: (for rental or sale)

- Bidding process – to be handed over to the contractor/ developer offering the most number of EWS/LIG flats free of cost to the ULB.
- Around 50% of plots to be allotted to EWS units and the rest of the land to be given to the developer for housing and maximum of 10% commercial use

7.10.6 FDI in Townships as a Model for Housing Development in PKDA

To boost Foreign Direct Investment (FDI) in townships, housing built-up infrastructure and construction of development projects, the Government has reduced the minimum area to be developed from 100 acres to 25 acres (approx.) or built up space of 50,000 sq. meters and with a minimum capitalization of $10 million for wholly owned subsidiaries or $5 million in the case of a Joint Venture with Indian partners.

Necessary actions and incentives should be provided by the state as well to attract investments in the region which is currently lacking. Thereby it is proposed that adequate attention should be paid to increase FDI in Housing sector so that the reality market get boost up which will increase employment generation potential and overall economy of the region. Major Investment in this regard can be done at the proposed residential area in Puri Sadar as it will be developed as a mixed use residential zone and therefore infrastructure will come up consequently. The potential of it should be tapped skillfully.

7.10.7 Development Concept of SRZ and SRC for PKDA

The Confederation of Real Estate Developers in India (CREDAI) has recommended the concept of Special Residential Zones (SRZ), to the Ministry of Urban Development, Government of India. This is similar to the concept of Special Economic Zones (SEZ). It urges the government to define affordable housing for the EWS and LIG as one in the 300 sq ft to 700 sq ft range and allow construction of only affordable housing in an SRZ.

In another proposal, the National Real Estate Developers Consortium (NaREDCo) has proposed that land for affordable housing should be made available by the government at controlled prices. They have proposed the concept of Special Residential Corridors (SRC) which should be located next to SEZs to benefit from the available infrastructure.

Real estate developers feel that it is not possible to provide low-cost housing with surging land prices. They state that for consumers to benefit, the government has to provide builders land at a reasonable price; otherwise it is not possible to provide houses at affordable prices. Therefore adequate policy should be formed at the state and municipal level to increase incentives and profit making scope for investors through provision of various tools to attract them into the profit making business.



7.11 Cost Outlay for Social Infrastructure Development in PKDA Region

Cost estimation for social infrastructure development in PKDA region consists of cost for education, health facilities development, socio-cultural infrastructure provision and other facilities such as postal, fire services development. Overall cost outlay has been worked out in the below table:

Table 52: Cost estimates for social infrastructure development in PKDA-2031

Facility		Additional No. of Facilities Required					Unit Cost (in Rs. Lakhs)	Estimated Cost (Rs. Lakhs)
		Puri Sadar	Block A	Konark	Block B	Total		
Education	Primary School	105	22	45	8	180	85	15300
	Middle School	81	20	35	8	144	100	14400
	Higher Secondary School	38	7	15	4	64	100	6400
	Technical College	2	2	0	0	4	150	600
	School for physically challenged	7	3	2	2	14	110	1540
	Adult Literacy Centre	26	7	12	3	48	30	1440
Sub total								**39680**
Medical Facilities	General Hospital	1	0	0	0	1	150	150
	Health Centre	10	5	8	2	25	100	2500
	Primary Health Centre	5	0	3	0	8	80	640
	Poly Clinic	3	0	1	0	4	25	100
	Mother and Child Care	7	3	2	0	12	80	960
	Dispensary	20	6	9	3	38	20	760
Sub total								**5110**
Socio-Cultural	Community Room	30	6	12	2	50	50	2500
	Comm. Hall, library	11	2	4	1	18	40	720
	Drama and Theatre	2	1	1	0	4	50	200
	Spiritual Centre	2	0	1	0	3	25	75

Facility		Additional No. of Facilities Required					Unit Cost (in Rs. Lakhs)	Estimated Cost (Rs. Lakhs)
		Puri Sadar	Block A	Konark	Block B	Total		
	Cultural Centre	3	1	1	0	*5*	*20*	100
Subtotal								**3595**
Others	Telecommunication	-	-	-	-	-	*25*	*25*
	Postal Service	3	2	1	2	*8*	*25*	200
	Fire Service	3	1	2	1	*7*	*60*	420
	Commercial / Co-operative Bank	14	8	10	6	*38*	*20*	760
	Parks & Playground (Area in Ha.)	418 Ha	210 Ha.	310 Ha	175 Ha	*1113 Ha*	*2*	2226
Sub total								**3631**
Estimated Cost for Mobile health & Education Facilities								*45*
TOTAL PKDA Area								**52061**

Table 53: Summary of Block Cost estimation of Social Facilities

Social Facility	Puri Sadar	Block A	Konark	Block B	Total
Education	22675	5410	9405	2190	**39680**
Medical	2585	860	1405	260	**5110**
Socio-Cultural Others	2150	450	855	140	**3595**
Others	1379	696	969	587	**3631**
Mobile Health & Education	3	18	17	7	**45**
Total	**28792**	**7434**	**12651**	**3184**	**52061**

8. Heritage Conservation & Tourism Development Plan

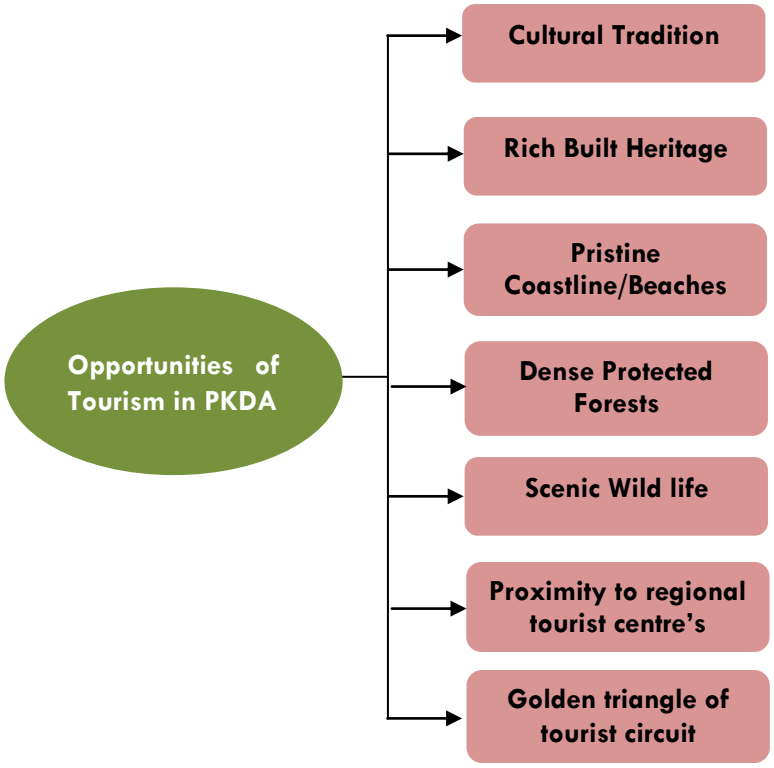


8. HERITAGE CONSERVATION & TOURISM DEVELOPMENT PLAN

Although the regional economy of PKDA is primarily driven by Tourism sector still adequate attention has not been given to the conservation of heritage and promotion of tourism activities comprehensively at a regional level. Strengthening and diversification of the sector needs to be emphasised through the development of diverse proposals is required. Linking them to economic opportunities shall ensure sustainability.

8.1 Opportunities of Tourism in PKDA

Puri town is the major cultural and economic centre of the region. PKDA is blessed with pristine natural features endowing several opportunities for tourism development which are:



Map 17: Tourism Opportunities in PKDA

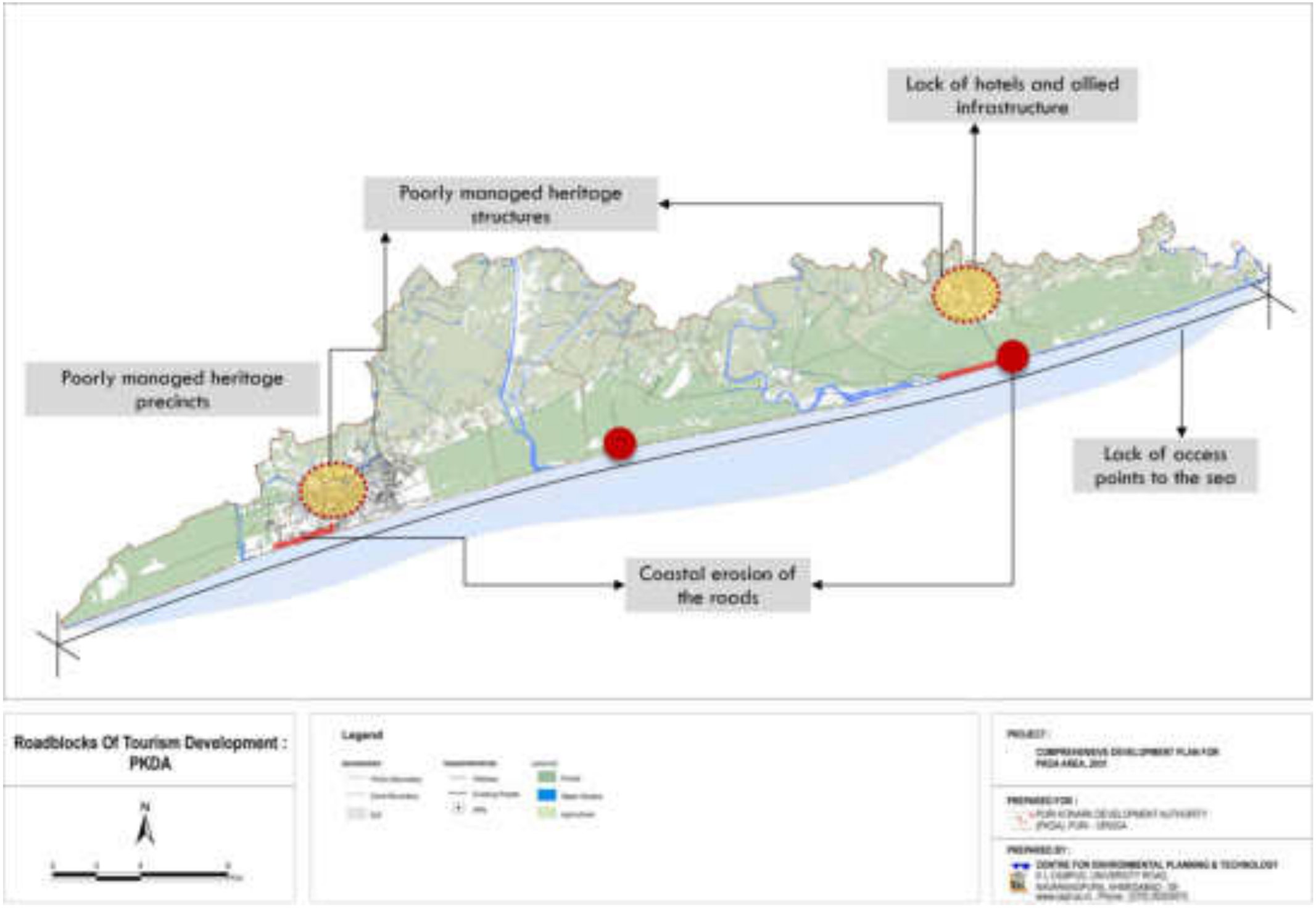
8.2 Issues and Concerns in heritage Management and Promotion of Tourism

Although the region has ample opportunities for tourism development but it faces severall challenges as identified from the analysis in Volume-1.

- There has been limmited efforts made for conservation of built heritage and deliniation of special zones for tourim promotion and development. This has resulted in degradation of heritage values which needs to be emphasised in the CDP.
- Major concern for tourism development has been limmited width of heritage routes and frequent encroachments especially on Grand road and Marine drive road. Conjestion on these major routes creating apathy among tourists vising the sacred town.
- One of the key feature of increasing heritage and tourim potential is availability of safe pedestrian paths as tourists mostly like walking for visiting the sites. Frequent encroachment and lack of design interventions has weakened the scope of pedestrianisation in the area resulting in conjestion on heritage cores.
- Lack of initiatives to rejuvinate old heritage monuments like Atharnala Bridge and waterfront has been a real bar in front of promoting the region as a attractive tourim destination. Developing these sites can be helpful in creating a symbol for attracting tourists to the region.
- Inadequate signages and street furnitures in the urban centres and especialy in heritage centres resulting in lack of information and knowledge among tourists about the heritage structures. This must be taken care of by initiating design interventions by PKDA authority.

The attached map indicates the roadblocks to tourism developemnt in the region

Figure 20: Summery of Issues in heritage conservation and tourism



Map 18: Roadblocks to Tourism Development PKDA

8.3 Proposed Heritage Conservation Zones

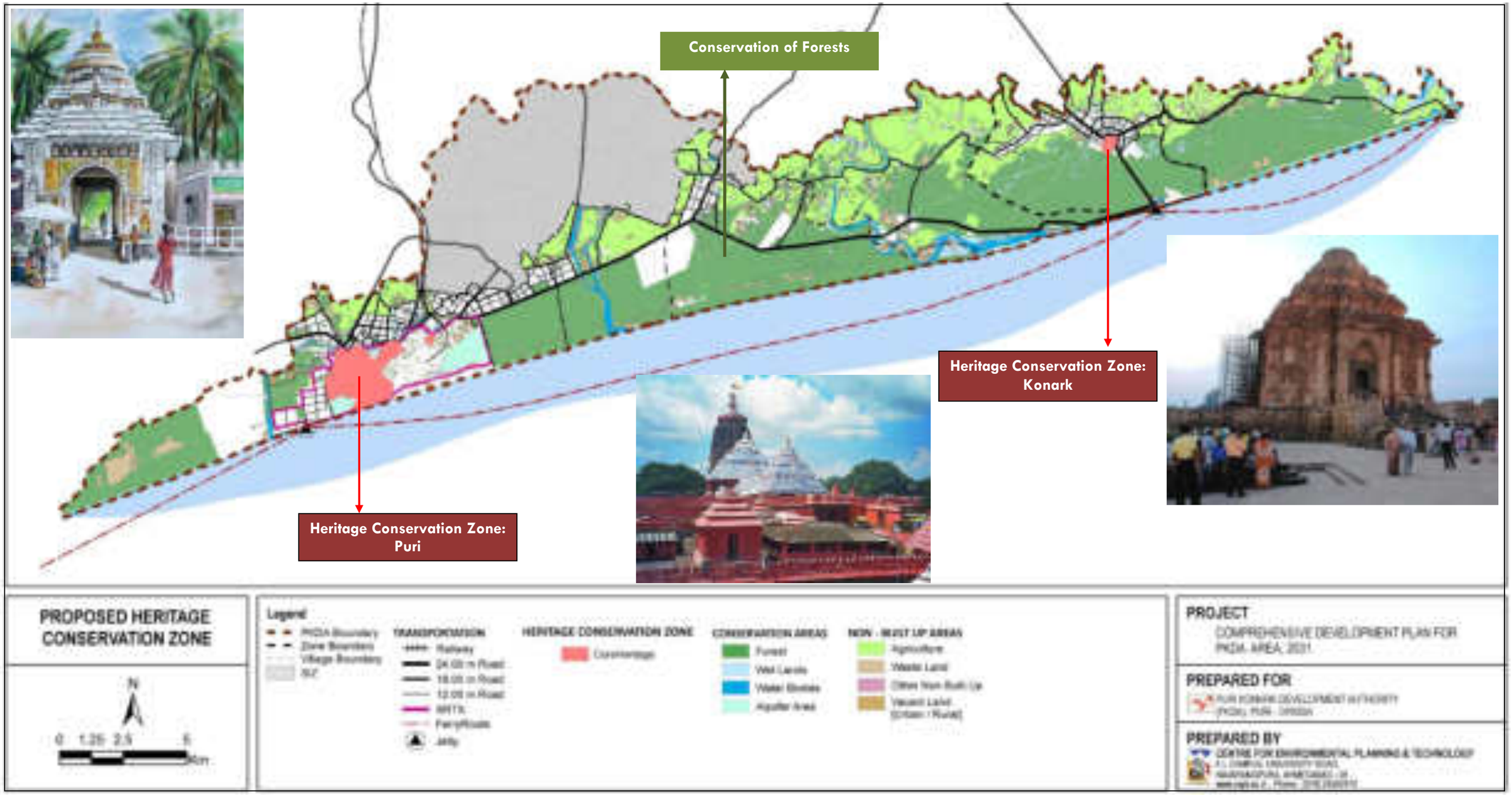
Conservation of built heritage and natural heritage has been proposed in PKDA region to promote tourism development. Built heritage conservation has been proposed in two zones. Part of Puri town and Konark NAC has been proposed under heritage conservation zone as shown in map above. Natural heritage conservation has been proposed to conserve the forest areas of the region which will retain the bio diversity of the region which in turn will promote tourism.

The driving idea is the conservation of the dilapidating heritage both built and un-built and opening them to controlled tourism activities which is not only environmentally but financially sustainable. Puri famously known for dwelling place of Lord Jagannath is the home to a plethora of temples, Mathas, Jagaghars, numerous sacred tanks and ponds that are under tremendous pressure owing to tourism and continuous urbanization of the town. The main heritage structures in the region comprise of the Temples, the Holy tanks, Mathas, Akhadas, Jagaghars, & Ashrams etc. The three major heritage zones in the town are: The Jagannath Temple, The Grand Road and the Swarghadwar road.

The Sun Temple, built in the thirteenth century, was conceived as a gigantic chariot of the Sun God, Surya, with twelve pairs of exquisitely ornamented wheels pulled by seven horses. Conservation zones have been proposed around the Sun temple for heritage protection and promotion of tourism. Various activities proposed within the component of heritage conservation within identified zones are:

- Identification and listing of important heritage monuments.
- Renovation of older and dilapidated heritage structures,
- Connecting these heritage monuments with specially formulated heritage route,
- Provision of signage's and street furniture's on access to these monuments,
- Regulated construction of buildings with traditional façade and architectural expression within this zone,
- Provision of adequate sanitation facility in vicinity to the identified monuments within the heritage zones, and
- Awareness generation among the residents and tourists about the lesser known monuments within identified zones and heritage conservation and management techniques.
- Hawkers management
- Improvement of the pedestrian infrastructure

Within total area of 296.32 sq km in PKDA region 111.15 sq km is covered with forest areas which contains protected forests, plantations, coastal plants and scrubs. These forest areas are also home to several species. Entire forest area in PKDA has been identified as natural conservation zone which will promote tourism activities in the region with restricted interventions in the zone. The conservation area runs along the coastal belt. In the proposals the intervention are in the form of punctures in the conservation areas with an intention to open up the pristine beaches of the PKDA region. Forest trails as an alternate to the road transport between Puri and Konark has been proposed. These activities are however subject to the clearances by the forest department.



Map 19: Proposed Heritage conservation zones in PKDA

8.4 Proposed Tourism Management Plan

The proposed Tourism management plan for PKDA revolves around the following aspects

- Conservation and Promotion of the built heritage
- Better management and marketing of the tourism opportunities
- Creation and allocation for tourism zones for better management
- Opening up the beach access along the PKDA coastline
- Linking tourism interventions with economic opportunities for the locals.

Puri Konark development area has a total of 58.3 kms of lush coastline. However out of the same hardly a fraction is accessible. The access points are those of:

- Along the Puri Marine Drive road – 4 kms
- Gadabangor Bus Stand
- In Sipasarubali Village Near Shamukha
- Near Gandhi Labour Foundation, Puri
- Hotel Hans Cocopalm, Puri
- Near Sea Beach Puri Dham
- Near Swargdwar
- Beleshwar
- Parking Area(Mahatma Gandhi Park) ,Puri Sea Beach
- Hotel New Shankar International, Puri
- Pentakota Slums
- Puri Konark Marine Drive Road- 3.3 kms
- Chandrabhaga beach
- Konark fisherman slum area

Through the proposed tourism management plan it is intended to develop access points to the coastline through road and water ways. In response the Nuanai waterfront, the ferry services, the Beleshwar beach and the forest trails along the coast have been proposed. While the interventions in the forest areas are subject to the clearances from the forest department the development of the forest trails are in the same lines of the existing trails that were takn up by the forest department.

Konark Bazaar Street

Eco village- Konark

Chandrabhaga beach front

Nuanai Riverfront

Beleshwar Beach

Ramchandi – Ecotel

Special Tourism Zone: Shamukha

Tourism development Zone

Map 20: Proposed special tourism zone in PKDA

8.5 Proposed Tourism Interventions

Basing on the potential of the region and the challenges to development especially environmental the suggested tourism interventions in the region have been elucidated in the following sections.

8.5.1 *Shamukha*

Located in the western part of the region within Puri Sadar block Shamukha has been identified as high end tourism zone which will cater for higher income group of tourists. Master Plan for the region has already been prepared for the region which should be implemented for promoting high end tourism in the region. All the modern tourism facilities like craft museum, Gurukuls, Joggers Park, hotels, Golf course, beach house etc activities needs to be promoted in the tourism zone as shown in illustrations below.

Figure 21: Components of tourism development in Shamuka area

8.5.2 *Special Tourism Zone: Ramchandi (Block A)*

The mouth of River Ramchandi is one of the most pristine and beautiful places in the region.

This area has been suggested to be developed as a five star hotel in the region. The river meanders as it enters the sea; the suggested location of the hotel is along the river bend. This is an estuarine ecosystem and the suggested development should be suitable to the location. A low intensity, Ecotel model has been suggested.

An ECOTEL® is an environmental certification that enables hotels to be truly green, socially responsible, and sustainable over the long term by involving the entire value chain of owners, architects, operators, employees, suppliers and hotel guests following the CRZ regulations. The ECOTEL® methodology evaluates a hotel's systems, processes and practices for environment friendliness through a stringent assessment of its range, scope and results across five crucial parameters, known as 'The Five Globes'. These are: Environment Commitment, Solid Waste Management, Energy Management, Water Management, and Employee Education and Community Involvement. To be certified as an ECOTEL, a hotel must score the minimum qualifying percentage on each of the globes.

The advantages of the proposed Ecotel in the Ramchadi area are

- Lower operating costs, greater profits through a focused effort on reducing waste generation and increasing operational efficiencies.
- Enhanced visibility for members through the ECOTEL® website who also gain access to the reservation engine and other marketing features.
- Publicly recognized branding for hotels
- First Ecotel in Orissa
- Management of the sensitive ecosystem of the Ramchadi area as well as financial gains.

Features of proposed Ecotel

- Local construction material
- Vernacular architectural forms
- Open spaces
- Wellness tourism concepts
- Traditional food
- Links to the other tourist sites of the region
- Solar kitchen
- Energy positive design
- Naturopathy
- Beach sports
- Trails and treks

One important factor that needs to be taken into consideration prior to development in the area is environmental considerations. The Kushabadra River has a tendency of changing its course Along with the fact that majority of the zone comes under forest areas, considerations for environmental management and safe developmental effort needs to be initiated.




8.5.3 *Chandrabhaga Beach Front*

Chandrabhaga derives its name from the river Chandrabhaga that used to meet the sea at that location. The Chandrabhaga beach is known for its golden sands and also is the gateway to the Konark. It can be accessed through the Marine drive road that runs to Konark from Puri. The beaches along PKDA have been notorious for the undercurrents and sudden slope. Chandrabhaga has been a gentle beach and hence the favourites of the tourists.

The beach is host to the international sand art festival and the Chandrabhaga festival where thousands of pilgrims come to take a holy dip in the Chandrabhaga tank. Being the gateway to Konark it is suggested to develop information kiosks and commercial development along the access way to the beach. Beach cafes and eateries, knick knack shops along with sufficient parking areas may be developed.

Figure 22: Activities in the Chandrabhaga area

8.5.4 *Special Tourism Zone: Konark*

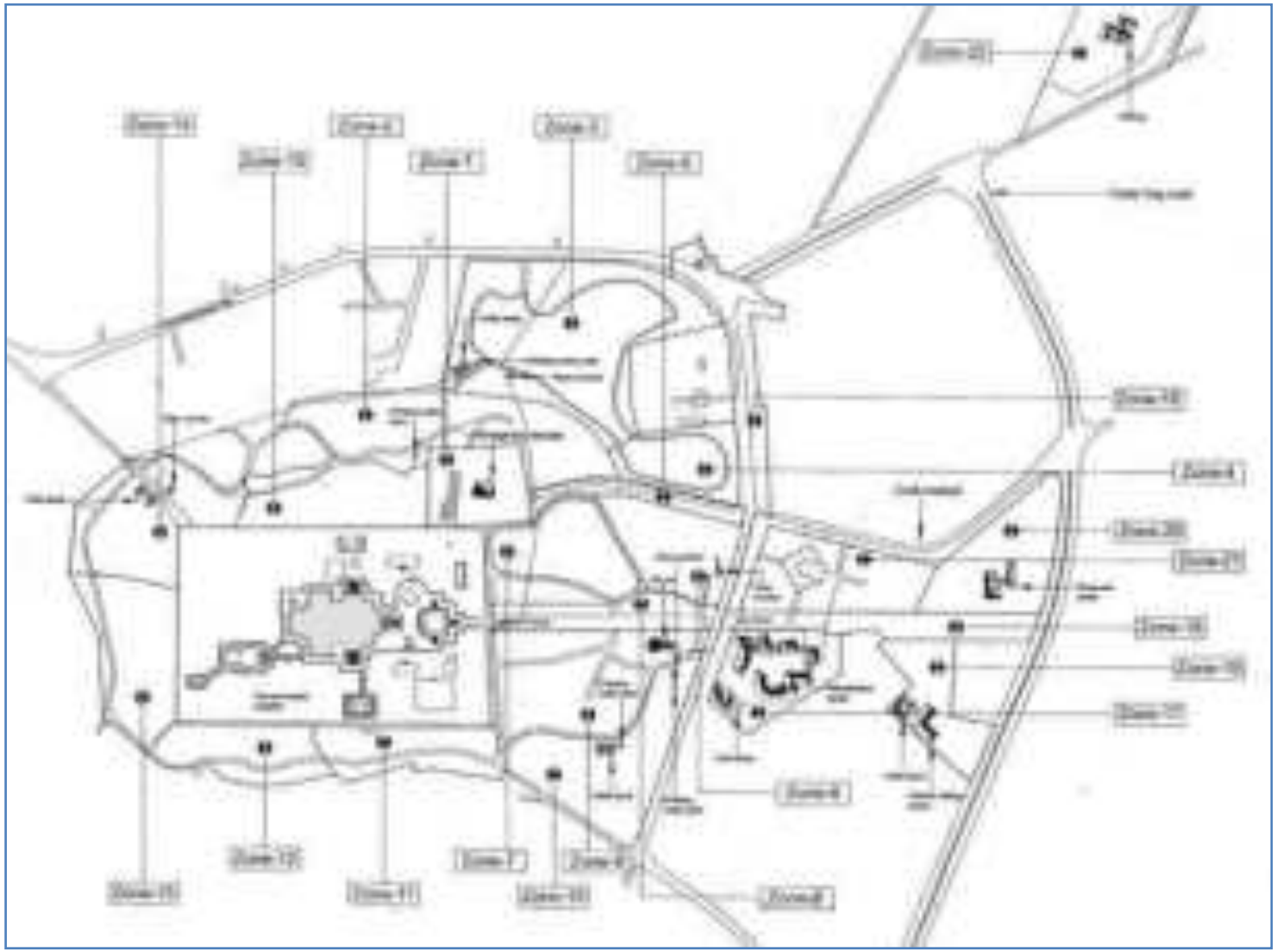
Konark region has rich cultural heritage and traditional values Alongwith historic Sun Temple being located in the area. The existing local strength has been promoted for heritage and tourism development in the region. Special tourism zone has been proposed in the NAC area which includes cultural centres, theatres, small scale beach festivals, tourism activities etc.

Due to the fact that currently accommodation facility is not available in the area, development of hotels, Dharmasala has also been promoted for providing tourists the scope to stay in the region. This will lead to generation and diversification of local tourism related economy.

The existing fisherman village can be redeveloped as a model urban village having small scale tourism facilities and traditional ornaments for attracting tourists.

For integrated development of the areas surrounding Sun temple Orissa Tourism Development Corporation (OTDC) and Indian Oil Corporation (IOC) have proposed several physical development options which is incorporated in this CDP. Although the land use plan prepared by CEPT for PKDA 2031 has some

alterations where as conflicts observed, still the overall land use arrangements have been kept in consonance with the proposal. The features of the proposal are illustrated below:



Map 21: Site Plan Proposed for development of Konark area (OTDC & IOC)

Figure 23: Design elements in Proposed Visitors Place

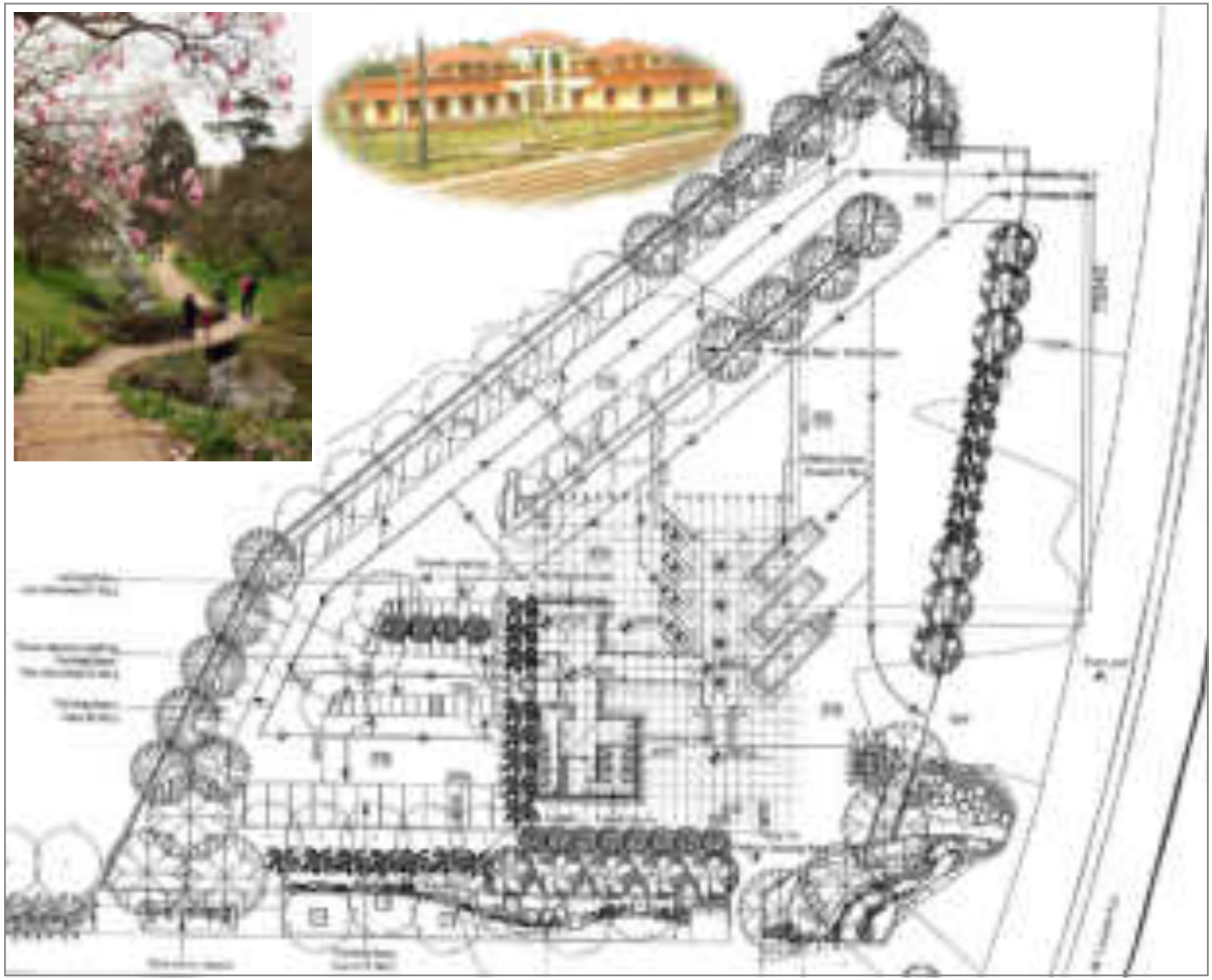


Figure 24: Design options proposed for Drop out point

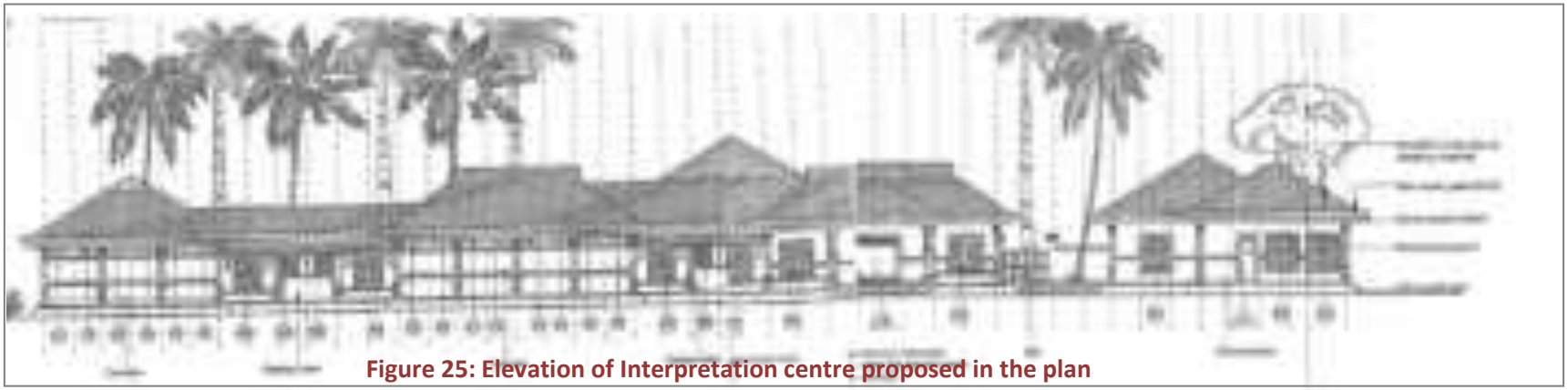


Figure 25: Elevation of Interpretation centre proposed in the plan

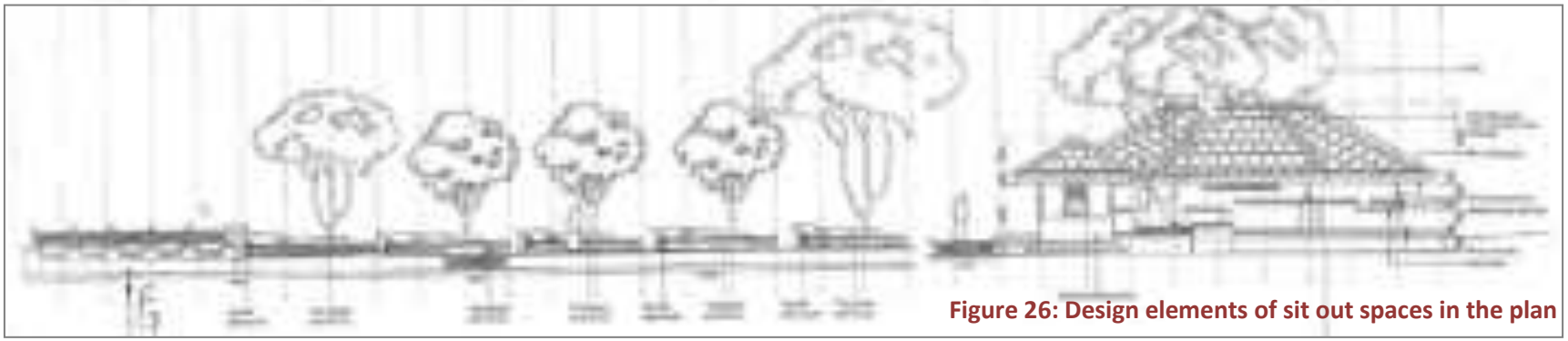


Figure 26: Design elements of sit out spaces in the plan

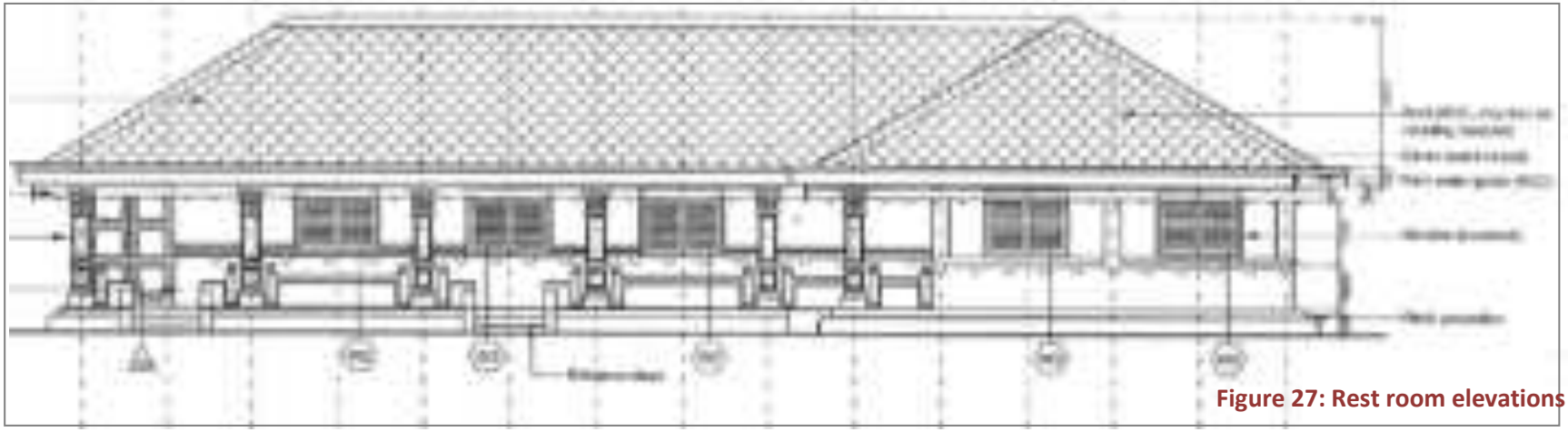


Figure 27: Rest room elevations

8.5.5 *Nuanai Riverfront*

The Nuanai river which drains into the bay of bengal between Puri and Konark has a beautiful riverfront. The attached images indicate the same.

Figure 28: Existing set up at Nuanai Riverfront

CEPT suggests the opening up of the riverfront through activities like walking tracks, picnic spots and boating to the river mouth. The development is suggested to be submersible in nature. This may be an intermediate stop between Puri and Konark. The existing road along the river may be developed to allow the traffic from the NH 203.

This might be another option of opening up the coastline through boating. Since the reserve forest cover mandate no development through them opening up through boating is a feasible as well as an interesting option. This might be an ideal weekend spot for people living in Puri and Bhubaneshwar. The attached illustration shows the creation of Wharfs, pergolas and benches with lighting along the Nuanai riverfront. The Wharf doubles up as a bridge to cross the river on foot. This might be also used for non-commercial fishing.

Figure 29: Suggested options for usage of space

8.5.6 *Proposed Development of Eco-village in Konark NAC Area*

Konark houses the surreal Sun temple and is located at a distance of 35 kms from Puri and 71kms from Bhubaneswar. It is ideally a one day drive from these two cities. This has led to Konark being shadowed by these two cities. The tourists usually go there by the day and leave after visiting the temple. CEPT believes that Konark has much more potential, to retain the tourists, hence contributing to the economic development of the town and the locals.

The areas of Konark need to be opened up through facilitating interventions. The theme of tourism development suggested for Konark is self sustainable and self financing models involving the locals. The government interventions range from improving the infrastructure levels in the designated areas, handholding in the initial years and the promotion and advertisement of the same, for the visitors to know the existence of such opportunities.

For a typical city dweller the experience of staying in a village and village like environs away from the polluted city environment is a rejuvenating experience. CEPT suggests the development of an Eco- village in Konark to strengthen natural conservation through participatory processes that empower local people to take responsibility for their socio-economic well-being.

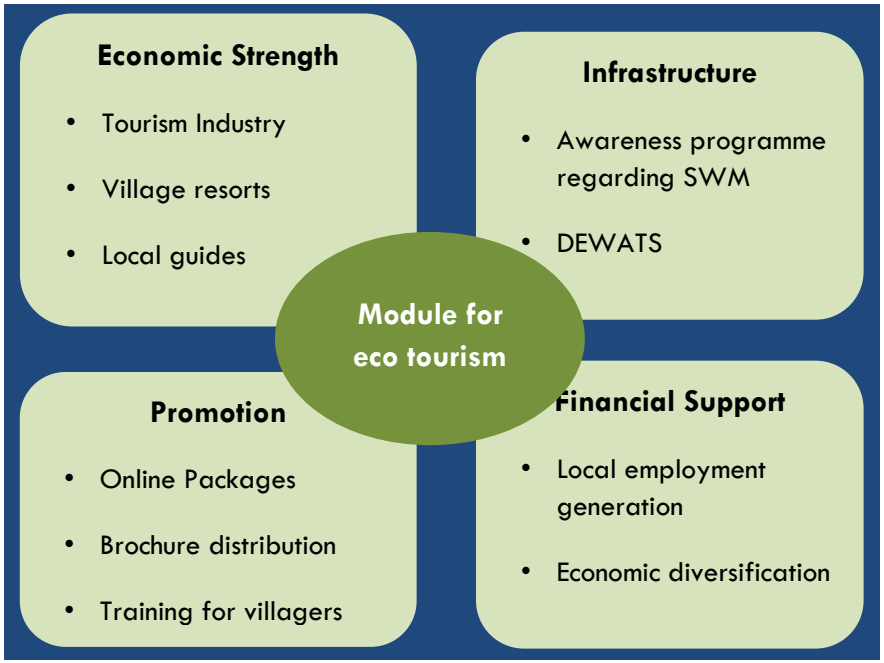
The focus of the same will be an environment friendly development through the use of local resources Agriculture promotion through enhancing knowledge of organic farming can also be focused. Villages in the Block B area should be identified for this kind of development as the area have such potential for development.

The visitors shall be participating in the day to day activities of the villagers, eating home cooked food and staying in the same houses. It is like a paying guest kind of accommodation with a tourism intervention. They may associate themselves with the traditional village activities like sowing, harvesting, dairy farming, fishing etc.

Activities proposed in such villages should be as following:

- Agriculture – Organic scientific agricultural practices
- Organic orchards
- Amphitheatre
- Common dining areas
- Open spaces for celebrations.
- Spiritual centers, crafts etc.

The attached map indicates the village identified to be developed as eco tourism villages in the Konark NAC area.



Map 22: Suggested sites for Eco village development

8.5.6.1 Prerequisites for Developing an Eco village

The success of the Eco- village development relies on the three things of

- Development of trunk infrastructure services
- Cleanliness
- Promotion and awareness

The eutrophic ponds need to be cleaned and maintained. Lighting and seating facilities need to be improved. The attached images indicate a comparison between the existing images from these villages and the proposed interventions

Figure 30- Eco village visualizations

8.5.7 *Proposal for Sea link (Ferry Service) and Trails & Treks in PKDA region*

The "sea link" proposed in PKDA area is essentially catering to tourists coming to visit Puri, Konark and other nearby areas of religious significance. The coastal line of PKDA area has some of the most beautiful natural features such as dense vegetation, forest areas, sea mouth etc. The coast line of PKDA area therefore has immense opportunities in terms of tourism development and part of the same ferry service / boating has been proposed to attract tourist base and give them an alternative to land travel in the area.

The ferry service proposed offers an alternate experience to visitors of the area from the water. Small ferries / boats of 25 – 30 seats are proposed to run along the length of the PKDA area especially between Puri and Konark to offer unique experience of the landscape along the beach.
The route between Puri and Konark can be covered in about 45 mins to 1 hour with live commentary on surrounding areas.

Major viewpoints would be

- Puri's Marine Drive
- Traditional fishermen communities
- Dense forest areas
- Stretch of the sea with colorful fishermen boats near
- Ramchandi temple
- Scenic sea mouth
- Sunset at Chandrabhaga beach

Within total area of 296.32 sq km in PKDA region 111.15 sq km is covered with forest areas which contains protected forests, plantations, coastal plants and scrubs. These forest areas are also home to several species. These natural elements can be used for promoting tourim in the region through development of trails and treks within the forests and coastal stretch between Puri town and Konark as well as Block-B area. Proposals have been identified for two routes of trails and four camping sites within forests for an alternative attractive option for tourists visiting the region. The first route extends from Puri town to Konark NAC area where as the second one is from Puri town to furthest corner of Block- B area in the PKDA region. Severall elements of the proposal are:

- Trekking routes within dense forests
- Connecting the routes with sanctuaries in between
- Alignment of route in vicinity to special institutional area and special commercial area.
- Option for boating in Nuanai and Kushabadra river
- Walking through beach in Chandrabhaga area etc.

Proposed Trail route

Proposed Camp sites

Proposed location of Jetty

Bay of Bengal

Proposed Sea link

PROPOSED FERRY ROUTE & TRAILS IN PKDA REGION

N

0 2.5 5 10 Km

Legend

PROJECT
COMPREHENSIVE DEVELOPMENT PLAN FOR PKDA AREA, 2031

PREPARED FOR
PURI KONARK DEVELOPMENT AUTHORITY (PKDA), PURI - ORISSA

PREPARED BY
CENTRE FOR ENVIRONMENTAL PLANNING & TECHNOLOGY

Map 23: Proposed ferry route and trails through forest in PKDA region

8.6 Identified Special Projects for Promotion of Heritage & Tourism

8.6.1 *Heritage Walk*

Most of the world heritage sites in the world have heritage walk provision for tourists which works as tourist guide and information toolkit. This is basically to interconnect various heritage monuments within an area which comes under a comprehensive package for tourists to visit and enjoy heritage essence. CEPT understands that the heritage and culture of Puri is no lesser than any other such heritage site and hence Heritage walk is proposed in Puri town connecting various heritage structures like temples, Akhadas, tanks, Jagaghars. Mathas etc. the objectives of the proposal are:

- To highlight Puri's heritage and religious significance through heritage walk proposal in one of the ancient and historic parts of the city.
- To interconnect and develop Temple's tanks and heritage monuments e scattered in many different parts of the city however Bali sahi, which is located at the South West of the Lord Jagannath Temple, has most of the religiously significant temples, mathas and jagaghars.
- Heritage walk is proposed in this area as a pilot project, which can be then multiplied as a model in different areas around the temple by identifying other significant religious centres with heritage or mythological significance.

We all know Puri is known as 'Jagannath Puri' because of its divine history since 12th century AD. Its charm and belief is still as big as it was in the ancient times. It is one of the four Dham pilgrimages of the Hindus and considered as one of the holiest cities. It is very well said that pilgrimage of the temples of India is not complete without making the journey to Puri. This highlights the fact that Puri is a city full of religious places and centre's or it can be stated that Puri is known for its sacred centre's like Temples, Mathas, Tanks and Akhadas. So this leads to an idea of having a Heritage Walk which is must in a city which gains its importance and values since ages.

The conceptualized heritage walk covers the following heritage components:

- Temples: 12
- Mathas: 11
- Akhada: 2
- Tank: 1

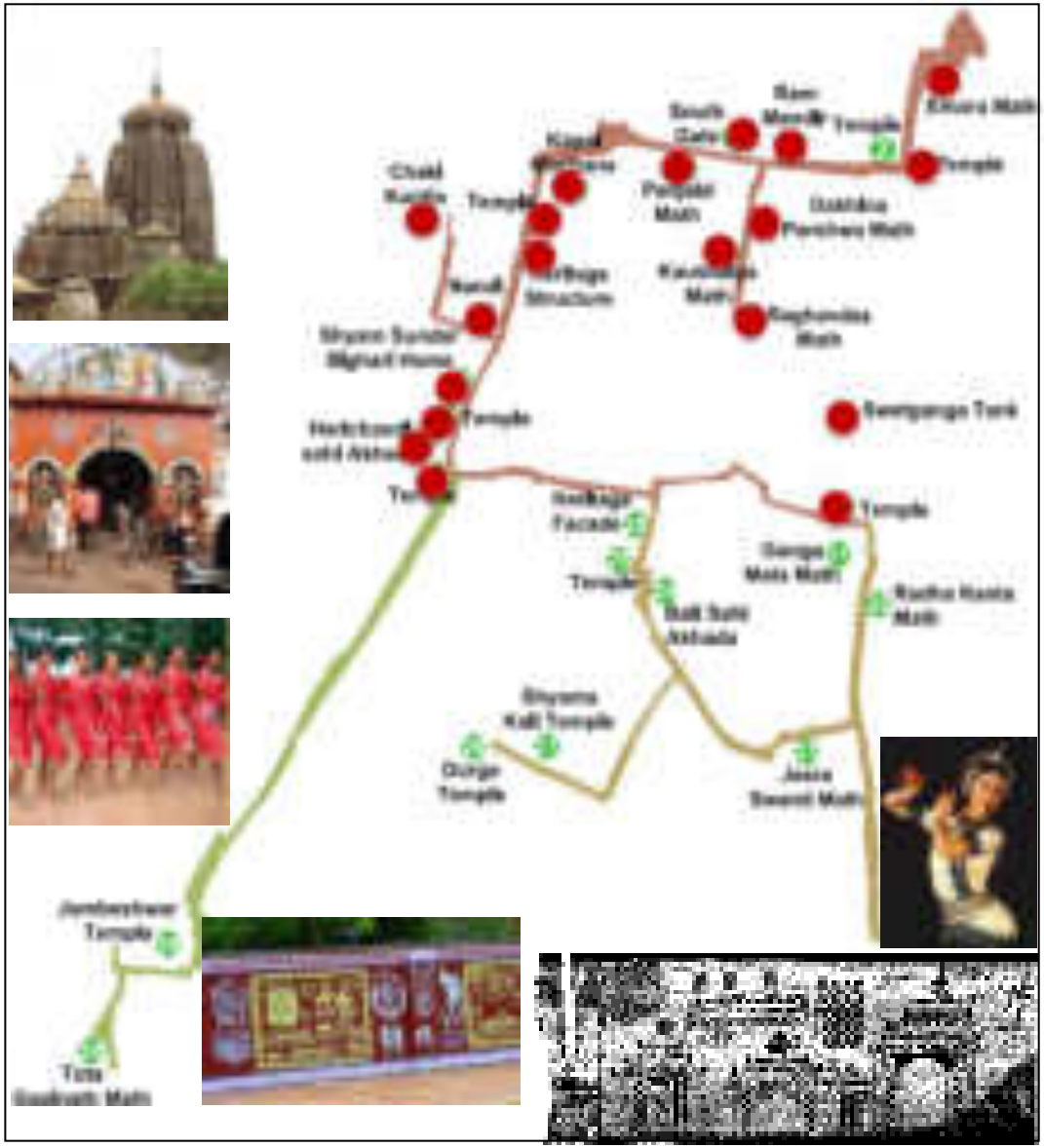
Figure 31: Proposed Heritage Route

- Others (Chaki Kuntia, Shyama Sundar Singhari and South Gate)

The divine heritage walk starts at Emara Matha which is one of the very old buildings of Puri. It is a living monastery with deities of Radha and Krishna. There is a library inside which is currently in use. The square adjacent to Emar a Matha is a very lively and crowded place and best point to begin the walk. It is the first gathering place which later gets transformed into small and big lanes consisting of sacred centre's

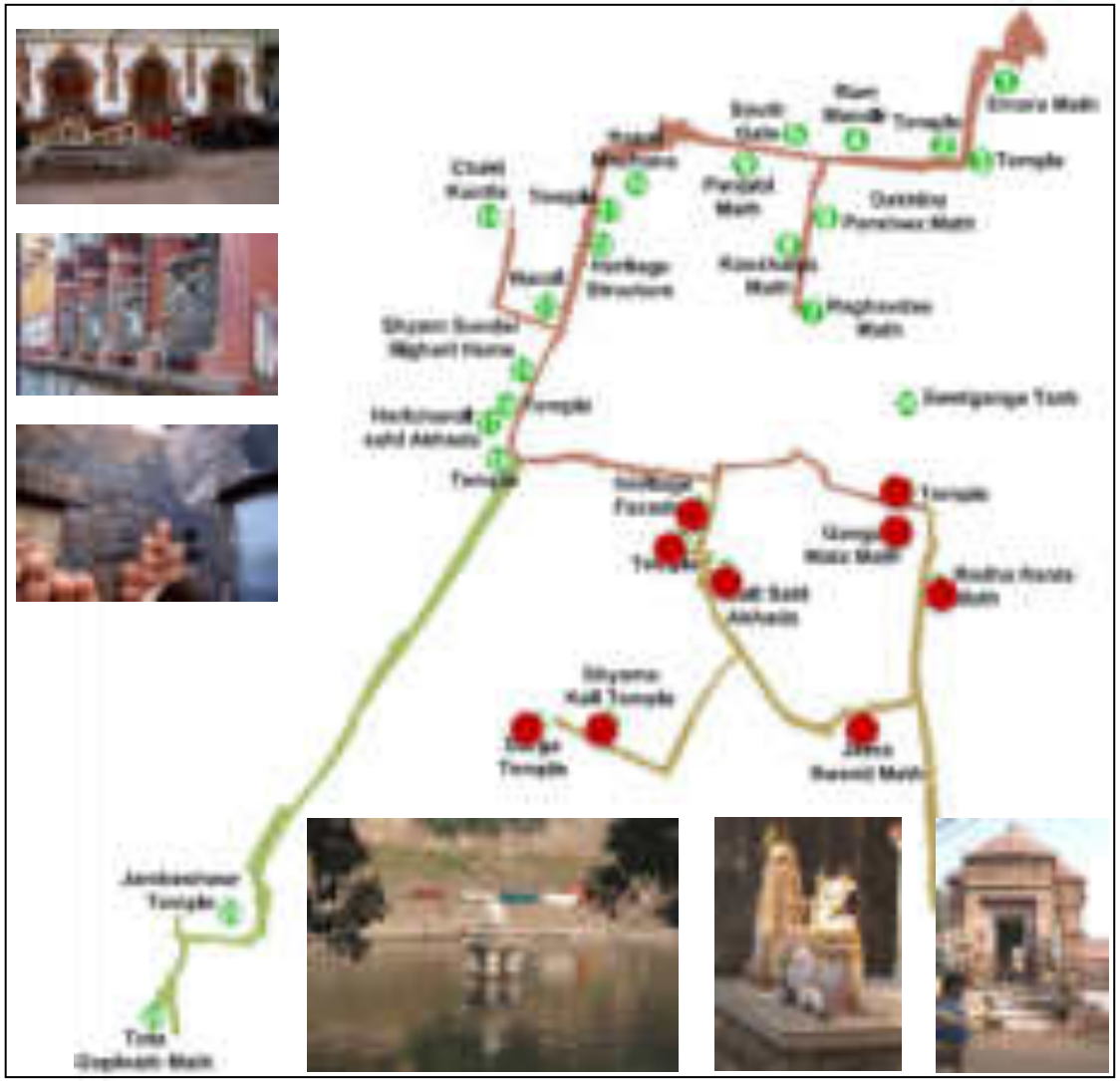
The facade of the building has a remarkable Architecture with large arches and other openings which gives it the character of an old heritage monument. When we enter the Matha through a narrow opening, to our surprise we find the nature and image of inside is completely different from that of inside. There is a whole transformation from crowded square full of people through a small door to a courtyard which is very peaceful and serene, with idols to be found at some places. This Matha gains its distinctiveness as it gives the tourist an impression of what could be happening through the entire heritage walk and should be geared up for surprises and revelations and to have a time of their life time.

On the right side is the jewel of Puri 'the Jagannath Temple'. As typical of Puri the temple also opens through a narrow door to a huge complex inside with the main shrine and idol and other elements to see. The divine temple demands for some time from the tourists and thus depends on how it can and cannot be included in the Heritage walk. The best is to experience it separately before the Heritage walk begins.



Map 24: Heritage Route, Zone-1

Throughout the journey numerous small and big temples are to be seen of different type and kind but with a special feature. Each one has an interesting tale to narrate. In the route inside a narrow lane in front of the south gate of the temple there exists four 'Mathas' of varied purpose and nature. The 'Mathas' irrespective of being in the same neighborhood and adjacent to each other, are able to keep their own individuality and character.



Map 25: Heritage Route, Zone-2

All four structures namely 'Dakshina Parswa, Samadhi, Raghavdas and Kaushalya Matha have different form of architecture, and spaces defined inside all of them are of very diverse kind depending upon the purpose it is serving for the temple. Dakshina Parswa is a living monastery and it is located on the left side of the Varahi Lane leading from Emara Matha to Lokanath Temple. *Pictures are in order from left to right.* Most of the monuments are in very bad shape and need immediate conservation.

As we move forward we find another Matha known as Punjabi Matha serving its purpose. The Punjabi Matha is located near the southern entrance of Jagannath temple, Bali Sahi. Mostly all of the monastery rooms are used for residential purpose and the rest are for rituals and monastic activity. The entire area adjacent to the temple is surrounded by 'Mathas' as they are needed there. All of them might have diverse character but one thing that is common in all is the courtyard though of different scale and size, which is why one feels forced to see what is inside. These 'Mathas' are living monasteries, established to carryout daily rituals related to the main Jagannath temple.

The next we come across a series of temples starting with Kapala Mochana Temple which has a remarkable history and perhaps the most important one in the series. It is a living temple; the presiding deity is a Shivalinga within a circular Yonipitha. The lane stops at a junction with a temple again and a big 'Nandi' which gains a lot of religious importance. It is said that a wish spoken in Nandi's ear is always fulfilled. The lane moves ahead to Shyam Sundar Singhari Residence (first picture - left) but meanwhile turns to reach Chaki Kuntia Residence (second picture - left). It is a big bungalow with huge facade which got built in during temple constructiion. The structure is still standing. As we move further we find two small temples and amid both is situated the first Akhada in the journey 'Harichandi Sahi Akhada'. These Akhadas have another form of architecture. They are the institutional buildings where decisions of religious activities are taken. Akhada's usually govern a group of Jagas.

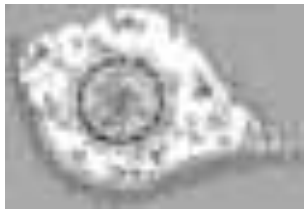
After this the tourist if interested can go for a loop to see few of the similar yet varied structures or can go straight to Swetaganga tank and end their journey there. Swetaganga tank is a sacred water body and possess high religious value. It is a hub for many religious activities throughout the year. On the way to the tank we come across Gangamata Matha which is again a living monastery and with the deity of lord Krishna and his consort Radha. It is exactly located on the southern embankment of Swetaganga tank in Bali Sahi.

Inside the loop there are many other 'Mathas' and 'Akhadas' but the most important is the Shyamakali Temple which has rich heritage and religious value. It is said that visit to Puri is not fulfilled if the tourist does not go to Shyamakali Temple. Bali Sahi Akhada is situated before turning towards the kali temple. It is one of the Akhadas which is still in very good condition and has notable work done on its façade.

Next on the list is Jeera Swami Matha followed by Hinjala Jaga and Radhakantha Matha. Jeera Swami Matha is a white building with a noticeable entry and is maintanied well. Hinjala Jagaghara tank was built in 15th century A.D and presently used to perform day to day rituals and bathing. Radhakantha Matha was built in 16th century A.D and is a living monastery presently having a purpose of clearing the main and Gundicha temple. It has been observed that Mathas are conserved well compared to other monuments in Puri. Apart from the above mentioned monuments, one of the other very important structure is Atharnala Bridge which was built in 15th century A.D and is presently used for commuting by light vehicles. The structure is old and has rich heritage value and thus should be conserved as an asset for the city. The bridge is one of the tourist attractions of the city that bears testimony of the history of the region and architectural expertise.

Heritage brochure formulated by CEPT aims to highlight salient features of Puri city in terms of available Heritage, regional arts and crafts, cultural diversity, and natural landscape of Orissa, festivals & celebrations and some other architectural marvels. The various components of the heritage walk brochure are:

"SHANKHA KSHETRA"
The holy conch shell province of the lord Jagannath temple



Location Map

Famous architectural sites of Orissa

- Jagannath Temple
- Sun Temple Konark
- Atharnala Bridge Puri
- Sacred Narenda Tank Puri
- Buddhist caves
- Lingraj Temple

Festivals and Celebrations

- Rath Yatra
- Durga Puja
- Kali Puja
- Chanda Yatra
- Dola Purnima
- Konark Festival

Arts and crafts of Orissa

- Sculptures
- Painting
- Pipli – Appliqué work

Orissa Dance and culture

- World renowned of Odissi dance
- Chhau – tribal dance

Natural Landscape of the region

- Chilika Lake
- Beaches
- Balukhand Sanctuary

Figure 32: Salient features of Heritage Brochure contents

Map 26: Heritage Brochure: Option-1

Map 27: Heritage Brochure: Option-2

For Heritage Walk implementation the following activities are proposed needs to be undertaken:

- Heritage Ticket provision / information support mechanism
  - Emar math Library (start point of the heritage walk - Emar math terrace),
  - Set up ticket booth /guided tour / brochures/ information kit,
  - Determine fixed timings and days when heritage walk would take place,
- Conservation / renovation and repairs of all buildings of heritage significance,
- Facade treatment for buildings within identified heritage zone,
- Cleaning / levelling of the existing roads,
- Draining and solid waste management within heritage precinct,
- Installation of street furniture / road lighting for better and safe urban environment,
- Proposal for specifically designed cycle rickshaws:
  - Cycle rickshaws are one the oldest, cheapest and convenient mode of transport widely used in Puri city, however due to increasing number of auto rickshaws and personal 2 wheelers cycle rickshaws are not used as much.
  - To bring in employment of cycle rickshaws drivers as well as to promote environmentally friendly transport system.
  - Such mode of transport is not widely used in many cities now a day and therefore can be taken considered as an opportunity to generate employment for lower income group as well as keep the tradition alive.
  - Heritage proposal therefore tries to revive and promote the tradition and make the heritage walk experience more memorable, enjoyable as well as comfortable for visitors as well as city dwellers.
  - Cycle rickshaws are specifically allotted for tourism purpose for heritage walk and Parikrama Yatra in selected locations: Emar math
    - Swargdwar
    - Swetganga tank
    - Narendra Tank
    - Puri Railway Station
    - Atharnala
    - Mahatma Gandhi Chawk
    - Gundicha temple

Figure 33: Sample view of rickshaw for heritage tour

8.6.2 *Parikrama Marg*

The second proposal identified for heritage development in Puri town is Parikrama Marg which will be explained in this section

8.6.2.1 The Tradition Behind The "Parikrama".

Puri is a land of divine forces; the divinity of Brindavan & Navadip is reflected here in every living & non living being. There are parallel divine activities that happen over here that is deeply associated with the rituals. The parikrama of "Khetramandal" happens the same way it happens in Brindavan or Navadip. It is believed that going around the circuit will wipe out all sins accumulated for several births. However going around may give someone the benefits of "Asvamedha Yagnya". In the month of Margasira (Comes nearly 45days later to Navratri) Krishna Panchami the parikrama of Sankha-khetra should be done. As it is equivalent to the parikrama of Lord Jagannath, Balabhadra, and Subhadra.

It is mandatory for every saint & disciple to complete a "Parikrama" of Srikhetra according to the scriptures. The loop proposed by various scripture & spiritual literatures joining various nodes should be popular among the people. The stretches which are not on ground should be planned & designed dedicated to the people. Due to undefined route the monks are facing problem in doing the parikrama. Hence Govt should put an effort to clearly define the route and obtain the blessings of Lord Jagannath.

8.6.2.2 Order of Parikrama

1. Bath in Markandaya Puskarini (Pond)
2. After taking bath going straight to Sri Mandir
3. Worship Lord Ganesh for success
4. Worship Bateswar.
5. Pray sarbamangala, Bishnu Shakti for making the darshan of Jagannath a great experience.
6. After praying to Mangala & go around the Kalpabata.
7. Pray Khetrapala for making the stay at SriKhetra comfortable.
8. Worship Nrusingha.
9. Worship at Bimala Mandir for purification of thoughts.
10. Worship Pataleswar to escape from all worldly attachements.
11. Pray Aiasaneswar for protection.
12. Pray Garuda to grant devotion for Bishnu.
13. Pray the Dwarpal Jay & Bijay
14. Go into the temple & have darshan of Lord Jagannath, Balabhadra & Subhadra. Then pray & worship Laxmi Saraswati & Madhaba.
15. Take a bath in Sweta Ganga to remove the sin & pray Sweta Madhaba & Matsya Madhaba.
16. Then have a Darshan of Ugrasen
17. Pray Chiranjibi Hanuma & beg permission to take a bath in the sea.
18. After going near the sea worship with "Sodasa Upachar" & pray for permission to take a bath to Lord Jagannath. Then take a bath in the sea praying the Lord in mind.
19. Worship Loknath
20. Pray Mangala
21. Then go around the shrine of Alama Chandi.
22. Then take dip in Indradyumnna sagar.
23. Pray Bileswar.
24. Come Janmeswar & pray.
25. Then move towards Kapalmochana.
26. After praying to Kapalmochan, get into the Sri Mandir & go around "Sudirgha Trutiya Barana". Then have a darshan of Lord Jagannath again & return home.

8.6.2.3 Route Landmarks & Religious Points

Puri is one of the fascinating littoral city of Odisha. The Cultural heritage of Puri with its long recorded history beginning from third century B. C till present day, The monuments and religious sanctity, way of life of the people with their rich tradition possess emphatically to be the cultural heart of Odisha. In deed Puri is considered cultural capital of Odisha. The culture here is flourished with its manifold activities.

Chaitanya Mahaprabhu, an incarnation of Lod Krishna, appeared 500 hundred years ago, in the mood of a devotee to taste the sublime emotions of ecstacy by chanting the holy name of Krishna. Stalwart scholars of Puri like Sarvabhauma Bhattacharya (head priest & great Sanskrit pandit) and others followed His teachings. Even kings and ministers of His period became His disciples. Espicially King Prataparudra became His great admirer and ardent follower. It was one of those major epicentres of "Bhakti Andolan" since 12th century. Hence for centuries together this city has been attracting pilgrims from various sects' Hindu religion. But unfortunately the since independence the city is only being known as one of the "Char Dhams" of Hindus. The intangible cultural heritage of the city has gone into oblivion.

The city being a major cultural centre for all Odiya people, it becomes essential to protect & conserve the heritage, in order to preserve the glorious culture & history of Orissa. The puri parikrama one of a major pilgrimage circuit in the city. As the circuit has some religious relevance, it becomes very important to develop the circuit to promote conservation of heritage in the city. As its being explained previously

Map 28: Route landmarks and religious points on Parikrama route

the city plays a very important role in the Oriya society & an image of the culture of Odisa. Hence promotion of the cultural heritage can improve tourism in the city. But the religious sentiments associated with the shrine & the city has to be understood carefully before making any planning interventions.

Puri being a very important pilgrimage of India, people from all over the country visits the place every day. Due to the cultural diversity of the pilgrims it becomes very crucial to create a visual interaction between city and the pilgrims. The urban character has to speak for itself. Today people only know the Jagannath temple in the city. But it will be really an incredible experience to take the pilgrim through the great heritage & spiritual journey of this city or the region as a whole. Therefore the Parikrama cannot be developed as a heritage walk or cultural corridor. Rather opening the circuit for both pilgrims and tourists can make it successful. So, the "Puri Parikrama" will be divided in the following packages for the convenience of the tourist & pilgrims.

1. **Complete Parikrama**
2. **Special Guided Tours Packages**

- Heritage Parikrama
- Spiritual Trail

Table 54: Road details along Parikrama Marg

Route	Road type	Leghnth
1. Markanda Pond - Sri Mandir	Pakka road	0.9KM
2. Sri Mandir - Sweta Ganga – Mahodadhi	Pakka road	1.3KM
3. Mahodadhi - Prachi - Damodar Road - Loknath Mandir	Pakka road	3.4KM
4. Loknath Mandir – Mangalaghat	Pakka road	2.4KM
5. Magalaghat - Matitota – Khandiabandha	No – roads	2.2KM
6. Khandiabandha - Atharanala - Indradumna Pond	Pakka road	2.5KM
7. Indradumna Pond - Sidha Mahavir - Chakratirtha Road	Pakka road	3.3KM
8. Chakratirtha Road – Swargadwara	Pakka road	2.9KM
9. Swargadwara - Janmeswar - Kapalamochan - Sri Mandir	Pakka road	2.4KM
Total		20.3 KM

8.6.2.4 Complete Parikrama

Path Description: The circuit includes all major religious destinations on the circuit. Dedicated parikrama paths & sitting area will be provided where ever possible. It will follow the path (20KM) mentioned above as per the rituals.

Mode of transport: The circuit will be complete by the saints on foot. The route will have all required signage to guide the people. Washrooms will be provided in every 2-3 Km distance for bath and toilet. Green patches and sitting arrangements will be provided where ever possible.
Charges: Completing the 20Km long circuit walking will be free of charges. The tour will be mostly religious for saints & pilgrims without any guide.

8.6.2.5 Special Guided Tour Package:

The Special guided tours will be designed as per the requirements of the tourist & the pilgrims. The package will have two options one focusing on the heritage & the other will focus on the spiritual significance of the city. A person can take the tour as his own area of interest.

❑ Heritage Path:

Path Description:

The heritage parikrama will touch few major & relevant heritages points. It will talk more about the history of the city & it journey till now. This package will be a guided tour for the tourist. This will also have exhibitions & audiovisual sessions to describe the rich intangible cultural heritage of the city. A visit to pentakota can be arranged to explain the traditional fishing techniques. A typical model heritage building can be taken to explain the Oriya lifestyle in earlier times. One typical oriya meal will be included in the package, which can be altered on request. The total time to complete the tour will vary between 2-3hrs approximately. The service will be available all throughout the year.

Map 29 Heritage Path for tourists

The route & the heritage points:

Sri Mandir (Singha Dwar) – Narendra tank – Atharnala – Gundicha Temple – Indradumna Tank – Sidha Mahavir – Pentakota – Chakratirtha Road – Mohodadhi – Swargadwar – Kapalmochana – Loknath temple – Markanda Tank – Sweta Ganga

❑ Spiritual trail:

Path description:

This package will be focus on the palaces with spiritual importance. It will be a tour that will reveal the spiritual heritage to the pilgrims. The parikrama will be a guided group (7+) tour but will only be conducted twice a day during a fixed time. During the leans season it can be once a day. It will take the pilgrims through the spiritual journey of great saints & gurus in the city, like Sri Chaytanya dev, Balram Das, Atibadi Jagganath Das, Paramahansa Yagananda Saraswati. The tour will take atleast 4-5 hrs to complete. It will include interaction with the monks & an appearance of Sankaracharya if possible. An "Aradhana" session & Satsang will be there in the "Gaudiya Math", that represents the tradition of Kirtan initiated by Sri Chaytanya Dev. Prasad will be provide as a meal to the pilgrims. The meal will have fixed menu and can be altered.

Map 30: Proposed Spiritual trail

This tour focuses on the Indian pilgrims coming to the city first time & the foreign disciples of Indian Gurus. The maths & temples will participate in guiding & organizing the tour. Ashrams and temples one route need to be renovated & maintained for this tour.

The route & the spiritual stopovers:

Sri Mandir (Singha Dwar) – Narendra tank – Atharnala – Gundicha Temple – Indradumna Tank – Sidha Mahavir – Chakratirtha Road – Mohodadhi – Swargadwar – Kadar Ashram – Govardhan Math– Kapalmochana – Loknath temple – Markanda Tank – Sweta Ganga Via Sri Mandir

Mode of transport:

The tour will have multiple transit options, like hand-rickshaws, auto rickshaws, Car. There will be an option where people can have different transit for different patches. A special transit network of Autos & Hand Rickshaws can be arranged to cater the tours on request. Local tourist office can arrange them for the various packages when ever required. The parking places for the tour shuttles (Preferably Auto rickshaws) are marked in black on the map.

Charges:

Being a guided tour it will be expensive than the other available options. The charge may vary between ` 400-500 per person. The price may vary depending on the kind of transit mode the tourist chose to take. Wheel cars will be provide on request free of cost.

8.6.2.6 Pre requisites for "Puri Parikrama".

For successful implementation of the above proposal below mentioned activities have to be undertaken:

a. The roads coming under the Parkirama route need to be cleaned regularly.
b. The roads need to be levelled & paved where ever required.
c. The solid-waste laying on the road need to be removed.
d. The sewage drains on the routes need to be cleaned.
e. Proper storm water drainage system needs to be provided to avoid water logging during the rain.
f. There can be dedicated team to clean & maintain the route.
g. Washroom & drinking water should be made available at regular intervals.
h. The can be small kiosks sell food & drinks (Non-alcoholic) in regular intervals.
i. Green spaces with sitting arrangements can be provide where ever there is space.
j. In some areas sidewalks can be provide depending on the availability of space.
k. The buildings & the temples on the route should be renovated & maintained regularly.
l. Sculptures & arts made by local artists can be portrayed on the route.
m. Good signage need to be prepared to guide the pilgrims. It will be better if the signage is more graphical then text. As many pilgrims may not be able to read it & where ever there is text it should be trilingual.

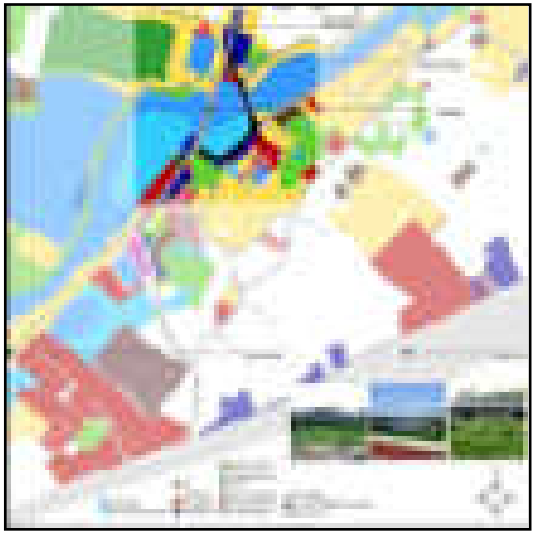
A complete makeover & restoration is required before the program starts. Garbage dumping & open defecation should be strictly prohibited as it carries the image of the city & its culture. The heritage buildings, ashrams & temples along the route need to be renovated and maintained regularly. There can be a committee/ council of stakeholder for this program. This committee will decide the charges & the timings of the tour program. No other private agency will be allowed to arrange such tour separately. Private agencies can be partners or service providers for this program. This restriction is required to prevent

commercialization of culture, heritage & pilgrimage. Agencies can get incentive upon selling the package. The prices can be revised after discussion with private agencies & religious institution.

8.6.3 *Atharnala Revitalisation*

Atharnala Bridge is a living example of medieval Orissan architecture, Atharnala Bridge was constructed over the Madhupur stream, by Bhanu Deba of the Ganga Dynasty, during the 13th century. The Atharnala Bridge at Puri helped the people to travel from one side of the stream to another. This bridge was constructed in an effort to develop the transport system of the place. The bridge was meant to make communication easier for the people there at that time.

This bridge is situated at the entry point of the town of Puri. The bridge measures 290 ft. in length. Even many centuries later it is still in use. The Atharnala Bridge is of special importance to the tourists who are inclined towards religious activities. The pilgrims often come to offer prayers to the Almighty, as this place is considered to be one of the most popular sites that are located in Puri for offering prayers. Few attempts are being made to renovate & develop the area but they didn't make much difference. So for the successful conservation and development of the bridge & surrounding region an integrated planning approach is required. The project is essential as it is conserving the rich architectural heritage of the state & adding one more heritage/pilgrim stopover to city.



Salient Feature of Atharnala Wetland	
Total Area:	3.5 hectares (Average length: 1100mt. & average breadth: 50mt)
Water Spread	6 Acres
Average Depth	6.6mt during Monsoon & 4mt in dry season
Water Source	Rain water from catchments

Proposed Atharnala Revitalization project components are summerised below:

- **Entry gate to Puri**
  - This gate would be designed keeping in mind the regional architecture, material and most importantly would follow and replicate the Jagannath temple complex. Such grand installation at the entry point of the city would give an impression of the grandness of the Jagannath temple as well as would create an impression of the ancient and regional richness of Puri.
  - The gate will carry specific symbols and signage's to keep the tourists aware about the regional features and heritage sites.

Map 31: Design elements of Atharnala proposal

- **Information Centre**
  - The revitalization proposal for the area sees a need for an information centre, which can cater to large number of tourists, visitors and devotees that come and visit Puri at different times of the year.
  - The information centre would be open 24/7 and would cater to tourist in giving information on
    - Festival dates & celebration locations
    - Transportation and location of touristic places in and around the city
    - Information on heritage and important temples
    - List of hotels and guesthouses
    - General information for public utilities (hospitals, police stations, health centres, main shopping areas etc...)
- **Exhibition centre**
  - A common area is proposed next to the information centre which exhibits cultural, heritage and artistic highlight of the city.
- **Recreational zone**
  - The proposed concept plan for the area provides recreational zone for Puri residents as well as visitors. The proposal includes park, paved open area with small kiosks, restaurants and small eating joints and children play area.
- **Revitalization of the river**
  - Cleaning of the river
  - Remove unwanted plantation
  - Clean water / hygienic
- **Structural strengthening of the Atharnala bridge**
  - Brink pointing
  - Structural strengthing
- **Awareness Generation**
  - Community awareness among residents
  - Awareness among tourists

8.6.3.1 Pre requisites for "Atharnala water front development" project.

For successful implementation of the above proposal below mentioned activities have to be undertaken:

- The roads coming under the Parkirama route need to be cleaned regularly.
- The roads need to be leveled & paved where ever required.
- The solid-waste laying on the road need to be removed regularly.
- The sewage drains on the routes need to be cleaned on a priority basis.
- Proper storm water drainage system needs to be provided to avoid water logging during the rain.
- There can be dedicated team to clean & maintain the route.
- Washroom & drinking water should be made available at regular intervals.
- The can be small kiosks sell food & drinks (Non-alcoholic) in regular intervals.
- Green spaces with sitting arrangements can be provide where ever there is space.
- In some areas sidewalks can be provide depending on the availability of space.
- The buildings & the temples on the route should be renovated & maintained regularly.
- Sculptures & arts made by local artists can be portrayed on the route.
- Good signage need to be prepared to guide the pilgrims. It will be better if the signage is more graphical then text. As many pilgrims may not be able to read it & where ever there is text it should be trilingual.
- Brick pointing & cleaning of the bridge need to be done.
- Good lighting has to be provided and the bridge should be decorated during evening time.
- Garbage dumping & open defecation should be strictly prohibited as it carries the image of the city & its culture.

Overall the proposal is trying will make the ASI protected monument more visible and usable by residents of Puri as well as visitors. Grand entry point like this would highlight importance of the city and bring in more economic development, businesses, investments and tourism opportunities for the town and the region. Conservation & restoration of the "Atharnala Wetland" through simple, low-cost & biological method of treatment will also be facilitated by the proposal. Resource recovery through fresh water Pisciculture can make the project sustainable which will lead to urban revitalization of the area and help to maintain the neighborhood setting an example.

8.6.4 *Grand Road Revitalization*

The Grand road or Badadanda is the main street, extending from the front of the Lion's gate of the Jagannath Temple to the Gundhicha Temple. This road corresponds to the central objective of the original layout of the sacred town and is one of the widest streets in India. It is on this road the three big chariots are taken in a procession to the Gundicha temple, which is two kilometers away from the Jagannath temple annually during the famous Rath Yatra during the month of Asharh (June-July). To witness Rath Yatra millions of pilgrims from all parts of India and abroad assemble on this street. Even during the non-festive season the congestion levels on this road is quite heavy, owing to the pilgrims who pour into this holy city throughout the year.

Grand Road is the centre of all the activities in Puri town. A number of dharmashalas, bus stand, hospital and clinics, service stations, shops both temporary and permanent, vegetable markets etc. are situated along the grand road. The shops located in close proximity to the sell sacred articles such as flowers, bangles, vermilion, Prasad, etc.

Different commercial activities along the Grand road

Mix of commercial activity, parking, pedestrians and vehicle movement on the Grand Road

Major issues identified for Grand road

- Multiple intersections with narrow roads creates traffic bottlenecks
- Non segregation of slow and fast moving traffic reduces the average speed of travel along the Grand road
- The lack of dedicated parking space close to the Grand road leads to high on street parking.
- Non segregation of pedestrian, motorized and non motorized means leads to clashes.
- High levels of encroachment by the hawkers. Lack of Public conveniences along the road.

Owing to the high tourist influx during the Rath Yatra, no permanent establishments/facilities are possible along the Grand road.

8.6.4.1 Proposed Interventions for Grand Road

The requirements on the road during festive and non festive season are considered while proposing suitable urban design solutions for the road.

Grand road urban design plan – Non festive season (with all the street furniture, parking facilities and commercial areas)

Grand road urban design plan – Festive season (Unobstructive path for the chariots and pilgrims to traverse)


Grand road- Festive Season


Grand Road- Non festive season

This road has a potential to develop as an inviting street for tourists and pilgrims by various addition of street furniture, green areas and segregated hawking zone without affecting the traffic. These design interventions will consider the requirements of the street during Rath Yatra.

Road and foot path at same level

In spite of being one of the widest streets of urban India, the Grad road faces severe congestion. During the festive season there is tremendous rush on the grand road, constituted by the participants of the famed Rath Yatra. This poses a restriction in the design of the Grand road section. Grade differences and any permanent street furniture are not possible on the grand road.

There is also a need to regulate the hawker zone and create notional driving lanes for the segregation of the varied traffic plying on the grand road. A hawker zone is proposed all along the Grand road, the commercial activities would be same as the existing ones. PMC will grant permissions only for vendors selling religious or tourism related artifacts other general household articles, fruits and vegetable vendors would have to be relocated in semi open shopping area which is adjoining the multistory parking in Jagannath Balav Math. There is also a pressing need for regulating the streamlining the on street parking. Therefore on-street parking for different type of vehicles (two wheelers, four wheeler vehicles and cycles) is proposed on the grand road depending on the traffic volume and the character of the street. The underlying idea of the urban design interventions are to regulate and plan the grand road such as to make it more user friendly, both for the pilgrims and the residents, while retaining its dynamic nature and charm.

A continuous 30m carriageway is maintained throughout the Grand road as the total width of the three chariots is 20m (10m buffer space). All the proposed street furniture such as kiosks, street lights, planters, etc. would be located beyond the 30m carriageway. The proposed landscape and street furniture is movable and not fixed, it could be bolted to the road surface. Any street furniture in concrete both pre-cast and in-situ should be avoided. These elements would be integral for beautification of Grand road and can be removed during Rath Yatra. The beautification and formalization of the activities and uses of the Grand road is essential to create a sense of entry to Jagannath Temple.

There would be no level difference between the carriageway and footpaths on the Grand road, as it would be act as an obstacle during Rath Yatra. Since large volume of pilgrims and tourists are present on the grand road during Rath Yatra, the level differences cause accidents or stampede. The carriageway and footpath would be visually segregated by the difference in materials. Grand road would not have physical divider, only markings to designate the division of carriageway.

Planters on the street

8.6.4.2 Design Approach

The grand road varies in width, the type of activities and the character throughout its length from the Jagannath temple to the Gundicha Temple. Therefore for better implementation of the design interventions Grand road has been divided into 5 stretches to work out the design options suiting the varying urban character along the road. The map below shows the identified stretches undertaken for proposal:

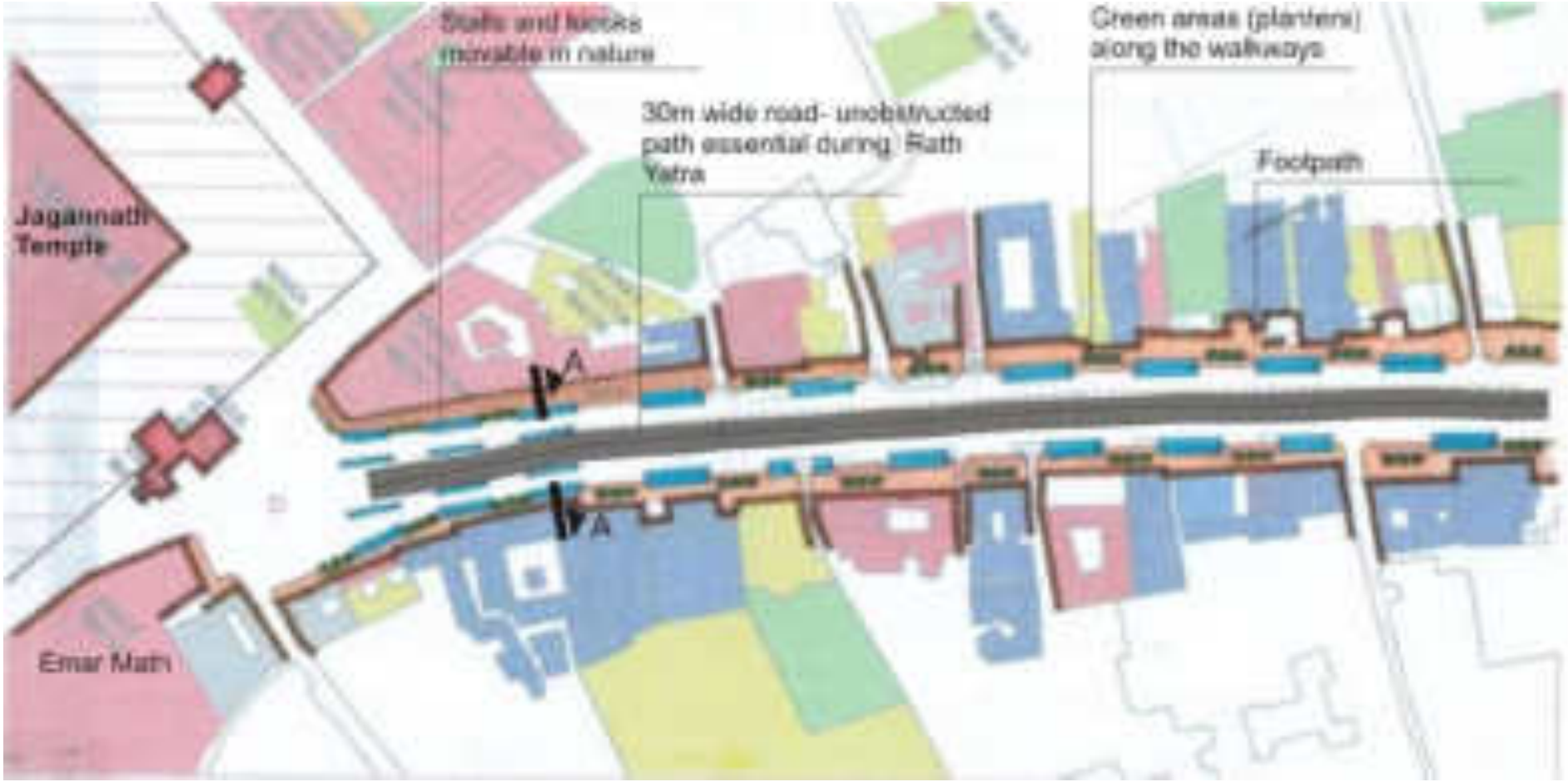
Division of Grand Road into five stretches

8.6.4.3 Detail Drawings for each Stretch

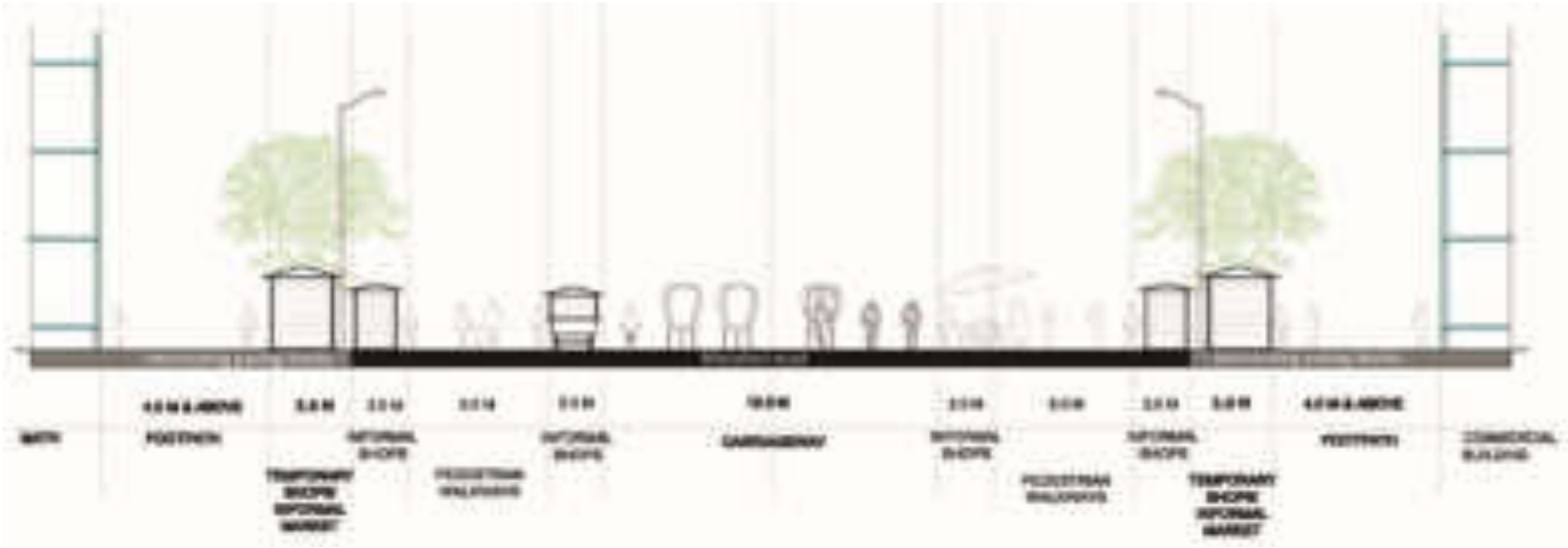
Stretch 1

The stretch 1 comprises of the area around Jagannath Temple. There are predominantly temple related activities in this area, stalls and kiosks selling articles of religious importance. Since this area forms the entry to the temple, the specific space should be allocated to respective activities to minimize chaos.

The proposed intervention would restrict vehicles in this area, only cycle rickshaws, cycles, temple trust buses and vehicles with special permission would have access. Also on street parking is not permitted on this stretch. The walkways are segregated for the pilgrims to have safe and easy pedestrian movement. The stalls and the kiosks are organized and are restricted to specifically designed spaces. Also the kiosks and stalls are on wheels or semi permanent in nature that can be moved during the festive season. The footpath can use interlocking paver blocks for a visual segregation from the metalled road



Layout of stretch 1(Vicinity of Jagannath Temple)



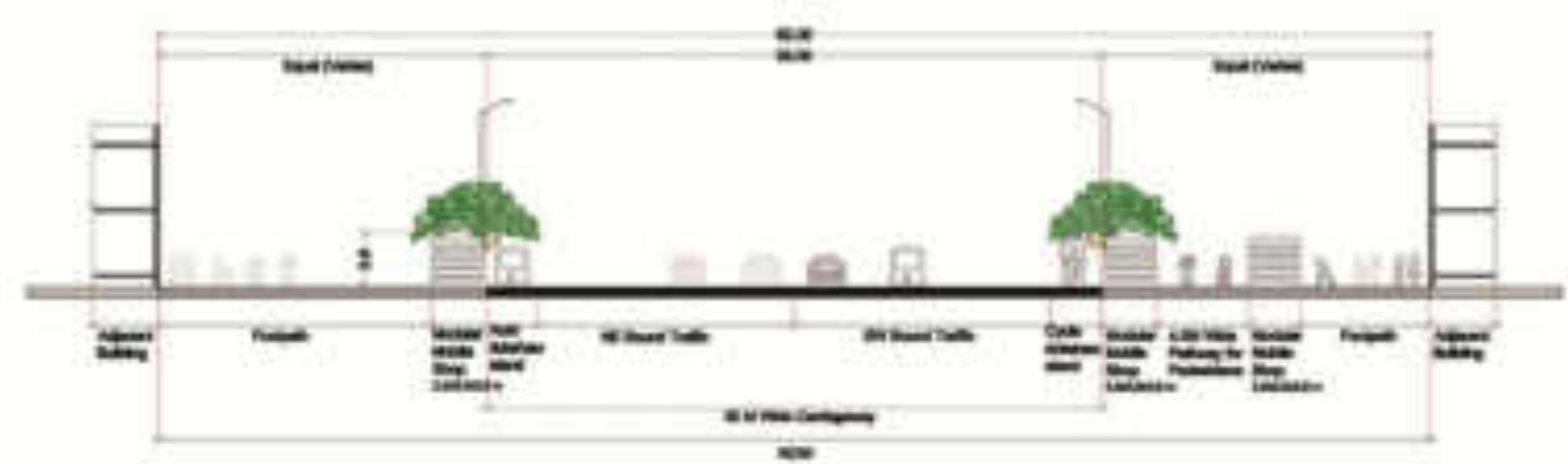
Section AA

Stretch 2

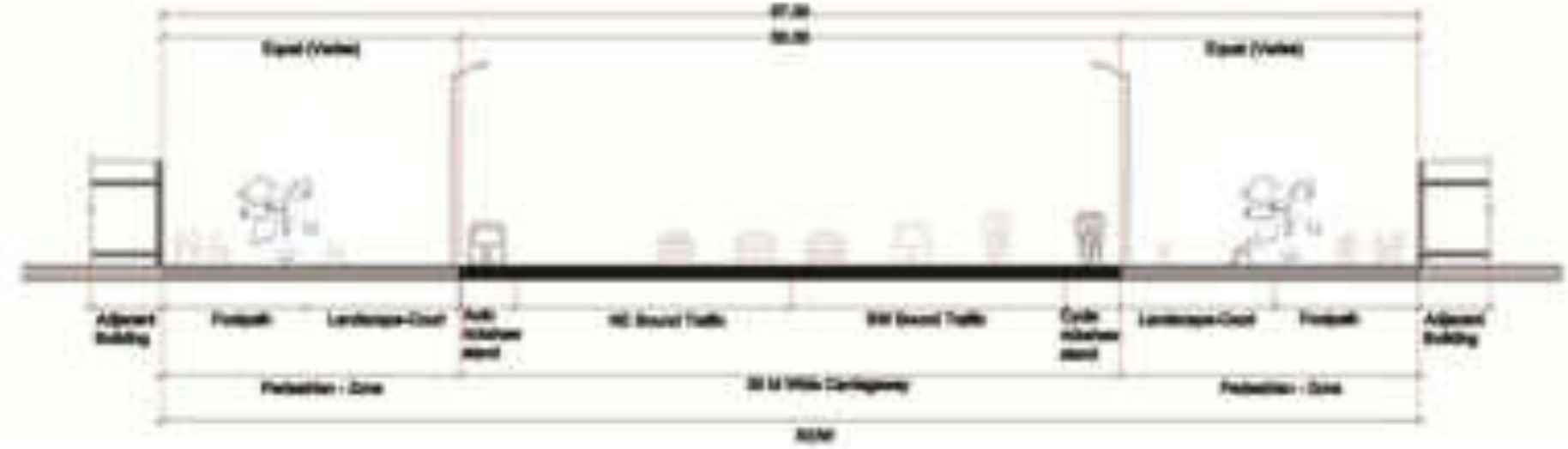
Stretch 2 starts from police station and ends at market square. This area has number of commercial activities that include selling of various handicrafts, traditional artifacts and also food kiosks. This area is also dotted with vegetable vendors.

In the proposed layout modular mobile shops are provided parallel to the footpath, they can be easily accessed from the pedestrian walkway as well as from the road. On street parking is prohibited, the proposed multi level parking in Jagannath Balav Math would be used for the same. There green areas consisting of planters proposed along the pedestrian walkway. There are small landscape courts with seating that are designed as interactive and resting space for pedestrians. This stretch would have cycle rickshaw and auto rickshaw stand as stretch 1 does not have any waiting area for these vehicles.

The vegetable vendors in this stretch would be moved to the commercial area in Jagannath Balav Math parking space. The other hawkers and vendors pertaining to handicrafts and traditional artifacts would use the proposed modular shops.

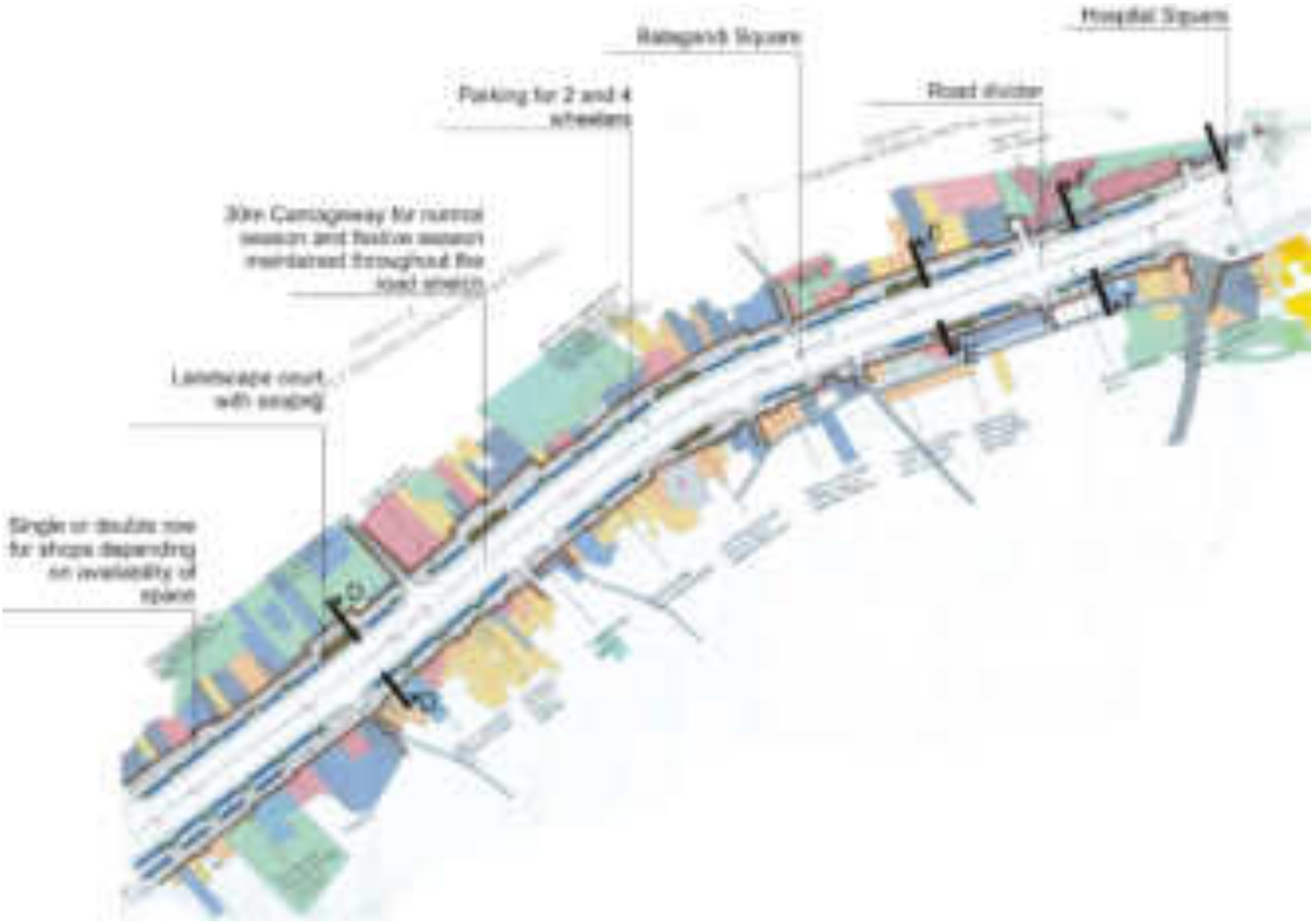


Section BB

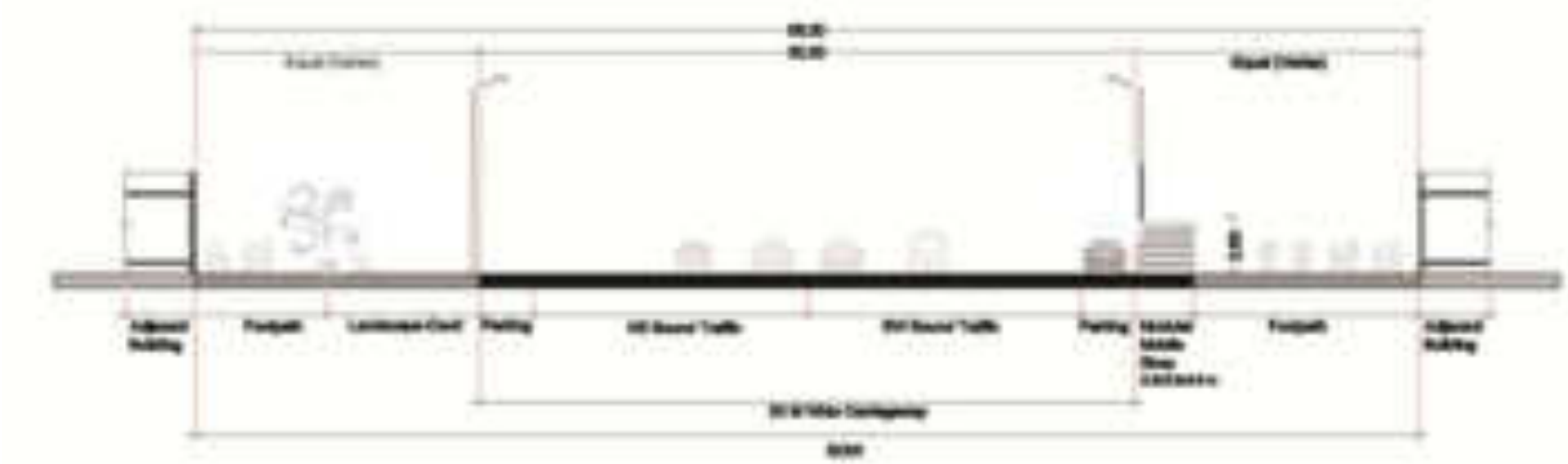


Section CC

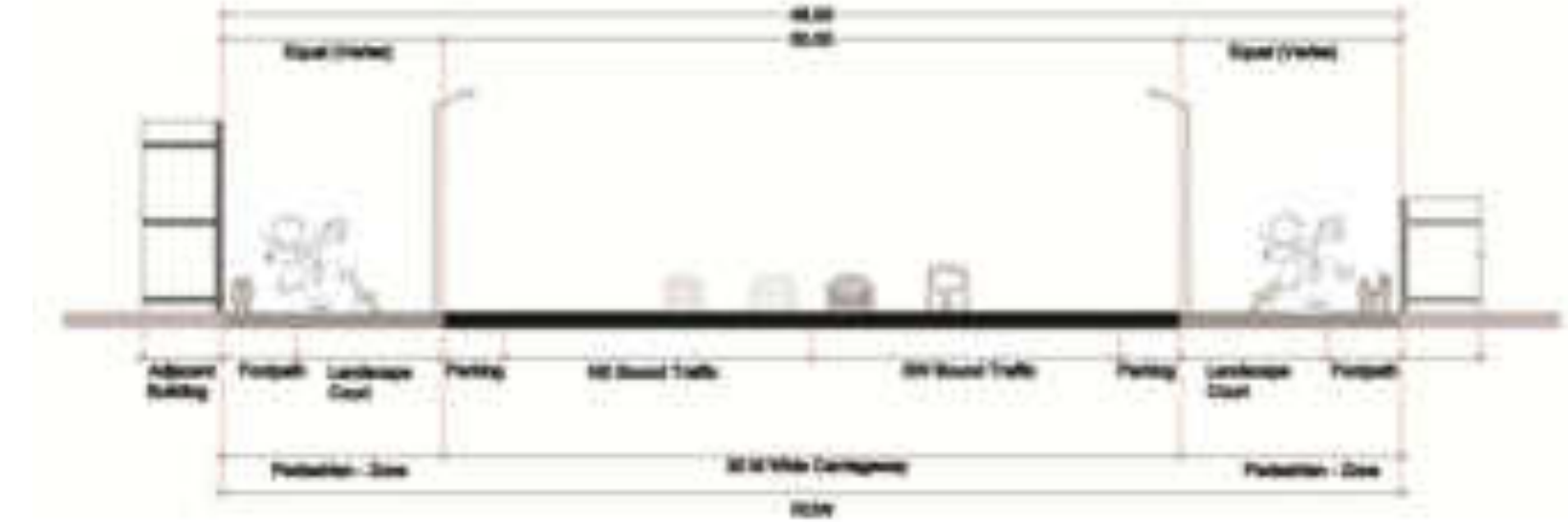
STRETCH 3 AND 4



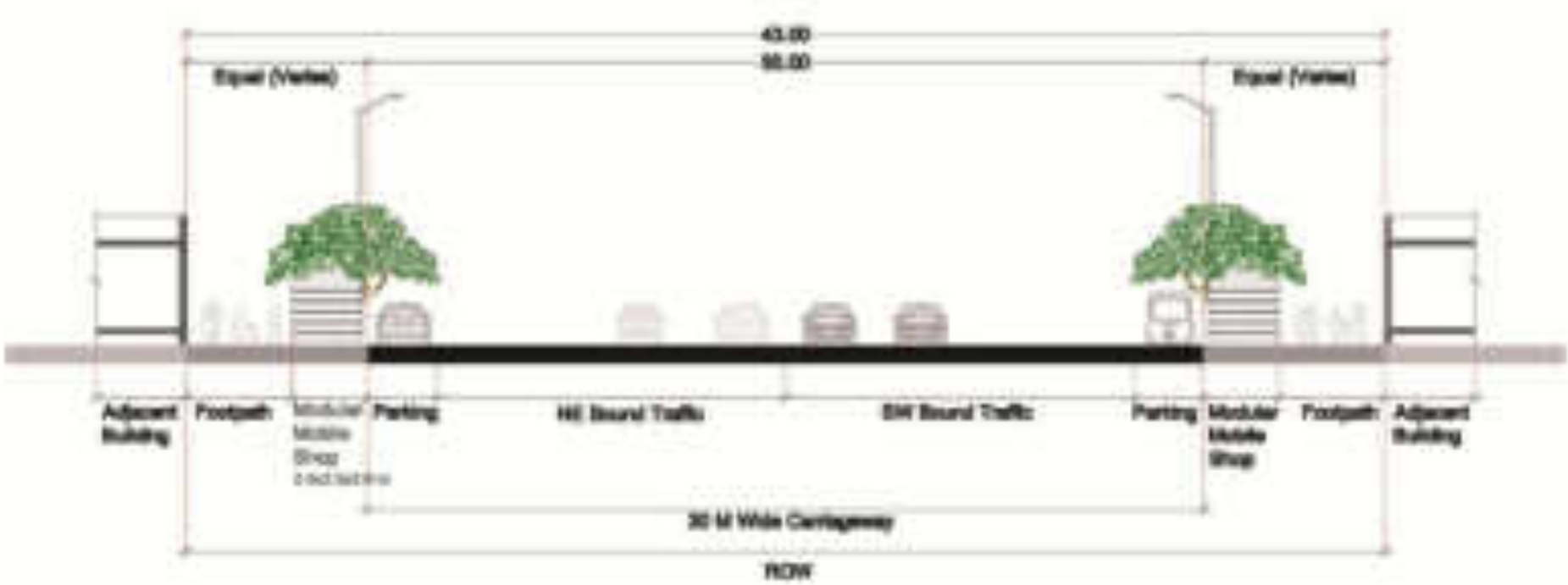
Stretch 3 & 4 (Stretch 3 – From market square to Maaushi-Maa Temple and Stretch 4 - Maaushi-Maa Temple to Hospital Square)



Section DD



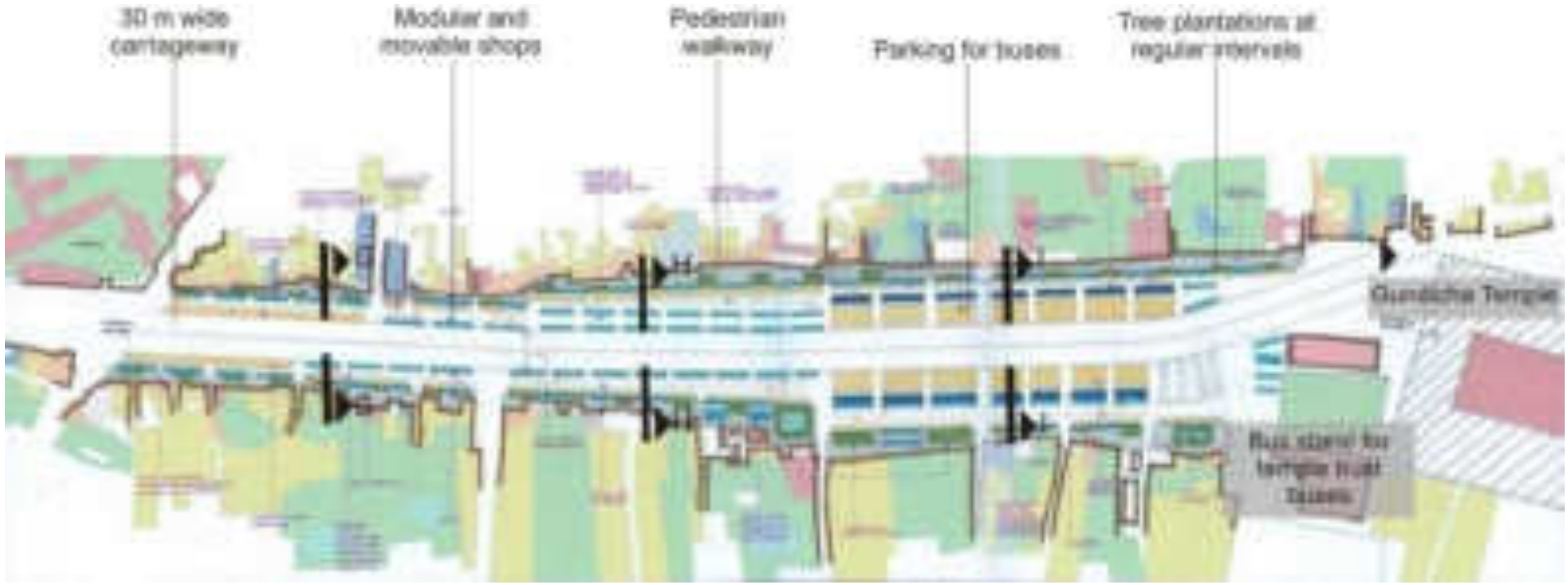
Section EE



Section FF

The stretch 3 and 4 includes area from market square to Hospital Square. The road width varies all through the stretch, but a 30m carriageway is maintained all through and accordingly the pedestrian walkways vary. All the activities in these stretches are retained in the proposed road layout.

Stretch 5



Stretch 5

Stretch 5 includes area around Gundicha temple. Currently there is a bus stand near Gundicha temple, as per the CEPT's proposal the bus stop would be moved and only the temple trust buses would use this bus stand and other tourist buses would be prohibited to use this bus stand. Since this road stretch has maximum width cafes, tree plantation, etc. can be planned.

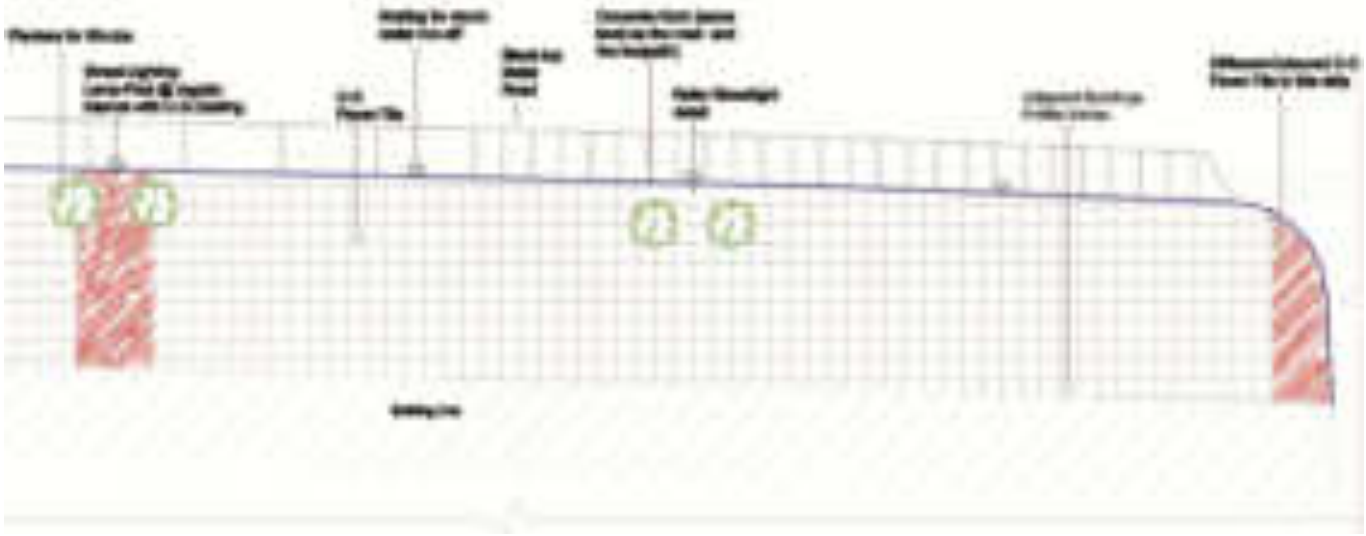
Section GG

Section HH

Section II

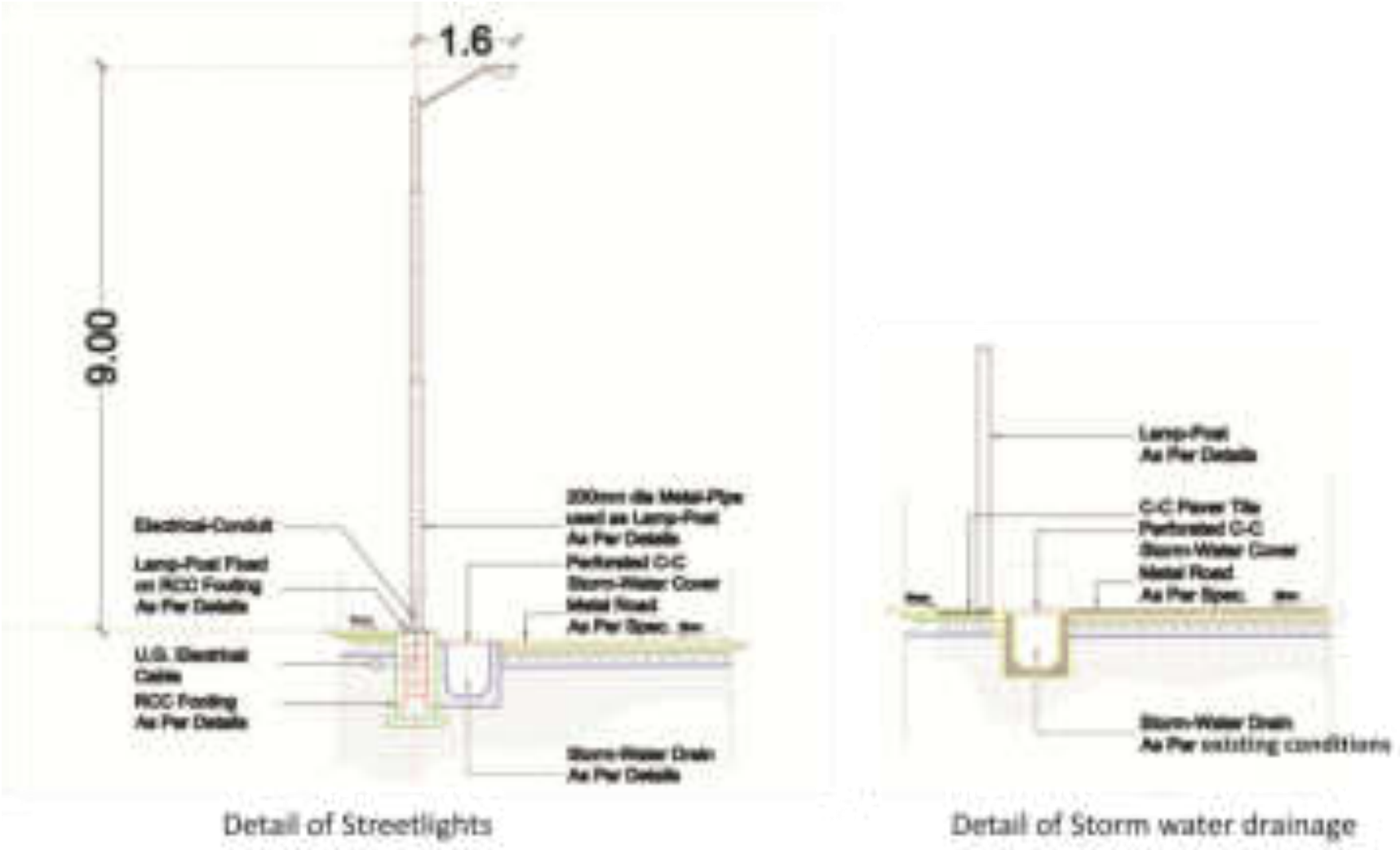
Details of services and street furniture

Details of prototype shops



Detail pedestrian walkway

(These details are illustrative drawings and may vary after detail study and analysis of the existing conditions)



Details of Lighting and storm water drain

(These details are illustrative drawings and may vary after detail study and analysis of the existing conditions)

8.6.5 *Marine Drive Improvement*

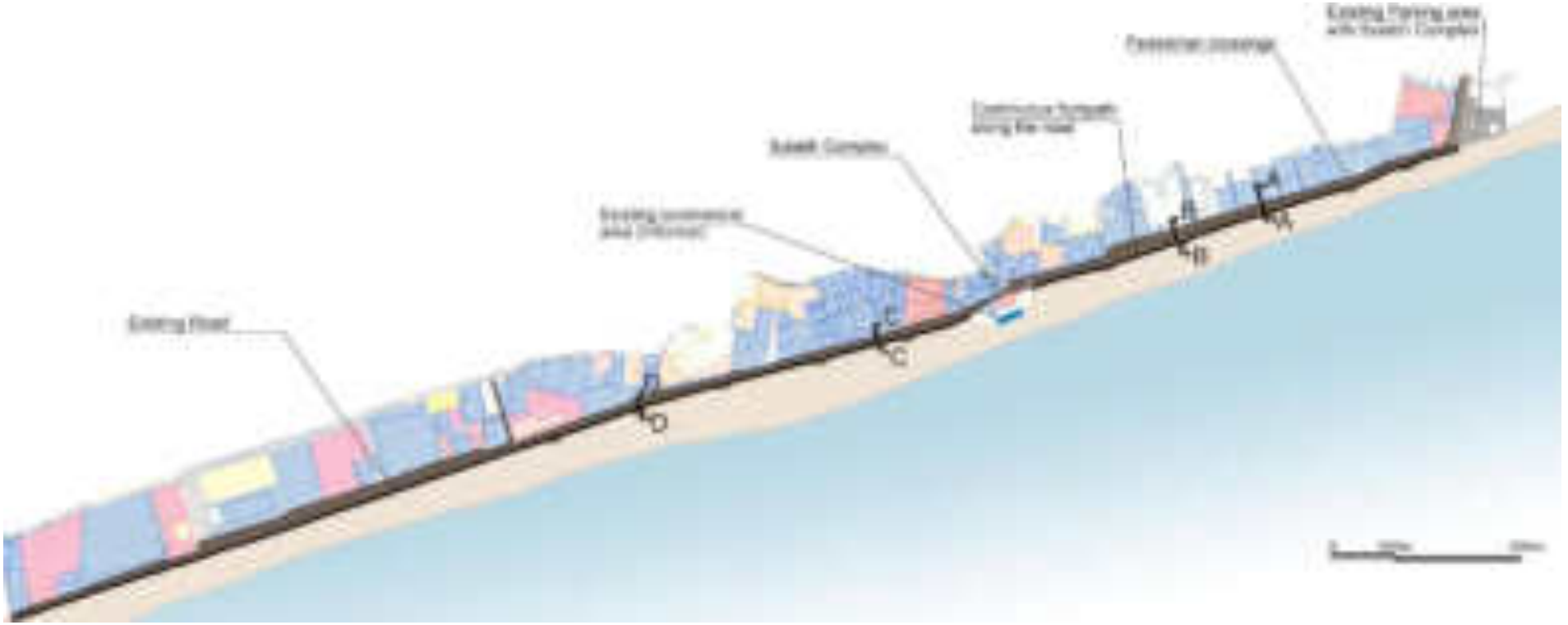
Marine drive road is an important commercial and economic hub in the town as majority of hotels, guest house and other commercial facilities are located on this road due to its location along the coast. This road is frequented by the tourists to visit the beaches of Puri. The high tourist influx, varying road widths, unorganized hawkers and on street parking pose bottlenecks along the Marine Drive road. Also Marine drive being a tourist area with high pedestrian flow, but there is lack of sufficient pedestrian infrastructure. Owing to its importance in terms of tourism and being the image of Puri, CEPT suggests some design interventions to manage the activities on the marine Drive road. The proposal will look to achieve the following components:

- Safe movement of tourist vehicles and reduced congestion
- Provision of adequate areas pedestrian movement
- Provision of parking facilities and reduction of on street parking
- Street furniture development in consonance with local culture and tradition
- Provision of seating spaces for tourists and visitors for recreational purpose
- Stopping encroachment on the road

Marine drive road

The proposed intervention would curtail on street parking of tourist vehicles for controlled and better traffic management of the road. The parking lot provided at the Gandhi chowk should be used by the tourist vehicles which will reduce the on street parking. The use of proposed BRTS should be initiated for domestic and tourist users which will result in lesser use of private cars reducing the traffic on the road. There are encroachments along the Marine Drive road consisting mostly of hawkers and on street parking from the hotels. These activities must be regulated for maintaining a uniform street width which will be helping in safe running

of vehicles and better managing the RoW. For the BRTS proposal to take place the road will need to be widened at some places so that it does not comes in conflict with other modes of transportation.



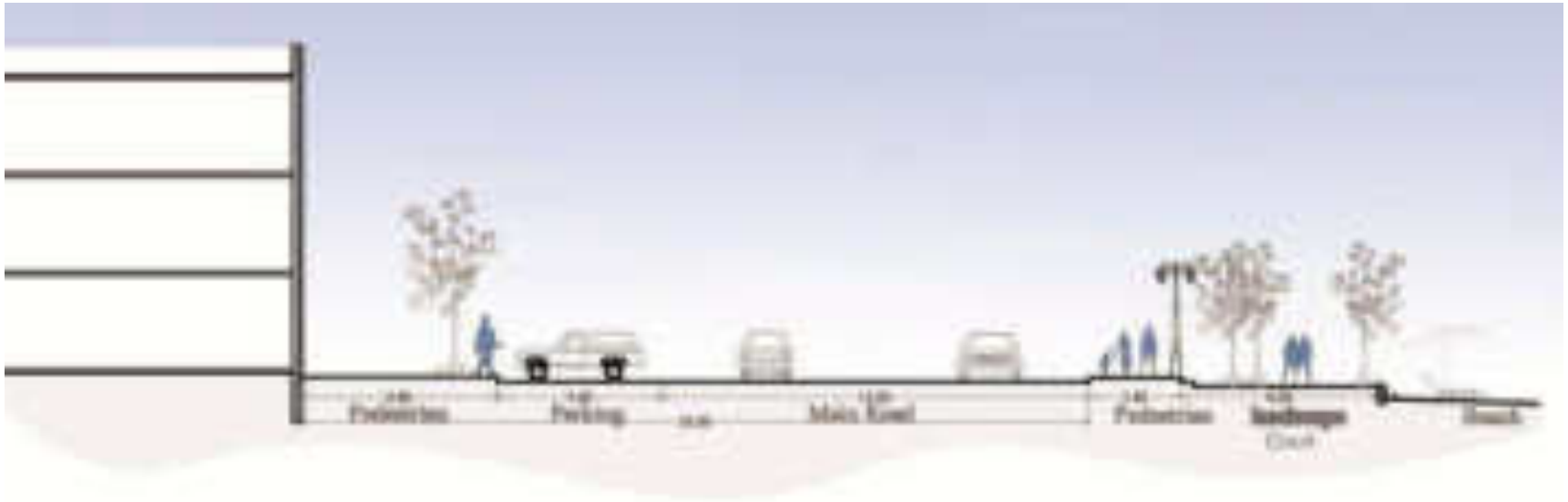
Marine Drive Road

The map above shows the Marine drive road and compact commercial development along the road. Since the existing pedestrian walkways are disjointed, continuous footpaths are proposed for the road. Depending on the traffic conditions and existing requirements parking zones should be demarcated on this street. Near Swargadwar the road width is narrow and there is traffic congestion around this area, therefore no parking zone should be proposed upto 200m (both side) from Swargadwar junction.

The width of the footpath cannot be increased for proposing seating and recreational areas as the carriageway for vehicles will reduce. As per the Costal regulation zone regulations construction on the beach is not permitted. Therefore decks using wood and steel and landscape courts are proposed at 300m interval along the footpath for recreational purposes and as interactive spaces.

8.6.5.1 Detail Sections

Section AA – Proposed decks in light weight material such as timber and steel with proper anchoring

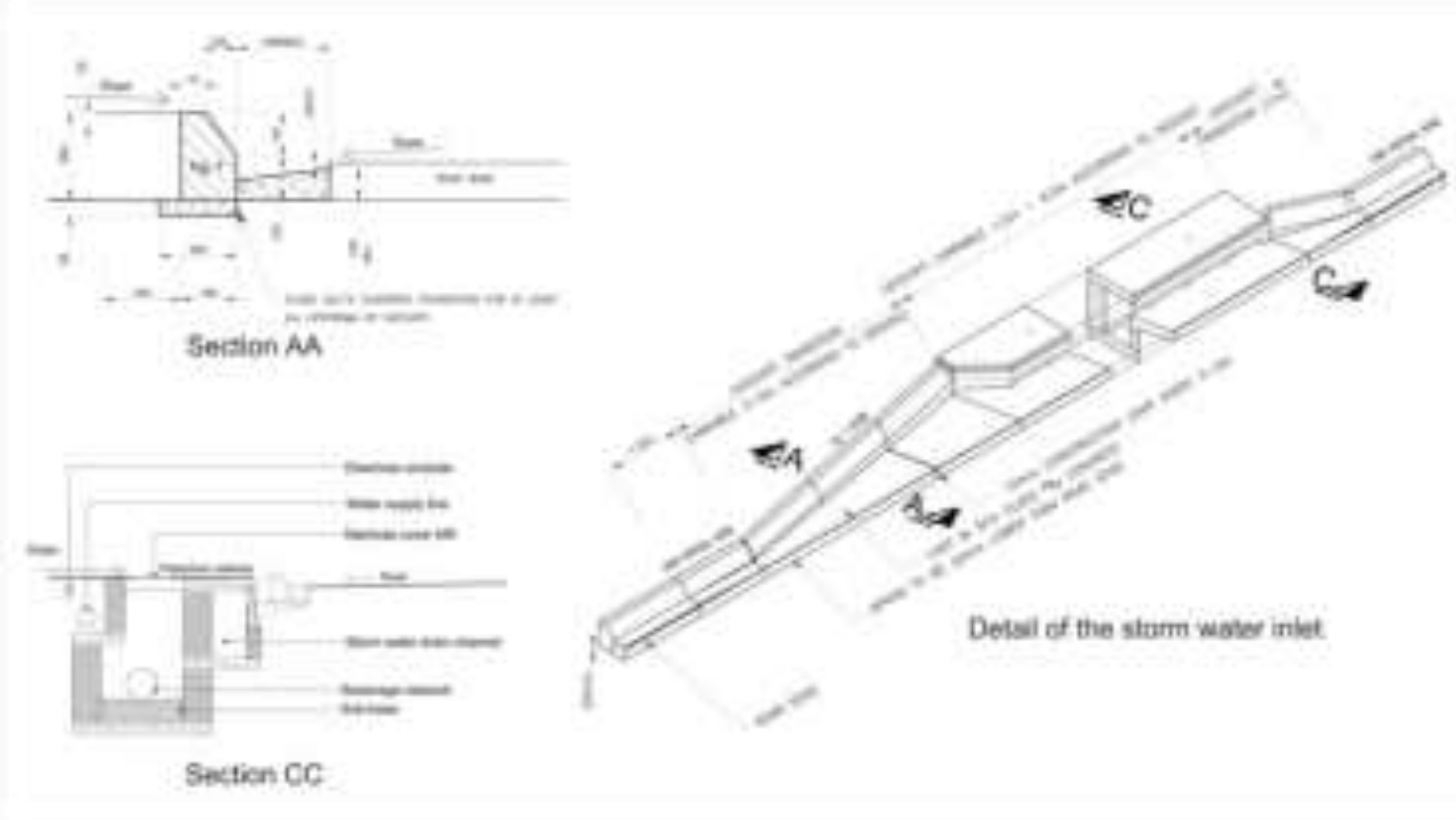


Section BB – Section through the landscape court adjoining the footpath

Section CC – The hawkers on the footpath are shifted on the beach, for proper pedestrian circulation (Small shops that are semi-permanent)

Section DD

8.6.5.2 Details (Services)



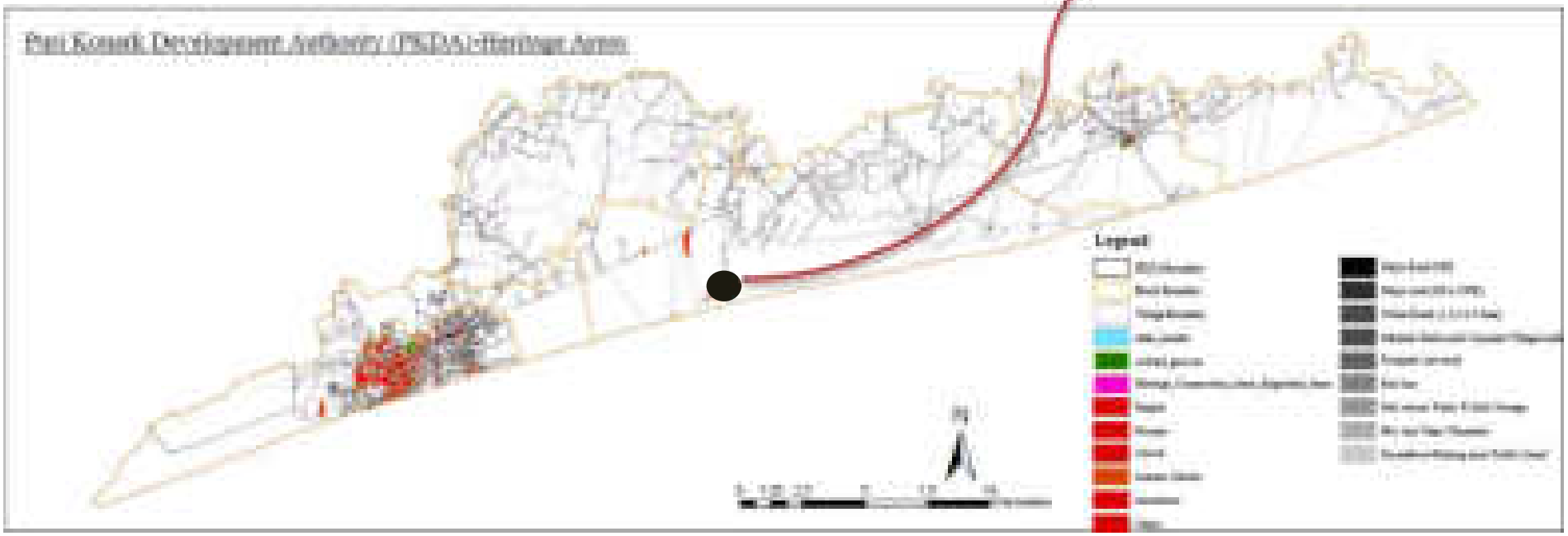
Detail of services along the footpath

(These details are illustrative drawings and may vary after detail study and analysis of the existing conditions)

8.6.6 *Proposal for Development of Tourism Village at Beleswar Temple area:*

Beleshwar temple, one of the most significant temple of Orissa is situated about 14 kms away from the Puri city on the Puri – Konark Marine Drive road. The ancient temple is dedicated to Belehswar god or more commonly known as lord "*Shiva*"*and* many pilgrims and tourists visit the temple because of its religious and spiritual significance. The temple is not architecturally significant but is quite important from religious point of view, "Beleshwar temple is one of the famous Shaiva shrines of Puri. Mahashivaratri is the famous festival celebrated here. On the day of festival, thousands of devotees arrive at the temple to offer their prayer to Lord Beleshwar. Forest areas at one side and beach at the other provides a special location for any kind of commercial or tourism related development.

Even though the place around Beleswar temple is not developed for tourism and does not have much to offer, many still visit the place and enjoy sunset and sunrise views on the beach and many come to enjoy swim in the sea and sunbathing. Water waves are quite calm and soothing and therefore many people from nearby villages and cities come to this area for picnic and short trip.



Map 32: Location of Beleshwar Temple in PKDA region

The area around Beleswhar temple has great potential for development because of the natural beauty around the temple and peaceful surroundings. The proposal therefore is to develop the area as a special commercial zone which includes tourism infrastructure and activities that attracts local as well as international tourist from all parts of the country and world. The strategic location of the temple and vacant land all around therefore is a great opportunity to develop and bring in revenue and offer diver activities and options for people to visit the area.

The model of "tourism village" is proposed to develop the area with multi purposed activities and areas. The village would be developed as an integrated area which would give visitors an opportunity to experience the area with variety of activities and feelings.

- **Integrated development**
  The tourism village would be envisioned to be a space which can be used for any kind of people and would cater to needs of people coming there for different purpose. Though the area has scenic natural beauty and has religious significance development of the village will offer facilities for tourism, entertainment, shopping, real-estate development, business development, knowledge dissemination etc…
- **Promote Village with rural characteristics**
  The village architecture and designed would be very carefully though about keeping in mind the natural surroundings, ancient built form of the region and promotion of natural materials. The proposed plan therefore would give the feel rural setting with world class infrastructure facilities.

- **Connection with special institutional area**
  Special institutional zone proposed in PKDA 2030 land use plan also envisions activities such as naturopathy institute, dance academy, performing arts center, Gurukul for artists and aspiring painters, dancers, sculptures and world class institutes for education, art, and craft. Tourism village would work as an extension of the same activities with great view and more natural setting. The tourism village would have more residential areas and peaceful places for relaxing and meditation as well as would have interesting recreational activities, arts and crafts related opportunities and great religious setting of Beleshwar lord.

- **Sustainable model**
  Proposed "tourism village" would be developed based on the sustainable economic model. Different type of public private partnership and revenue generating model would be developed to operate and maintain such area with diverse activities. Implementation and construction activities would be divided into phases for "smart" operation of the village.

Map 33: Proposed Plan for development of tourism village in Beleswar temple area

Information center:

Since the area is in outskirts of the city and in the middle of forest area, the village would have a small area dedicated for tourist information, programs, and packages available for different Packages and tours available. The center would have information about nearby tourist attraction, other temples, hotels, and guesthouses in nearby areas.

The center would also provide information on festivals and celebrations in Puri, Konark and nearby areas.

Convention center:

Proposed tourism village is almost equidistance from Puri and Konark and just about 1.5 hour away from Bhubaneswar and other major urban centers. The area offers green scenery and therefore the plan for the area also includes small convention center having all the facilities for business meetings, conferences, meetings, and small lectures. The area along with nice great view and greenery around would offer world class facilities for business / professional discussions and gatherings such as

- Conference hall
- Meeting areas
- Auditorium
- Exhibition center
- Business center with adequate facilities

Conventional center is envisioned to have architecture suitable to the area and would be constructed by using natural materials, however would be designed with great facilities to attract companies and organizations from different walks of life. Secluded place like this would be great to host workshops, training programs and other educational as well as business oriented activities.

Hotels and resorts

This would be one of the most important activities proposed in the plan of tourism village since it would not only cater to visitors coming from different parts but would also help to generate revenues for the village. Proposed plan would have hotels, guesthouses, dharamsalas, resorts and small cottages to cater to middle income groups as well as higher income groups. Beautiful beach view and forest surrounding would be used to offer best views for all kinds of lodging activities. Architectural character of these buildings would not be too modern and overpowering but would give opportunity to visitors to live in beautiful scenery.

As one can see in the design layout, residential facilities within the village is sparsely situated with grant green / open spaces all around. These areas would offer wonderful view of the scenic beach as well as dense vegetation of the area.

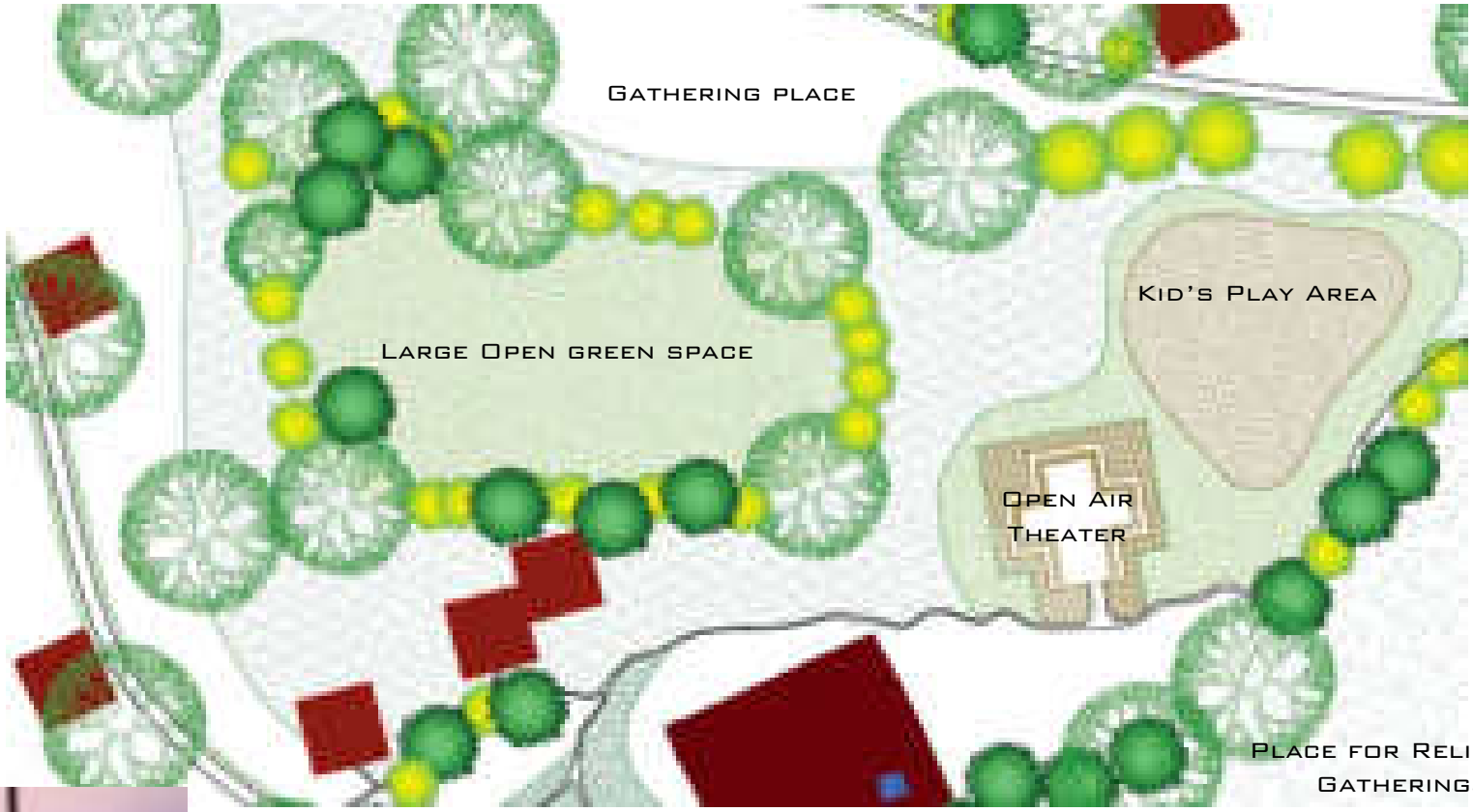
Restaurants and eateries

The tourism village would have restaurants and eatery joints serving local Odiya food as well as would also cater to international tourism with world food. These restaurants would be linked with other activities such as parks; children's play area, picnic spots, hotels and guesthouse and business facilities. The village would give variety of setting and food to people visiting the place.

Regional shopping area / market

The tourism village would have a demarcated area for regional products. The market would be designed and constructed keeping the culture and architecture of the area in mind. The market would give opportunity to nearby villagers, farmers, and artisans to showcase their products and give them opportunity to sell it to visitors. Designed market place would have open, semi open as well as enclosed areas for different kinds of good and to give different experience of shopping to tourists visiting the area.

Along with the regional market there would also be small kiosks and shops for groceries and other routine stuff. These small shops/ markets would be in multiple locations.



Recreational spaces

Recreational areas in the tourism village would be designed with great detail and strategy to bring in a special character of a tourism village of Orissa. Such areas would be designed in different locations housing different types of activities. Recreational spaces would include gardens, parks, walking trails and other similar open areas where as sports activity, boating and other semi open or enclosed areas.

Major activities and areas could be mentioned below

- Parks
  - Open areas for picnic
  - Vestibules
  - Small areas along the beach for refreshment and to pass time
  - Walking trails
- Sun rise / sunset points
- Swimming pool
- Sport activities
- Boat ride and infrastructure
  - Small (4 seater) boat ride service seasonal, depending on weather and condition of the sea.

* Detail analysis and field investigation of the sea, surrounding are and soil condition

- Special areas for kids

Arts and craft workshops

Arts and crafts workshops would be one of the most interesting activity offers in the village. Such workshop would not only bring in revenues but would promote Orissa's culture , its art form, painting, and dance form which is famous not only in India but in world. These workshops would offer short term courses, workshop, as well as a place for artists to work. Workshops would also offer housing facility and artists and art enthusiasts. These workshops would also be linked with regional market proposed under the tourism village for promotion and generating revenues.

Type of workshops would be

- Odissi dance form
- Patta chitra workshop
- Sand sculpture training and workshop
- Local music and literature

Meditation center

Because of the natural surrounding and strategic setting of the tourism village, they would also cater to visitors and tourists coming to the area for relaxation, meditate, and live a peaceful life for desired period. Meditation hall, small cottages, open platforms by the beach etc would be provided as a part of facility. Because of the temple and math in the surroundings these area can also be use for large religious gatherings and spiritual activities and residing.

8.6.7 UD Guidelines and Street Furniture (Signage's, Bollards, Lights etc)

One of the efficient methods of better city management is providing information and direction in specific locations and structures for visitors coming for tourism purpose and other intentions. This helps in promotion of tourism in urban centres and results in grooming of other associated sectors.

Puri town although is majorly dependent on tourism for economy generation but there is very weak signage provisions and direction mechanism prevailing which result in inefficient utilisation of heritage monuments as many of the sites are not known for the tourists and visitors. CEPT has analysed the situation and formulated various signage options for heritage structures, major junctions and nodes as well as important roads for providing better information acquiring platform for tourists and visitors. Signage options have been worked out for 12 selected heritage monuments in the town as well as 12 major locations and 12 central streets which all are bearing heritage values for the town. The map beside show the location of the sites:

Map 34: Identified location for signage's

SL No	Monuments	Period
1	Emar Matha	12th C.A.D
2	Jagannatha Ballav Matha	16th C.A.D
3	Sankaracharya Gobardhan Matha	16th C.A.D
4	Radhakanta /Gambhira Matha	16th C.A.D
5	Jagannath Temple	11th C.A.D
6	Gundicha Temple	16th C.A.D
7	Indrayumna Tank	12th C.A.D
8	Markanda Tank	12th C.A.D
9	Narendra Tank	
10	Swetaganga Tank	
11	Atharnala Bridge	15th C.A.D
12	Swargdwar	

SL No	Major Locations
1	Singha Dwar
2	2Emar Math
3	South Gate
4	Dakhina Parswa Math
5	SamadhiMath
6	Punjabi Math
7	Kaushalaya Math
8	Kapala Mochana Temple
9	Raghavadas Math
10	Harichandi Sahi Akhada
11	Bali sahi Akhada
12	Chaki Kuntia Residence

S.L No.	Major Roads
1	1NH – 203 Bhubaneswar to Puri
2	NH - 203 (e) Puri to Konark
3	3NH – 203 (a) Puri to Brahmagiri
4	4Grand Road
5	5VIP Road
6	6Governor Road
7	7Marine drive Road
8	Chakrathirtha Road
9	Sta□on Road
10	1 Hospital Road
11	1 College Road
12	Swargdwar Road

8.6.7.1 Signage options for Heritage Monuments

Heritage walk is the major proposal identified for conservation and upgradation as well as efficient utilisation of the monuments. Hence proper information and signage facilities must be developed for tourists to know and enjoy the religious and cultural vibe. Text printed on eco-solvent stickers on a vinyl base should be mounted on 72mm dia steel bars or as suitable on site. The Information board should be placed on the grand road as shown in below image.

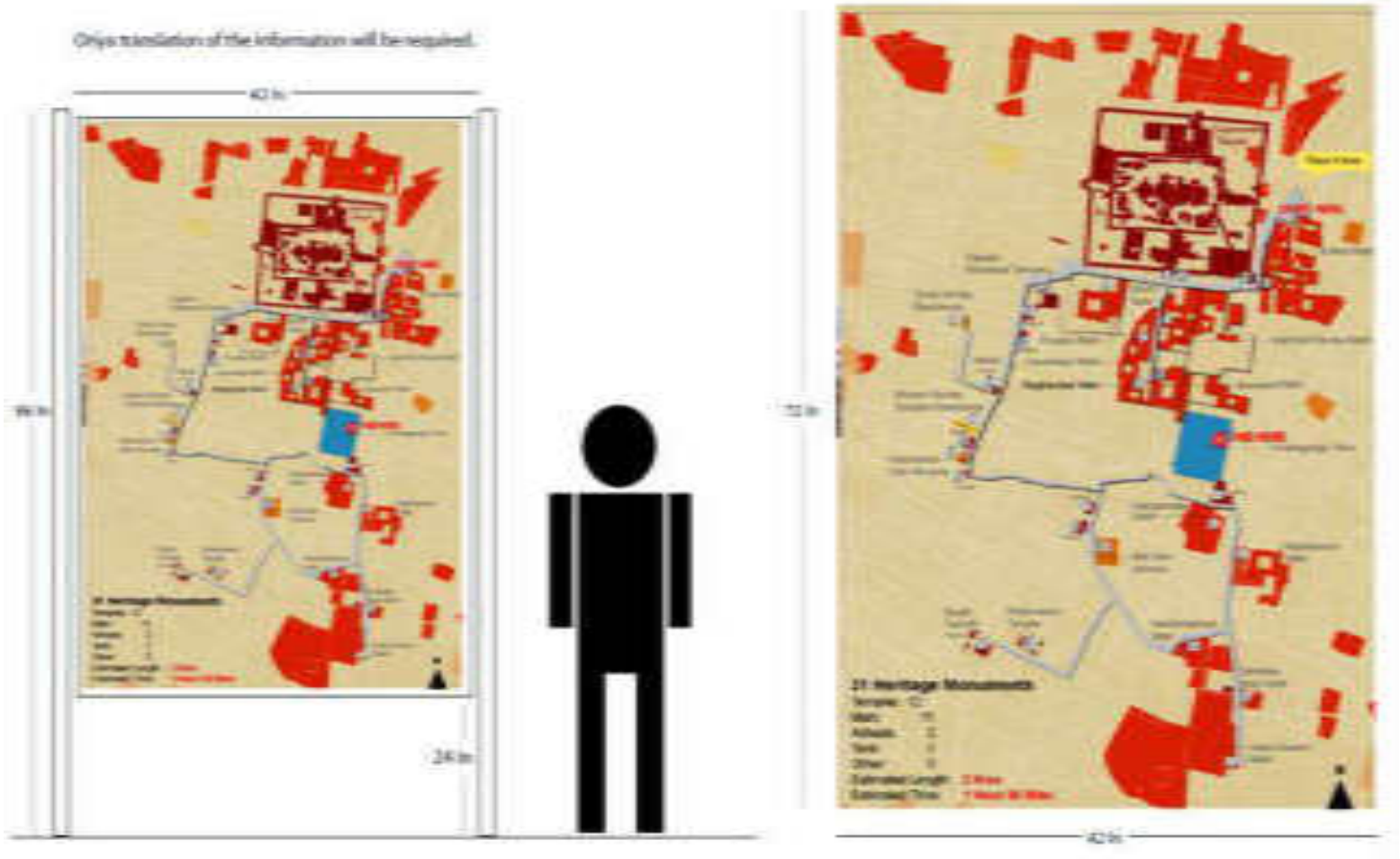


Table 55: Selected monuments, roads and locations for street furniture

The major heritage structures such as Jagannath Temple must be taken for signage development as these are the monuments which are of maximum attraction for tourists. the image below shows design options for signage in Jagannatha Temple AND Singha Dwara. The signage structure is a combination of 2 sandstone, lathe turned bases (500 mm ht and 122.5 mm dia); a stainless steel pipe structure(1800mm ht) ; Composite Aluminum Panel flags ; with images and text printed on eco-solvent stickers on a vinyl base. the height and specifications should be followed accordingly as per standards which are specified below.

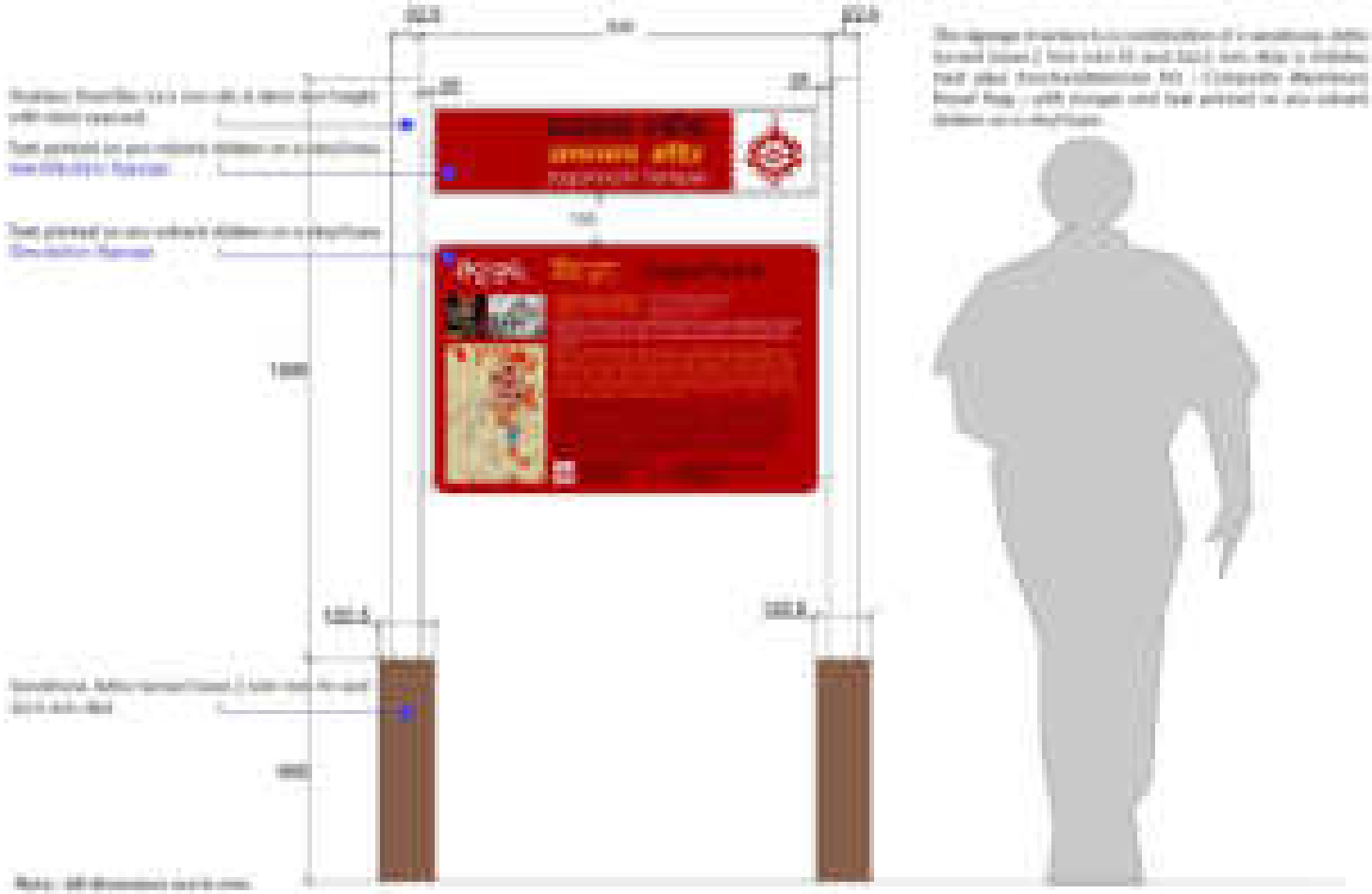


Figure 34: proposed locations for Signage in heritage route

The Singhadwara, which in Sanskrit means the Lion gate, is one of the four fates of Jagannath Temple and forms the main entrance. Singhadwara is so named because of two huge statues of lions exist on both side of the entrance. The gate faces east opening to the Bada Danda or Grand road. This is one of the few symbolic structures of the town which is proposed to conserve and specific signage proposal for the same is developed as show in below image. The same can be replicated for other similar important structures around the region.

Sample View

The region has many sacred temples, Mathas, Akhadas which are carrying equally important heritage value as the monuments discussed above. For comprehensive heritage development it is proposed that all these structures and sites should be interlinked and similar signage options can be developed for all of these structures so that the location and details are available for tourists and visitors coming to the region. This will lead to better management and efficient utilisation of the rich heritage elements existing in the region.

the image shown beside shows signage options for Gobindaji Temple located in vicinity to Jagannath Temple built by the king of Ganga dynasty Chodaganga Dev between 1078-1148 AD. Again it was rebuild by Anagabhim Dev same dynasty in 1174AD which is still standing today. Historic elements as well as specific importance should be highlighted in the signage designs as shown beside. These can be developed by PKDA and sponsored by some private partners. Within specific design these details should also be incorporated.

this prototype design can be replicated elsewhere there is same type of structure so that these are well known to the tourists and gain importance which will lead to revive of heritage spirit in the region as a whole.

8.6.7.2 Signage for Roads

Roads are very important mediums for spreading required message and create awareness about intended subject. There are some very important roads in the town which has rich heritage significance and economic importance. Those roads should be identified and taken for signage development. These places can carry information about direction and location, heritage site identification etc.

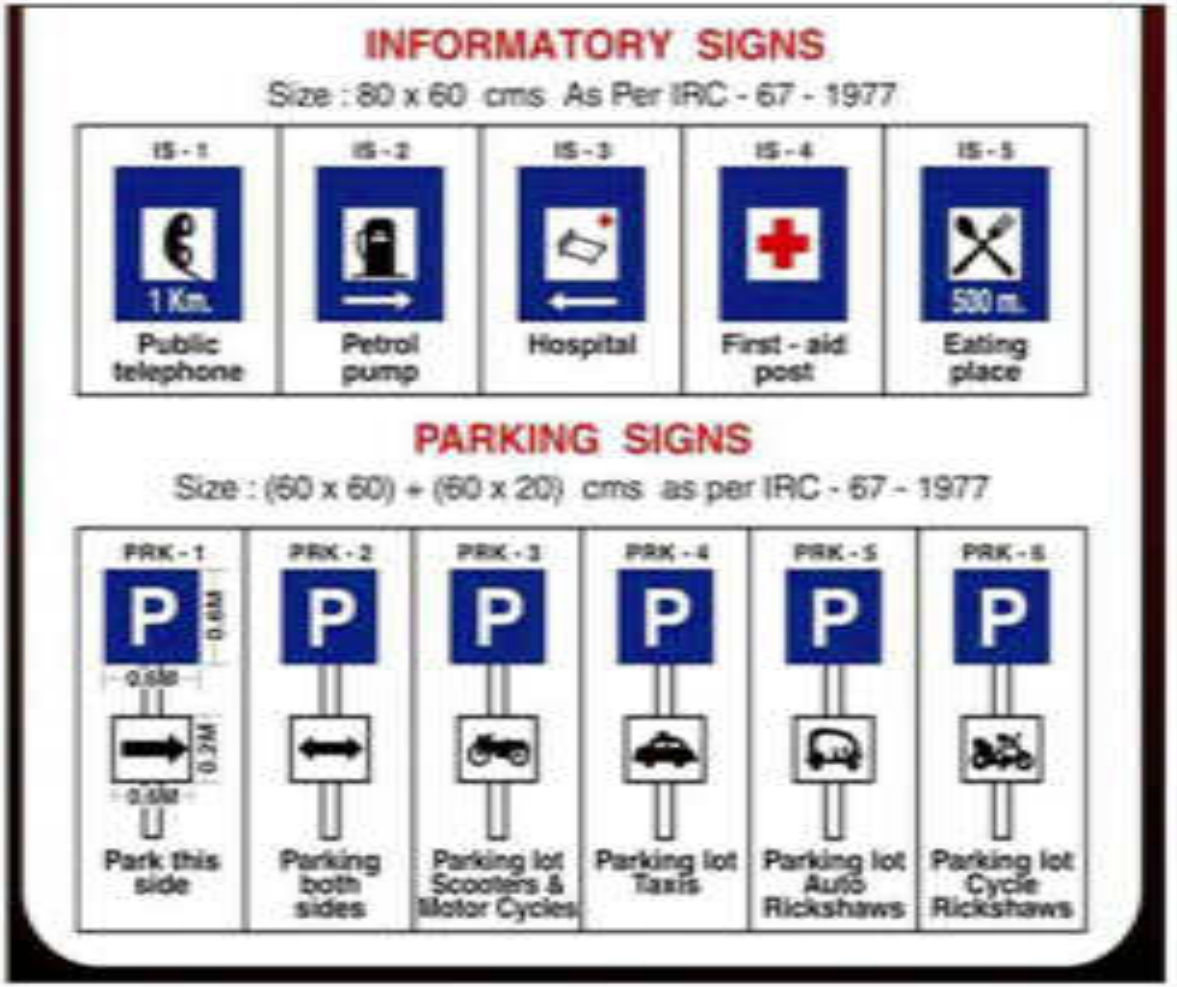
The below image show a prototype signage design for showing direction towards Jagannatha temple. Also information of different characters like identification and direction has been worked out in the below image. This type of signage should be developed for other important roads of the town and the region for better information sharing and heritage development in the area.

8.6.7.3 Signage for Common information

Signage options for common information sharing should also be developed for citizen comfort and tourist guidance in the town. Basic information signage has been worked out and proposed for implementation is shown in below images. Components such as public toilet, telephone booth, hospital, eating place, parking space, walking ways etc needs to be undertaken at an urgent basis to improve the urban management and information sharing.

600 x 600 mm panel

Image printed on eco-solvent stickers on a vinyl base.



8.7 Cost Estimates

8.7.1 *Heritage Walk*

Cost outlay for development of heritage walk has been illustrated in the below table:

Sr. No.	Components	Quantity	Unit	Unit Rate (Rs. Lakhs)	Estimated Cost(Rs. Lakhs)
1	Improvement of existing roads (widening, resurfacing etc.)	2	km	20	40
2	Drain Cleaning or Covering the same	2	Km	10	20
3	Improvement of heritage structure (structural strengthening, restoration: plastering, painting, repairs of staircases, flooring, cleaning of premises, Fresco painting revival etc… • 12 Temples • 11 Mathas • 2 Akhadas • 3 Others (Gates etc.)	28	Nos.	40	1120
4	Revitalization of Swetganga Tank	1	nos	200	200
5	Landscaping	3	Ha	10	30
6	Street Furniture (Benches, special solid waste bins, street lights etc.)	-	-	LS	35
7	Signages	-	-	LS	200
8	Support Infrastructure within Emar Math (Kiosks, ticketing, information, audio Hiring special heritage cycle rickshaws, visual exhibition etc)	-	-	LS	35
9	Addition Infrastructure (public toilets, wash areas, drinking water facilities etc.)*	-	-	LS	10
10	Establishment of Heritage Cell (registration, staff etc.)	-	-	LS	15
				TOTAL	1705

** New construction is not permitted in 100 meters radius from Jagannath Temple therefore provision for public toilets, wash areas, drinking water etc. can be included on conditional bases*

Note: Operation & Maintainace cost is not included

8.7.2 *Parikrama Marg*

Component wise cost estimates for Parikrama Marg development will be as mentioned below:

Sr. No.	Components	Quantity	Unit	Unit Rate (Rs. Lakhs/Unit)	Estimated Cost (in Rs. Lakhs)
1	Existing Road Upgradation & Drain Clearing	20	Km	10	200
2	Improvement of heritage structure at Sidha Mahavir & Lok Nath Temple (Structural strengthening, restoration: plastering, painting, repairs of staircases, flooring, cleaning of premises, Fresco painting revival etc…)	2	Nos.	15	30
3	Landscaping	5	Ha	10	50
4	Street Furniture (Benches, special solid waste bins, street lights etc.)	-	-	LS	70
5	Procurement of Golf Carts	10	Nos.	1	10
6	Parking of auto rickshaws/ Golf Carts at 11 identified spaces (Markanda Pond, Sri Mandir, Sweta Ganga, Mohodadhi, Prachi, Loknath Temple, Atharanala, Indradumna, Pond, Sidha Mahavir, Chakratirtha Road, and Swargadwar etc.)	140	Sq. m.	0.5	70
7	Revitalization of Markanda Pond & Indradumna Pond	2	No.	200	400
8	Addition Infrastructure (public toilets, wash areas, drinking water facilities etc.)	-	-	LS	20
				Total	850

Note: Improvement, Cleaning, Resurfacing of roads are covered in other proposals like Heritage Walk, BRTS roads, etc.

8.7.3 *Atharnala Revitalisation*

Cost estimates for revitalisation of Atharnala has been calculated in the below table:

Sr. No.	Components	Estimated Cost (in Rs. Lakhs)
1	Preparation of Entry Gate at Puri (Local Material/craftsmen, ornamentation, carvings and structure shape inspired by temples of Orissa)	250
2	Development of 24*7 Information Centre for tourists, visitors and devotees with support infrastructure like computers, LCD, AC, Pantry, Refrigerator, library etc.	300
3	Exhibition centre for cultural, heritage and artistic highlight of the city	300
4	Development of Recreational zone (Park, Paved open area with small kiosks, Restaurants, Small eating joints, Children play area, Washroom & Drinking Water Facilities etc.)	800
5	Revitalization of the river (Average length-1100 mt and breadth-50 mt)	150
6	Structural strengthening of the Atharnala bridge (Brink pointing, Structural strengthing etc.)	150
	Road Upgradation & Drain Cleaning	50
	Landscaping & Beautification (Sculptures, street furniture, Lighting, Provision of Solid Waste Dust Bins, Development of Side Walks etc.)	180
	Signages	15
	Pamphlets, brochures, location/ tourist maps, general information etc.	10
	Total	2205

8.7.4 *Grand road & Marine drive revitalisation*

Grand road rejuvenation and marine drive redevelopments are two key urban revitalisation proposals identified which will promote tourism in the region as well. Cost estimates for the two proposals are illustrated below:

Sr. No.	Components	Estimated Cost (in Rs. Lakhs)
1	**Grand Road Rejuvenation (app 2.1km length)** • Road: Resurfacing & side drain cleaning • Walkway development • Approx. 50 nos. of Kiosks • Parking facilities • Street furniture, street lighting etc. • Restoration and Revitalisation of Heritage Buildings/ Maths etc. for the entire road • Demolition of identified (by Puri Municipality) structurally unsafe buildings	**2050**
2	**Marine Drive Redevelopment (approx 4 km Length)** • Road: Resurfacing & side drain cleaning • Walkway development • Parking facilities • Provision of street furniture, street Lighting, Solid Waste bins etc.	**2700**
	Total	**4750**

8.7.5 *Signage Development*

Unit cost identified for different type of signage development is as shown in the below table:

Sr. No.	Signage Type	Specifications	Sample	Unit Cost per Signage (Rs. Lakhs)
1	Selected Heritage Monuments	Combination of 2 sandstone, lathe turned bases (500 mm ht & 122.5 mm dia); a stainless steel pipe structure(1800 mm ht & 62.5 mm dia) ; Composite Aluminum Panel flags ; with images and text printed on eco-solvent stickers on a vinyl base		**7**
2	Common Information at Major Locations	Informatory Sign: Size 80X 60 cms as per IRC-67-1977 (60 X 60 mm panel & image printed on eco-solvent stickers on a Vinyle base) Parking Signs: Size: (60X60) + (60X 20) cms as per IRC-67-1977		**6**
3	Major Roads/ Central Streets having heritage values	Stainless Steel Bar 62.5 mm dia & 2500 mm height with sandstone, lathe tumed bases (500 mm height & 12.5 mm dia) and text printed on eco-solvent stickers on a vinyl base		**7**

Estimated cost soulay for signage development is as illustrated below:

Sr. No.	Signage Type	Tentative Location of Signage	No.	Estimated Total Cost (Rs. Lakhs)
1	Selected Heritage Monuments	Emar Matha, Jagannatha Ballav Matha, Sankaracharya Gobardhan Matha, Radhakanta /Gambhira Matha, Jagannath Temple, Gundicha Temple, Indrayumna Tank, Markanda Tank, Narendra Tank, Swetaganga Tank, Atharnala Bridge, Swargdwar	12	84
2	Common Information at Major Locations	Singha Dwar, Emar Math, South Gate, Dakhina Parswa Math, Samadhi Math, Punjabi Math, Kaushalaya Math, Kapala Mochana Temple, Raghavadas Math, Harichandi Sahi Akhada, Bali sahi Akhada, Chaki Kuntia Residence	12	72
3	Major Roads/ Central Streets having heritage values	NH – 203 Bhubaneswar to Puri, NH - 203 (E) Puri to Konark, NH – 203 (a) Puri to Brahmagiri, Grand Road, 5VIP Road, Governor Road, Marine drive Road, Chakrathirtha Road, Staon Road, Hospital Road, College Road, Swargdwar Road	12	84
			Total	**240**

8.7.6 *Total Cost Outlay*

Total cost outlay for promotion of tourism and heritage management consisting of six different components will be as worked out below:

Table 56: Total cost outlay for heritage conservation and tourism development

Sr. No.	Component	Estimated Block Cost (Rs. Lakhs)
1	Heritage Walk	1705
2	Parikrama Marg	850
3	Atharnala revitalisation	2205
4	Grand road rejuvenation	2050
5	Marine Drive redevelopment	2750
6	Tourism Village at Beleswar Temple	1100
7	Signage	240
	Total	**15900**

9. Environment & Disaster Management



9. ENVIRONMENT AND DISASTER MANAGEMENT

9.1 Introduction

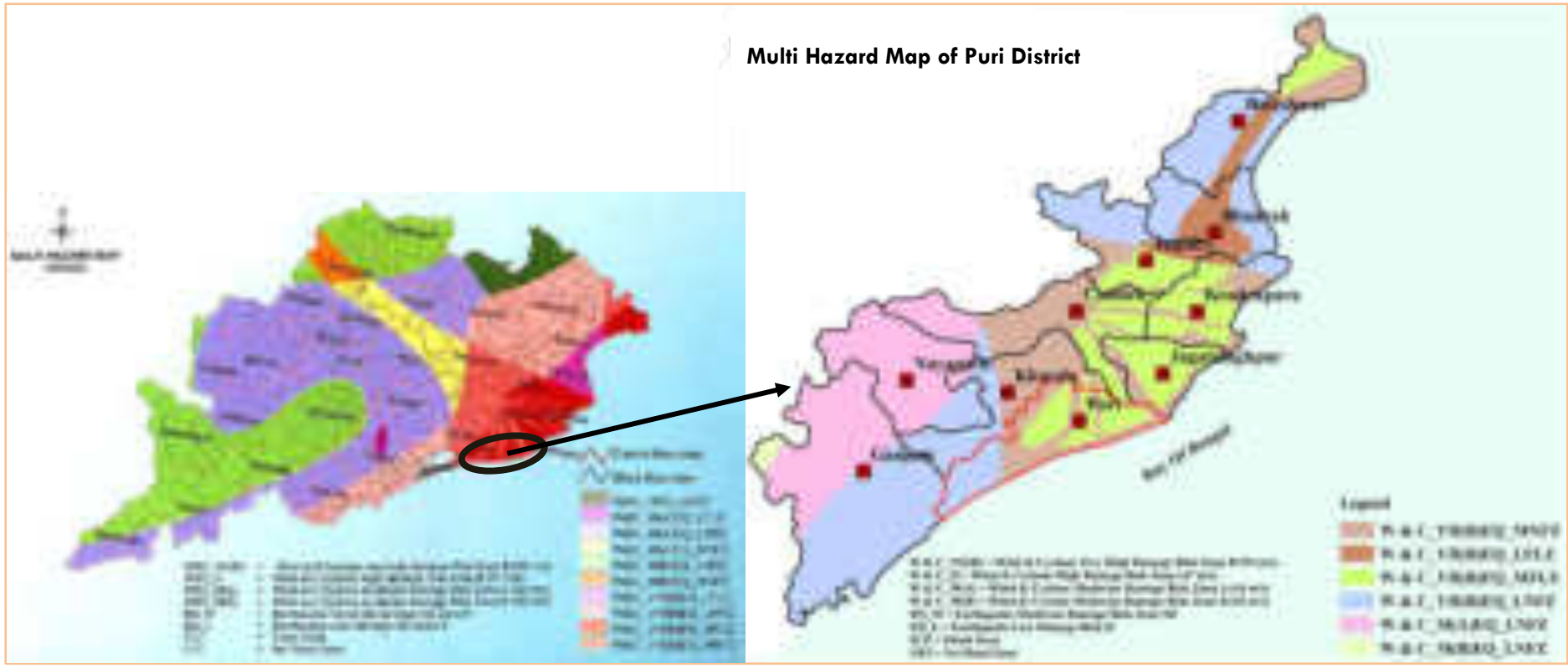
Management of environment and adaptation &preparedness to disasters are an important part of the Comprehensive development for PKDA region. This section deals with some of the major issues highlighted in the analysis from Volume-1 through various physical and policy level proposals.

9.2 Environmental Issues with Disaster Linkages in PKDA region

The region of PKDA is situated in a highly environmentally sensitive location. Along with its pristine beaches are the associated hazards of climate change vulnerability, cyclones that hit the Bay of Bengal and the unplanned development pattern which contributes to its disaster vulnerability. The major environmental issue identified has been enlisted as under.

- Degrading coastal plantation increasing the risk of sea level rise
- Estuarine habitats
- Dilapidating mangrove cover
- Urban congestion due to inadequate management of the transportation
- Coastal erosion
- Risk of salt water intrusion in the sweet water owing to the location
- Unplanned development
- Insufficient storm water management contributing to the increased vulnerability of flooding
- High dependency of populace to the sea and associated activities

Orissa is vulnerable to multiple disasters. Due to its sub-tropical littoral location, the state is prone to tropical cyclones, storm surges and tsunamis. Its densely populated coastal plains are the alluvial deposits of its river systems. The rivers in these areas with heavy load of silt have very little carrying capacity, resulting in frequent floods, only to be compounded by breached embankments. The multi hazard vulnerability of the study area shown below clearly indicates that the Puri Konark development authority area is the one which faces the most serious challenge in the state.



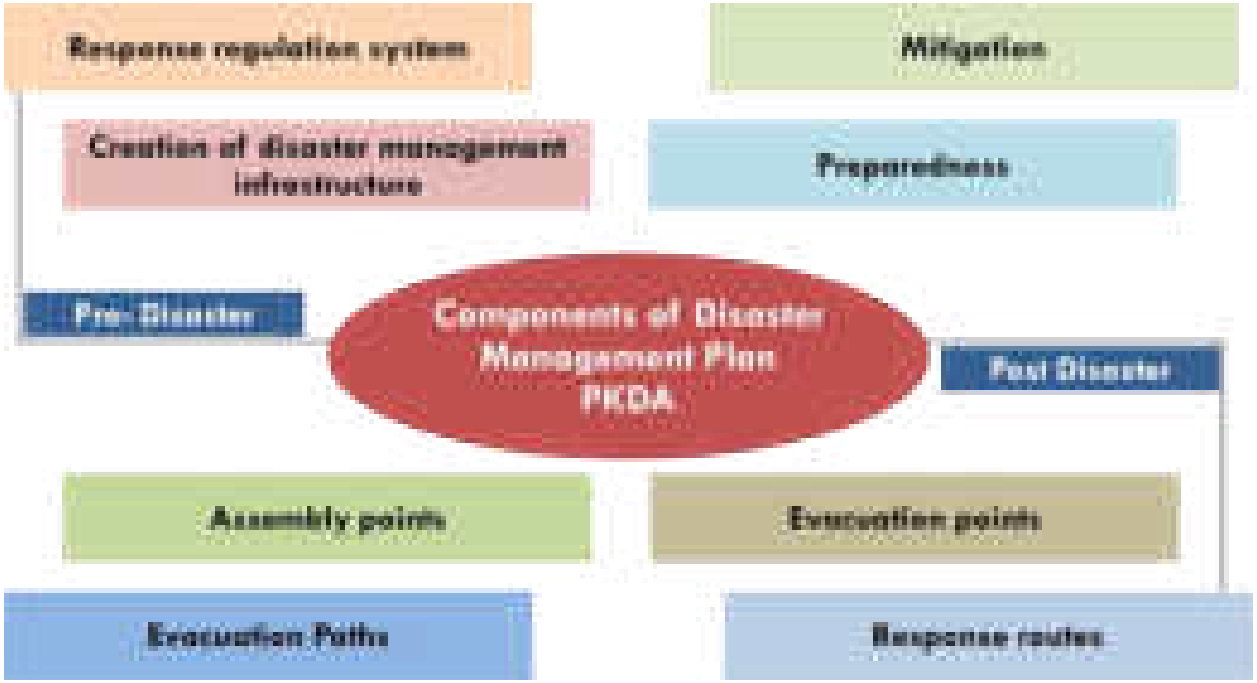
Map 35: Multi-Hazard Map of the Study Region

9.3 Disaster Management Plan for PKDA

It has been observed from the analysis in volume-1 that majority of the PKDA area comes under high intensity hazard zones. This coupled with the fragile environment and ecosystem in the area possesses high vulnerability to disaster. Due to the fact considerable proportion of the population living in close proximity to sea in the region there is a constant threat from natural calamities. All of these coupled together there is a greater importance and need felt for a disaster management plan for the PKDAC region which has been drafted here.

9.3.1 *Disaster Management Plan: Components*

A management plan is necessary to avoid a hazard from turning into a disaster. The disaster management plan for PKDA has been fragmented under the two sections, pre disaster preparedness and post disaster section. While pre disaster preparedness deals with setting the necessary disaster infrastructure the post disaster section deals with the relief and recovery systems.



9.3.2 *Planning for Disaster Preparedness and Mitigation*

Cyclones and tsunamis have similar forms of impact in varying scales. Both disasters are accompanied by high speed winds and huge quantities of water entering land. Landfall of both the disasters is partially predictable, and strong level of preparedness is the only way to escape their brunt.

In order to avoid serious damage to property and loss of lives during impact, it is essential to strengthen all four stages of the disasters.

Mitigation & Preparedness

PKDA can formulate and implement the following long and short term mitigation and preparedness strategies along with the concerned authority like OSDMA:

- Designating Evacuation routes connecting all major and minor settlements of the region to the inland areas.
- Construction of designated cyclone shelters (institutional buildings like schools, colleges, hospitals etc.) as per National Disaster Management Agency guidelines. *(www.ndmindia.nic.in)*
- Educating people about the hazard and the areas of the region prone to it.
- Bringing an awareness in preparedness for the disaster, like waterproof storage of valuables (gold, money, documents etc.), keeping handy a disaster kit (torch, rubber boots, raincoats, hats, radio, spare batteries, desiccated food pouches, first aid etc), knowledge of evacuation routes and nearest cyclone shelters(aided by laminated waterproof maps).
- Identifying people who can volunteer during disasters and aid the rescue operations carried out.

Figure 35: Disaster Mitigation Tools and Programs

Response & Recovery: Once the disaster strikes, quick response plays a major role in minimizing damage to property and avoiding loss of life. Recovery is a process based on the scale of damage and impact on the livelihood and daily life of the inhabitants. As a development authority, PKDA can aid the authorities responsible for rescue operations like Puri Municipality, ODRAF, OSDMA, police, fire fighters, the army and authorities extending medical help.

As a part of the recovery, where it is essential to bring the region back on its feet, PKDA along with the local authorities, can:

- Aid in repairing physical infrastructure like roads, electrical lines, sewerage lines, water supply etc.
- Aid in sanitizing and sterilizing the affected areas to avoid spreading of diseases.
- Aid in checking and repairing/ reconstructing (if needed) of the cyclone shelters.
- Reiterating the importance of development control regulations and safe construction techniques.

Figure 36: Rescue Operations after Cyclones/ Hurricanes

Evacuation Routes: Evacuation routes have been identified in the region to disperse the affected population as fast as possible inland. These are divided into two categories – primary and secondary. The primary evacuation route traverses the region parallel to the coastline, connecting all possible urban and rural settlements. This route plays a very important role in communicating the danger of the disaster to inaccessible areas and also dispersing the spillover population from urban areas through alternative secondary routes.

It is essential that this route is well designed, and of considerable structural strength (built preferably with cement concrete) with appropriate embankments. It needs to be raised and provided with culverts to flush excess water at low lying areas.

The secondary evacuation routes are connections at periodic intervals to the primary route, leading landward or towards the nearest major roads like National or State highways.

Figure 37: Different Signage used for Emergencies

Emergency Shelters:

In addition to the existing five shelters in the PKDA region, 15 more shelters have been proposed at regular intervals and at close proximity to the primary and secondary evacuation routes. These shelters need to be built as per National Disaster Management Agency guidelines. They can be institutional buildings (Govt. Schools, hospitals etc) in use and maintained during non-disaster period.

The proximity to the evacuation routes enables these shelters to be accessible to the supplies (food, medicines, clothing etc) brought for the affected population.

Map 36: Cyclone Shelter Map (Existing & Proposed)

Lookout Towers within forest areas

In order to keeps a watch on activities happening in and around forest areas, and to identify any possible sources of forest fires, lookout towers have been proposed at regular strategic locations in the forests. These lookout towers shall be equipped with communication devices with exclusive emergency frequency and sirens to warn people in close proximity to the forest areas.

The locations of the lookout towers are shown in the attached map.

Map 37: Proposed Location of Watch Towers with the Forest within PKDA Region

9.3.3 *Policy level instruments & Institutional linkage suggested for Disaster Management in PKDA region*

The broad features of the draft National Policy on Disaster Management are enunciated below:-

I. Adoption of a holistic and pro-active approach towards prevention, mitigation and preparedness.
II. Incorporation of mitigation measures in the on-going schemes/programmes.
III. Each Ministry/Department of the State Government will set apart an appropriate quantum of funds under the Plan for specific schemes/projects addressing vulnerability reduction and preparedness.
IV. Where there is a shelf of projects, projects addressing mitigation will be given priority.
V. Each project in a hazard prone area to have mitigation as an essential term of reference and to include a statement indicating as to how the project addresses vulnerability reduction.

VI. Community involvement and awareness generation, particularly that of the vulnerable segments of population and women has been emphasized as necessary for sustainable disaster risk reduction. This is a critical component of the policy since communities are the first responders to disasters and, therefore, unless they are empowered and made capable of managing disasters, any amount of external support cannot lead to optimal results.

VII. Interaction with the corporate sector, non-governmental organizations and the media in the state and regional efforts for disaster prevention/vulnerability reduction.

VIII. Building up institutional structures/appropriate chain of command and imparting appropriate training to disaster managers at various levels to ensure coordinated and quick response and development of inter-State and regional arrangements for sharing of resources during emergencies.

IX. Inculcating a culture of planning and preparedness at all levels for capacity building measures.

X. Formulation of Standard Operating Procedures (SOPs) and disaster management plans at state and regional levels as well as by relevant central government departments.

XI. Compliance with construction designs laid down in relevant Indian Standards.

XII. Evaluation and, where necessary, retrofitting of lifeline buildings in seismic zones III, IV & V – hospitals, railway stations, airports/airport control towers, fire station buildings, communication network, major administrative buildings.

XIII. Conversion of relief codes into disaster management codes for institutionalizing the planning process.

XIV. Promotion of international cooperation in the area of disaster response, preparedness and mitigation in tune with national strategic goals and objectives.

Table 57: Possible Disaster Management Policy & Institutional Mechanism

Key Components	Policy Measures	Institutions
DISASTER MITIGATION/PREVENTION		
Disaster mitigation/prevention to be mainstreamed into the development process.	(i) Each institution (state/local) which has a role in mitigation /prevention will make appropriate outlays for schemes addressing mitigation/prevention (ii) Where there is a shelf of projects /schemes, projects / schemes contributing to mitigation to be given a priority. (iii) Wherever possible schemes/projects in areas prone to natural hazards to be so designed as to contribute to mitigation, and preparedness. (iv) Projects in vulnerable areas/areas prone to natural hazards to be designed to withstand natural hazards.	State Govt of Orissa, OSDMA, Puri Collectorate, PMC, Konark NAC
Techno-legal regime	(i) regular review of building codes and its dissemination (ii) Construction in seismic zones III, IV and V to be as per BIS codes/National Building Codes. (iii) Construction in areas vulnerable to cyclones to be so designed as to withstand the wind hazard as per BIS codes/National Building Codes.	State Urban Development Department / Urban Local Bodies (PKDA,

Key Components	Policy Measures	Institutions
	(iv) Comprehensive review and compliance of - Town and Country Planning Acts -Development Control Regulations -Planning and Building Standards Regulations (v)Put in place appropriate techno financial regime (vi)Capacity enhancement of Urban Local Bodies to enforce compliance of technolegal regimes	PMC, NAC)
Land-use Planning and Zoning regulations	(i) Legal framework for Land-use planning and zoning regulations to be reviewed. (ii) Zoning regulations to be enforced.	UD Department, PKDA
PREPAREDNESS AND RESPONSE		
Specialized Response Teams at Regional level	(i) Designation of units for conversion into Specialist Response Teams. (ii) Designation of training centers. (iii) Training of trainers. (iv) Procurement of equipment using CRF, OSDMA resources (v) Training of teams.	OSDMA, State Police Training College/ District Fire Training Institute
Setting up Emergency Operations Centre[EOC]	(i) Multi hazard resistant construction. (ii) Communication system linkages. (iii) Mobile EOCs for on-site disaster information management	Public Works Department of state/PKDA, ULB'S
Emergency Support Function Plan	(i) departments/agencies which perform emergency support functions to draw up ESF plans constitute teams, and set apart resources in advance so that postdisaster response is prompt.	State Government, Puri collectorate
Disaster Management Plans	(i) To be drawn up under the supervision of District Magistrate/Collector and to include mitigation, preparedness and response. (ii) Emergency Support Functions by various Departments to be included. (iii) To be drawn up in consultation with all relevant Departments. (iv) District inventory of resources to be maintained.	State Government, OSDMA, Puri Collectorate, PKDA, ULB's
EARLY WARNING SYSTEMS		
(i) State of the art sensors to be	(i) IMD/CWC/OSDMA to carry out a review of sensors available and draw up plans for	Indian Meteorological

Key Components	Policy Measures	Institutions
set up. **(ii) Hazard monitoring, tracking and modelling.**	strengthening the system. (ii) Models to be updated to improve prediction accuracy.	Department/ National Centre for Medium Range Weather Forecasting/OSDMA
Warning Protocols	(i) Warning protocols to be user friendly. (ii) Warning to be communicated as quickly as possible to the States/districts/community. (iii) Protocols should be simple to understand. (iv) Districts to set up protocols for communication of early warning to the community. (v) Panchayats/local bodies to be used for early warning communication. vi) Communication linkages for early warning.	IMD, OSDMA, District Information Centre
CAPACITY BUILDING AND KNOWLEDGE MANAGEMENT		
Training for services /cadres/ agencies involved in mitigation, Preparedness or response.	(i) Training needs analysis/ Human Resource Development Plan (ii)Drawing up of capsule courses for training. (iii) Training of trainers. (iv)Setting up/strengthening training institutions in state faculties of Disaster Management in Administrative Training Institutes	State Government of Orissa
Mass media campaign for awareness generation	Design and develop a communication strategy for awareness campaign Use audio, visual and print medium to implement awareness campaign Development of resource materials on mitigation, preparedness and response	State Government, OSDMA, District weather office
Non-government community-based organizations involved in awareness generation and community participation	(i) Facilitate network of non-govt community based organizations at district level/Regional/ULB (ii) Co-opted into the planning process and response mechanisms at all levels	NDMA, OSDMA
Promote research in state and regional institutions in the areas of disaster risk reduction	(i) Assessment and evaluation of ongoing programmes and activities regular documentation of key lessons (ii) Establish Regional Disaster Resource Network as knowledge portal to pool and exchange information and knowledge among all concerned institutions and organization	NDMA, OSDMA, PKDA, PMC, NAC

9.4 Linking DMP PKDA to National Programs

The Disaster Management Plan of PKDA can be linked and featured through the various government plans and programmes. The following sections detail certain possible options. While the Eco – City program aims at improvement of the city environs through funding mechanisms for relevant infrastructure, the Urban Disaster Risk Reduction states the policy guidelines for the development of suitable disaster risk reduction strategies. The National Mission on Sustainable Habitat suggests interventions in the various components of the urban infrastructure for better livability and higher sustainability.

9.4.1 *Eco City*

The Ecocity Programme has been conceptualized for improving environment and achieving sustainable development through a comprehensive urban improvement system employing practical, innovative and non-conventional solutions. The EcoCity Programme was initiated under the 10th plan to bring in visible environmental improvement in the small and medium towns.

The primary features of the proposed model are as follows:

- Innovative, non-conventional, practical and sustainable
- Cost effective
- Easily maintainable
- Simple in design, creating visible impact
- Replicable
- Providing multiplier effect
- Using locally available materials and artworks
- Adopting concepts and designs that appeal/suit the local people
- Custom made with state-of-art designs to suit local conditions and play a catalysing and demonstrating effect

Active participation of public in the improvement of the city should be encouraged right from the stage of planning to their implementation. Public-private partnership should be encouraged through the system where government, private business and civil society pool their resources and skills to address the urban environmental challenges.

The main results expected to be achieved from the EcoCity Project are:

- Improved environmental quality
- Improved traditional water bodies

- Improved sanitary conditions including efficient solid waste management and drainage system
- Improved amenities for tourists/pilgrims
- Improved traffic & transportation system including pilgrim/tourist friendly routes

Till now various projects have been undertaken under Eco-city programme in Puri town which are:

- Repair/Covering/Improvement of existing drains around Lord Jagannath Temple
- Improvement of drinking water point at Lion's Gate near Lord Jagannath Temple
- Improvement of public toilet near Narendra tank

The feasibility studies for the following projects are under preparation

- Rejuvenation of Traditional Water Bodies- Markendeya Tank in Puri
- Shifting of Auto Garages from existing location along Grand Road and vicinity of Jagannath temple - Development of Eco Automobile Park in Puri

It is suggested this model of Eco city should be expanded through undertaking of various environment conservation projects which will give a different shape to the as well as the entire region.

9.4.2 *Urban Disaster Risk Reduction*

Disaster risk management (DRM) is a set of processes, planning actions, policies and legal and institutional arrangements aimed at managing, and eventually reducing the effects of hazardous events (natural or man-made) on the human and physical assets of a community, and minimizing the impacts of these hazards on the delivery of essential services to the population. These policies and actions take place at various levels often at the community level (e.g., neighborhoods, associations, etc) to escalating levels of government (district, municipal, provincial, and central). They can be formal or informal, public or private; however, their effectiveness is highly correlated to the level of coordination that takes place during the course of implementation. The protection of assets (human, institutional and material) and services establishes the link between DRM and development. As a community takes measures to make its built environment and its processes for management of resources and delivery of services (i.e., transportation, sanitation, energy, health, education, etc) resilient to external damaging hazards, it is accomplishing disaster risk reduction (DRR).

DRR is an overlap between three broad actions:

1. An analysis of the risk elements. This starts with an assessment of the risks as they relate to the various assets and services that underlie the socio-economic conditions of a community (e.g., transportation, or health care delivery, or education, etc.). Several techniques exist and are used in the identification, assessment and analysis of risk. They encompass simple empirical techniques to very complex analytical scientific and engineering approaches.

2. The existence and effectiveness of the policies, strategies and planning processes for the management of the risks and the inter-coordination mechanisms for the implementation of these policies and their resulting programs
3. The communication and understanding of risk and risk management practices to the public and to various institutions that serve the public.

There are several short and long term strategies can be adopted for effective mainstreaming of disaster risk management which is as follows:

- Attaining more favourable legal and institutional arrangements
- Integrating DRR in land use planning and urban development
- Improving the project planning and project execution capabilities of local government
- Promoting urban redevelopment as a powerful tool to reduce urban risk
- Enforcing life-safety construction standards for every new building
- Raising the standard of care and work ethics
- Developing a culture of prevention
- Improving regional cooperation to generate resources and incentives

9.4.3 *National Mission for Sustainable Habitat*

The national mission on sustainable habitat which is one of the eight missions under national climate change action plan aims to make cities sustainable through improvements in energy efficiency in buildings, management of solid waste & shift to public transport. It is suggested that development standards and guidelines in the region should follow the proposals identified by the mission.

The proposals broadly cover the following aspects:

- Extension of the energy conservation building code - which addresses the design of new and large commercial buildings to optimize their energy demand;
- Better urban planning and modal shift to public transport - make long term transport plans to facilitate the growth of cities in such a way that ensures efficient and convenient public transport;
- Recycling of material and urban waste management - special areas of focus will be development of technology for producing power form waste.
- Bio-chemical conversion, waste water use, sewage utilization and recycling options wherever possible.

The deliverables identified by the NMSH which should be incorporated in the development framework in the PKDA region are as tabulated below:

Sl. No.	Mission Deliverable Needs to Implemented
1.	**Sustainable Habitat Standards – development and incorporation in State laws** ○ Development of Standards ○ Consultation with Stakeholders ○ Circulation of finalized standards ○ Amendment in Rules/Acts
2.	**Promotion and Support of public transport** ○ Promotion and use of Its ○ Preparation of Comprehensive Mobility Plan ○ Introduction of cycle sharing scheme ○ Inter medal integration of different transport modes
3.	**Incentivization of cities taking up waste recycling projects and waste to energy projects** ○ Demonstration projects for decentralized waste management system for community/housing complexes/public buildings ○ Demonstration project for state and sustainable system of human waste disposal in peri-urban areas ○ Awareness programme for segregation and storing bio-degradable and non-bio degradable waste ○ Demonstration project for waste recycling ○ Demonstration project for waste to energy
4.	**Supporting through earmarked funds, pilot/demonstration projects for promotion of sustainable habitats** Following activities could be considered in the cities :- ○ Pilot project for financial incentives for energy efficient construction ○ Demonstration project for recycling of construction waste ○ Demonstration project for energy efficient construction technologies for housing for EWS/LIG categories ○ Demonstration projects for promotion of low-use water toilets and ecological sanitation approaches ○ Demonstration project for promoting use of treated waste water for artificial recharge of aquifers ○ Pilot projects for segregation at the household level of black and grey water ○ Promotion of renewable energy in residential and commercial sectors
5.	**Capacity building of both the elected leadership and the professional leadership of urban local bodies**

10. Institutional Set Up



10. INSTITUTIONAL SET UP

Institutional arrangement is a key component for successful implementation of any planning document. This chapter hence will focus on developing effective organizational structure as well as clear interlinkage between them. Strategies for capacity enhancement will also be touched upon for ensuring better and efficient implementation of this Comprehensive Development Plan of PKDA area.

10.1 Existing Institutional Mechanism – PKDA Region

There are different institutions, local authorities and planning agencies operating in the region providing different services in the study region. Those are Puri Konark Development Authority (PKDA), Puri Municipality, Konark NAC, Village Panchayets, and district Collectorate. There are other Parastratals service providing agencies namely Orissa Water Supply and Sewerage Board (OWSSB), Public Health Engg. & Organization (PHEO), Works Department (R&B Division), Water Resources Department, Dept. of Forest & Environment, Revenue Dept., Orissa Pollution Control Board, Orissa tourism development corporation (OTDC), etc.

The table below highlights the major roles and responsibilities of various local level institutions, state level agencies/ Parastratals and various planning authorities.

Table 58: Existing Roles & Responsibilities performed by Various Institutions in PKDA Region

Name of Institutions	Roles & Responsibilities Performed
PKDA	• Preparation of Interim, comprehensive and zonal development plans • Enforcement of the provisions of the development plan, zoning regulations and planning and building standards by way of issuing permissions for construction of buildings • Preparation of development schemes and its implementation • All city planning functions, development controls and building sanctions • Principal objectives of the authority include creation of housing stock, creation of commercial complexes, improvement of city level infrastructure, environmental improvement, parks and plantations in colonies, blocks, institutions and roadsides.
Puri Municipality	• Urban planning including town planning • Planning for economic and social development • Public health, sanitation, conservancy and solid waste management • Urban forestry, protection of the environment, and promotion of ecological aspects • Safeguarding the interests of the weaker sections of the society, including the handicapped and the mentally retarded • Slum improvement and Upgradation • Urban poverty alleviation

Name of Institutions	Roles & Responsibilities Performed
	• Promotion of cultural, educational and aesthetic aspects • Burials and burial grounds; cremations, cremation grounds and electric crematoriums • Cattle pounds, prevention of cruelty to animals • Vital statistics including registration of births and deaths • Public amenities including street lighting, bus stops, public Conveniences • Regulation of slaughter houses and tanneries
Konark NAC	• Provide health, sanitation, water supply, roads, safety and public convenience of the citizen of the urban inhabitants. • Improvement and up-gradation of the socio-economical status of the Urban Poor's.
Village Panchayats	• Establishment of primary health centres and primary schools. • Supply of drinking water, drainage, construction/repair of roads. • Development of cottage and small-scale industries and opening of cooperative societies. • Establishment of youth organisations.'
District Collectorate	• Maintenance of Law & Order • Monitoring different developmental activities. • Monitoring rescue operation during emergency like flood, drought and all sort of accidents. • Different Welfare activities for upliftment of SC & ST community. • Rural sanitation & Electrification. • Promote literacy in the sphere of women & illiterate. • Promote health of child & women through ICDS Projects • Rural connectivity.
Public Health Engg Organization (PHEO)	• Construction & O & M of city water supply, sanitary, sewerage installation owned by the GoO • Planning, Designing, construction, O & M of W/S & management of WW schemes including their transportation and distribution • Construction & maintenance of the external & internal W/S, sanitary & sewerage installation for state govt. buildings (both residential & non residential) in the city
Works Department (R & B Division), GoO	• Construction, repair & maintenance of buildings, roads, bridges & other related structures financed from the state & capital budget allocations of the GoO • All major arterial roads in the city are under the control of the WD • Ensuring that no encroachment or structure, whether temporary/permanent is erected on the land & property under the control of WD. It is also responsible for removal of such encroachments as per the GoO rules • Maintaining a register of land, buildings & properties belonging to the GoO & under the administration of WD

Name of Institutions	Roles & Responsibilities Performed
Orissa Water Supply & Sewerage Board (OWSSB), GoO	• Construction of WS, sanitary sewerage scheme on behalf of PHEO & local bodies at their cost and on payment of cent age charges
Water Resources Dept., GoO	• Construction & maintenance of major storm water drains
State Pollution Control Board, Orissa	• Pollution control & environmental protection • Dealing with environmental monitoring and pollution control in the state • Environmental Planning studies for the entire state
Directorate of Town Planning, GoO	• Advises the GoO on matters pertaining to urban planning
1. Orissa Tourism Development Corporation **2. State Tourism Dept., GoO**	• Identification & development of tourist interest site, publicity & development of infrastructure of tourism in form of lodging and boarding, transportation facilities. Arrangement of different tourism packages covering different tourist sites
1. Forest (City Afforestation) **2. Social Forestry**	• Development and maintenance of greenbelts, road side plantation, development of parks and social forestry
1. Archaeological Survey of India (ASI), GoI **2. State Archaeological Dept.,**	• Identification, protection of preservation of ancient monuments of national and state importance • Excavation of new sites of archaeological importance
Jagannatha Temple Administration	• Management & protection of temple precinct • Promotion of tourism and heritage spirit

10.1.1 *Institutional Overlaps in Service Delivery: PKDA*

Preparation of various proposals and arrangements for service delivery in PKDA region is presently carried out by more than 15 city level, regional and state level agencies. Due to the fact that the two local bodies in the region have been entrusted with limited responsibilities there is predominance in parastratals for key service provisions. Due to this multiplicity of institutions there is always a need felt for greater co-ordination and accountability which is currently missing. The overall sector wise categories for service provision and involved organizations are mapped out in the table below:

Table 59: Overlapping responsibilities in service delivery within PKDA region

ector	Description	H&UD Dept, GoO	DTP	PKDA	Puri Municipality	Konark NAC	NHIA	OWSSB	PHEO	Dept. of Forest & Environment	OTDC	PWD (R&B)	ASI	Shri Jaganath Temple Trust	Water Resources Dept.
Development Plan	Comprehensive Development Plan	√	√	√											
	City Development Plan	√	√		√										
Water Supply	Plan, Design & Construction							√							
	HH Connection								√						
	O/M								√						
	User Charges								√						
Sanitation	HH Connection				√	√									
	Design Approval							√	√						
	HH Discharge Approval				√				√						
	Community Toilet				√	√			√						
	Public Toilet				√										
Sewerage	Plan, Design & Construction							√							
	HH Connection							√							
	Operation & Maintenance				√			√							
	Sewage Treatment Plant							√							
	Disposal				√	√		√							
Strom Water Drainage	Plan, Design & Construction				√										√
	Operation & Maintenance				√										√
Solid Waste Management	Collection				√	√									
	Storage				√	√									
	Transportation				√	√									
	Sorting & Processing				√										
	Disposal				√	√									
Transportation	Planning, Design & Construction				√		√					√			
	Operation & Maintenance				√	√	√					√			
	Collection of charges						√					√			
Heritage Conservation & Tourism	Protection/Conservation of monuments				√								√	√	
	Planning for tourism development									√	√				
	Management & development of tourism										√			√	

10.1.2 *Existing Organization Structure and Staffing Pattern in PKDA*

Puri Konark Development Authority is headed by the Chairman, currently the Honorable Minister of Housing & Urban Development Department, Orissa. He is followed by Vice Chairman who is the Collector of Puri District. The leading executive of PKDA is the Planning Member & Secretary who is responsible for overall operation of the organization. He is assisted by officials from two sections: Planning and Engineering. The Town & Regional Planning Section is headed by town and regional planning member who is followed by technical assistant, investigator, architectural assistant, draftsman etc. on the other hand the Engineering section is headed by Engineer member followed by assistant engineer and junior engineer.

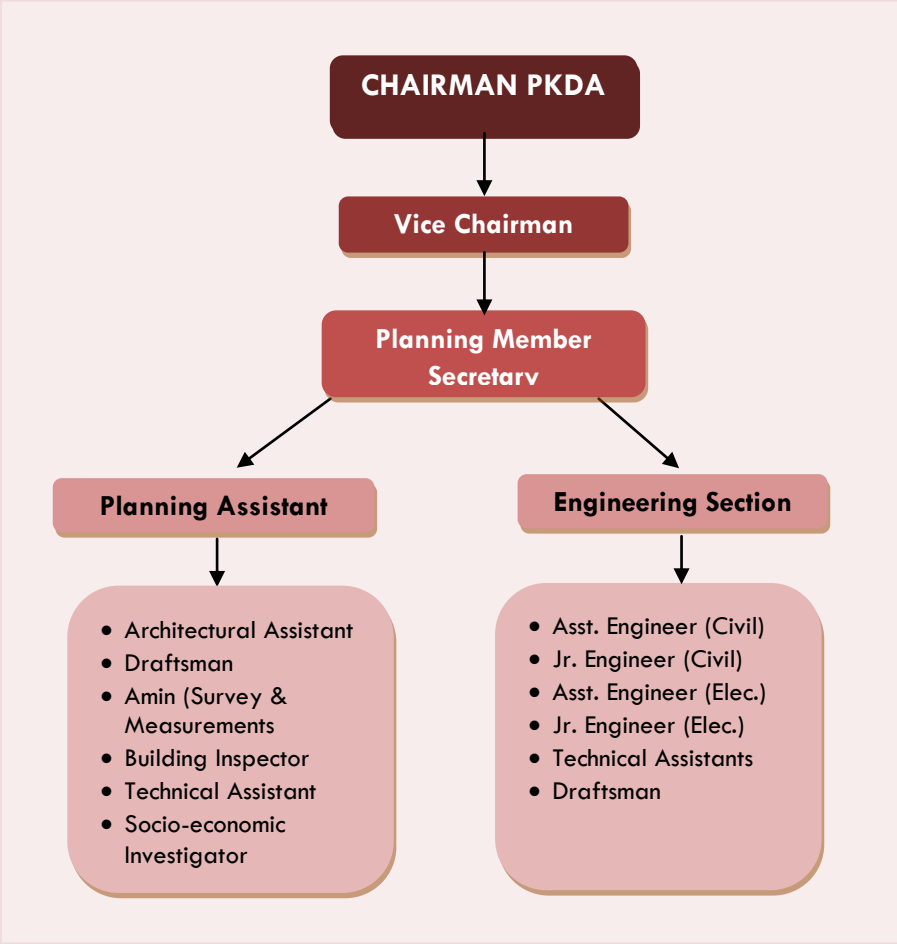


Figure 38: Existing Organizational set up: PKDA

Table 60: Staffing Inventory for PKDA

Section	Designation	No. of Staffs	Vacant position
Town & Regional Planning	T & RP Member (Part time)	1	
	Technical Assistant	1	
	Investigator	1	
	Architectural Assistant	1	
	Draftsman	1	
	Tracer	1	1
	Printer Operator	1	
	Building Inspector	1	
	Amin	2	
	Chainmen	2	
	Peon	2	
	DLR's	7	
Engineering	Engineer Member (Part time)	1	
	Assistant Engineer (Civil)	1	1
	Junior Engineer (Elet.)	1	
	Junior Engineer (Civil)	1	1
Establishment	Secretary, Est. (Part Time)	1	
	Section Officer	1	
	Sr. Assistant	1	1
	Jr. Assistant	3	
	Jr. Steno	1	
	Jr. Draftsman	1	
	Driver	1	
	Peon	2	
	Watchman	1	
	DLR's	3	
Finance	Finance Member (Part Time)	1	
	Section Officer	1	
	Sr. Assistant	1	
	Peon	1	
Architecture	Architect Member	1	1

10.1.3 *Organogram Mapping for two ULB's in the Region: Puri Municipality & Konark NAC*

Puri town which is the major urban spread in the region is governed by Puri Municipality entrusted with various planning and service delivery functions. The Political wing of the ULB comprises of The Chairman who is the head of the Municipal body, Vice Chairman and the City Council. The Executive wing is headed by Executive Officer drawn from IAS cadre and employed by State. He is assisted by three officials heading the departments in the ULB: Additional Executive, Municipal Engineer and Health Officer. The overall organiosational set up of Puri Municipality is mapped below.

On the other hand Konark NAC has similar political structure as explained in case of Puri Municipality, but having different executive structure. The NAC is having four departments which are: Establishment, Public Works, Tax and Sanitation. The staff strength is as follows, Executive officer (1), Junior Engineers(2), Junior Assistant(2), Tax collectors(4), Peons(3), Sweepers(3). There are 21 other workers (DLL/NMR) for street sweeping, waste collection etc.

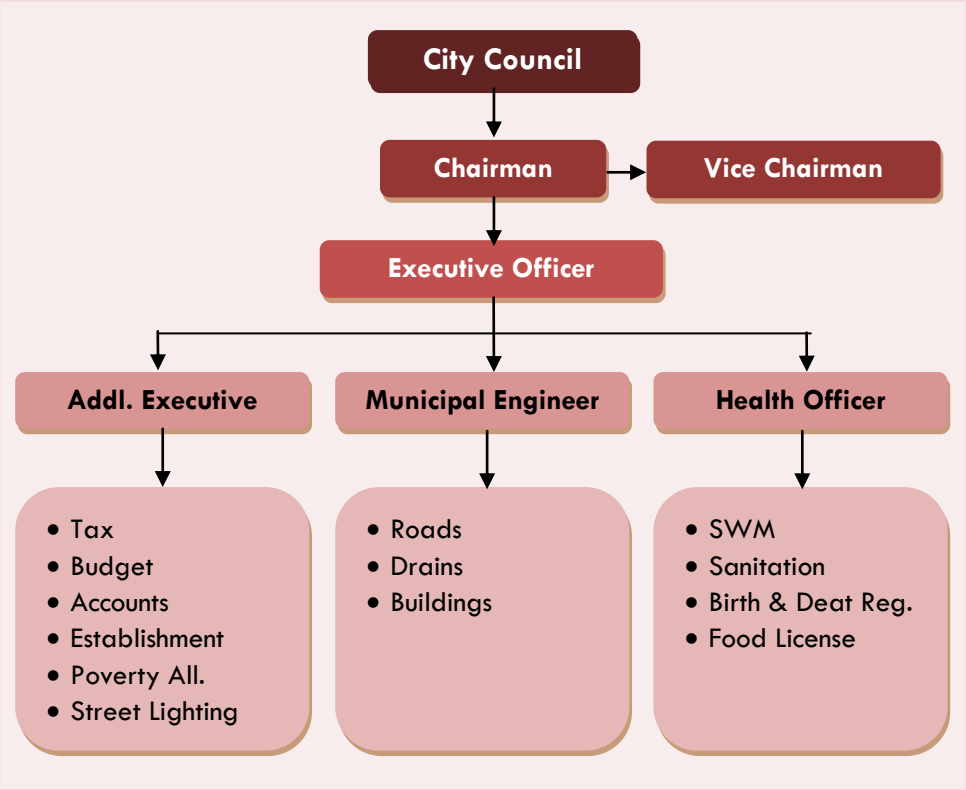


Figure 40: Existing Organisational Structure of Puri Municipality

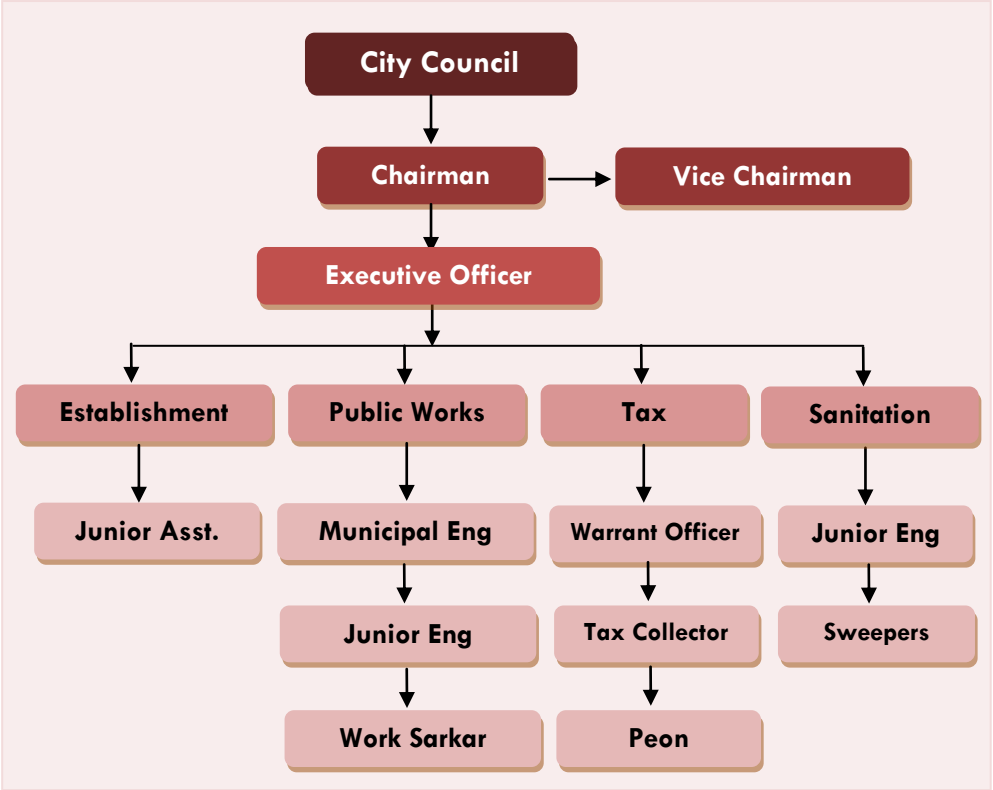
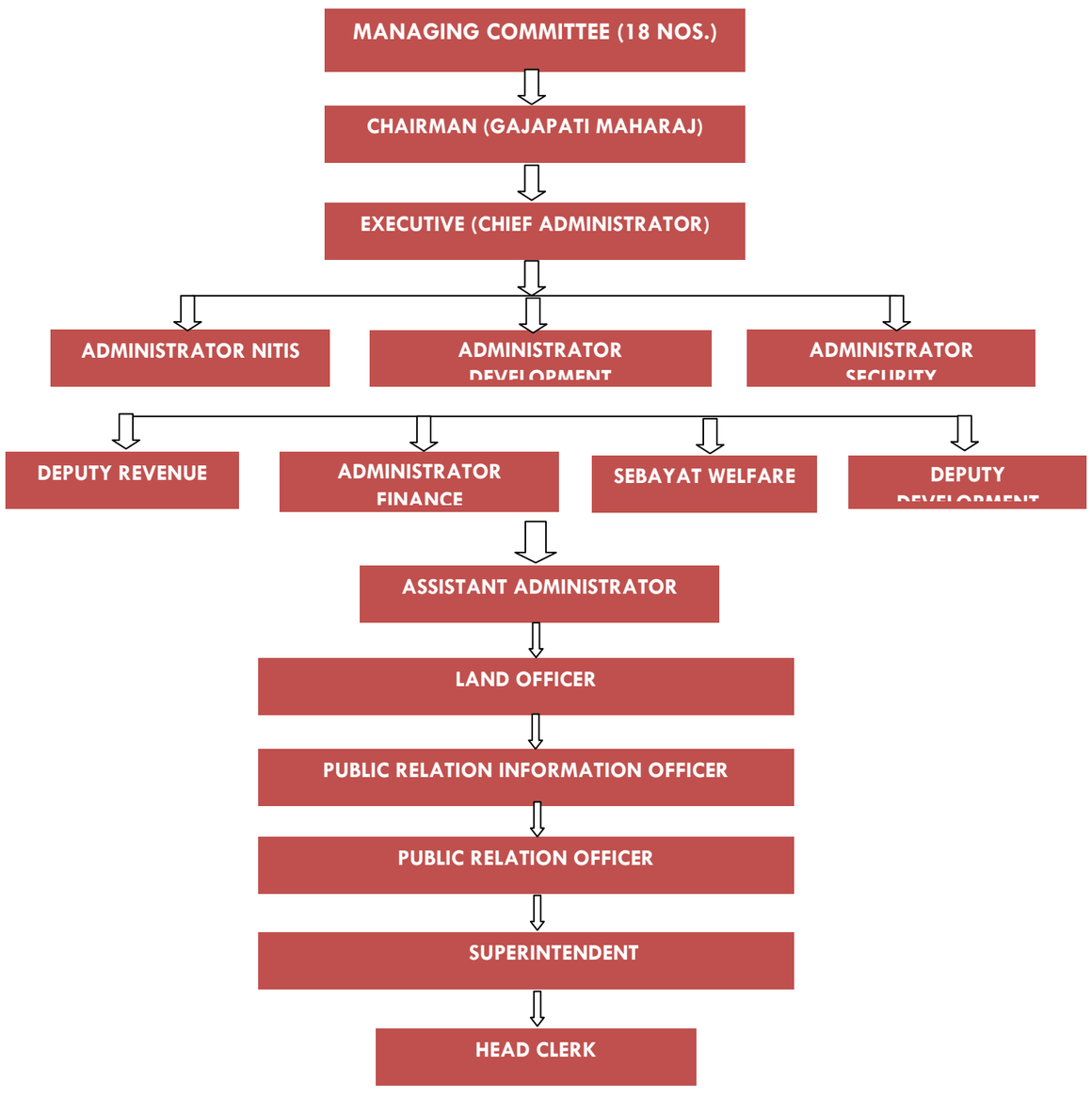


Figure 39: Existing Organisational Structure of Konark NAC

10.1.4 *Temple Administration Organization Structure*

This maintenance and administration of this great Jagannatha temple is like a small state within a big state. The foundation of a sound administrative system was laid by the Gajapati Kings for smooth management of the temple. The Puri ShriJagannath Temple (Administration) Act, 1952 " with provisions to prepare the Record of Rights and duties of Sevayats and such other persons connected with the system of worship and management of the temple. Subsequently a special act known as “Shri Jagannath Temple Act - 1955 " was enacted to reorganize the scheme of management of the affairs of the temple and its properties. In terms of the provision of this act the management, administration and governance of the temple vests in a committee known as "Shri Jagannath Temple managing committee. The existing administrative structure of this entity is as follows\



Temple Administration Organization Structure

10.1.5 *Key Issues Observed from Existing Institutional Set up*

- Lack of inter and intra departmental co-ordination between various local level and state level institutions resulting poor planning and delay in implementation of various development proposals.
- Lack of effective decentralization of local administration as per the true spirits of the 74th Constitutional Amendment Act, CAA..
- Although various specific regional level plans have been prepared but due to weak implementation mechanism those has not been effective.
- Lack of adequate skilled staffs in PKDA and Puri Municipality resulting in poor service delivery.
- Poor revenue mobilisation fabric at ULB level.
- Lack of capacity building and training initiatives has been a barrier in front of successful planning and management of infrastructure services.

10.2 Analysing Possible Options for Strengthening Institutional Structure and Linkages

10.2.1 *Objectives*

The main objective of the analysis is to:

- Frame adequate institutional set up for PKDA region to better plan and implement development strategies,
- To strengthen the co-ordination between various service providing institutions acting within the regions for effective service delivery mechanism, and
- Better operation and maintenance as well as adequate revenue generation for sustainable infrastructure investment.

10.2.2 *Need for strengthening of Organization Structure, Departmentalization & Staffing for PKDA Based on 12th FY Capacity Development Report*

It is suggested that the basic responsibility of PKDA shall be to prepare Comprehensive development plan of the entire area and delineate boundary of authority, prepare zonal development plans and provide zonal level infrastructure services to the entire area and technical support for regional physical and social, heritage & tourism infrastructure development strategy identification. For performing overall responsibilities entrusted on the authority PKDA shall be headed by Chairman, Vice Chairman with a Chief Executive Officer responsible for overall operation. Under CEO various divisions/sections shall be as under.

- **Town Planning Dept** – Headed by Town Planning Member with Assistant Town Planner, Junior Town Planner, Enforcement Officer and drawing and CAD operators in the hierarchical order.
- **Engineering Section** – Headed by Engineer Member followed by Executive Engineers (drawn from PH Division & R & B), Assistant Engineers, junior Engineers and CAD & Data entry operators.
- **Finance and Accounts division** – Headed by Finance & Accounts Member with Dy. Manager Finance, Dy Manager Project & Costing, Manager MIS and Assistant staffs.
- **Architecture, Heritage & Tourism Dept** – Headed by Architect Member supported by Asst. Architect Heritage, Tourism Expert and Draftsman.
- **Administration** –Headed by Secretary Administration and followed by Establishment Officer, Land Officer, Legal Officer and Assistants, and
- **Forests and Agriculture division** – Headed by Forest Officer with Agricultural Expert and Landscape Expert.

The proposed hierarchy and the organizational framework for Puri Konark Development Authority (As shown below) has been drawn on the basis of responsibilities needs to be performed by the authority as demarcated by the CDP as well as keeping in view the Organization structure of other Development Authorities (BDA, CDA, RDA) in the State.

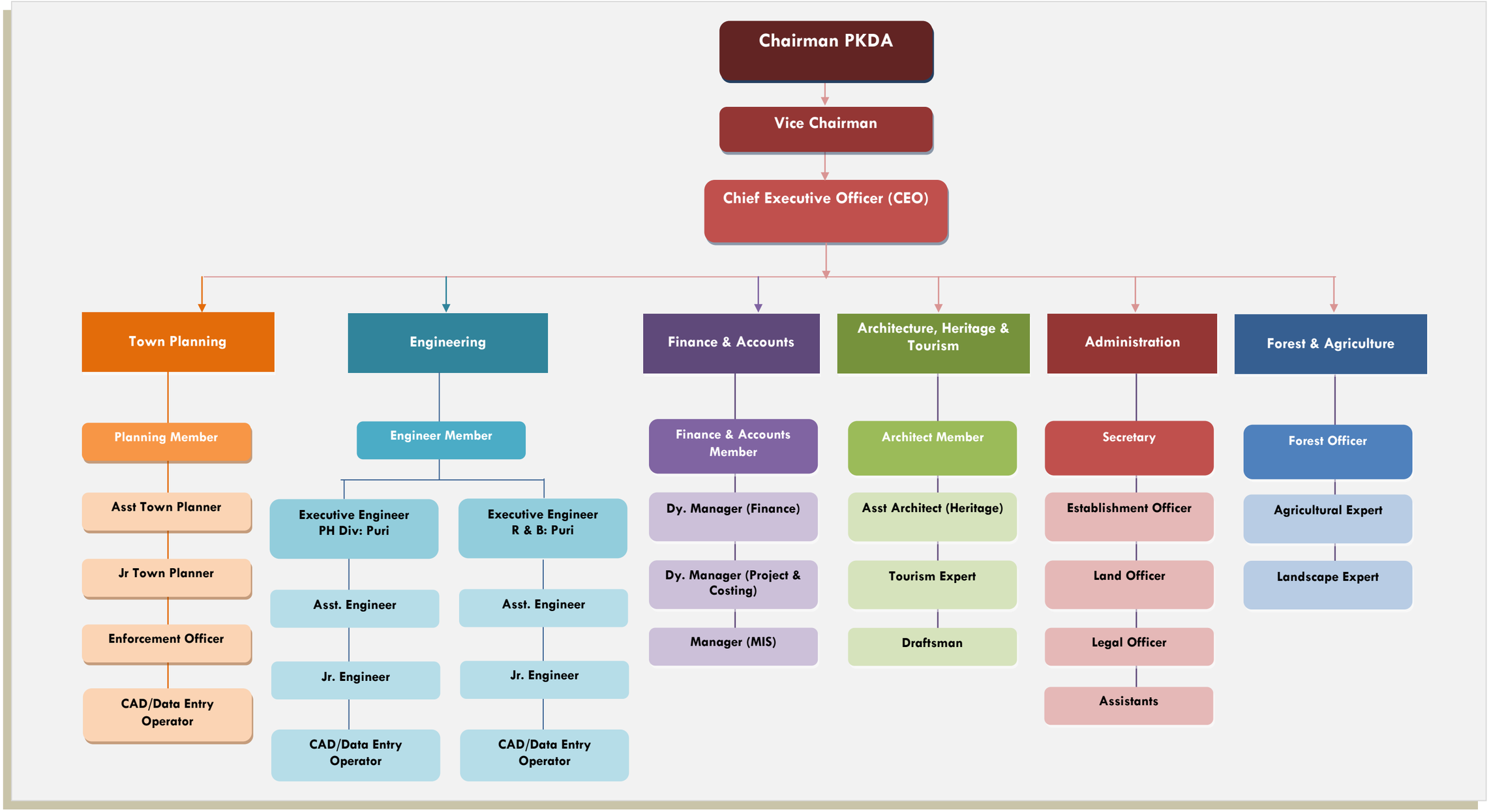


Figure 41: Suggested Organizational Framework for PKDA

It is proposed that PKDA should be consisted of 6 major departments/Sections to carry out several function entrusted upon them to implement the PKDA CDP. The responsibility to handle various works related to the departments lies with different officials in hierarchic manner. The table below has been formulated to highlight suggested staffing needs for various departments, departmental roles and qualification as well as number of staffs in hierarchic manner:

Table 61: Possible Staffing Pattern for PKDA

Department	Post	Area of Work Assigned	Qualification	Proposed Number
Town Planning	Planning Member	Building permission and building use permission, Preparation of TP Schemes, Control unauthorized construction	M. Plan./M.Tech.	1
	Assistant Town Planner		M. Plan./M.Tech.	1
	Junior Town Planner		B.E./M.E.	1
	Enforcement Officer		B.E./M.E.	2
	Draftsman/Tracer		B.Arch./ Dip. Architecture	2
Engineering	Engineer Member	Development works, Planning, Design & maintenance of civic services	M.E/ M.Tech./ M.Plan.	1
	Executive Engineer		B.E./M.E	2
	Assistant Engineer		B.E./M.E	3
	Junior Engineer		B.E./M.E	2
	Technical Assistant (CAD)		B.E./B.Arch/ B.Tech.	2
Finance & Accounts	Finance & Accounts Member	All the activities related to accounts and finance in the organization	Graduation/ MBA	1
	Dy. Manager (Finance)		Graduation/ MBA	1
	Dy. Manager (Project & Costing)		M. Tech.	1
	Manager (MIS)		M. Tech./ B.Tech	1
	Assistants		Diploma/Intermediate	2
Architecture, Heritage & Tourism	Architect Member	Heritage Planning & management	M. Tech. /M.Plan. /M.E. /M.Arch.	1
	Asst Architect (Heritage)		M. Arch./ B.Arch.	2
	Tourism Expert		Graduation	1
	Draftsman		Graduation	1
Administration / HR	Secretary	Transfers and postings, pay fixation and matters relating to employees and contract workers; Secretarial matters; Public Relations; Monitoring; Public grievances; Legal Matters etc.	OAS	1
	Establishment Officer		Graduation	1
	Land Officer		Graduation	1
	Legal Officer		BA LLB	1
	Assistants		Diploma/Intermediate	2
Forest & Agriculture	Forest Officer	Conservation, protection and development of natural heritage	OAS	1
	Agricultural Expert		Graduation/BE Civil	1
	Landscape Expert		M. Tech/ BE Civil	1
			TOTAL	**37**

Note: *Based on 12th Financial Year capacity development report staffing norms and CEPT Analysis*

10.2.3 *Possible Options for Changes in Status and Structure in the ULB's of PKDA Region: Puri Municipality & Konark NAC*

From the institutional analysis and service provision standards it is been observed that the existing ULB set up in Puri Municipality and Konark NAC is insufficient. In the context to growing population and greater demand for service provision it has been felt that there is an acute need for re organization and strengthening of existing local bodies in the area. In the proposed land use plan for 2031 a total of 377426 populations has been accommodated in Puri town and Puri Sadar area which will result in considerable increase in service demands. Hence it is suggested that the Entire area of Puri town and Puri Sadar should be governed under Puri Municipal Corporation. This calls for two changes in the form of Change in status of Puri Municipal Corporation from Puri Municipality and delimitation of existing municipal limits. The possible structure of then formed Puri Municipal Corporation should be as following:'

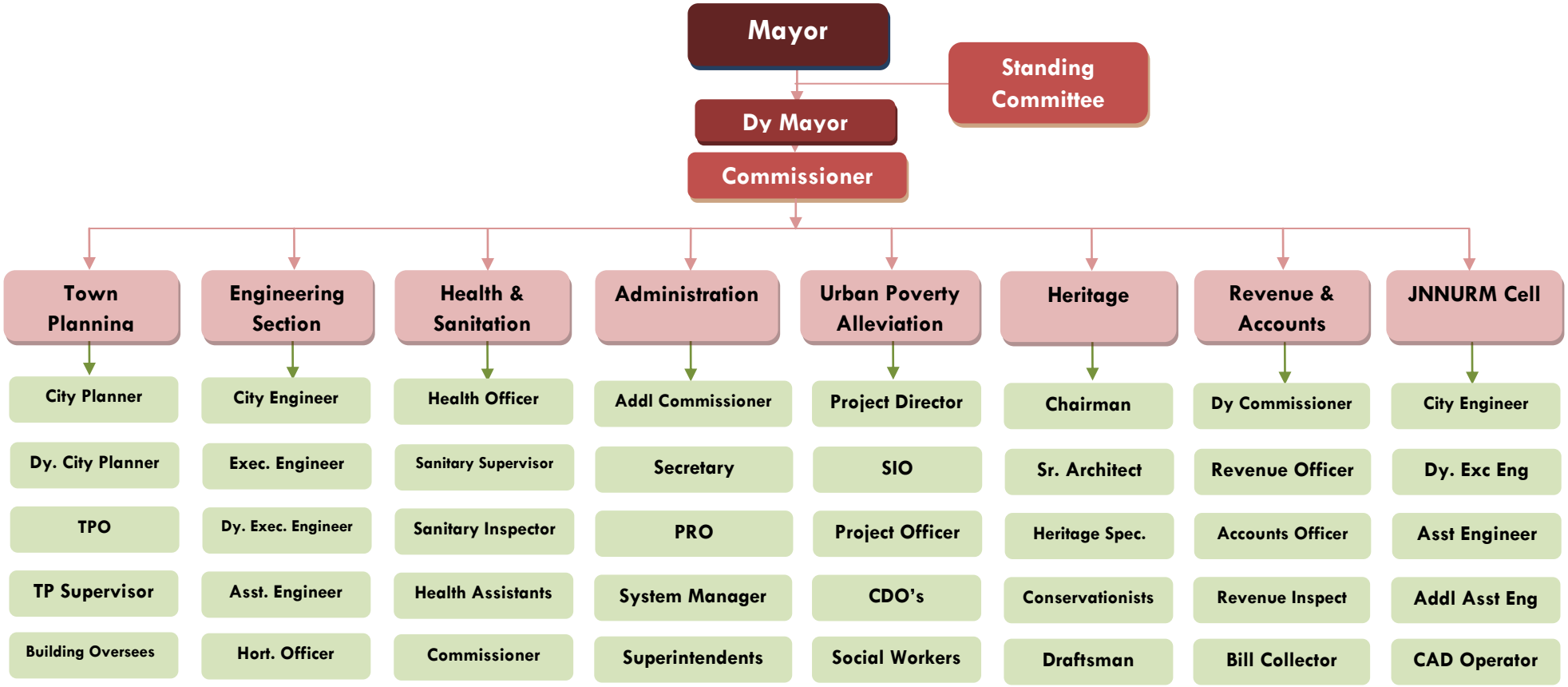
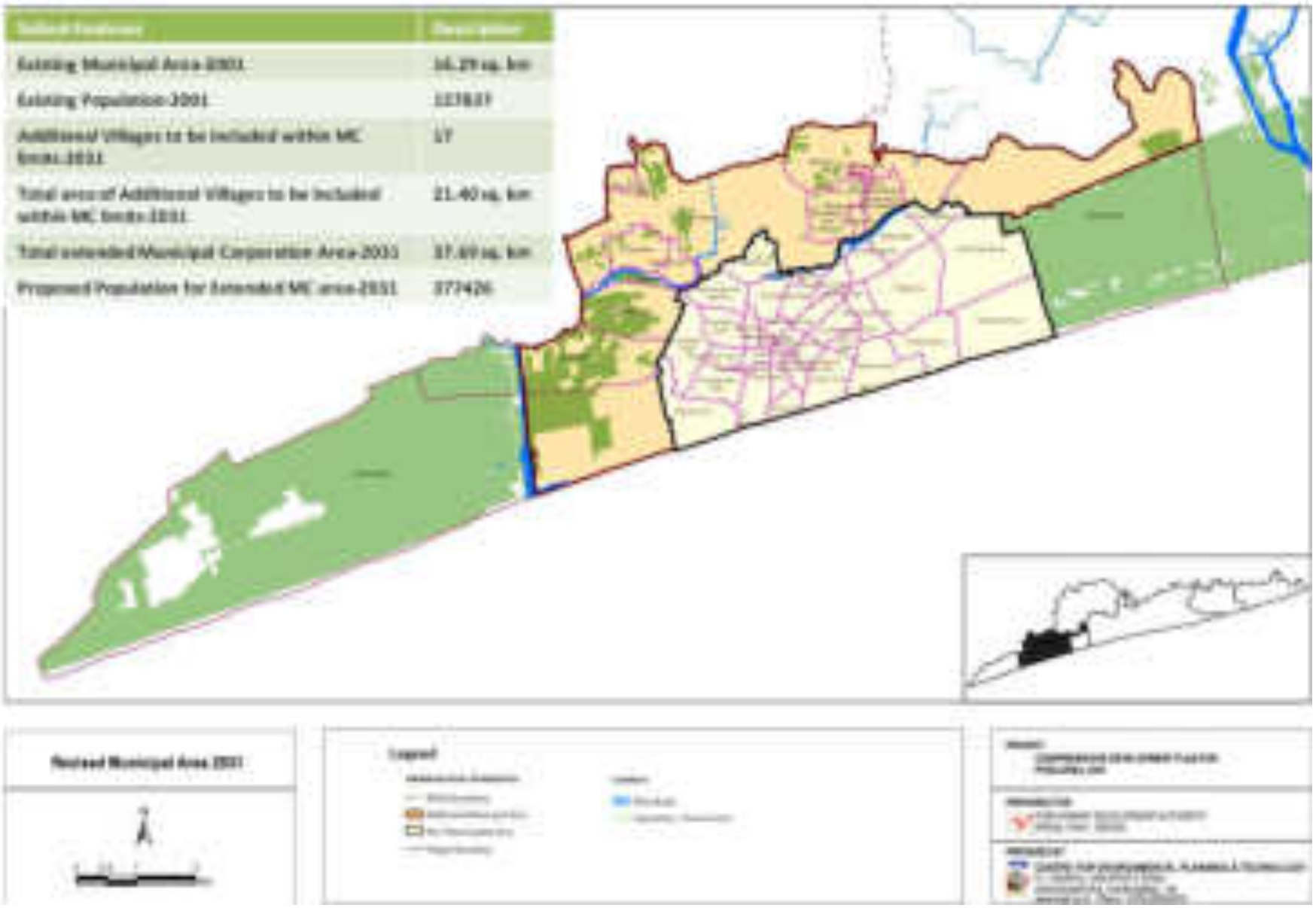


Figure 42: Possible Organisation Structure for Puri Municipal Corporation


Revised Municipal Area 2031
Legend

The organizational structure suggested for Puri municipality which is the major service providing authority for Municipal area as shown in below figure. The structure have been prepared keeping in view of the existing structure and responsibilities as well as demand for services arising under the context and *based on 12th Financial Year capacity development report staffing norms*. The organization will be headed by Chairman followed by Executive Officer with City Council acting as advisory body between the two. Various departments should work at the next level performing various activities as mentioned. A special purpose planning board should be formed at the Municipality level for undertaking planning and related activities. Key planning members from the same board should be nominated to the Regional planning committee formed at the regional level under PKDA

Table 62: Suggested Staffing Pattern for Puri Municipal Corporation

Departments	Position	Qualification	Numbers	Area of work
Town Planning	City Planner	M. Plan/M. Tech/ME	1	Building permission and building use permission, Preparation of TP Schemes, Control unauthorized construction etc.
	Dy. City Planner	M. Plan/M. Tech/ME	1	
	TPO	ME/BE	1	
	TP Supervisor	ME/BE	2	
	Building Oversees	BE	3	
	CAD/GIS Operator, Tracer	BSC/ B. Tech/IT	2	
	Town Surveyor	BE	2	
Engineering Section	City Engineer	M. Tech/ME	1	Development works and maintenance of civic services viz., water supply, drainage, roads, street lights, maintenance of public places etc.
	Exec. Engineer	M. Tech/ME	1	
	Dy. Exec. Engineer	ME/BE	2	
	Asst. Engineer	ME/BE	3	
	Hort. Officer	M. Tech/ME	1	
	Work Inspector	BE	2	
	CAD/GIS Operator	BSC/ B. Tech/IT	1	
Health & Sanitation	Health Officer	M. Tech/ME (Medical)	1	Solid waste management, Sanitation, Maintenance of dispensaries and Public Health. Promotion of health awareness programs, Registration of birth & death and implementation of various state and central schemes.
	Sanitary Supervisor	B. Tech/BE	1	
	Sanitary Inspector	B. Tech/BE	3	
	Health Assistants	B. Tech/BE	2	
	Sanitary Maistry	BE/Diploma	4	
Administration	Addl Commissioner	OAS	1	Transfers and postings, pay fixation and matters relating to employees and contract workers of all the departments; Secretarial matters; Public Relations; Monitoring; Public grievances; Election; Legal Matters etc.
	Secretary	Graduate	1	
	PRO	Graduate	1	
	System Manager	B Tech/M Tech (IT/STATS)	2	
	Superintendents	Graduate	3	
	Sr. Assistant	Graduate/Diploma	2	
	Jr. Assistant	Diploma/Intermediate	2	

Departments	Position	Qualification	Numbers	Area of work
Urban Poverty Alleviation	Project Director	Masters in Social Science	1	Slum development, Low cost Sanitation, Pension schemes, Poverty Schemes, SJSRY, Women Empowerment, EWS Housing, Basic services for urban poor, Assistance to oldage and disabled etc.
	SIO	Graduate	1	
	Project Officer	Graduate	1	
	CDO's	Graduate/Diploma	2	
	Social Workers	Diploma/Intermediate	2	
Heritage	Chairman	M. Arch/ME	1	Heritage conservation and development with coordinating with the state level agencies and departments and implement the identified projects under their guidance
	Sr. Architect	M. Arch/ME	1	
	Heritage Specialist	M. Arch/ME/ B. Arch	1	
	Conservationists	B. Arch/BE	1	
	Draftsman	B. Arch/BE/Intermediate	1	
JNNURM Cell	City Engineer	M. Tech/ME	1	Looking after JnNURM Projects, Urban Reforms and co ordination work with State and Central Govt.
	Dy. Exc Eng	M. Tech/ME	2	
	Asst Engineer	B. Tech/BE	1	
	Addl Asst Eng	B. Tech/BE	2	
	CAD Operator/Data Manager	Diploma/Intermediate	1	
Revenue & Accounts	Dy Commissioner	OAS	1	Preparation of demand, billing, collection and MIS, Assessment of new buildings and revision of old building assessment.
	Revenue Officer	B. Tech/BE	1	
	Accounts Officer	B. Tech/BE	1	
	Revenue Inspect	BE/Diploma	4	
	Bill Collector	BE/Diploma	20	
	Junior Accountant	Graduate/Intermediate	2	

Note: *Based on 12th Financial Year capacity development report staffing norms and CEPT Analysis*

Although Konark NAC is currently having a population of about16, 979 (2001 Census) it has been projected to grow to near about 40,040 in 2021 and 61,487 in 2031. Hence for effective governance in the urban area Existing ULB structure has to be reorganized to meet with the arising demand. Therefore it is suggested that the NAC status for Konark has to be revised with Municipality status by the state of Orissa. This will call for a change in the departmental structure and staffing in the ULB which can be developed following to the current structure of Puri Municipality as well as proposed hierarchy as discussed in this chapter.

10.2.4 *Possible Model for Interlinkage between Institutions for Implementation of CDP & Other Development Proposals: PKDA Communication Plan*

Due to preparation of various level plans and presence of various institutions in the region convergence of plans, clear demarcation of PKDA roles and interlink age between institutions is very crucial for efficient implementation of this plan and future PKDA assignments. Hence, post analysis and proposal for organizational stregnthenining focus have been given to define clear roles of PKDA in each sector and overall involvement of institutions in the region for implementation of this plan and integrated development as a whole. The below chart represents the suggested model for assigning responsibilities between institutions as well as enlists visualized involvement of PKDA in the overall scenario:

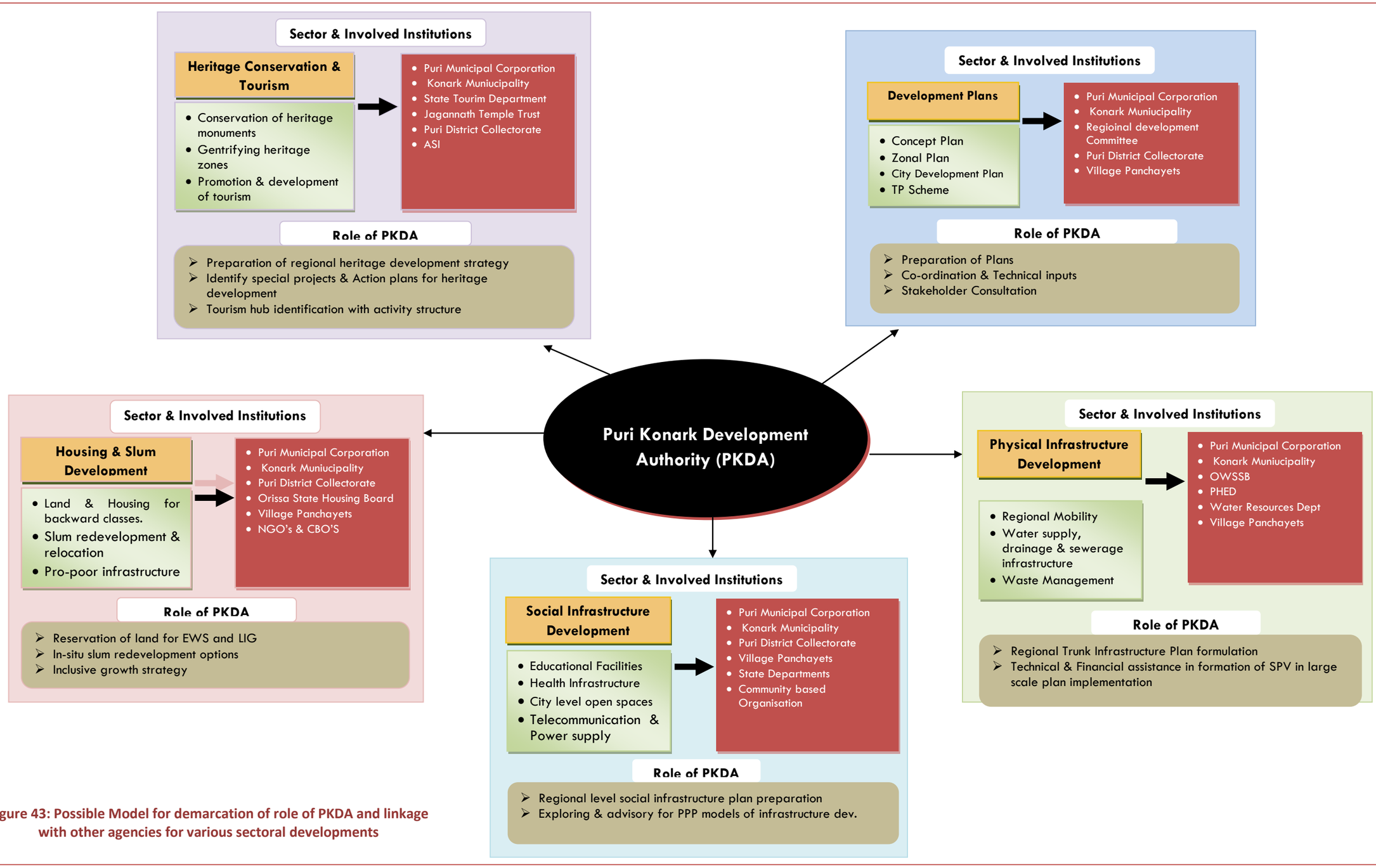


Figure 43: Possible Model for demarcation of role of PKDA and linkage with other agencies for various sectoral developments

10.3 Institutional Capacity Building

Capacity building is defined as the "process of developing and strengthening the skills, instincts, abilities, processes and resources that organizations and communities need to survive, adapt, and thrive in the fast-changing world." Capacity building is the elements that give fluidity, flexibility and functionality of a program/organization to adapt to changing needs of the population that is served.

Capacity Building is much more than training and includes the following:

- **Human resource development-** the process of equipping individuals with the understanding, skills and access to information, knowledge and training that enables them to perform effectively.
- **Organizational development-** the elaboration of management structures, processes and procedures, not only within organizations but also the management of relationships between the different organizations and sectors (public, private and community).
- **Institutional and legal framework development-** making legal and regulatory changes to enable organizations, institutions and agencies at all levels and in all sectors to enhance their capacities

The personnel engaged in management of urban affairs and municipal services are usually not trained for implementing a Comprehensive Development Plan in-house and thus, there emerges the need of long term handhold and capacity building support to the ULBs so as to enable them to internalize the urban planning and management capacities within the existing framework.

Thus, the underlying objective of the Capacity Building Program for PKDA area is to strengthen the existing in-house capacity of the ULBs for CDP Planning, Preparation, Implementation and Management. The proposed strategy is to combine various forms of capacity building approaches.

CEPT proposes a combination of various consultative delivery activities under the strategy as in

- Hands-on Workshops
- Theme specific Rapid Training Programmes
- Knowledge Support
- On Call Help Desk
- National Exposure Visits

- **Hands on Workshops**: On the job learning during preparation of CDP CEPT's support and guidance in form of hands-on on CDP Preparation.
- **Knowledge support**: Capacity Building Knowledge management hub to enhance participant's experience by exposing them to more knowledge and project experience.
- **National Exposure Visit**: Visit to Indian metros with local planning initiatives. Awareness and knowledge development on urban planning and development projects.
- **Help Desk**: Formulation of Capacity Building help desk with dedicated email ids for communication
- **On call internal and external expert guidance and support**

Figure 44: Capacity building strategy for CDP-PKDA

10.3.1 *Need for Capacity Building*

Appropriate capacity building allows the translation of plans into action, since it involves the capacity building of the actual agents of change. In PKDA the following heads have been identified that needs to have interventions which are not only technical but also have the component of capacity building of the right people. They are as follows:

- Development Planning
- Conservation of Heritage
- Urban Poverty Alleviation
- Environmental Sustainability
- Public Private Partnership
- Water Supply
- Sewerage & Sanitation
- Solid waste Management
- Urban Transport
- IT Applications
- Project Management
- Quality Control and Monitoring
- Procurement of Goods and Services
- Project Structuring
- Institutional strengthening
- GIS Database Management
- Preparation of Detailed Project Report

10.3.2 *Handholding Support for CDP Implementation and Sequencing of the Activities*

The overall, proposed interventions are detailed out through the following Tasks/Sub-Tasks, as under:

Table 63: Sequence of capacity building exercise

Task 1	**Introduction of Comprehensive Development Plan**
	• Why? When? How? • Kick off workshops • communication and awareness programmes
Task 2	**Hand Holding support**
	• City specific Engagement Planning • Consultations/Workshops • Hand-Holding Support (on and Off-line) • Help Desk/Expert Pool support (on Call basis)
Task 3	**Capacity Development**

	• Detailed engagement plans with PKDA
	  ○ Complete support intervention
	  ○ Knowledge and skill support
	  ○ Training the staff
	  ○ Establishing knowledge/skill transfer system
	• Technical and resource workshops
	• National Exposure Visits
	  ○ Identifying modern planning practices
	• Training of the City Staff
	• Formation of Specific Skill Sets
	  ○ Conservation of Heritage
	  ○ GIS Database management
	  ○ Infrastructure Planning & Management
	  ○ Project Management
	  ○ Bids Process Management
	  ○ Preparation of Detailed Project Report

Task 4	**Knowledge Management**
	• Peer Experience Sharing Workshops with other cities in india • Knowledge workshop with experts of various fields (City Level) • Process Documentation • Resource/Knowledge Bank Support • Model Planning Guidelines
Task 5	**Dissemination**
	• Web page development/ site linking • News letters • Publications/Working Papers/Lessons Learnt • Films

10.3.3 *Pre Training Consultation for Nomination of Participants*

The first step of pre-training preparation would be to consult with the targeted urban local bodies and state level Parastratals. The primary objective of the consultation would be aimed on to get better understanding about the need of training in each department. The secondary objective would be focused to convince the department heads and commissioners of ULBs about the need and importance of this training programme and request for the nominations.

A senior project team member from CEPT shall visit a few of the departments well in advance to discuss in detail with the secretaries of concerned departments as well as with the commissioners of ULBs. The pre-training consultation will be done through telephonic discussion, emails and faxes. Continuous follow up will be done with the cities to get nominations in time.

10.3.4 *Selection of Target Groups*

Since the training of the entire ULB is not possible, it becomes essential to identify the right target group who can be trained and they can transmit their learning's to their team. The target groups consisting of engineers from four levels, as given in table below.

Table 64: Target Groups for Capacity Building

TG	Target Groups	Designations			
TG 1	**Elected Wing**	Commissioner, Mayor, Deputy Mayor, Councilor			
TG 2	**Technical Staff**	**Local Bodies: Urban** • Puri Municipality • Konark NAC	**Local Bodies: Rural** • Puri District Collectorate • Village Panchayets	**Parastratals** • PKDA • PHEO • NHIA • OWSSB • Dept. of Forest & Environment • Revenue Dept. • PWD (R&B) • OTDC	**Other Local Bodies** • Shri Jagan Temple Trust • Math Sami Ashram etc.
TG 3	**Non Technical Staff**				

Engineers from sector specific Para-statals of individual department, like PKDA, PHEO, OWSSB, PWD, Revenue Dept. etc. had been included. Inclusions of staff from Para-statals are critical as they are important for such capacity building programmes.

The training can be split into two broad levels

- Level 1- Awareness and knowledge - which can be undertaken in 1-2 days
- Level 2- Skill development – which can be undertaken in 3-5 days

Duration of the training programme has been finalized by looking into the level of training required for different category of participants and their availability. As the senior groups like TG-I and TG-II require more of awareness and knowledge it could be decided to organize the training for one or two days, as availability of senior officials for longer period might be difficult.

For junior engineers and officials the training should be proposed for about 3 to 5 days to have a detail training programme for skill enhancement.

10.3.5 *Strategy Framework for Capacity Building*

The broad strategy framework for capacity building shall revolve around base minimum requirement which could be enlisted as below.

- On-site short Term Awareness Programme (1/2 day to 2 days)
- On-site medium/long term programmes along with specialized programmes
- Off-site specialized programmes
- Study Tours/Exposure Visits within the state
- Study Tour/Exposure visits- National
- Help Desk support/On-call expert support

10.3.6 *Preparation of Training Calendar*

As a part of training calendar spread over one year duration, few thematic area based on the needs of the PKDA were selected for capacity development.

- Urban Planning and Management
    - Development Planning
    - Environmental Sustainability
    - Public Private Partnership
    - Urban Poverty Alleviation

- Conservation of Heritage
    - Project Development
    - Water Supply
    - Sewerage & Sanitation
    - Solid waste Management
- Urban Transport
- IT Applications
- Project Management
    - Quality Control and Monitoring
    - Procurement of Goods and Services
    - Project Structuring
- Institutional strengthening
- GIS Database Management
- Preparation of Detailed Project Report
- Public Awareness/Communications

10.3.7 *Capacity Enhancement Action Plan*

The objective of the Action Plan is to translate the Capacity Enhancement Strategy (CES) for PKDA, focussing on the four key elements i.e. organisational development, policy framework, human resource development and knowledge exchange into simple actionable points which can be implemented in a time bound manner. The action plan also identifies the time period of implementation as well as the resource persons/ responsible agencies for each activity to ensure monitoring of the plan.

The Capacity Enhancement action plan is divided into three phases namely; **immediate**, **short term** and **long term**. The immediate steps constitute simple decisions to be taken by Chairman, PKDA, which do not have any direct financial implications and do not require any structural changes in the organisation. Although there is a strong need for dedicated professionals with competence in the area of urban planning & management and capacity building. However, as an immediate measure it is recommended to designate one of the officers with dual responsibility, until budget provisions are made for two new positions of urban planning and HR Officer in the PKDA. The PKDA could also consider setting up HRD group with representation of all departments for focussed training related interventions. The designated officer can co-ordinate with the HR groups to come up with the annual training calendar.

The short term activities are geared towards introducing systematic interventions beginning with awareness workshop for the ULB staff/PKDA staff and elected representatives to sensitise them about the urban planning concerns and discuss the way forward. This consultative approach is suggested to ensure greater commitment from the stakeholders, so that the PKDA is ready to allocate a certain budget for Urban Planning and capacity building activities. The long term action plan is aimed at professionalizing the municipal services over a 2-3 years duration, which requires a number of initiatives at the state as well as ULB level.

11. Implementation Mechanism



11. IMPLEMENTATION MECHANISM

The implementation mechanism has been developed with an understanding of the

- Vision and Growth corridors
- Market responsive phasing of the physical plan
- Availability of funding
- Identification of the possible sources of funds
- Identification of the various modes of project implementation in terms of PPP
- Identification of Best practices for Innovative project implementation

The following section details the proposed implementation mechanism of the CDP PKDA. The implementation mechanism has been suggested as per the following components.

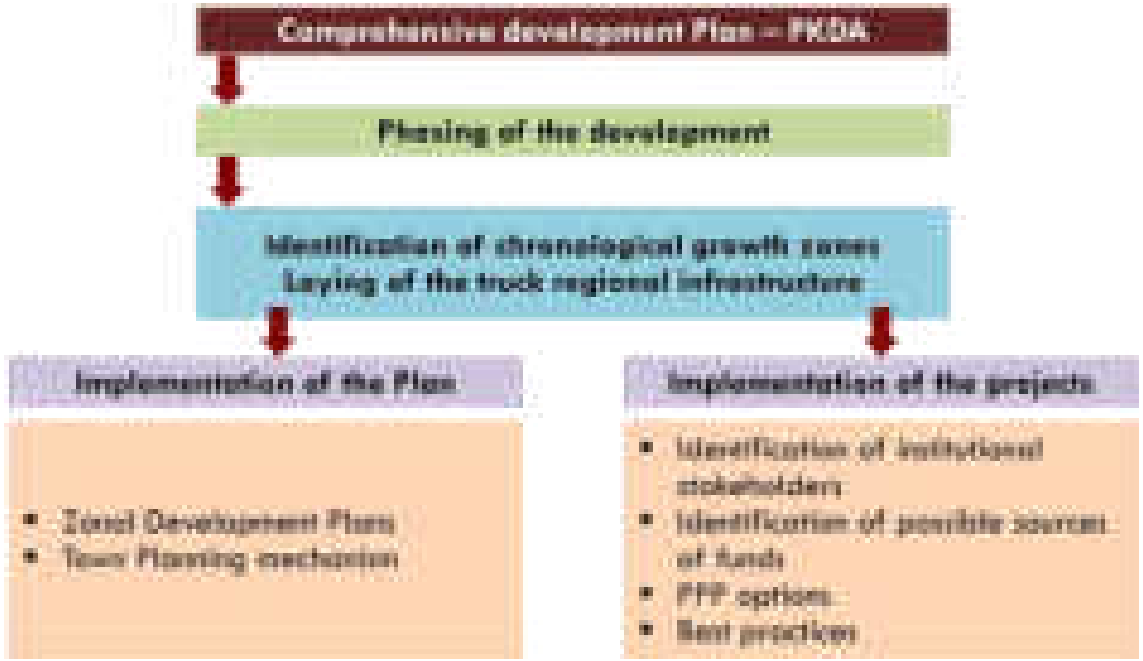


Figure 45- Implementation mechanism structure

11.1 Phasing and Implementation of CDP PKDA

The comprehensive Development Plan is a macro strategic plan document that defines the direction of growth and envisions the citywide infrastructure for the entire development area. A Development Plan conceived within the framework of the approved perspective plan, is a medium term (20 years) plan providing the comprehensive proposals for socio-economic and spatial development of the urban centre indicating the manner in which the use of land and development therein shall be carried out by the local authority and other agencies. It's a statutory plan, adopted by the local authority for implementation with the help of schemes and projects. Its proposals are precise and definite.

The Comprehensive Development Plan includes the following:

- Land development mecahism
- Identification of Area vision, substantiating it with the growth patterns
- Trunk infrastructure plan
- Socio economic management plan- Creation of better economic opportunities
- Block cost estimation
- Environmentally conducive development

The CDP/ DP are revised every 10 years and is updated in the interim whenever a need arises to respond to the changing context. The State Government may suggest modifications, keeping the overall public good in view if required, before approving the CDP/DP.

The comprehensive development plans are followed by the development and design of the **Zonal Development Plans**. Zonal plans are the linkages between the macro and micro level planning tools. The level of details in terms of road widths and the delineation of the land use based on the cadastral information are taken at the zonal level. While the CDP essentially suggests the need for the trunk infrastructure the Zonal Plans dwell into greater details of detail zone level infrastructure demand calculation and related apportioning.

The PKDA development plan has been suggested in 8 zones. These zones have been developed in terms of their feasibility in implementation based on the administrative boundaries and the potential of the zones to be developed in various phases homogenously. The zonal plans help in integrating the various land use proposals with the transport and the social development proposals. The ZDPs have higher linkages to the on ground situation and are followed by intensive ground truthing process for the allocation of uses to lands. The ZDPs are to be followed by the process for developing TP schemes which are the ultimate micro level planning tool with the development authority, The following section details the same.

11.1.1 *Phase I – Short Term (2012-2021)*

Zone 1- Puri (Immediate 2012-2014)

Puri town is to be taken up for immediate phase of development. This consists of 5% area of PKDA Puri already has the CDP prepared. The laying of the trunk infrastructure is also to be taken up for the immediate phase

Zone 2- Puri Sadar and Zone 6- Konark

Puri Sadar and Konark the areas which shall be taken up for the first phase of development. Once the trunk infrastructure is laid in the immediate phase the opening up of the land markets and the laying of the feeders should be taken up based on the details form the Zonal Plans. This would constitute 28 percent of the total PKDA area.

The development of the Zonal Plans for these areas is to be followed by the development of the TP Schemes. Most importantly, the new areas for growth to be opened up for development are clearly marked and divided into smaller areas of about 100 to 200 hectares. Each such area is called a TPS. The TPS are micro plans prepared for about 100 to 200 hectares typically involving 100 to 250 landowners. The TPS are numbered starting from one, two, three, etc., and are usually named after the "village" they fall in. A complex system is used to simultaneously reorganize land parcels or plots, provide access to each land parcel or plot, set aside land for public uses by taking a portion from each landholding, and appropriate increments in land values for infrastructure development. Detailed infrastructure is designed and cost estimates are prepared. The process involves intensive public participation and consultation at several stages. The implementation history of Ahmedabad is detailed in Annex-1.

11.1.1.1 Sample - Town Planning Scheme for PKDA Area

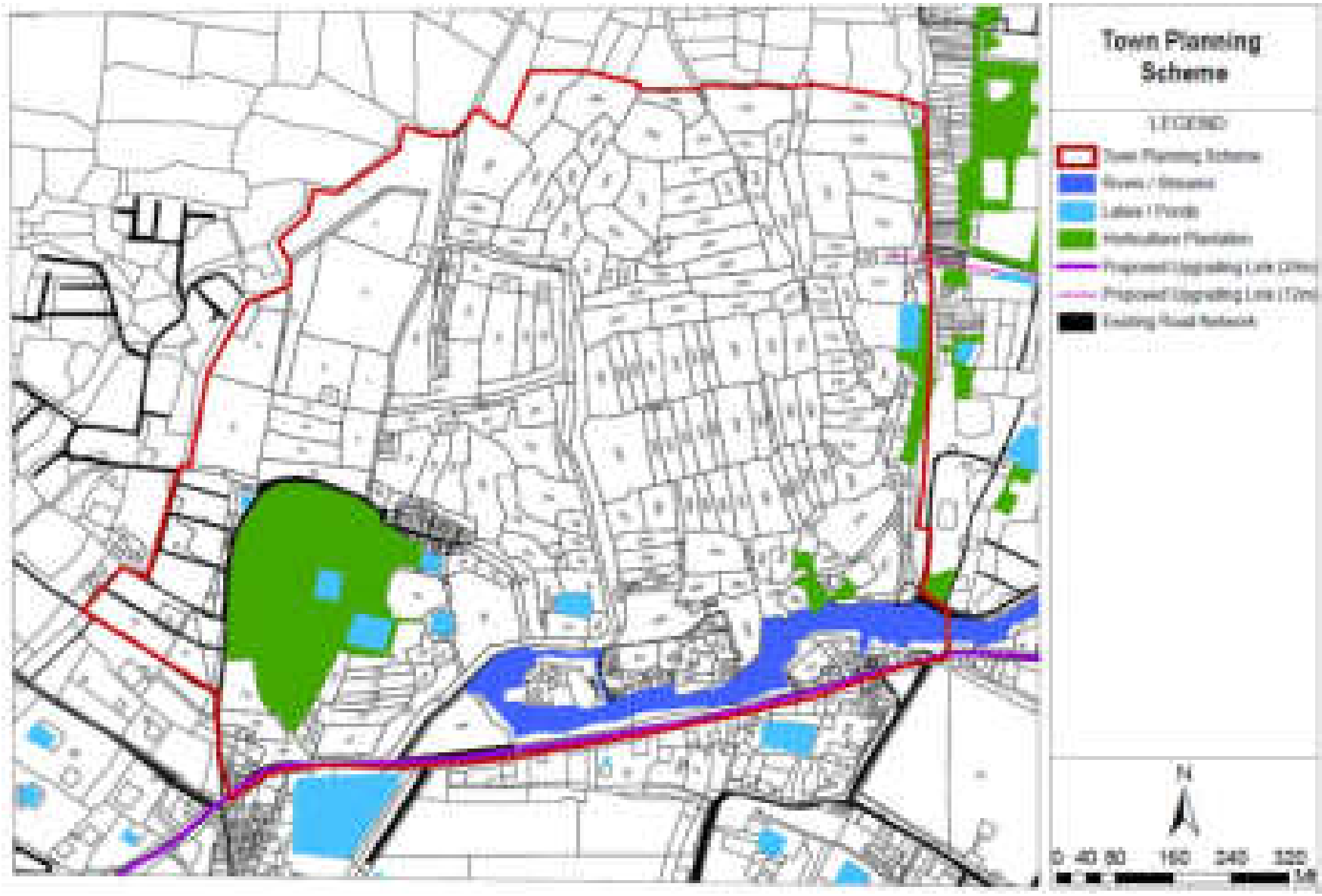
Town Planning scheme and similar development is still a new concept for Orissa and has not been tested yet. TP scheme therefore has been proposed at the strategic location in the PKDA area. As per the land use proposal 2030, the TP Scheme proposal is situated in the Puri Sadar area (Zone 2 as per the Proposed Land use plan) right at the outskirts of the Puri Municipal boundaries. The proposal is envisioned near the junction of NH 203 connecting Bhubaneswar and NH 203E connecting Konark. West side of the area currently falls under agriculture however is proposed as residential development in the proposed land use plan.

The area is selected based on the Land use proposal which describes future residential growth in that area. The site has 2 major roads at its east and south side. Other side of the NH203 is envisioned to be the transport hub / bus terminal with many other activities.

The bus terminal acts as a growth node for Puri sadar area for future development. Such site setting for the TP scheme is selected since there is potential for developing surrounding areas around the bus terminal.

Total area of the site is close to 90 hectares. The site mostly has agricultural plots. West – south corner of the site has horticulture plantation and small water bodies, where as the south – west corner of the site has river Musa Nai.

The map below shows existing revenue plot distribution within the site.


Town Planning Scheme
LEGEND
N
0 40 80 160 240 320
Mt

The map above shows existing layout of the area with current plotting. Red boundary is the area selected for the TP scheme and about 412 plots are taken within the boundary for the proposal.

Institutional Areas within TP Scheme

Areas for Utilities / services within TP Scheme

EWS Housing within TP Scheme

Green / recreational/ existing water bodies within TP Scheme

Residential areas within TP Scheme

Commercial areas within TP Scheme

Road network within TP Scheme

Land use category	Proposed Area distribution (%)
Residential	40 - 45
Commercial	5 - 7
Institutional	3 -5
Reserved for EWS	7 -10
Public utilities +roads	15 -20
Urban green	30 - 35

Design Concept for the TP Scheme: The conceptual layout for the TP scheme is based on the "Green Infrastructure" concept of urban design. The plan therefore has generous green spaces and is sensitive towards natural features of the site such as lakes, river, and trees. The plan therefore looks to achieve environmental friendly habitat development. Main land use categories within the site

1. Residential
2. Reserve land for EWS
3. Commercial

4. Institutional
5. Utility and transportation
6. Green / recreational

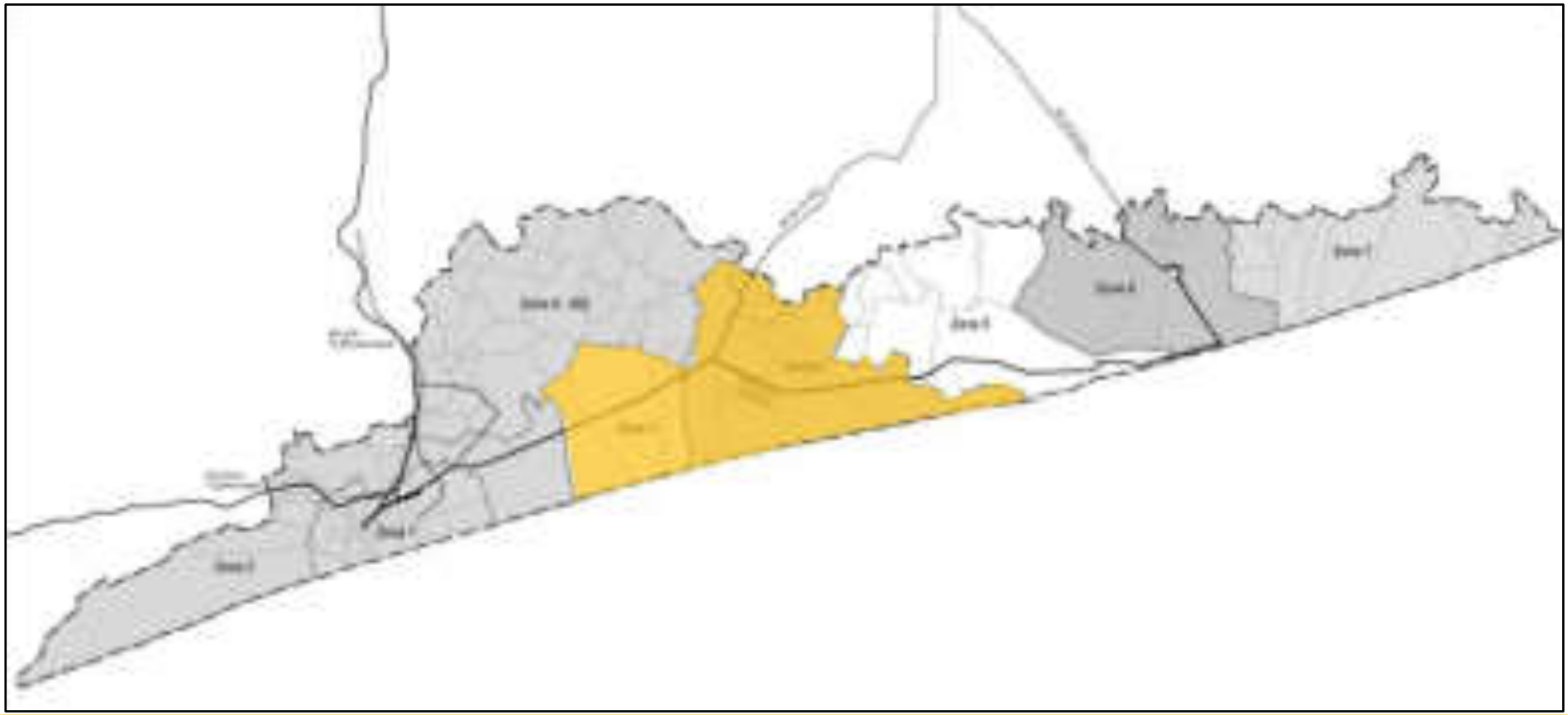
The proposed TP Scheme constituting of 410 revenue plots. In case of Gujarat an average, similar area would have about 90 – 100 plots and therefore TP scheme development specifically becomes little more challenging in the case of PKDA and Orissa. The process therefore could be suspected to be little longer as well as complicated.

After understanding the context of the site, the design concept has been evolved as shown in above map.

- Basic concept of the TP scheme proposal was to provide ample open space, circulation and high intensity residential development.
- The proposal also has close to 10 % area reserved for EWS housing.
- Institutional areas and commercial areas are spilt in to small areas rather than one big central area and have been distributed at equidistance from residential development.
- The proposal has generous green / recreational areas and is acting as connector between different land uses as well as within the same land use. Green areas are also provided as buffers wherever there are water bodies, river, or plantation.
- The site has wide roads connecting different areas and activities within the site; however the proposal tries to reduce impervious surfaces by not putting any extra road network. All of the existing roads are used in the proposal and are connected with new roads and areas. Some of the old roads / cart roads are widened to suit the current proposal.
- The table above shows area distribution in % for the site

More than half of the site area is used for residential where as 30% is given for open spaces. The other share of land use is given as per normal standards as shown in the table beside. This prototype model of TP Scheme can be replicated in other existing sites in the proposed areas for high intensity residential development zones

11.1.2 *Phase II – Medium Term (2022-2027)*

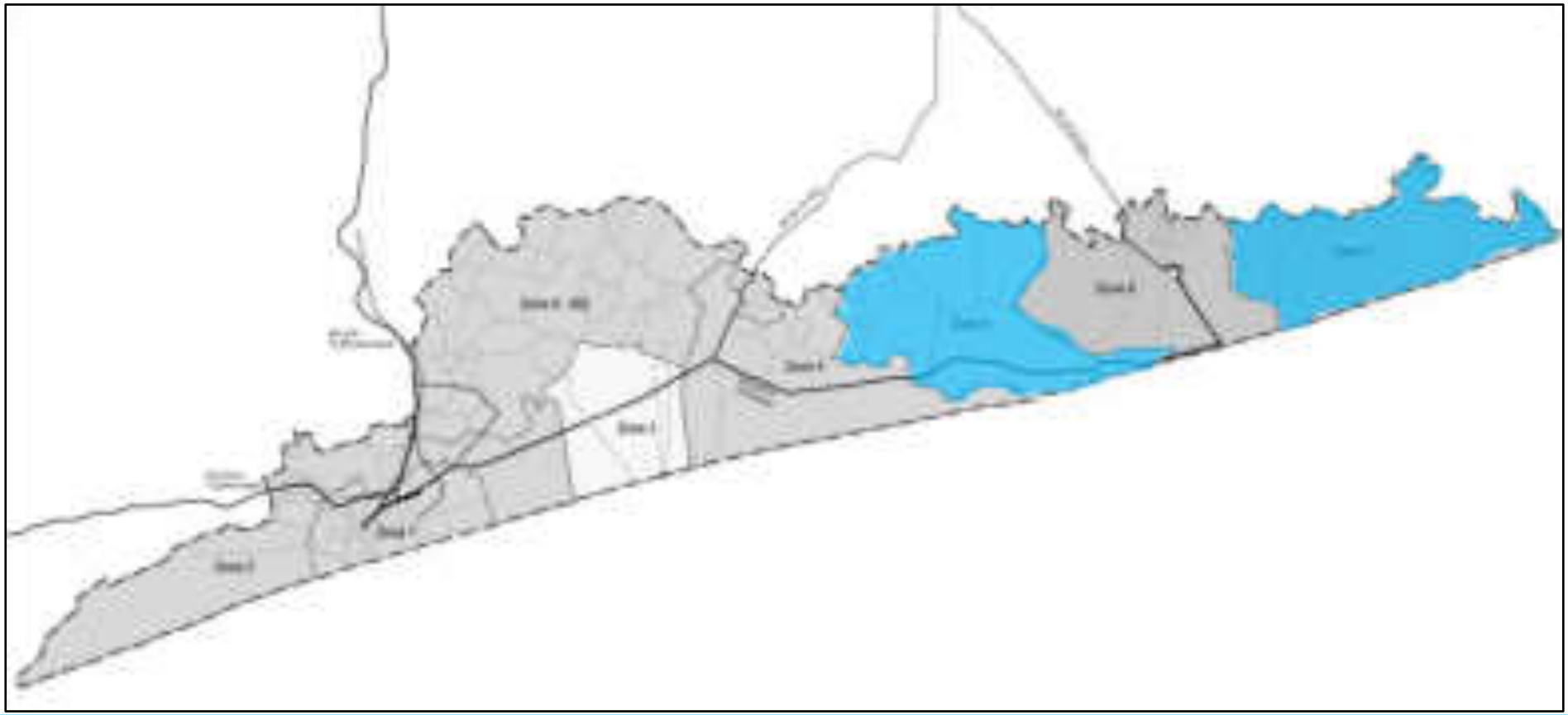


Zone 3 and Zone 4- Block A

The two Zones within Block A have been identified as the growth zones in the medium phase. The proposals for the special institutional areas and the special tourism zones in Ramchandi are the highlights of these zones. The development of the zonal plan documents should be taken up by the end of Phase 1, such that it may be ready for implementation by the end of medium term. These constitute 20% of the total area of PKDA.

Further to the Zonal Plans these areas also need detail design documents for the special projects that are identified in this Zone.

11.1.3 *Phase III – Long Term (2028-2031)*



Zone 5 (Block A) and Zone 7 (Block B)

Zone 5 and Zone 7 have been identified as the last phase of the development in the proposed CDP. However the trunk infrastructure of these Zones have been suggested to be taken up in the short term such as to facilitate development in these areas. This area is almost 26% of the total region in terms of area.

The attached table sums up the total development phasing of the PKDA region. The phasing programme for implementing the Development Plan has been developed considering the locations, present development pattern, direction of growth, availability of public lands, priority, nature and scale of facilities and the overall vision envisaged for the effective development of Development Plan. The programme proposes the plan implementation in 4 phases. PKDA area development is divided in to 4 phases according to the need and contextual setting of existing development. Development implementation is divided in to 4 phases according to the need, identification of growth nodes and to achieve holistic PKDA development approach.

Strategies adopted for phasing of development

1. Implementation of special projects
2. Growth node identification and development of peripheral areas
3. Development of suburban areas
4. Development of areas with tourism potential
5. Connect urban areas and promote homogeneity

Phase	Year	Zone	Name of Zones
Phase I	2012-2014	Zone-1	Puri
Phase II	2015-2021	Zone-2, Zone-6	Puri Sadar, Konark
Phase III	2022-2027	Zone-3, Zone-4	Block-A, Block-A
Phase IV	2028-2031	Zone-5, Zone-7	Block-A, Block-B

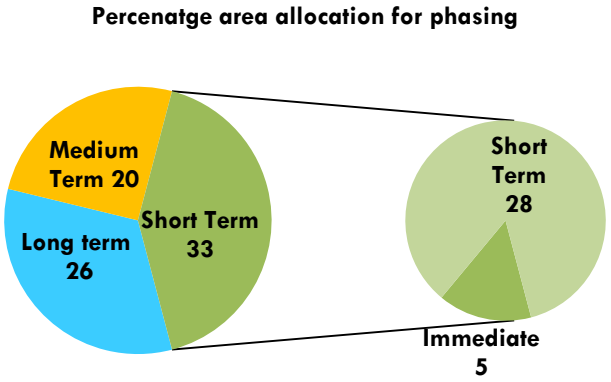


Table 65: Phasing Development of PKDA Area till 2031

The following section details the project implementation strategies for the projects suggested under the PKDA.

11.1.4 *Project Prioritization*

The project prioritization assists cities and development authorities to do a better and more structured job in urban infrastructure planning, prioritization and programming. Project Prioritization offers pre-project preparation and capacity-building to turn existing city development strategies into an urban reality.

Under various policies and in accordance with state vision, cities prepare varied plans and reports to secure financial support from central or state government. These plans and reports are often prepared for different time frames and purposes and also varying administrative boundaries that. There are number of projects such as solid waste management, airport, SEZ, BRTS, environment, agriculture, water supply, education, etc that a city proposes but it is important to identify the projects that would truly benefit the city. Funding (JnNURM), state Leadership, urban local body, political wing and public interest are the diverse components that are essential in selecting a project beneficial to the city.

Road & Bridge


BRTS


Water Supply


Drainage & Sanitation


Solid Waste Management


Airport


SEZ


Energy


Environment


Heritage


Agriculture


Education

Why Project Prioritization?

- Achieve the city's vision
- Urgency of any kind (Disaster, Fair, Festival?)
- Need of the citizens
- Available funds/Mission
- Attract economic growth
- Revenue generating
- Bankable Projects, PPPs..

Project Prioritization Benefits

- Transparent Planning Process
- Help in Selecting Real Benefited projects
- Help in choosing the right projects more important than ever
- Provides sufficient understanding of the costs, risks, & benefits of proposed projects

On the other side of the equation are financing agencies that can help cities to realize infrastructure projects. For them to commit funds under infrastructure loan agreements, they require city governments to submit well formulated and bankable investment projects and to demonstrate managerial and technical capacity to ensure project viability.

Many city governments in Asia want to access infrastructure financing but are not sufficiently equipped to undertake the task of programming and prioritizing strategic urban investments. This toolkit has been developed to help fill the gap.

11.1.5 *Project Prioritization for Puri*

A two days workshop has organised at Puri, on 3rd and 4th November 2011, on Prioritization of Urban Infrastructure projects through CIIPP toolkit developed by CDIA. The primary aim of this workshop is to introduce the CIIPP toolkit to all relevant stakeholder organisations of Puri and to develop a shortlist of prioritized infrastructure projects which could seamlessly integrate with the on-going comprehensive development planning exercise as well as all other strategic planning documents for this region.

The workshop has diverse participants, mainly the decision makers from various agencies and departments from PKDA region like Puri municipality, Konark NAC, ASI Konark, Housing and urban development department, collectorate, OWSSB, PKDA, Directorate of town planning- Bhubaneshwar and Revenue Department.

Puri is a coastal city and an important pilgrimage center. The existing heritage, architecture and scenic beaches make this city an important tourist location with ever increasing infrastructure needs. Following are some of the primary points discussed during workshop session:

- The growth of Puri town may not be similar to the pace in metros. But the needs for basic services and infrastructure are bound to increase with city's growth.

- The city is dominated by religious and cultural precincts. Also the beaches attract both domestic and international tourists. Therefore while considering any project for the city it should consider the citizen's need, existing heritage areas and floating population.
- All the departments and agencies in Puri should collectively understand the process of prioritization and use it in decision making.
- Cities infrastructure is an essential component that supports a city's functioning and its development.
- Prioritization would streamline the projects that would be essential for improving the city's scenario.

After some base studies of city development plan, Puri and Draft Comprehensive Development Plan, PKDA, CEPT had shortlisted 25 projects from different sectors. After discussions and debates during the first day of workshop, projects were selected.

Table 66: Shortlisted Projects of Project Prioritization for Puri

Sr. No.	Project	Pro Cost in (Cr)	Sector / Project
1	Preservation of ancient and sacred WaterBodies	30.00	Preservation
2	Sea and Riverfront Development (new Locations)	100.00	
3	Development of Storm Water Drain - development of secondary and tertiary drains and roads	90.00	
4	Social Amenities (Community Toilets, Halls etc)	25.00	
5	Solid Waste Management	35.00	Environment
6	Beach Cleaning Mechanism	5.00	
7	Heritage Management plan for PKDA and Eco Friendly Tourist Vehicle	17.05	Heritage Conservation
8	Atharnaala Revitalization	22.05	
9	Grand Road, all other major roads redevelopment / face-lifting /remove berms in PKDA area	20.5	Urban Revitalization
10	Signages	2.4	Signage

Figure 46: Workshop Sessions at a Glance

There are five parameters that are considered in the prioritization Process and they were

1. Purpose of Project,
2. Public Response,
3. Environmental Impact of Project,
4. Socio-Economic Impact of Project and
5. Feasibility of Project Implementation

Out of the 10 shortlisted projects, the final five projects after the prioritization exercise were Social amenities, preservation of water bodies, SWM, Pilgrim's Village and Atharnaala Revitalization

Figure 47: Summary sheet for prioritized projects

11.1.6 *Funding Mechanisms: PPP Options / Infrastructure and Special Project Finance*

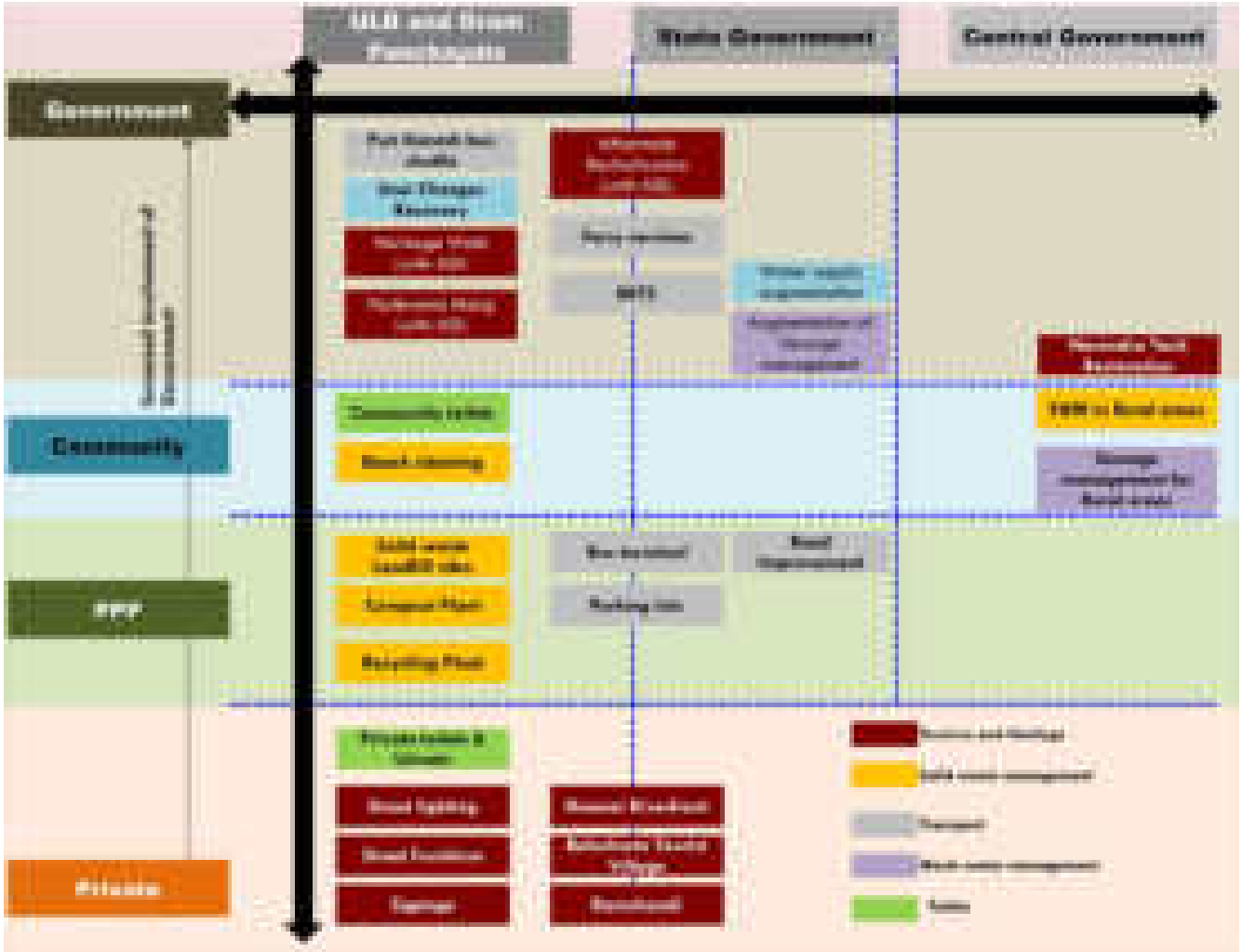
The CDP PKDA identifies a range of intervention areas in the region. While some of the sectors are identified through deficit management and better service delivery systems, certain new intervention areas have been identified through the assessment of the regional potential. These are primarily heritage, tourism and urban design oriented segments. While the CDP identifies the projects at a conceptual stage, further design, detail and development of the same is within the purview of the relevant institutional stakeholders.

CEPT suggests that intensive feasibility studies should be undertaken for the proposed intervention areas to crystallize a clear set of projects from the suggested list. A set of funding options and project financing mechanism have been suggested for each of the projects identified under the CDP. Various schemes under the central government like the PURA, NLCP and the new JnNURM have been suggested as the possible sources of finances.

Having identified the set of projects, the need to develop detail design documents for the same is suggested. Certain

projects like signages, heritage walk, street lighting, public toilets etc can be tendered immediately. While other projects like the Beleshwar tourist village, ferry services, BRTS need detailed feasibility study and detailed project designing.

11.1.7 *Implementation mechanism of proposed projects in CDP PKDA*



With multiple projects and investments needs traditional methods of financing can no longer sustain themselves over time. The increased relevance of public, private and people's partnership in implementing and financing projects is felt. While the sections of Public infrastructure still rely heavily on the government funding and the various schemes, the tourism and transport projects can be taken under PPP, owing to their quick return and lesser capital expenditure demands. Solid waste has emerged as one of the leading infrastructure sectors to be taken under PPP in the country. The attached matrix examines the possibility of implementation of the different projects under the CDP through the various government and non government stakeholders. The term "public-private partnership" is used to describe wider public private joint ventures and initiatives which may not solely rely on government revenue streams as the sole source of repaying bank debt taken out to finance a service or asset or may not require asset finance at all. PPP's are a generic term which can involve the private sector taking a majority stake in a public agency.

The attached table enlists the various projects identified under the CDP and the possible funding agencies for the same.

Sr. No.	Projects	Central Government			State Government				ULB	Gram Panchayats	PPP
		JnNURM/ MoUD	MoHUPA	Other central government agencies	Housing and Urban development	OTDC	OWSSB	Other state agencies			
1	Heritage Walk	✓				✓					
2	Parikrama Marg					✓					
3	Atharnala revitalisation	✓				✓			✓		
4	Grand road rejuvenation	✓				✓			✓		
5	Marine Drive redevelopment	✓				✓			✓		
6	Tourism Village at Beleshwar Temple					✓					✓
7	Narendra Tank Restoration			✓							
8	Signage										✓
9	Street Furniture										✓
10	Ramchandi Beach					✓					✓
11	Nuanai Riverfront					✓					✓

Physical Infrastructure											
12	BRTS Puri	✓							✓		✓
13	Ferry Services					✓					✓
14	Street Lighting							✓			
15	Road widening							✓			
16	New roads							✓			
17	Water Supply						✓				
18	Waste Water Management						✓				
19	Public toilets										✓
20	Community Toilets	✓	✓								✓
21	Strom Water Drainage						✓	✓			
22	Solid waste management	✓							✓		✓

The attached table highlights the quick PPP options (green colored cells) for some of the tourism and infrastructure projects. These projects essentially involve lesser planning and implantation time as against the high capital intensive projects. Hence these have been suggested under quick Public Private Partnership with the respective ULBs.

PPP can be defined as the procurement of public services and assets by government and local authorities where the private sector is responsible for the design, construction, finance and operation of an asset or service for a specified period of time after which it is transferred back into the public sector. Various models of PPP like the BOT (Build Operate Transfer), BOOT (Build Operate Own Transfer), DBFOT (Design Build Finance Operate Transfer), BOO (Build Own Operate) may be examined. For the projects, demanding higher capital expenditure and longer project timeframes, private participation may be increased through the unbundling of the various components. For example in Public transport projects, the project may be unbundled into -creation of the carriers, procurement of rolling

stock, ticketing, operations and maintenance etc and the same can be tendered to various private operators. The role of the government is more as a facilitator in such cases. The attached chart indicates the various possible PPP options.

ESSENTIALS OF A SUCCESSFUL PPP

- Public bodies should be clear about the fundamental principles and objectives behind PPP.
- Private sector contractors to take responsibility of
    - Designing
    - Building
    - Financing and
    - Operating assets
- Central and local government agencies to become regulators and focus resources on
    - Service planning,
    - Performance monitoring and
    - Contract management

Figure 48: Different PPP Arrangements

11.1.8 *Innovative Project Financing Mechanism*

Various cities and states have evolved innovative mechanisms for the funding of infrastructure projects and better utilization of the value of urban land. The following section details the same.

C.G. Road Redevelopment In PPP- Ahmedabad, Gujarat

With the improvement in its financial position in 1994-95, AMC undertook a major investment programme for road development. As part of AMC's initiative in forging urban partnerships, the C.G. Road, a prime business and commercial artery of the city, has been redeveloped as a pilot project in partnership with Arvind Mills Ltd. The design for a stretch of approximately 3.5 km of C.G. Road in Ahmedabad addressed issues of vehicular movement, shopping, residential access, electric & telephone cabling and parking. The redevelopment of C.G. road includes a 100-foot wide thoroughfare for fast-moving vehicles, welldefined footpaths with trees and lights for pedestrian use, a side lane and parking bay. With the completion of the project, it has become a prime shopping street providing an outlet for the sale of various national and multinational brands of goods.

The estimated project cost of Rs 35 million was funded by Arvind Mills and all additional costs have been borne by AMC. Arvind Mills expects to recover its contribution from advertising and parking revenues. Following recovery of the capital investment, these revenues will then go to AMC. The project was coordinated by a committee headed by the municipal commissioner with representatives of Arvind Mill.

Development of Parks and Gardens In PPP- Ahmedabad, Gujarat

AMC has entered to participatory arrangements with private parties/NGOs for greening the city. The underlying purpose is two-fold, namely, to make private companies share the cost of upgrading and maintaining the parks, gardens and road-side plantations in lieu of advertising rights; and to utilize, with the help of NGOs/CBOs, the Corporation's vacant lands for urban forestry, thus giving the community an opportunity to undertake agro forestry and other remunerative activities. AMC owns and maintains 66 gardens, 45 parks and 64 traffic islands. There are 15 gardens larger than 2 hectares (5 acres) in size. The Corporation is working with four leading industrial houses to improve and maintain gardens originally maintained by AMC alone. Among others, the Ashima Group of Industries has so far invested Rs 8 million in Law Gardens (3.2 hectares/eight acres), and the Torrent Group Rs 6 million in Parimal Gardens (four hectares/ten acres). Similarly, 13 traffic islands have been adopted by various industrial groups

In this way, while the Corporation's financial liability has been reduced, the overall expenditure in this area has increased substantially with significant benefit to the community

Betterment charges- Gujarat

Betterment charges are levied such as to recover the cost of infrastructure funding through charges that accrue to the increased value of land arising due to the better infrastructure levels. Legal provisions exist for recovering 50% of the land value gains either in case of Improvement Schemes, Town Planning Schemes and Infrastructure Projects. The TPS in Gujarat involves the levy of betterment charges to offset the capital expenditure under the infrastructure provisioning. The levies are fixed through intensive and participative process of consultation with the land owners and the valuation experts.

Premium FSI – Chennai Metropolitan Development Authority

The concept of premium FSI is the incremental FSI that can be which can be availed after paying a fee there have been no major changes in the allowable FSI. This has been used in the Chennai Metropolitan Development Authority's revised master plan. The premium FSI is given as a percentage of the permissible FSI, based on the width of the road frontages in the case of Chennai. The amount so collected towards the award of the premium FSI shall be remitted into the government account so as to be allocated specifically for the purpose of the infrastructure development.

Funding of infrastructure projects through sale of FSI- Ahmedabad BRTS, Gujarat

It is observed that bus transit development results into changes in the land use and built form. It has also been observed that when development concentrates along BRTS corridor, transit patronage increases. In view of this it is imperative that the potential of land use transformations be exploited to strengthen BRT project. A policy to encourage rebuilding activity in the area using higher FSI is being contemplated. It is envisaged that all new developments in the vicinity of BT corridor (250 Mts) will have the permission to build up to FSI 1.8 plus an additional F.S.I of 1. With this the densities on the corridor is likely to increase by 2.5 times. The impact charges value capture is expected and the modification in the proposals of the Development Plan has been incorporated. Revenues from advertisements and parking are also envisaged.

External Development Charges – Haryana

"External development" includes the creation and maintenance of water supply, sewerage, roads, street lighting, community buildings, etc. External Development Charges(EDC) are the charges for utilization and repair/maintenance/strengthing of existing infrastructure/proposed infrastructure and License/Permission fee is the fee for granting permission for the projects. The External Development Charges and License fee shall be utilized by the concerned Local Planning and Urban Development Authorities for providing infrastructure.

Multiple levies- Hyderabad

Andhra Pradesh in Hyderabad has introduced a number of land linked levies to be charged at the time of granting development permission. These are;

- Fees for permission for layout and subdivision of land
- Betterment charges for internal amenities / works paid along with the application for layout / subdivision.
- External betterment charges for arterial roads and other citywide amenities.
- Building permit fee for construction/reconstruction/ additions.
- Betterment charges for Built up area (for internal amenities)
- External Betterment charges for Built up area (External-City-wide amenities)
- Fees and charges mentioned above are levied under the municipal legislation.
- Development Charges (under AP Urban Areas (Development) Act, 1975)
- Impact Fee (as prescribed by Government from time to time). Impact fee is levied to mitigate the impacts of construction of commercial buildings that lead to increased traffic and necessitates decongestion measures.
- City Level Infrastructure Impact Fee:
- Special Fees & Other Provisions: The Sanctioning Authority with the specific approval of the Government may, when implementing such Projects, levy Special fees and other fees / charges for lands / sites / premises abutting or in the vicinity of the Ring Road or other highways / major roads or the Mass Rail Transit System / Light Rail Transit / MMTS route indicated in the Master Plan, at the rates and procedure prescribed by the Government.

Table 67: Summary of cost estimates for CDP PKDA

Sr. No	Facility	Estimated Cost (Lakhs)				
		Phase I	Phase II	Phase III	Phase IV	Total
	A. PHYSCIAL INFRASTRUCTURE					
1	Transportation	2372	47878	10513	5792	66555
3	Water Supply	0	5235	285	285	5805
4	Waste Water Management	228	3572	142	143	4085
5	Access to Toilets	1475	0	0	0	1475
6	Strom Water Drainage	298	2252	565	0	3115
7	SWM	750	1353	70	50	2223
8	Power Supply	500	225	75	75	875
	Subtotal (A)	**5623**	**60515**	**11650**	**6345**	**84133**
	B. SOCIAL INFRASTRUCTURE					
1	Education	4535	27545	5410	2190	39680
2	Medical	517	3473	860	260	5110
3	Socio-Cultural Others	430	2575	450	140	3595
4	Others	277	2091	714	594	3676
	Subtotal (B)	**5759**	**35684**	**7434**	**3184**	**52061**
	C. Special Tourism Projects					
1	Heritage Walk	1705	-	-	-	1705
2	Parikrama Marg	850	-	-	-	850
3	Atharnala revitalisation	2205	-	-	-	2205
4	Grand road rejuvenation	2050	-	-	-	2050
5	Marine Drive redevelopment	2750	-	-	-	2750
6	Tourism Village at Beleswar Temple	1100	-	-	-	1100
7	Signage	240	-	-	-	240
	Subtotal (C)	**10900**				**10900**
	TOTAL	**22282**	**96199**	**19084**	**9529**	**147094**

Note: O & M not included

ANNEX-1: THE IMPLEMENTATION HISTORY OF AHMEDABAD

Implementation history in Ahmedabad

Most of Ahmedabad has been developed using the TPS mechanism. The process began as early as 1915. TPSs were prepared continuously under the various planning acts. Following figure shows the total number of TPSs built over a period of time under different legislation. There is a long history of implementation of the TPSs, which has made the process acceptable to the people. There have been continuous improvements in the content of the proposals over the years.

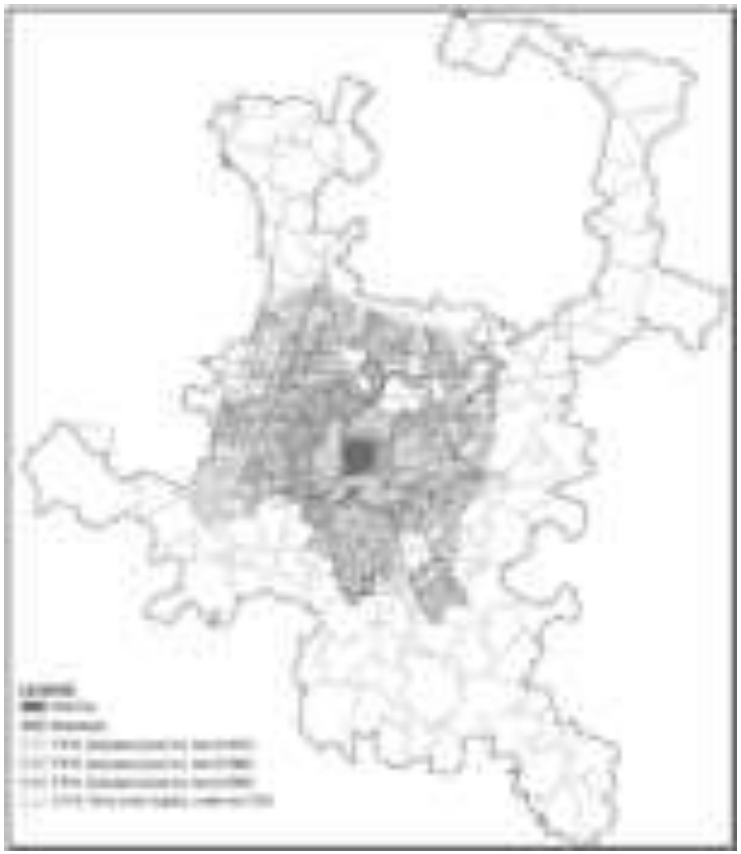


Figure 49: Town planning schemes in Ahmedabad over years

Sample TPS preparation in Vinzol (TPS no. 90 Vinzol 2), Ahmedabad

Introduction to the case study area:

The TPS No. 90 Vinzol 2 is taken as a case study to explain the process. The TPS area is located in the southern portion of the city of Ahmedabad very close to the junction of Ahmedabad Mehmedabad Highway and the 60-meter-wide Sardar Patel Ring Road. This is one of the most rapidly developing corridors and is predominantly an industrial area. It falls in the village of Vinzol (see figure 10.2). The TPS falls within the jurisdiction of Ahmedabad Municipal Corporation. River Khari abuts the entire northern portion and passes through the TPS. To the west is the Mumbai Ahmedabad Railway line. To the east is the TPS No. 91Vinzol 3. To the south are TPS Nos. 71 Vinzol Hathijan and 72 Vinzol 1. Most the area is vacant and includes the village settlement of Vinzol. The total area of the TPS is approximately 82 hectares and it has 80 land parcels. The case study is interesting because in this TPS, there is a village settlement that needed to be integrated, a large water body that needed to be responded to, and a non-perennial river that passes through the area.

Location Map of TPS 90 Vinzol 2

The TPS preparation process

The process for preparing a TPS is prescribed in GTPUDA, 1976, and its Rules. It is quite a complex and long process involving over 50 steps that can take a maximum of four years and one month as provided by the act, but in practice takes much longer. Each stage of the TPS mechanism is illustrated by relevant drawings and documents.

Survey of the area:

A very detailed and accurate topographical survey of the entire area for which the TPS is being prepared is undertaken using high-accuracy equipment called the Total Station Survey, which records all physical features on the ground—structures, trees, fences, compound walls, electric poles, water bodies, drains, etc. Following figure shows the physical features surveyed.

Establishing the ownership details for each land parcel:

All cadastral records are collected to reflect the ownership details, extent (area), tenures & encumbrances for every land parcel and are compiled in a prescribed format. The type of tenure for each land parcel is noted; this is crucial as it has a direct implication on the change of use and transfer of ownership, and usually the same tenure is retained while giving back the newly shaped land parcel. This process is extremely tedious and time consuming, as the land records are of several types, are spread across various agencies, are non-computerized, and are in different formats. Following figure illustrates some of these types of records.

Various types of records collected to establish ownership details

Reconciling the survey & landownership records to prepare a base map

Along with the cadastral records, all types of spatial records (maps) are also collected. As in the case of cadastral (area) records, these are of several types, spread across agencies, and non-computerized, using not-to-scale drawings and in different formats. The spatial records are vectorized and reconciled with the physical survey of the area. At this point, the area from the maps and records are compared and finalized. This is called the "melavni" in the local language and literally translated means "to match." This process is a major bottleneck, as it must be certified by the Land Records Department. This department has limited staff and is unable to cope with the pace. The base map of the area is now ready for undertaking planning. Following figure shows the base map.

Base map for preparing the TPS

Defining the boundary of the area

On the final base map of the area that shows the survey, the boundary of the TPS area is clearly marked. At this stage, the intention to prepare a TPS for the area is publicized in a clear fashion in local newspapers. Following figure shows the area with the TPS boundary. At this point, the information pertaining to the land prices is collected from the register of land transactions. Based on the information on relevant sales of land, a sales map is prepared. Obviously, sales are not available for all parcels and hence, based on the available transactions and valuation principles, land values are attributed to each plot. This is called the original plot (OP) value; it is the value of the land parcel before any kind of planning intervention.

Defining the boundary of the TPS

Marking Original Plots (Ops) on the base map

All the OPs are marked on the base map. If more than one land parcel or plot belongs to one owner or group of owners with exactly the same tenure status, then such land parcels or plots are consolidated and given one OP number. The land parcels need to be contiguous. Thus, at this stage landholdings within a TPS are also consolidated as far as possible. Following figure shows the OPs within the TPS.

Marking original plots on survey

Tabulating ownership details and plot size

The task of tabulating the information is commenced in a format prescribed in the GTPUDA Rules called the F Form. The first few columns are filled—name of the owners, land tenure, revenue survey numbers, OP number, OP area, and OP value. Following figure shows the F Form at this stage.

Form for the TPS indicating ownership details and original plot sizes

Laying out the roads in the area

The planning of the TPS area begins and at this stage the TPS is called a draft TPS. The first major step is laying out the roads. If a road that is shown in the DP passes through the TPS area, it is usually respected. It may be slightly modified, keeping in view the findings of the survey. While designing the road network, the transportation planning principles are followed, a planning pattern (e.g., a grid or a radial pattern) is devised, and appropriate connectivity with the arterial road network identified in the DP, & the DP roads passing through the TPS is established, if a natural feature such as a water body is present, it is addressed and, most importantly, care is taken to ensure that each OP gets access to it. The GTPUDA indicates a tentative percentage of areas under roads to the total scheme area of about 15 to 17 percent. Following figure shows the road network within the TPS.

Road network in the TPS

Carving out plots for amenities in the area

Plots providing adequate social infrastructure such as schools, hospitals, dispensaries, clinics, open spaces, housing for the poor, etc., are marked on the base map along with the roads. The areas to be allocated for such uses are indicated in the GTPUDA as tentative percentage to the total area of the TPS is about 20 percent. Following figure shows the road network and amenity plots within the TPS.

Road network and amenity plots in the TPS

Tabulating deduction and Final Plot size

The total percentage of area that goes under roads and amenities is about 35 to 40 percent. The GTPUDA allows this to go up to 50 percent. The F Form is continued to be filled further. From each OP this percentage is deducted and a final plot (FP) size is arrived at.

At this stage, the process of valuation is continued further. A semifinal (SF) value to the OP is also assigned. Usually, this is the same as the OP value. In some instances, however, there can be a change in the value of the OP before the provision of infrastructure—it may increase or decrease owing to the planning proposals such as zone changes, changes in plot shape, changes in the plot size that are impacted certain development control regulation, a substantial shift in plots, and proximity to features that may negatively impact development, such as a high tension lines, eroded lands, etc. Following figure shows the F Form at this stage.

Form for the TPS indicating land values and final plot sizes

Delineation of Final Plots

After the roads and amenity plots are worked out, each OP is reconstituted or redrawn. At this stage, the irregular shapes of the OPs give way to regularly shaped FPs with the new areas. Following figure shows the proposed road network, amenity plots, and FPs.

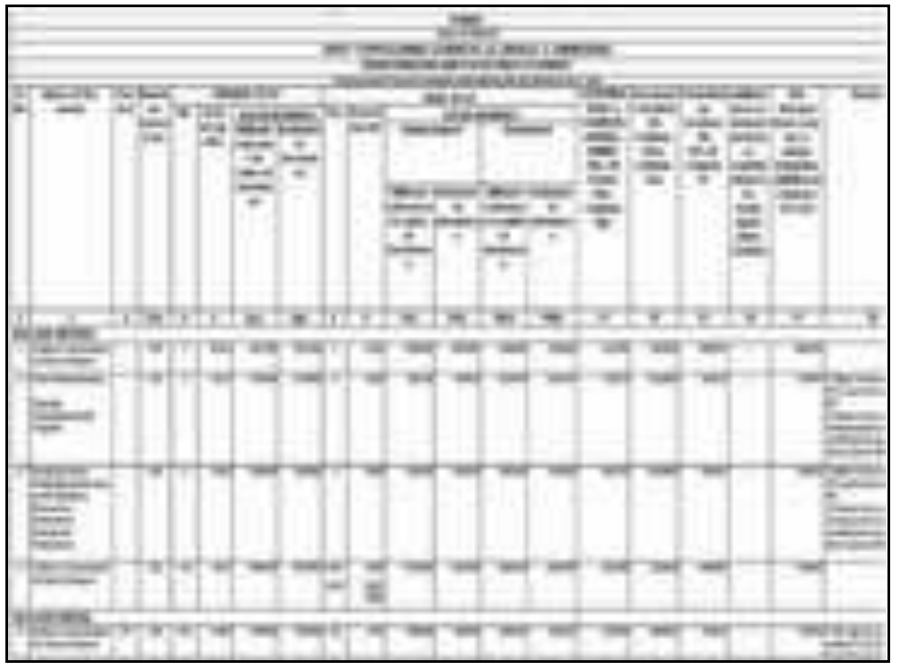
Delineation of final plots in the TPS

M. Tabulating infrastructure and Betterment Charges

At this stage, costs for a TPS are worked out. These include the following:

- Costs of key infrastructure—roads, water supply, drainage, and streetlights—are calculated
- Compensation to be paid to each landowner for the land is appropriated based on the SF value
- Administrative costs of implementing the TPS are accounted for
- The final value for each plot is systematically assessed
- A portion of this increase in land value is taken as betterment charges
- A "G Form" summing up the inflows and outflows for a TPS is prepared summarizing the overall financial strategy of the TPS
- The "F Form" is completed—each landowner is given compensation for the land taken and a portion of the land value is taken as betterment; based on the two, the net demand is computed for each owner. Refer following figure.

G Form for the TPS indicating financials



F Form for the TPS indicating betterment charges

N. Owners' meeting

Landowners are consulted and heard at this stage for the first time when the work on the draft schemes is completed. A well-publicized landowner's meeting is prescribed in the GTPUDA. Based on the suggestions and objections received from each landowner, the draft TPS is modified and published. It is again thrown open for objections and suggestions from the landowners. Based on the second round of objections and suggestions, it is modified and then submitted to the State Government for approval. Once approved, the draft TPS is now called the sanctioned draft TPS. The proposals for roads can be implemented.

O. Modification of the Draft TPS and its Approval

Based on the suggestions and objections received from each landowner, the draft TPS is modified and published. It is again thrown open for objections and suggestions from the landowners. Based on the second round of objections and suggestions, it is modified and then submitted to the State Government for approval. Once approved, the draft TPS is now called the sanctioned draft TPS. The proposals for roads can be implemented.

P. Appointment of the Town Planning Officer (TPO)

After approval of the draft TPS, a quasi-judicial officer called the town planning officer (TPO) is appointed. The TPO's task is to deal with each landowner both on the physical planning proposal—the shape and location of the FP and the financial proposal—the compensation and betterment issues, and eventually demarcate the FP on ground and hand it over to the owner. The TPO divides the sanctioned draft TPS in two parts to facilitate his or her functioning: a preliminary TPS to deal with the physical planning proposal and a final TPS to deal with the financial proposal.

Q. Individual hearings to each landowner on the preliminary TPS

The TPO gives individual hearings to each landowner and revises the preliminary TPS if required. Inputs from the State Government and local authority and development authority are sought. The preliminary TPS may be modified if required, and the TPO gives a second round of hearings. These hearings, as mentioned above are on the physical planning proposals.

R. Finalization of the preliminary TPS and its approval

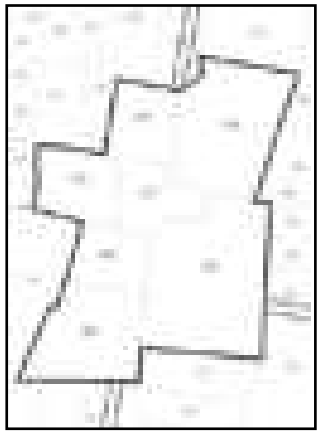
The preliminary TPS is again modified based on the second hearing. At this stage, demarcation of FPs commences. The TPO finalizes the preliminary TPS by writing his or her decisions with regard to every plot. This is referred to as the award of the preliminary TPS and is published in the local newspapers. At this stage, the preliminary TPS is sent to the State Government for approval. It must be approved within two months. The preliminary TPS comes into effect from the date of sanction and all plots appropriated for public purpose vest with the local authority or development authority.

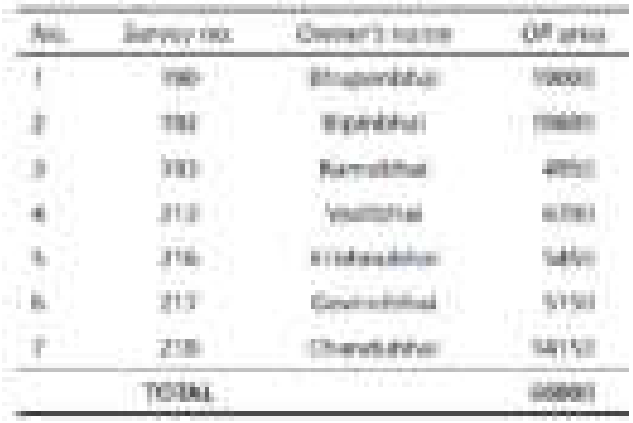
S. Individual hearings to each landowner on the final TPS

At this stage, the financial proposals are taken up with each owner. These pertain to the compensation and betterment charges. The TPS at this stage is called the final TPS.

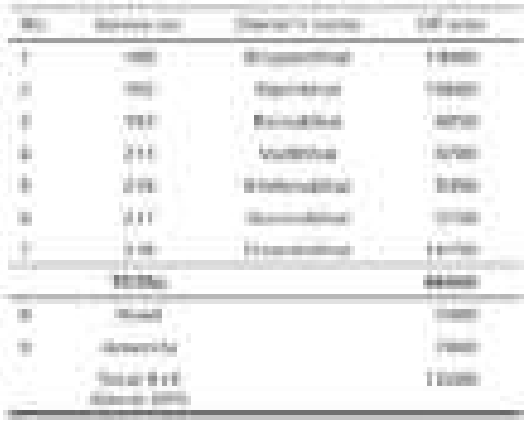
T. Finalization of the final TPS, its approval and implementation

Once the hearings are done, the financial proposals may be modified and sent to the State Government for opinion. There may be some modifications. The TPO then finalizes the TPS and publishes it in the local newspapers. This is referred to as the "Award of the Final TPS". A Board of Appeals for further issues on financials is constituted. Once all appeals are resolved and the final TPS is modified, it is sent to the State Government for approval. The State Government is required to sanction it within three months, but it usually takes longer. Once approved, the drawings and documents are sent to the State's Revenue Department to update the records.

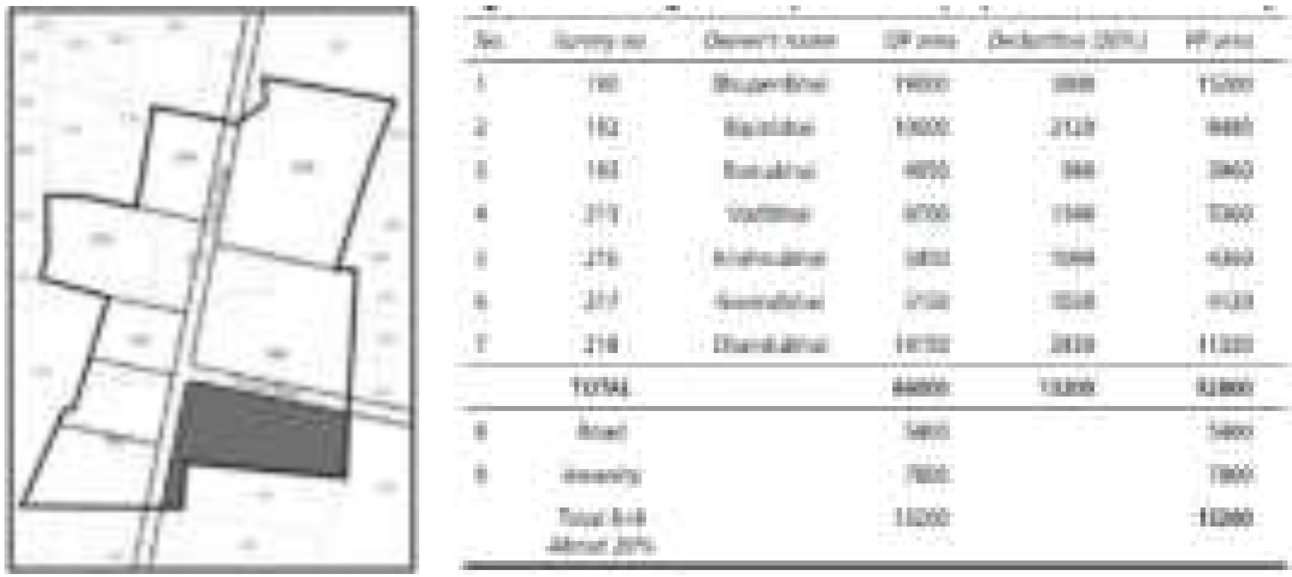




Original Irregular Land Parcels



Original Irregular Land Parcels with proposed roads & Amenity



Final Regular Land Parcels with Proposed Roads & Amenity

The financial aspects of the TPS

This section briefly explains the financial aspects involved in the process of preparing a TPS. This process essentially consist of reconstituting original plots into a more organized pattern of final plots after deductions for various purposes like roads, open spaces, social infrastructure, EWS housing, etc. which means that the land owner gets back lesser land than he originally has. This deduction is between 40-50% and the owner is eligible to get compensation for this deducted land at the prevailing market price of undeveloped land.

On the other hand, when the Development Authority makes investment in infrastructure such as roads, water supply and sewerage lines, street lights, etc. above all makes the effort of preparing the scheme the value of the final plot is enhanced. Since this value enhancement is as a result of investment made by the Development Authority, the owner has to contribute a share of the increment in land value which is known as 'Incremental Contribution'. The difference between Incremental Contribution and compensation for a plot is due to be paid by the owner to the Development Authority or vice versa.

But the history of TPS in Gujarat has revealed that the above system was insufficient to cover all the capital costs including the cost of preparing and implementing the scheme and the cost of building infrastructure. Therefore, on Ahmedabad Urban Development Authority's initiative, the GTPUDA, 1976 was

modified to enable the authorities to deduct additional land (upto 15%) to be sold after development of the scheme to recover the cost of infrastructure development. This land bank generated forms a part of the real estate assets portfolio of the Development Authority. The timing of the sale of this land and the proceeds from it may not be directly linked to the particular scheme within which it is located.

The development costs to the authority include costs of construction of roads, providing water supply and sewer lines with treatment plant, providing street lights and other such street furniture. Other costs include compensation to be paid to owners, the cost of making and publishing the Scheme, etc. The revenue due to the authority is generated from incremental contribution to be paid by each owner and from the sale of reserved resale plots.

Key Advantages, Limitations and Potentials of the TPS

This section briefly sums up the advantages, limitations, and potentials of the TPS process.

Advantages

- **Long history**: The process has a long history—it was introduced in 1915 by legislation, and since then the legislation has been continuously improved to make the process more responsive to the changing context of development.
- **Democratic and participatory**: The process is democratic and participatory, with a built-in mechanism for dispute resolution—the landowners are involved in the process of planning and have ample opportunity to present their views on the proposals and place on record their objections.
- **Fair:** The process is fair, as all owners loose the same proportion of land.
- **Equitable and inclusive development**: The process facilitates equitable and inclusive development; a portion of land is appropriated for accommodating urban poor. Respects property rights and is no disruptive: The process respects property rights and is no disruptive; the landowners are not thrown off their lands and are given a better-shaped land parcel, usually very close to the original land parcel.
- **No coercive and no authoritarian**: The process is no coercive and no authoritarian; the proposals are reviewed at several stages that are formally prescribed in the act.
- **Win-win proposition**: The process has been a "win-win" proposition for both the landowners and the planning agencies—both gain from the appreciation in the land values
- **Transparent**: The process is transparent: it is very clearly described in legislation, planners have mastered it, and people understand and accept it.
- **Tested in law courts**: It is tested in law courts; it has been challenged in law courts and has withstood the challenges successfully.
- **Making development pay for the cost of infrastructure**: The cost of infrastructure is in a sense paid for by the owners directly, and the planning agency and development authority is not required to make huge investments up-front.

Limitations

Despite the TPS mechanism being well articulated in the GTPUDA, prepared by the planners in the State Government since 1915, and widely accepted, there are a few shortcomings, which result in the growth not being managed in time, renewal of areas, although possible, becomes difficult and development occurs before the provision of infrastructure in some instances. The following are a few of the limitations:

- **Lengthy time frames**: The timelines proposed in the regulatory framework— four years—are far too long. The State Government actually takes much longer to approve the various stages. The TPSs thus take far too long to prepare and implement. These time frames were determined when computerization was nonexistent, communication technologies were cumbersome, and there was virtually no private sector in place to assist the public sector. In view of changes in technology, the timelines can be easily reduced.
- **Inadequate attention to substantial issues**: Substantial issues are dealt with in an inadequate manner. These need to be supported by preparing manuals and guidelines.
- **No asset management framework is in place**: The significant land assets generated by the local authority are not managed in an appropriate manner. Most local authorities or development authorities do not even have a comprehensive list of all such land assets created.
- **Centralized processes**: The processes are far too centralized—too much power is vested in the State Government to approve and sanction the DPs and TPS. The State Government is responsible for undertaking both substantial reviews and procedural reviews of each and every DP (there are about 150 urban areas) and for innumerable TPSs. There are no limits on the time it takes for this and there is a tremendous amount of corruption that takes place at this stage. Inadequate capacities in terms of lack of staff and qualified planners add to the problem.
- **Disconnected with the city budgeting process**: At the moment, there is no clear linkage of the DPs and TPS with the city budgeting process.

Potentials

The TPS has tremendous potential that needs to be demonstrated effectively to the planners practicing in the public sector. This will considerably reinvigorate the urban planning system that is so critically required at this stage to transform Indian cities.

- **TPS as an infrastructure financing tool**: Although several TPSs have been done and a land bank is being built up with the planning authorities, there is no systematic asset management framework in place. As a consequence, valuable land parcels created are not efficiently leveraged to finance infrastructure in cities. The present manner in which land valuation is done needs to be overhauled and made more systematic and rational so that it is realistic and in sync with the market prices. At present, land valuation is dictated by the concern to match the revenue in the form of betterment charges to the expenditure incurred by the Development Authority to develop the infrastructure and compensation.

- **TPS as a tool to introduce innovative planning concepts**: Until now, the task of preparation of DPs has been restricted to land use zoning and the arterial road network structure. The TPSs have until now been treated as mechanical exercises in reconstituting land parcels, and not enough attention has

been paid to planning concerns, be it in terms of the road network or responding to special site features. Three dimensional aspects are not addressed. Although the GTPUDA has a provision for introducing special regulations and urban design guidelines to regulate development, these are never exercised. Further, the manner in which the land for public uses is appropriated is highly fragmented. The TPS tool offers and opportunity to consolidate public lands. This has happened partly because this potential has never been demonstrated and partly because, the technical capacities of the town planning staff are severely constrained.

- **TPS as a tool to build accurate maps and land records for the city**: The city of Ahmedabad does not have an accurate surveyed map of the city after 60 years of independence. While a DP is prepared, the first task is to prepare a base map. When the TPSs are prepared, very accurate cadastral maps and landownership details are developed. The cadastral maps and records are now maintained by the Revenue Department, and these are then procured by the planning agencies to prepare maps and databases. Both of these function separately, however, and they maintain and update their own records, resulting in considerable confusion and duplication of efforts. Again, the spatial records are not linked with the databases. The planning department itself has not collated individual TPSs and created accurate maps and databases. The lack of maps and the absence of databases has hindered planning and management functions by different line departments. Hence, while the DPs and TPSs are prepared, there is an opportunity created to build a fairly accurate GIS-based base map and land record system that can be used by both the planning and revenue departments.

All of the above issues can be addressed via a process of systematic reform. The urban planning system in Gujarat can be easily reinvigorated and has significant lessons for other states in India. A series of reforms in the form of amendments to the act have already taken place, but a lot more needs to be done.

DISCLAIMER

This report has been prepared based on information, maps and drawings collected from various primary and secondary sources. As far as possible, care has been taken to correct and update all information as of January 2012. CEPT shall have no responsibilities, whatsoever, due to any errors, omissions and printing mistakes in such information or database