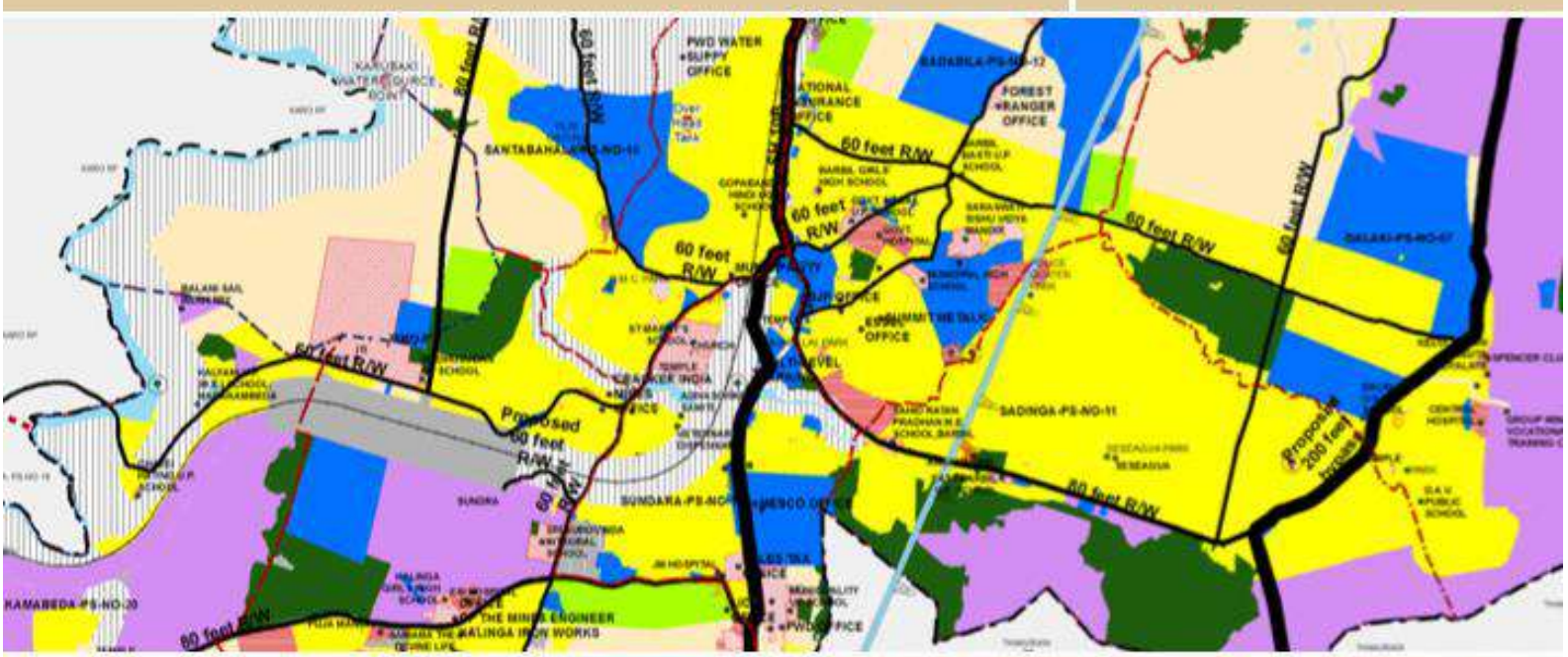
SPECIAL PLANNING AUTHORITY BARBIL

BARBIL MASTER PLAN 2030



Directorate of Town Planning, Government of Odisha

Prepared By: Rudrabhishek Enterprises Limited

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PREFACE

Barbil, a statutory town of Keonjhar District, exhibits the general trend of urbanisation and its consequent socio-economic, physical, educational and many other aspects and co-related problems which needed immediate and specific attention for its solution. Keeping this persistent process of urbanisation and its effects in view, an attempt has been made for the preparation of a Master Plan for the Urban Area along with adjoining rural areas to channelize the growth in a pre-conceived and desirable manner. The process of preparation of Master Plan encompasses the studies on existing physical, socio-economic, transportation, health, sanitation and other basic services for identification of problem and specifies major policies for a compatible and harmonious distribution of land uses as per defined zonal regulations.

The Draft Master Plan was prepared and published by Special Planning Authority, Barbil under section 31 of OTP & IT Act 1956 vide gazette notification No_____ dated _____ and objections &suggestions were invited from the general public. After due consideration of the objections and suggestions, the Final Master Plan has been prepared by the consultant Rudrabhishek Enterprises Ltd. New Delhi incorporating recommended modifications which would be published under the section of 32 of OTP & IT Act 1956. It is submitted for approval from the Director of Town Planning Odisha. This planning document has a planning horizon upto the year 2030. Through implementation of various programmes of developments with projects, Barbil town and its adjoining planning area will grow dynamically. In course of modification, valuable suggestions from general public have been incorporated in the plan. It is felt that this document shall help the Planning Authority to accomplish the above objectives of planned development to a greater extent.

ACKNOWLEDGEMENT

This Master Plan is an outcome of the statutory provision under Section-29 of the Orissa Town Planning & Improvement Trust Act,1956. Rudrabhishek Enterprises Limited (REPL) is extremely grateful to the Directorate of Town Planning, Bhubaneswar and Special Planning Authority Barbil for the extensive support and assistance they have provided to REPL team through the duration of the project.

The project team acknowledge and sincerely thanks the following organisations and persons, whose consistent support and active cooperation have contributed toward the completion of the Master Plan in its present form. The team also extend our thanks all those who have contributed towards completion of the report directly or indirectly whose names may or may not have been listed below:

- Honourable Chief Minister, Government of Odisha
- Honourable Minister, Housing & Urban Development, Government of Odisha
- Commissioner-cum-Secretary, Housing and Urban Development, Government of Odisha
- Collector, Keonjhar District
- Sub-Collector, Keonjhar District
- Director, Directorate of Town Planning, Bhubaneswar, Government of Odisha
- Project Director, Special Planning Authority Barbil
- Executive Engineer, Barbil Municipality
- Superintendent of Police, Barbil,

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EXECUTIVE SUMMARY

The Master Plan for Barbil prepared by the Rudrabhishek Enterprises Ltd. provides vision to the physical development and guides the urban growth for the target year 2030 as envisaged in OTP &IT Act, 1956. The Master Plan for Barbil is a statutory document which attempts to identify short, medium and long term development goals using Geographical Information System. The Master Plan has been prepared taking into account the structural frame of the available Master Plan considering the existing developments in and around the Master Plan area.

The Master Plan beings with the introductory profiles which encapsulate the city's growth trend and the approach to the Master Plan focused on key sectors for a meaningful spatial development.

Studying the historical physical growth and primary economic activity along with the population growth projections, the vision is:

"To develop Barbil as a Service Centre for surrounding region and augment the infrastructure of the town so as to promote mining and related industries in a sustainable manner aiming at countering pollution that is associated with such activities".

The second chapter provides an overview of the Barbil Master Plan Area as well as the resources available in the area for an integrates development of the city. While the third chapter depicts the socio-economic profile and economic activity of the planning area and reflects the potential for future economic growth.

The fourth chapter identifies the land utilization pattern and estimates the demand for supporting public infrastructure which are intrinsic to the city's physical and economic growth trend. The fifth chapter covers the other key aspects such as housing demand for 2030 which is around 17000 to be developed under affordable housing schemes.

Traffic and Transportation is one of the major issues that determines the sustainable growth of the city. Sixth chapter assess the travel scenario of the Barbil Planning Area using various survey methods and proposes the mobility plan which specifies the management techniques and other geometric improvement to enhance the traffic mobility in the area.

The success of development projects can only be assured with an accurate resource assessment and its potential in the city. Hence the seventh chapter presents the existing condition and status of existing physical infrastructure like Water Supply, Sewerage, Storm Water Drainage, Solid Waste Management and Power. For ease of study the city has been divided into two zones to identify the issues with the existing system and address the issues as well as augment the level and quality of infrastructure for growing population.

Social Infrastructures are the important essential part of city to facilitate and improve the living condition of the people. The eighth chapter, therefore, analyses the existing condition and status of existing social infrastructure which constitutes Education, Health and Socio-Cultural facilities to address the issues as well as augment the level and quality of infrastructure for growing population.

Barbil faces a number of environmental challenges due to intensive mining activity which are mentioned in the tenth chapter. This chapter stress the important aspect of environmental management in development and planning. Disaster mitigation proposals are given in form of a plan so as to decrease the vulnerability of Barbil to natural disasters.

Land ownership is an important aspect of the Master Plan to understand the feasibility of proposed projects in terms of Land acquisition. Following this Zoning and Sub Division Regulation forms one of the most important components of the Master Plan. Zoning regulations and development control regulations proposed in the twelfth chapter will guide the physical development in the area and will help in realising the vision and proposed land use plan.

In order to guide these projects in an efficient and effective manner the thirteenth chapter presents the network of agencies responsible for planning, development and maintenance in the master plan area and describes their functions and responsibilities. The roles and responsibilities of each agency are clearly defined. Lastly the action plan for implementation of Master Plan of Barbil, Implementation mechanism is described and phasing has been done for the proposals based on its priority. Sources of funding are also identified in the last chapter.

CHAPTER-1 INTRODUCTION

1.1 Background

The process of urbanization involves the spatial expansion of cities due to the phenomenon of growth in human population, which is an inevitable process. Motivated by both push and pull factor an increasing proportion of the growing population in an attempt to satisfy their economic & social needs and desires in an urban context, migrate from rural environs to the urban area. Economic growth, technological change, population growth and migration determine the pace of urbanization.

India is one of the fastest growing economies in the world with high population. It is world's second most populous country and witnesses an increased pace of urbanisation, which includes an increase in population living in urban settlements and percentage of the population engaged in non-agricultural activities. Importance of cities in national economy is growing and contributes over two-thirds of gross domestic product and account for 90 percent of government revenues, which implies that urbanization is directly correlated to the level of economic development of a country.

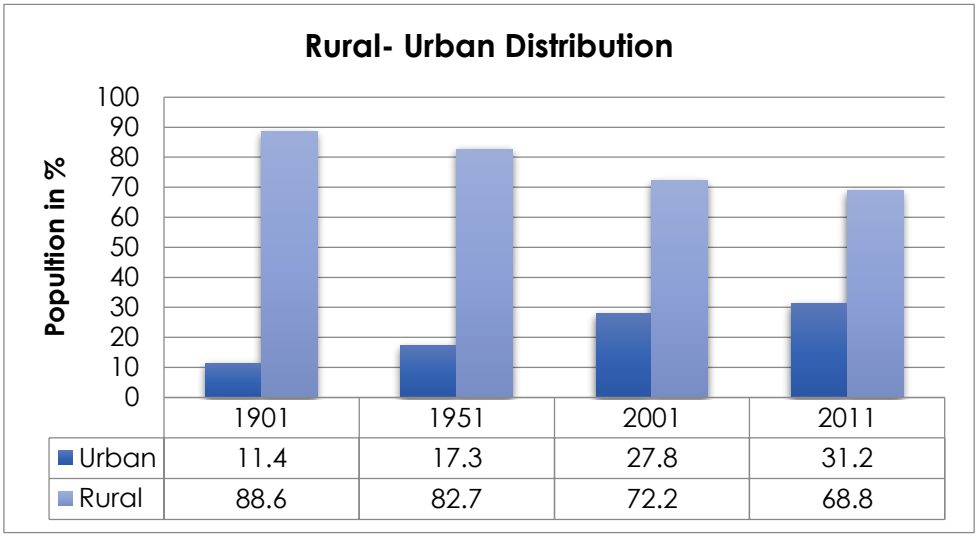
1.1.1 Urbanisation Trends in India

The levels and trends of urbanisation reveal that India has been predominantly rural in character throughout the ages, though a few urban centres have flourished from time to time. It was only in the late nineteenth and the early twentieth centuries that industrial cities grew in India. Urban population of India has increased from 25.8 million in 1901 to 62.4 million in 1951 and to 285.4 million in 2001, thereby showing more than tenfold increase in total urban population. As per Census year of 2011, the urban population shares 31.16% of the country's population with 377.1 million persons. For the first time since Independence, the absolute increase in population is more in urban areas that in rural areas with level of urbanization increased from 27.81% in 2001 Census to 31.16% in 2011 Census.

India's urban population is likely to grow 468 million by 2020 and 533 million by 2025 as per the projections based on historical growth pattern of population (1901 – 2001). Further, the number of urban agglomeration /town has grown from 1827 in 1901 to

8410 in 2011. During the last fifty years, the population of the country has grown two and half times, while the urban India has grown by nearly five times.

Figure 1.1: Urban- Rural Population Distribution- India from 1901 to 2011



	1901	1951	2001	2011
Urban	11.4	17.3	27.8	31.2
Rural	88.6	82.7	72.2	68.8

Source: (Census of India)

According to the *World Urbanisation Prospects- The 2011 Revision*[1] carried out by the United Nation Dept. of Economics and Social Affairs/ Population division, it is estimated that the percentage of population residing in urban areas will be increased to 51.7% by 2050, which implies that half of the population of the country will be residing in urban areas. The study also reveals that the no. of 10 million plus cities will be increased to 6 by 2025, 5-10 million and 1-5 million cities will be 3 and 54 respectively by 2025.

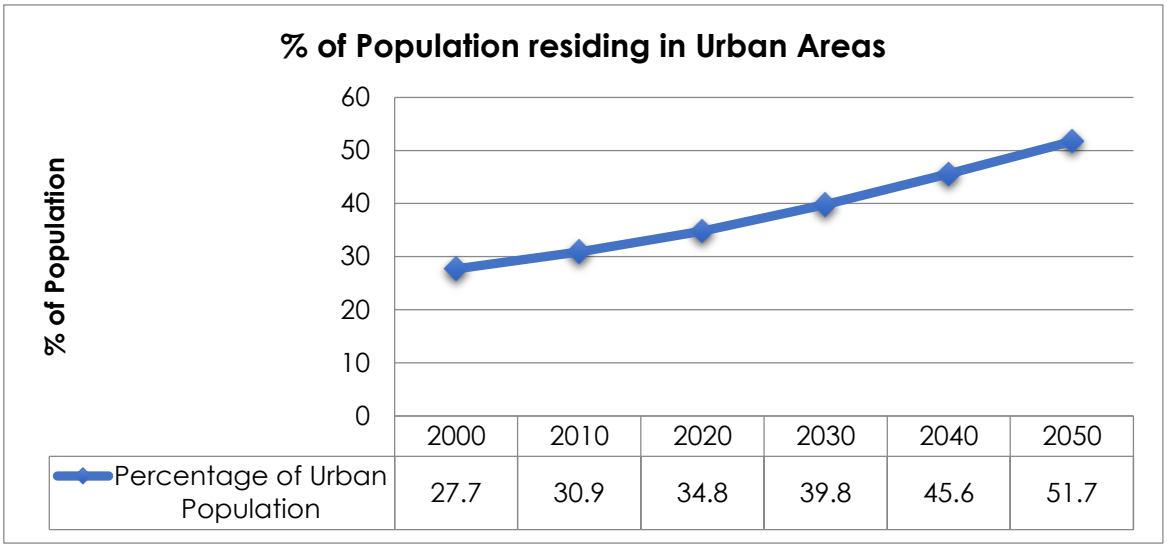
Data Highlights-INDIA- Census 2011

- Rural- Urban Distribution: 68.84% & 31.16%
- Level of urbanization increased from 27.81% in 2001 Census to 31.16& in 2011
- For the first time since Independence, the absolute increase in population is more in urban areas than in rural areas.
- Population Growth Rate (%) from last Census Decade (1991-2001):
  India: - 3.9%
  Rural: - 5.9%
  Urban: + 0.3%

[1] The Population Division of the Dept. of Economics and Social Affairs of the United Nations is responsible for providing the international community with up-to-date and scientifically objective information on population and development.

The 2011 Revision of World Urbanisation Prospects gives the officials United Nations estimates and projections of urban and rural populations for major areas, regions and countries of the world. The estimation is basically based on the census data of respective countries/ region.

Figure 1.2: Estimation of Future Urban Population- India



Source: (World Urbanization prospects- The 2011 Revision)

1.1.2 Urbanisation in Odisha- An Overview

Odisha is one of the least urbanised states in India. As per the urbanisation trends of 2011 census, Orissa state is the 32nd most urbanised state among all state/ UTs in India with about 16.68 percent of urban population, which is only higher than Assam, Bihar and Himachal Pradesh among the major states. Among the districts in the state, the lowest degree of urbanisation is in the district of Baudh with 4.6% of urban population and the highest degree of urbanisation is in Khordha district.

Data Highlights-ODISHA- Census 2011

- Rural- Urban Distribution: 83.3% & 16.7%
- Decadal Change 2001-2011
  Total- 14.0 %
  Rural- 11.8%
  Urban- 26.9%
- No. of Towns (Including Statutory Towns and Census Towns)
  Census 2001- 138
  Census 2011- 223
- Density of Population (Persons per sq.km)
  State- 270
  Highest- Khordha (800 P/sq.km)
  Lowest- Kandhamal (91 P/sq.km)

The urbanisation trend in the state is much lower in comparison to the national average of 31.16% as per 2011 census. However, the urban decadal growth rate in the last census decade is quite high with a growth rate of about 26.9 percent. Prior to 1951, there were only 39 urban centres in the state, which has grown up to 223 in 2011. In other words, the urban population of the state has increased from 3% in 1941 to 16.68% in 2011.

1.2 Need for Master Plan

The positive role of urbanization has often been over-shadowed by the deterioration in the physical environment and quality of life in the urban areas caused by widening gap between demand and supply of essential services and infrastructure. It is further associated with many problems, such as high levels of poverty, environmental stress, risks to productivity, and lack of access to basic services, such as water supply, sanitation, and housing. If urbanization, as a phenomenon has registered a steady progress among the developed nations, 'urbanization explosion' is taking place in the developing countries. Urban growth arising out of it is one of the major concerns of planners and governments all over the world.

The Housing and Urban Development Department, Govt. of Odisha, under the provision of Town Planning & Improvement Trust Act- 1956 have constituted the Barbil Special Planning Authority area, covering a total number of 18 revenue villages and 4 nos. of forest area namely Forest – A, B, C and D with an area of 57.87 sq.km. And subsequently Master Plan for Barbil Planning Area was prepared for horizon year 2001. The area covered under planning area included Barbil Municipal limit and surrounding 9 rural revenue villages Forest area.

As per the statutory provision under the Odisha Town Planning and Improvement Trust Act, 1956, Master Plan is required to be prepared to translate broad implementable planning proposals along with detailed land-use plans for achieving planned development of the cities and its immediate surrounding areas. Accordingly, the Master Plan for Barbil was prepared in 1980 with the perspective year 2001, which came into effect in 1986. Meanwhile, in the year 1986, the jurisdiction of revenue villages was reconstituted and the number of revue villages were increased to 20 nos. within the master plan limit, having the same extent of area.

With the changing scenario of urbanisation and technology, the Government of Odisha have decided to prepare GIS / Remote Sensing based Master Plan for several towns of the state including Barbil to guide the overall development in a sustainable manner in future. In this context, the Special Planning Authority- Barbil intends to revise the existing master plan and prepare the Master plan for Barbil for the horizon year 2030 with the objective of enhancing meaningful spatial development in a systematic and well planned manner.

In this context, the Barbil Special Planning Authority has appointed REPL, New Delhi to prepare the GIS/RS based Master Plan for Barbil with a focus on planned spatial development and overall physical & economic improvement of the quality of life in the region.

The assignment of preparation of GIS/RS based Master Plan for Barbil aims at:

- Formulating a meaningful physical Development plan to promote, regulate and guide the urban growth in the region by 2030 in a planned and sustainable manner
- Identifying thrust areas, phasing of development, implementation strategies, resource mobilization and prioritization of development initiatives

1.3 The Vision

Barbil is primarily a 'Mining Town', with its surrounding area rich, both, in minerals and forests. Being a mining town, Barbil faces a high degree of pollution risk, which must be proposed for while strategizing its development. For a growing town like Barbil, infrastructure must be augmented with special focus on transportation, drinking water and sanitation infrastructure. Keeping the above points in view, vision for Barbil is as below –

"To develop Barbil as a Service Centre for surrounding region and augment the infrastructure of the town so as to promote mining and related industries in a sustainable manner aiming at countering pollution that is associated with such activities".

1.4 Objective

The master plan for Barbil planning area will provide all the aspects that are necessary for the integral development of the region. The main objectives of Master Plan are:

- To generate the up-to-date urban land use map of the area using revenue maps and recent period satellite imageries using GIS technology
- To formulate a meaningful physical development plan to regulate and guide the urban growth in the area by 2030 in a planned and healthy manner as per the provision indicated in OTP & IT Act of 1956.

The overall focus of the master plan will be on:

- **Promotion of sustainable mining and related activities**

  As Barbil is primarily a mining town. It can efficiently function as the node for trade and commerce for the surrounding rural areas as well as smaller towns.

However, balance must be maintained thus, the Master plan will focus on promoting industries especially dealing with minerals and allied activities.

- **Augmentation of existing infrastructure**

  Barbil is a hub of employment and thus attracts population from surrounding areas. Thus, the existing infrastructure, both physical and social, in the city needs to be augmented, so that Barbil can efficiently function as an employment node.

- **Improving mobility within and outside the Master Plan area**

  Connectivity of the town with other towns and cities influences the economic growth in the town. Thus, Master Plan shall aim to strengthen the inter-town connectivity for Barbil. In addition to this, mobility within the Master Plan area will also be proposed to be improved.

- **Conserving natural resources**

  Barbil has significant natural features like Uliburu forest and River Karo, which forms the western boundary of the settlement. It is imperative that planning for development of the city doesn't take place at the cost of environment. Thus, all the proposals under Master Plan will not be in contradiction to the overarching aim of conservation of natural features.

1.5 Approach and Methodology

The preparation of master plan is initiated with the assessment of existing condition of the region, its potential resources and constraints. Thereafter, developing priorities in different sectors are framed taking into consideration the future requirement for the horizon year 2030, the existing deficits/ surplus, socioeconomic need and the aspiration of the local people. Status analysis and prime issues pertaining to different sectors such as physical characteristics & natural resource, demography, economic base & employment, housing, transportation, facilities, infrastructure, environment and institutional set-up etc. are well analysed for formulation of Master Plan for the region.

The Master Plan of Barbil comprises of:

- Reports on physical and socio-economic aspect
- Projection and assessment of requirement
- Functional plans on Land use, Traffic and Transportation, Housing, Public utilities, Social infrastructure, Heritage and Tourism, Zoning regulation etc.
- Spatial impact assessment of development proposals

- Strategies of development and identification of priorities for the city region and phasing
- Investment Plan and Action Plan
- Proposed Land use plan translated over revenue map in GIS format

Based on the understanding of the scope of work, a detailed methodology is framed to carry out the master plan process. The execution of the assignment involves a number of inter-linked tasks which is outlined below:

- Task –A : Project Initiation
- Task – B: Digital Base Map Validation
- Task – C: Field Survey, Data Collection and Updating of GIS base map
- Task – D: Preparation of Draft Master Plan
- Task – E : Investment and Implementation Plan
- Task – F: Notification of Draft Master Plan and Finalisation of Master Plan

Accordingly, phase wise discussion thereon with the stakeholder is made to receive inputs, suggestions and comments at each stage of the master plan preparation process.

Task- A: Project Initiation

- Team Mobilization and Start up Meetings
- Collection of GIS database from SPA & preliminary review and data gap analysis
- Site visit and documentation
- Kick-off meeting with various stakeholder's/ line departments and secondary data collection from various agencies
- Preparation of Inception Report and meetings/ interactive workshop

Task- B: Digital Base Map Validation

- Preparation of GIS database for validation
- Identification of methodology for conducting land use validation/ survey
- Ground verification of supplied GIS database
- Validation of base map and preparation of final base map

Task- C: Field Survey, Data collection

- Finalisation of survey questionnaire for socio-economic and traffic survey
- Conducting socio-economic survey for sample HH

- Conducting Traffic and transportation survey such as Total volume count, Origin- destination, Parking and speed-delay survey etc.
- Micro level study on various aspect such as land use & infrastructure, environmental feature, SWM, sewerage disposal etc., study on land with suitability analysis, study on natural resources, analysis on existing development control etc.
- Data compilation and Analysis to identify trends, potentials and problems
- Analysis and trend based projections for all sectors such as demography, housing, infrastructure etc.
- Preparation of Status Survey Report and interactive workshop/ meeting for taking feedback & views of different stakeholders

Task- D: Preparation of Draft Master Plan

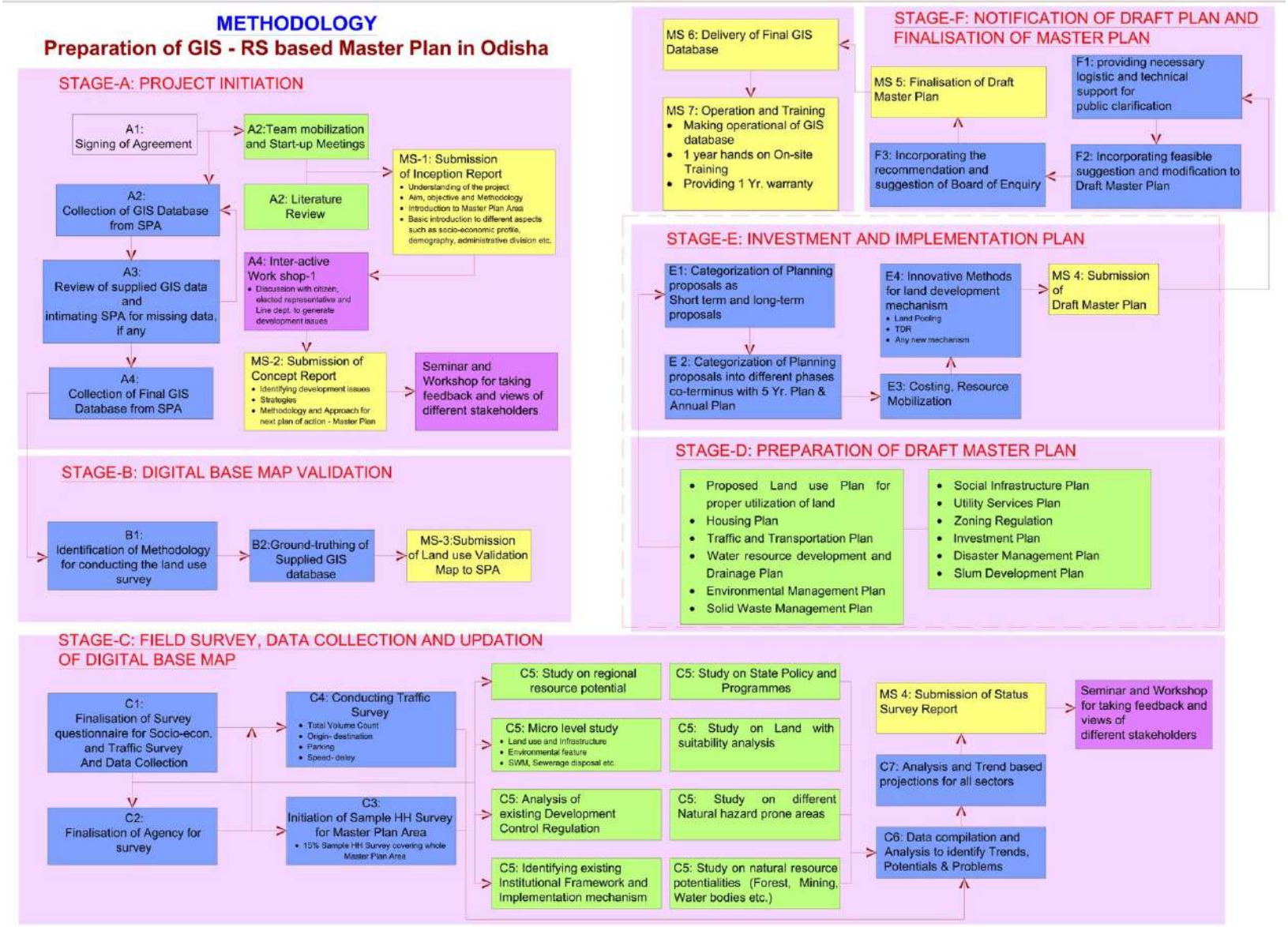
- Based on the sectoral analysis and projection for the horizon year 2030 different developmental proposals such as proposed land use plan, housing plan, traffic & transportation plan, water resource development & drainage plan, social infrastructure plan, environmental management plan, zoning regulation, investment plan etc. are framed with aim and objective in each sectors and proposed strategies to meet the goal.
- Identification of different sectoral projects based on the future strategies.

Task- E: Investment and Implementation Plan

- Categorization of planning proposals as short-term and long-term proposals
- Categorizing planning proposals into different phases dovetail with five-year plan and annual plan.
- Costing mechanism and resource mobilization
- Finalisation of draft master plan containing the draft proposals and investment & implementation plan and interactive workshop/ meeting for taking feedback & views of different stakeholders.

Task- F: Notification of Draft Plan and finalisation of Master Plan

- Incorporating feasible suggestion and modification to the draft master plan
- Statutory obligation of hearing by Board of Enquiry & observation, compliance
- Incorporating the recommendations and suggestions of Board of Enquiry
- Submission of Final Master plan, delivery of final GIS database and notification
- Operation and training for making operational of GIS database


METHODOLOGY
Preparation of GIS - RS based Master Plan in Odisha
STAGE-A: PROJECT INITIATION
A1: Signing of Agreement
A2:Team mobilization and Start-up Meetings
MS-1: Submission of Inception Report
Understanding of the project
Aim, objective and Methodology
Introduction to Master Plan Area
Basic introduction to different aspects such as socio-economic profile, demography, administrative division etc.
A2: Collection of GIS Database from SPA
A2: Literature Review
A3: Review of supplied GIS data and intimating SPA for missing data, if any
A4: Inter-active Work shop-1
Discussion with citizen, elected representative and Line dept. to generate development issues
A4: Collection of Final GIS Database from SPA
MS-2: Submission of Concept Report
Identifying development issues
Strategies
Methodology and Approach for next plan of action - Master Plan
Seminar and Workshop for taking feedback and views of different stakeholders
STAGE-B: DIGITAL BASE MAP VALIDATION
B1: Identification of Methodology for conducting the land use survey
B2:Ground-truthing of Supplied GIS database
MS-3:Submission of Land use Validation Map to SPA
STAGE-C: FIELD SURVEY, DATA COLLECTION AND UPDATION OF DIGITAL BASE MAP
C1: Finalisation of Survey questionnaire for Socio-econ. and Traffic Survey And Data Collection
C4: Conducting Traffic Survey
Total Volume Count
Origin- destination
Parking
Speed- delay
C2: Finalisation of Agency for survey
C3: Initiation of Sample HH Survey for Master Plan Area
15% Sample HH Survey covering whole Master Plan Area
C5: Study on regional resource potential
C5: Micro level study
Land use and Infrastructure
Environmental feature
SWM, Sewerage disposal etc.
C5: Analysis of existing Development Control Regulation
C5: Identifying existing Institutional Framework and Implementation mechanism
C5: Study on State Policy and Programmes
C5: Study on Land with suitability analysis
C5: Study on different Natural hazard prone areas
C5: Study on natural resource potentialities (Forest, Mining, Water bodies etc.)
MS 4: Submission of Status Survey Report
C7: Analysis and Trend based projections for all sectors
C6: Data compilation and Analysis to identify Trends, Potentials & Problems
Seminar and Workshop for taking feedback and views of different stakeholders
STAGE-D: PREPARATION OF DRAFT MASTER PLAN
Proposed Land use Plan for proper utilization of land
Housing Plan
Traffic and Transportation Plan
Water resource development and Drainage Plan
Environmental Management Plan
Solid Waste Management Plan
Social Infrastructure Plan
Utility Services Plan
Zoning Regulation
Investment Plan
Disaster Management Plan
Slum Development Plan
STAGE-E: INVESTMENT AND IMPLEMENTATION PLAN
E1: Categorization of Planning proposals as Short term and long-term proposals
E 2: Categorization of Planning proposals into different phases co-terminus with 5 Yr. Plan & Annual Plan
E4: Innovative Methods for land development mechanism
Land Pooling
TDR
Any new mechanism
E3: Costing, Resource Mobilization
MS 4: Submission of Draft Master Plan
STAGE-F: NOTIFICATION OF DRAFT PLAN AND FINALISATION OF MASTER PLAN
MS 6: Delivery of Final GIS Database
MS 7: Operation and Training
Making operational of GIS database
1 year hands on On-site Training
Providing 1 Yr. warranty
MS 5: Finalisation of Draft Master Plan
F1: providing necessary logistic and technical support for public clarification
F2: Incorporating feasible suggestion and modification to Draft Master Plan
F3: Incorporating the recommendation and suggestion of Board of Enquiry

1.6 Planning Area at a Glance

Barbil Planning area consists of Barbil Municipality and 9 revenue villages adjoining to municipality area. Earlier town was developed in the core city i.e. central part of the town along NH 215. Later, with the process of mining activity in town and nearby areas, town started to grow along major corridors in the south, west and some parts of northern area. Total Planning Area covering an area of 57.87 sq.km.

1.7 Structure of Report

The Draft Master Plan report comprises of 14 Chapters which indicates the existing situation in the city under various components, analyses for gaps in provision of services and proposes strategies for improvement as well as to achieve the vision envisaged in the Master plan. A brief of 14 chapters is shown below –

Chapter 1 – Introduction

It gives an overview of the urbanization trends in India and Odisha and establishes the need for preparation of a Master Plan. Vision for development of city of Barbil is proposed and is detailed in objectives. Approach to prepare the Master plan and its detailed methodology is also documented.

Chapter 2 – Barbil Planning Area

It introduces the Barbil Planning Area, its administrative jurisdiction and its various characteristics like climate, topography, soil and water resources. Existing Master Plan is also reviewed and regional linkages are established.

Chapter 3 – Demographic and Economic Perspective

It shows the demographic profile of the master plan area and trend of population growth. Considering past trends and growth factors, population is projected till 2030. The city is reviewed for socio-economic factors like Work Force Participation Rate, Literacy Rate and Sex Ratio etc. This chapter also identifies economic potentials of the master plan area.

Chapter 4 – Land use

It shows the existing distribution of uses in the Master plan area. The land use distribution is analysed and issues with respect to suitability and conformity of uses are identified. Land use distribution is proposed for 2030 considering the existing situation

and vision of Master Plan. Under this, growth nodes, growth corridors and restricted development zone are identified in the Master Plan area.

Chapter 5 – Housing and Slum

It presents the condition of Housing, its distribution and demand existing in the city. Housing requirements are calculated for horizon year as per the demand assessment. This chapter also deals with slums existing in the city and proposes strategies for their up gradation.

Chapter 6 – Traffic and Transportation

It presents linkages and connectivity of the city with its surroundings as well as intra-city mobility pattern. Issues are identified based on traffic survey findings for which strategies for proposed. Road network to address issues and cater to traffic demands of 2030 is also proposed.

Chapter 7 – Physical Infrastructure

It presents the existing condition and status of existing physical infrastructure which constitutes of Water Supply, Sewerage, Storm Water Drainage, Solid Waste Management and Power. Issues with the existing system are identified and proposals are given to address the issues as well as augment the level and quality of infrastructure for growing population. Broad cost estimates for proposed developments is also included in the chapter.

Chapter 8 – Social Infrastructure

It presents the existing condition and status of existing social infrastructure which constitutes of Education, Health and Socio-Cultural facilities. Issues with the existing system are identified and proposals are given to address the issues as well as augment the level and quality of infrastructure for growing population. Broad cost estimates for proposed developments is also included in the chapter.

Chapter 9 – Tourism and Heritage

It offers insight on the tourism potential of Barbil by showing the existing heritage and tourism sites. Strategies are proposed for promoting tourism and conserving heritage after assessing the opportunities of tourism in the Master Plan Area and around.

Chapter 10 – Environment and Disaster profile

It presents an important aspect of development and planning which is disaster mitigation and environmental protection. Disaster mitigation proposals are given in form of a plan so as to decrease the vulnerability of Barbil to natural disasters.

Chapter 11 – Land Ownership

This chapter presents the land ownership details of the land within the planning area boundary. And hence gives the idea of the feasibility of proposed projects in terms of Land acquisition.

Chapter 12 – Zoning and Sub Division Regulation

It forms one of the most important components of the Master Plan. Zoning regulations and development control regulations proposed in the chapter will guide the physical development in the area and will help in realising the vision and proposed land use plan.

Chapter 13 – Institutional Set up

It presents the network of agencies responsible for planning, development and maintenance in the master plan area and describes their functions and responsibilities. This shall help in implementation of the master plan as roles and responsibilities of each agency are clearly defined.

Chapter 14 – Implementation Mechanism

It presents the action plan for implementation of Master Plan of Barbil. Implementation mechanism is described and phasing has been done for the proposals based on its priority. Sources of funding are also identified.

CHAPTER-2 BARBIL PLANNING AREA – AN OVERVIEW

2.1 Background

Barbil is a medium sized town with a municipality in the Keonjhar district of the state of Odisha. Its importance as a mining and industrial town offers Barbil a significant place in the economy of the state. Barbil and its environs are potentially rich with mineral resources with fifth largest deposit of iron ore and manganese ore in the world. Mineral resource is the major source of revenue generation and plays significant role in the economy of the state as well the central government.

It is situated on the bank of Karo River and at a distance of 75km from the district headquarters, Barbil was a forest and mere virgin land till the early twentieth century. It got the lime light since Bird and Co. Ltd began to extract its manganese and iron ores. Thereafter mining and industrial activity have accentuated which led to the emergence of today's Barbil town. Barbil has a cosmopolitan culture with the influx of migrants from surrounding districts and almost all states of India due to significant employment opportunity in the region.

Initially the development of Barbil town was limited to Barbil municipality, but later due to intensive mining activities and industrial potentiality of the region led to spread of urbanisation trends to the surrounding villages such as Serenda, Jhadagaon, Kasi (Ka), Kasia (Kha), Bhusugaon, Matiaposi. Afterwards growth pattern was noticed on the buildable lands and new spatial expansion was observed along the main arterial roads like State highway. Subsequently being an industrial and mining hub, the town functions as a centre for commerce, transportation activities, residential areas for the service class people etc., that lead to the present day of urban fabric of Barbil.

2.2 Barbil Master Plan Area

With the initiative to have a planned development of the urban centres, original thought was to frame a Master Plan for Barbil Municipality. Accordingly, Section 1 (3) of the Orissa Town Planning and Improvement Trust Act, 1956 was applied over the area. But later it was noticed that the urbanisation has spilled over to surrounding villages due to excavation of ores in village limits. Again, Orissa Town Planning and Improvement Trust Act, 1956 was applied over Uliburu and Hayarpur in 1968. Consequently, upon the transfer of Kalinga Iron Works to Industrial Development Corporation, the industrial activity revived with additional industrial establishments

and the mining as well allied industrial activities projected to the adjacent forest land. Hence the forest areas (Forest –A, B, C and D) had been brought into the ambit of the Barbil Master Plan area in 1975. And ultimately, the Master Plan for Barbil Planning Area was prepared for 18 nos. of revenue villages including Barbil Municipality and Forest- A, B, C and D for the year 2001 with a horizon year of 20 years.

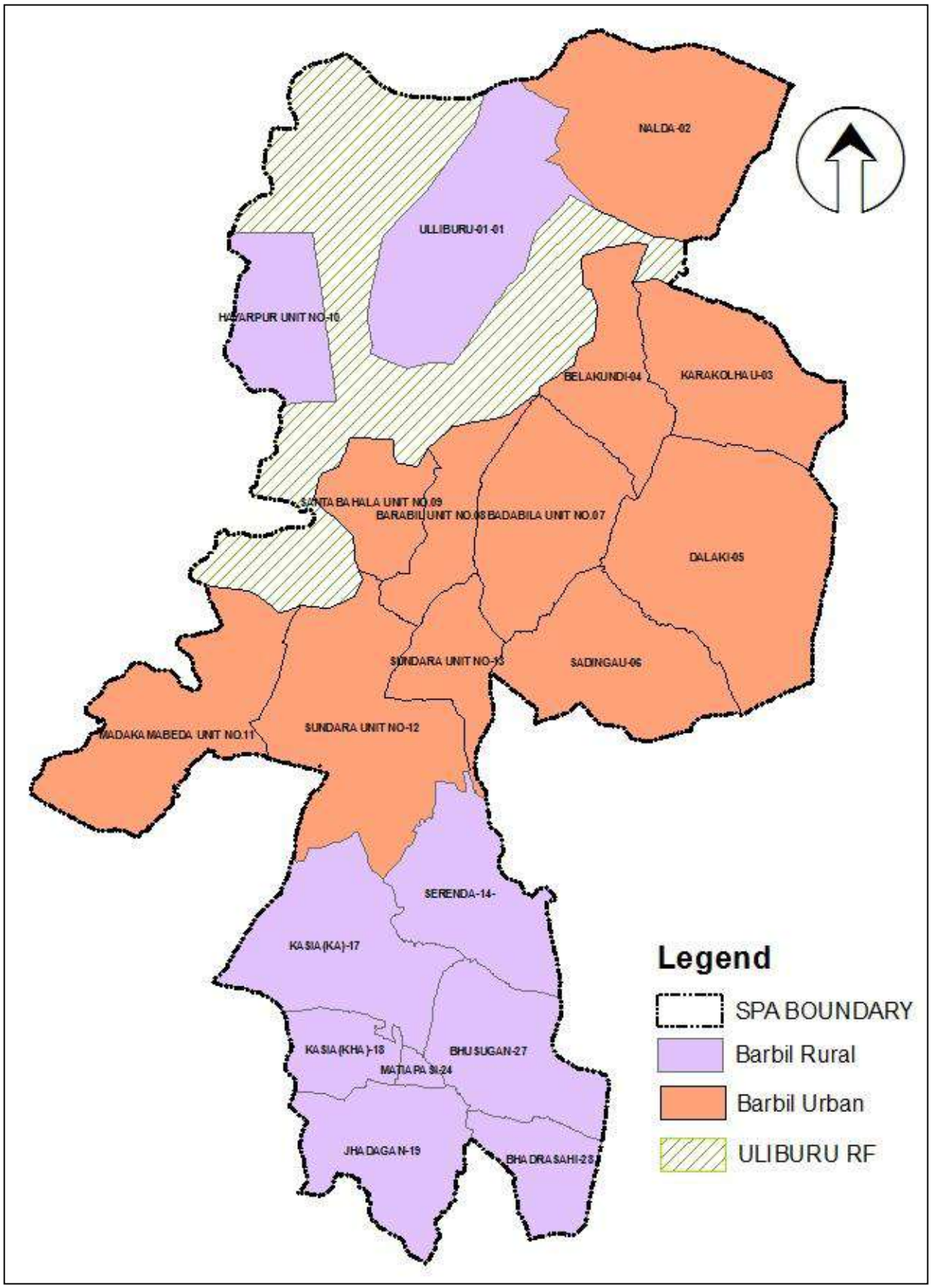
Meanwhile, in the year 1986, the jurisdiction of revenue villages was reconstituted and the number of revenue villages were increased to 20 nos. within the master plan limit, having the same extent of area.

The present master plan area comprises of Barbil Municipal limit (11 revenue villages) and 9 nos. of the adjoining rural areas, with a population of about 76676 (according to the 2011 census) and stretched over an area of 57.87 sq.km.

Table 2-1: Review of Master Plan Area

	Previous Master Plan (1981-2011)	Master Plan-2030
Total Area	57.87 Sq.km.	57.87 Sq.km.
No. of Revenue Villages under Barbil Urban	9 (Mainly consists of Barbil Municipality)	11 (Mainly consists of Barbil Municipality)
No. of Revenue Villages under Barbil Rural	9 Nos. Rural Revenue Villages and Forest- A, B, C and D as notified in Master Plan	9 nos. Rural Revenue Villages And Uliburu Reserve Forest
No. of Total Revenue Villages	18	20

Map 2-1 Barbil Master Plan Area- Revenue Villages



The extent of Master Plan Area boundary is as follows:

North: Nalda and Uliburu

East: Karakolha, Dalaki and Seding

South: Bhadrasahi and Jhadagaon

West: Matkambeda, Hayarpur and Kasia (Ka)

Table 2-2: List of Revenue Villages under Barbil Master Plan Area (Rural)

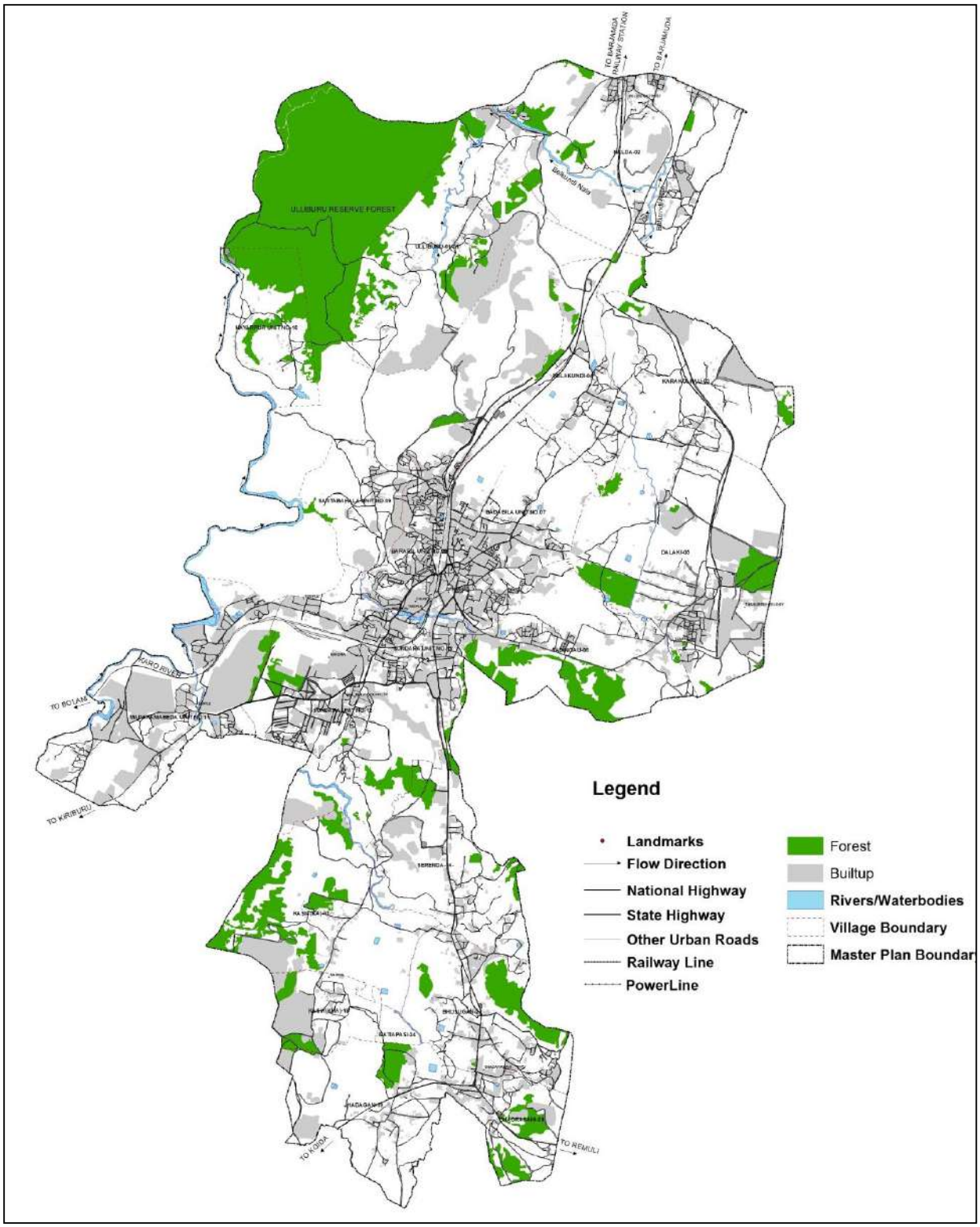
Sl. No.	Village Name	Thana No.	Settlement Type	Name of Gram Panchayat
1	2	3	4	5
1	Uliburu	01	Rural	Balaguda
2	Hayarpur	17	Rural	Balaguda
3	Serenda	26	Rural	Bhadrasahi
`4	Kasia (Ka)	`	Rural	Bhadrasahi
5	Kasia (Kha)	23	Rural	Bhadrasahi
6	Bhusugaon	27	Rural	Bhadrasahi
7	Matiapasi	24	Rural	Bhadrasahi
8	Jhadagaon	30	Rural	Bhadrasahi
9	Bhadrasahi	28	Rural	Bhadrasahi

Table 2-3: List of Revenue Villages under Barbil Master Plan Area (Urban)

Sl. No.	Village Name	Thana No.	Settlement Type	Name of Municipality
1	2	3	4	5
1	Barbil, Unit No.-7	12	Urban	Barbil Municipality
2	Barbil, Unit No.-8	15	Urban	
3	Belakundi	3	Urban	
4	Dalaki	7	Urban	
5	Karakolha	4	Urban	
6	Matkambeda	20	Urban	
7	Nalda	2	Urban	
8	Seding	11	Urban	
9	Santabahal	16	Urban	

10	Sundara, Unit No.-12	13	Urban	
11	Sundara, Unit No.-13	14	Urban	

Map 2-2 Master Plan Area- Barbil



2.3 Administrative Jurisdiction

Barbil Special Planning Authority (SPA) was formed covering a total number of 18 revenue villages under Orissa Town Planning and Improvement Trust Act of 1956. The main objective of the authority is to ensure planned development of the area under its jurisdiction with preparation of development plans, undertaking works related to different town planning schemes and public amenities. Subsequently after the reconstitution of revenue villages in 1986, the number of villages has increased to 20. The planning area of Barbil mainly consists of following planning jurisdictions:

- Barbil Urban mainly confined to Municipal limit of Barbil
- 9 number of revenue villages of adjoin rural areas – Barbil Rural

2.3.1 Barbil Urban

Barbil urban broadly comprises of Barbil municipality limit only. As per the Census 2011, the whole limit comprises of 15 numbers of wards over which Barbil Municipality is responsible for its maintenance and management. Barbil municipality was established in the year 1990s. Before upgrading to municipality, Barbil Notified Area was constituted to make administrative provisions as laid in Orissa Municipal Act, 1950 with the following boundaries:

North: West Singhbhum (Jharkhand)

South: Kolhabarpada, Kasia (Ka), Serenda and Sayabahal

East: Kafakhenda and Thakurani Hill

West: Uliburu, Limtur, Hayarpur, Balagoda and Bolangi

2.3.2 Barbil Rural

It comprises of 09 revenue mauzas namely Uliburu, Hayarpur, Serenda, Kasia (Ka), Kasia (Kha), Bhusugaon, Matiapasi, Jhadagaon, Bhadrasahi which comes under two gram panchayats namely Balaguda and Bhadrasahi. The whole rural area of the master plan limit stretches over an area of 26.76 sq.km. Including Uliburu Reserve Forest area. The detail of revenue villages with GP is given below:

Table 2-4: List of revenue villages (Within MP Area) with Gram Panchayat and Block

Sl. No.	Village Name	Thana No.	Name of Gram Panchayat	Name of the Block
1	2	3	4	5
1	Uliburu	01	Balaguda	Joda
2	Hayarpur	17	Balaguda	
3	Serenda	26	Bhadrasahi	
4	Kasia (Ka)	25	Bhadrasahi	
5	Kasia (Kha)	23	Bhadrasahi	
6	Bhusugaon	27	Bhadrasahi	
7	Matiapasi	24	Bhadrasahi	
8	Jhadagaon	30	Bhadrasahi	
9	Bhadrasahi	28	Bhadrasahi	

Table 2-5: Overview of Barbil Master Plan Area- 2030

Sl. No.	Description	No. of Revenue Villages	Area in Sq.km	Remarks
1	2	3	4	5
1	Barbil Urban	11	31.11	Urban area comprises of Barbil Municipality confined to 15 nos. wards
2	Barbil Rural	09	26.76	Rural area comprises of 9 nos. of Revenue Villages surrounding the municipal limit and Uliburu Reserve Forest with area
Master Plan Area- Barbil SPA		**20**	**57.87**	

**Note: As per RFP, the total Master Plan area is 56.95 Sq.Km, However as per the Boundaries provided by ORSAC in GIS Format and through ground measurement and verification there after it was observed that the total master plan area is 57.87sq.km and is used for all the calculation & Proposal here after.*

2.4 Geographical Setting: Planning Area

Barbil Planning Area is situated between 85° 20' E - 85° 25' E longitude and 22° 02' N - 22° 09'N latitude with an altitude of 477 meter. Barbil SPA area consists of municipal

limit of Barbil and additional 09 rural revenue villages/mouzas. Beyond the Master Plan area Barbil is bounded by following adjoining villages:

Table 2-6: Name of the adjoining villages and Natural features to Master Plan Area

Sl. No.	Direction	Village Name
1	North	Singhbhum (Jharkhand State)
2	East	Karakhendra No.-5, Thakurani Reserve Forest
3	South	Kolhabarpada No.22, Tanto No.-31, Fulabadi, Sidhamatha Reserve Forest
4	West	Karo River, Balagoda No.- 19, Karo Reserve Forest, Limitur No.-18

2.5 Topography

Keonjhar district consists of a compact land locked area and can be divided into two widely dissimilar tracts – the lower Keonjhar and the upper Keonjhar. The former is a region of valleys and low lands with planes of Anandpur and a portion of Sadar Sub-division, while the latter includes mountainous highlands with a general slope from North to South and some of the highest peaks of Odisha namely Gandhamardan, Gonasika and Thakurani. The average elevation in its central part is about 500 m. But most of the areas have a general elevation of over 600m. which forms the watershed of some rivers. Barbil Planning area with its undulating plains and hills stands at the upper Keonjhar tract having slope towards north western side, which is evident from the flow direction of Karo River and other seasonal streams in the planning area.

2.6 Climate

This city has a tropical climate. In winter, there is much less rainfall than in summer. This climate is considered to be Aw according to the Köppen-Geiger climate classification. The average annual temperature in Barbil is 25.0 °C. In a year, the average rainfall is 1378 mm.

Climate data for Barbil, Odisha [hide]

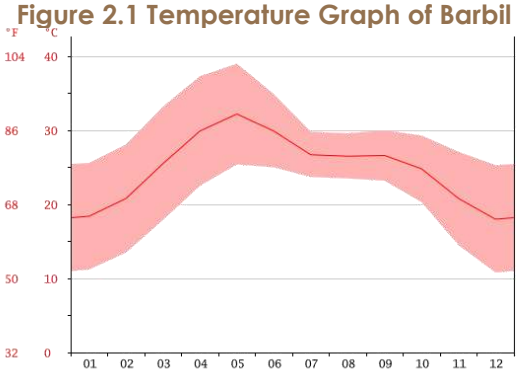
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	25.6 (78.1)	28.1 (82.6)	33.2 (91.8)	37.3 (99.1)	39.0 (102.2)	34.9 (94.8)	29.8 (85.6)	29.6 (85.3)	30.0 (86)	29.3 (84.7)	27.1 (80.8)	25.3 (77.5)	30.77 (87.38)
Average low °C (°F)	11.2 (52.2)	13.5 (56.3)	17.9 (64.2)	22.5 (72.5)	25.4 (77.7)	25.0 (77)	23.7 (74.7)	23.5 (74.3)	23.2 (73.8)	20.3 (68.5)	14.5 (58.1)	10.8 (51.4)	19.29 (66.72)
Average rainfall mm (inches)	12 (0.47)	25 (0.98)	25 (0.98)	20 (0.79)	56 (2.2)	201 (7.91)	354 (13.94)	370 (14.57)	237 (9.33)	66 (2.56)	11 (0.43)	2 (0.08)	1,378 (54.24)

Source: en.climate-data.org

2.6.1 Temperature

The temperatures are highest on average in May, at around 32.2 °C. In December, the average temperature is 18.0 °C. It is the lowest average temperature of the whole year.

Figure 2.1 Temperature Graph of Barbil



2.6.2 Rainfall

The least amount of rainfall occurs in December. The average rainfall in this month is 2 mm. Most precipitation falls in August, with an average of 370 mm.

Source: en.climate-data.org

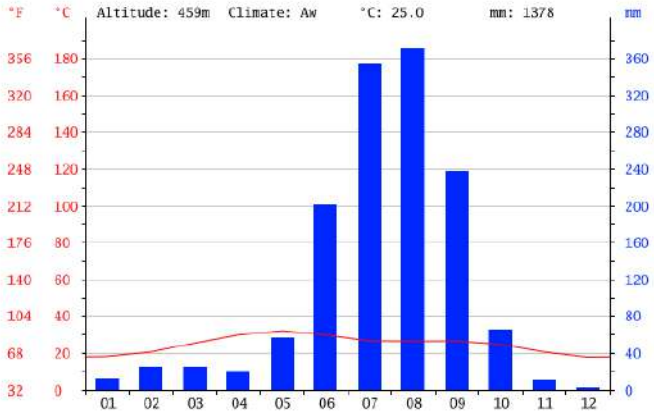


Figure 2.2 Climate Chart of Barbil

2.6.3 Wind

The wind velocity is light or moderate throughout the year with some increase in the month of April and May. Prevalent wind direction is between south-west and south-east in summer and south-west during monsoon seasons. In the post monsoon and winter season, winds are mainly from south or south-east direction. In the month of May and post monsoon season storms and depression over reach the district and cause heavy rain and high winds.

2.7 Soil

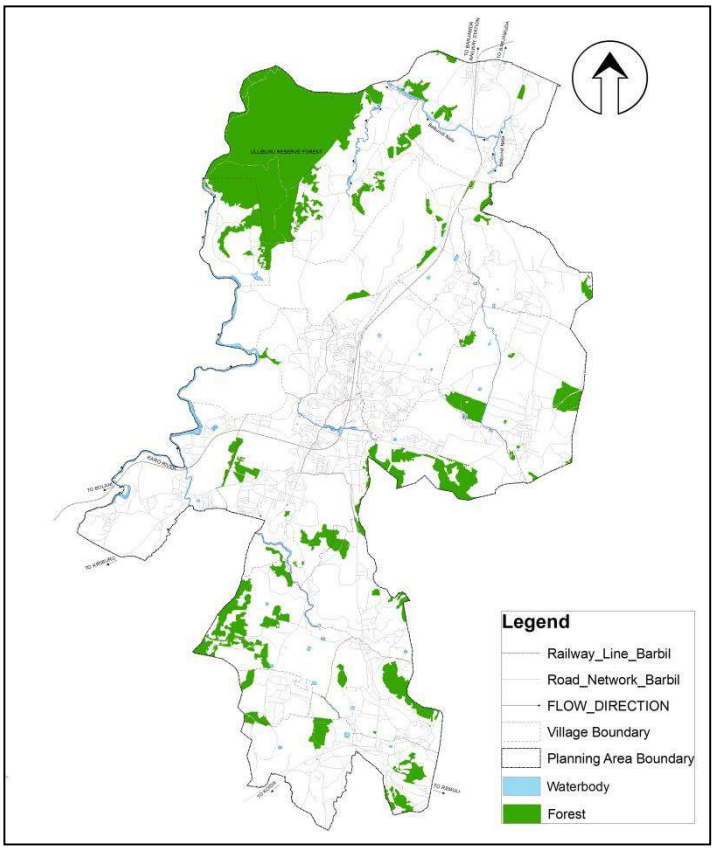
Mostly the planning area is having rocky terrain. The general soil condition of the area is stony and rocky. The topography in and around the town constitute mainly hilly areas forming a part of the plateaus of Upper Keonjhar tracts. The surrounding areas are having rich deposits of iron and manganese ore.

2.8 Water Resource

The entire region of master plan has a good number of water resources of river, ponds and reservoirs. Originating from Bonai, Karo River is a major river of the district flows on the western boundary of the planning area and serves as a major source of water supply in the municipal area of Barbil.

It is also noticed that due to drawl of water by several industries and mine owners for their use, the flow of the river reduces in the downstream. Apart from River Karo, which flows on the north-western boundary of the master plan area, there are a number of natural nallas such as Dholki Nalla, Sundara Nalla and Barapada Nalla, which form the natural drainage channel in the master plan area.

Figure 2.3 Water Resources- Barbil MP



Apart from the river system in the planning area, there are a very few water bodies in the form of ponds which mainly used for household activities in the rural environ. Also, it is seen that in summer season, the water level of the river as well the ground water depletes which results in scarcity of drinking water supply. Therefore, proper intervention needs to be taken up for augmentation of existing water supply scenario in the planning area. Already initiatives have been taken by PHEO for water supply augmentation scheme in Barbil urban.

2.9 Flora and Fauna

Barbil Special Planning Area is full of exquisite flora & fauna. The area is home to wild elephants, sambhar and cheetal deer breeds etc. Apart from this, the surrounding area near Barbil town is also rich in forest resources with large forest areas such as Thakurani and Ulliburu Reserve Forest, which could be developed as ecological tourist spots. The neighbouring district West Singhbhum in Jharkhand is home to the Saranda Reserve Forest which is dense forest and hilly region,

2.10 Economy

The whole district of Keonjhar is highly rich in mineral resources and has vast deposits of iron, manganese and chromium ores. Likewise, Barbil and its rural environs are important due to the presence of such type of ores and attract many industrial set up in the vicinity. As a result, the town act as a hub for mining and ancillary activities. Also,

being located at the rail head which facilitates smooth transportation of minerals, the city occupies a significant place in the region and has an advantageous position to grow economically keeping trade relation with other towns of the State and outside State as well. The establishment of Kalinga Iron Works in 1955 has added on to the local economy and has turned Barbil to an important production centre. Demands for iron ore fines are increasing day by day which are being exported to foreign countries. In this area, a large number of industries have grown up and has a great potential for development.

Being a service and industrial town of the district, activities such as administrative, institutional and commercial also hold the key role in employment generation of the town.

Table 2-7: Working Population- Barbil MP Area

Particulars	Barbil Master Plan Area		Barbil Urban		Barbil Rural	
	Census 2011	**Census 2001**	**Census 2011**	**Census 2001**	**Census 2011**	**Census 2001**
Total Population	76676	59297	66540	52627	10136	6670
Total Worker	25207	18306	22014	16259	3193	2047
Main Worker	21213	16423	19050	14826	2163	1597
Marginal Worker	3994	1883	2964	1433	1030	450
Non-worker	51469	40991	44526	36368	6943	4623
WFPR	**32.87**	**30.87**	**33.08**	**30.89**	**31.50**	**30.69**

Source: (Census of India)

After intense industrialisation in the region, utilization of land in the periphery of the town is being changed from agricultural use to non-agricultural use; as a result, numbers of agricultural workers are decreasing. Also, the yield from agricultural activity is quite limited as compared to tertiary sector which resulted lower participation rate of workers in primary sectors. But the restriction on mining in early 2008 resulted stagnation of economic upliftment of the region. However, the present decision on re-opening up mining activities would definitely add on to the local economy. Also, proper intervention such as establishment of industrial units like Iron based engineering and fabrication industries need to be taken up for improvement of local economy along with entrepreneurship development of the local residents.

2.11 Culture, Heritage and Tourism

The history of the town is interconnected with the discovery of minerals in the surrounding areas. Before that little history is recorded. Since the town is based on the mining activity which is quite lucrative it attracted large number of migrant populations and workers from various parts of the country. The resultant cultural environment of the town thus has become multi-ethnic and multi lingual in nature.

The tourism in the town is not a significant activity even though there is a large potential for developing the tourism sector. The neighbouring district West Singhbhum in Jharkhand is home to the Serenda Reserve Forest which is dense forest and hilly region, full of exquisite flora & fauna can be well reached though Barbil which is connected by all means of transportation. The area is home to wild elephants, sambhar and cheetal deer breeds etc. Apart from this, the surrounding area near Barbil town is also rich in forest resources with large forest areas such as Thakurani and Ulliburu Reserve Forest, which could be developed as ecological tourist spots.

Another tourist attraction near Barbil is Murgamadeva temple, which is situated in Champua sub division of the Keonjhar district at a close distance to the town. It is located near a perineal spring which is fed by water channel in the Thakurani hills. The Murgamadeva temple is dedicated to lord Shiva and is pious to both local tribal population and other incoming devotees.

Tourism development of the region could be enhanced with development new tourist attraction spots, arranging mining & industrial excursion tour, preservation and development of existing water bodies such as Karo River and natural nallahs to tourist places.

CHAPTER-3 DEMOGRAPHY AND ECONOMIC PERSPECTIVE

Demographic and economic analysis is needed in all stages of the planning process for both new and revised plans. It is required to identify problems and community needs, establish goals and objectives, assess alternative courses of action, allocate resources for plan implementation, and evaluate the ability of the plan to achieve goals and objectives. This chapter basically outlines the demographic, social and economic profile of the master plan area along with the projection for master plan period.

3.1 Demographic Profile

Population growth and change has a major impact on the urban fabric of a region. To guide the physical, social and economic development of a region, study of existing demographic indicators such as population distribution, growth trends, and density pattern along with population projection for the horizon year of 2030 is an essential part.

3.2 Population and Growth trends

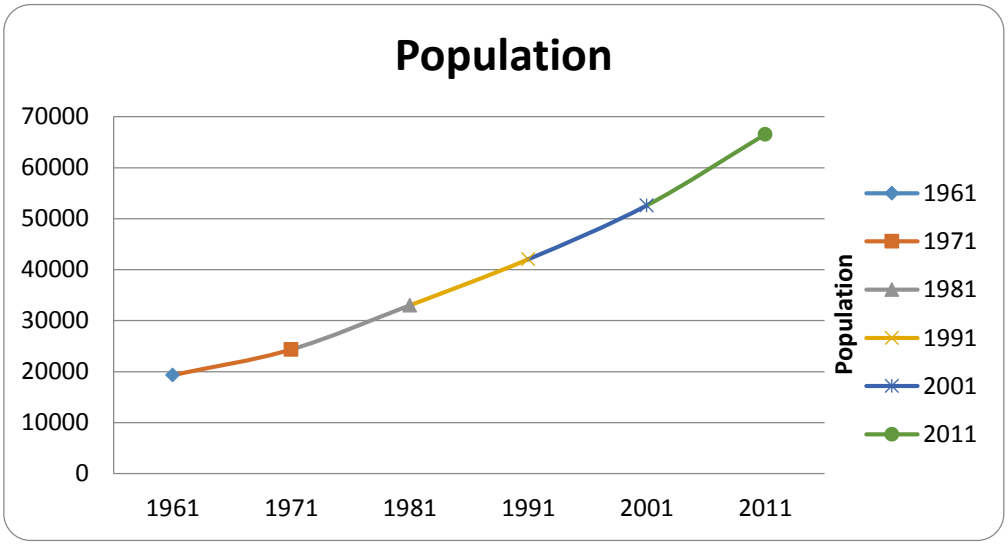
The population of the Master Plan Area includes that of the Barbil Municipality and the villages within it. The following table shows the increase in population of the Master Plan Area over last three decades (1991-2011). As per 2011 census, Barbil Special Planning Area had a population of 76,676, out of which Barbil Municipal Area (Urban Area) had a population of 66,540 (86.78% of the Total Population) with a population growth rate of 26.44 percent from last census year and rural area is having 10136 populations (13.22% of the Total population) with a growth rate of 52 percent from last census year.

Table 3-1 Decennial Growth Rate of Barbil Master Plan Area

Census Year	Urban Population	Decadal Growth Rate	Rural Population	Decadal Growth Rate
1991	42032	27.24	6702	-
2001	52627	25.21	6610	-0.50
2011	66540	26.44	10136	52.00

Note: Negative growth rate in rural areas was due to migration from rural to urban areas for mining activities but in 2011 people again shifted to rural areas due to ban of mining activities.

Figure 3.1 Population Growth Trend- Barbil Municipal Area



Source: Barbil Master Plan for 1986, Census of India 1991, 2001 & 201

Table 3-2 Population of Barbil Master Plan

Description	Absolute			Percentage		
	Total	Rural	Urban	Total	Rural	Urban
Persons	76,676	10,136	66,540	100%	100%	100%
Males	40,151	5,213	34,938	52%	51%	53%
Females	36,525	4,923	31,602	48%	49%	47%

Source: Census of India, 2011

3.3 Population Distribution

3.3.1 Barbil Urban Area

Barbil urban mainly consists of Barbil Municipality having 15 nos. of wards. As per the 2011 Census, the population of municipal area is 66540 with a population growth of 26.44% from last census year.

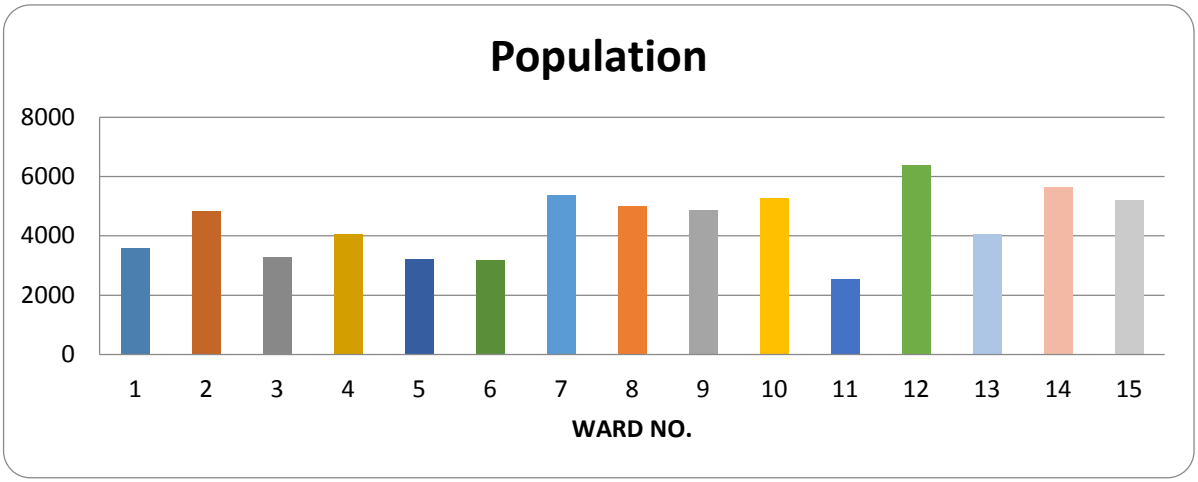
Table 3-3 Ward wise- Population Distribution of Barbil Municipality Area

Ward	Total Population	Male Population	Female Population	Population 0-6
1.	3578	1818	1760	518
2.	4845	2510	2335	857
3.	3278	1636	1642	581
4.	4057	2161	1896	625
5.	3216	1707	1509	455
6.	3173	1664	1509	386
7.	5387	2807	2580	845
8.	4999	2617	2382	835
9.	4877	2526	2351	746
10.	5274	2763	2511	793

11.	2547	1385	1162	418
12.	6397	3465	2932	1118
13.	4054	2117	1937	580
14.	5644	3036	2608	665
15.	5214	2726	2488	863
Total	**66540**	**34938**	**31602**	**10285**

Source: Census of India, 2011

Figure 3.3 Ward wise population distribution



Source: PCA DATA

Among all the wards in Barbil, highest population is in ward number 12 whereas lowest is in ward no. 11. Highest percentage (17.72%) of population between the age group 0-6 is in ward number 3. The further demographic data for the urban area is shown in the table below.

Table 3-4: Demographic Details of the Urban Area

1	Description	Number	Description	Value
1	Number of Households	15094	Average HH size	4.41
2	Total population	66540	Sex Ratio	905
3	Total Male population	34938	Sex Ratio (0-6 Year)	939
4	Total Female population	31602	Proportion of SC (in %)	12.77
5	Population in 0-6 years age group	10285	Proportion of ST (in %)	24.48
6	SC Population	8500	Literacy Rate (%)	72.18
7	ST Population	16291	Work Participation Rate	33.08
8	Literates	40607	% of Main Worker	28.63
9	Illiterates	25933	% of Marginal Worker	4.45
10	Total Worker	22014	% of Non-worker	66.92
11	Number of Households	15094	Average HH size	4.41
12	Main Worker	19050		
13	Marginal Worker	2964		
14	Non-Worker	44526		

Source: PCA DATA

The above table shows that key parameters like sex-ratio, Schedule tribe and schedule caste population and the work force participation of the town. As seen above the percentage of SC and ST population in the town is nearly 12 and 24% respectively. The work force participation rate is around 33% and the percentages of non-workers are quite high.

3.3.2 Barbil Rural Area

It mainly consists of 9 number of revenue villages surrounding the municipal limit of Barbil as notified in the Master Plan. Out of all villages in Barbil Rural, Matiapasi is an un-habited village. Total village population in Barbil Rural sums up to 10136 with 2149 nos. of households. Uliburu Reserve Forest which is a part of Barbil Rural Area

Map 3-1 Density Pattern in Barbil Master Plan Area

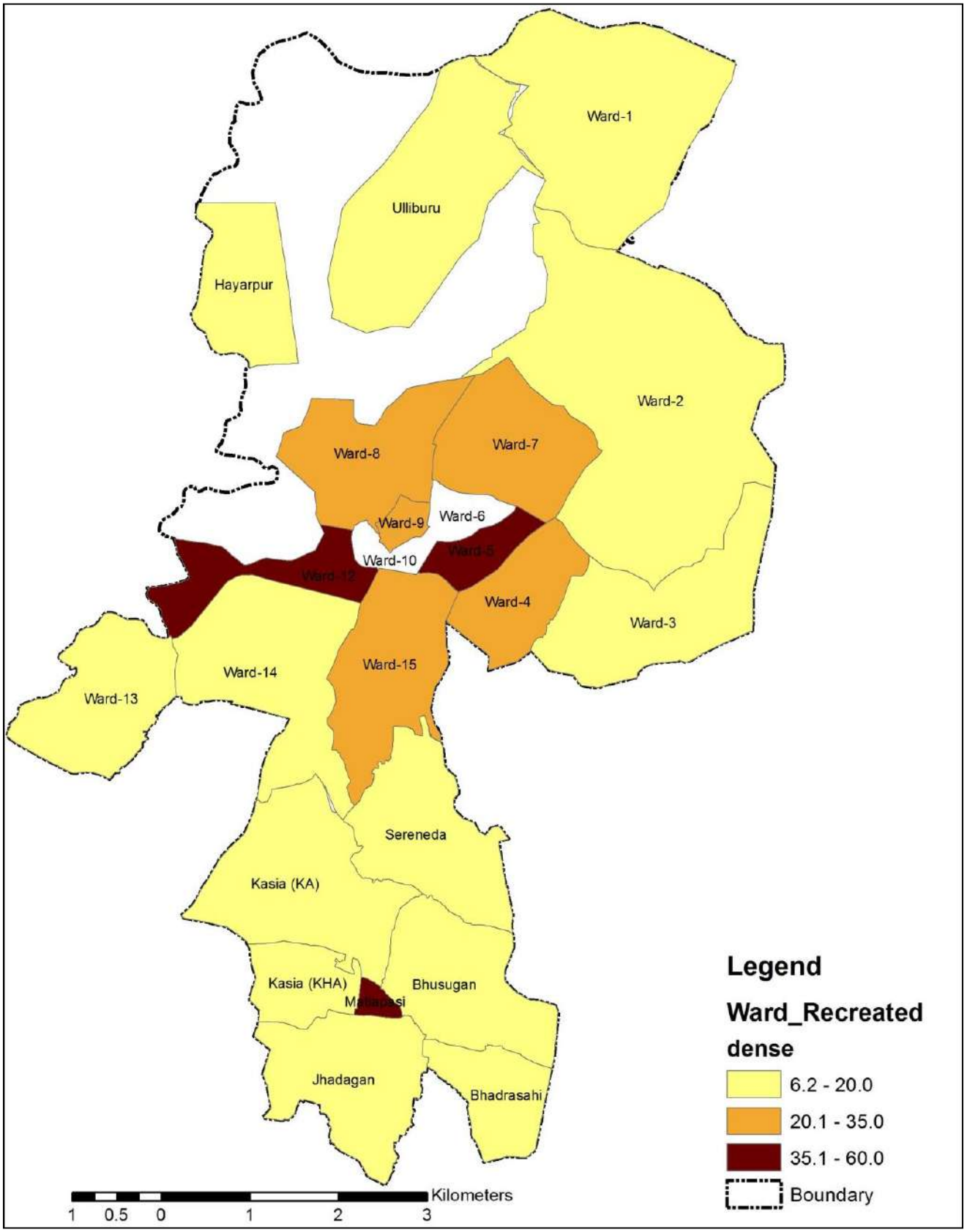


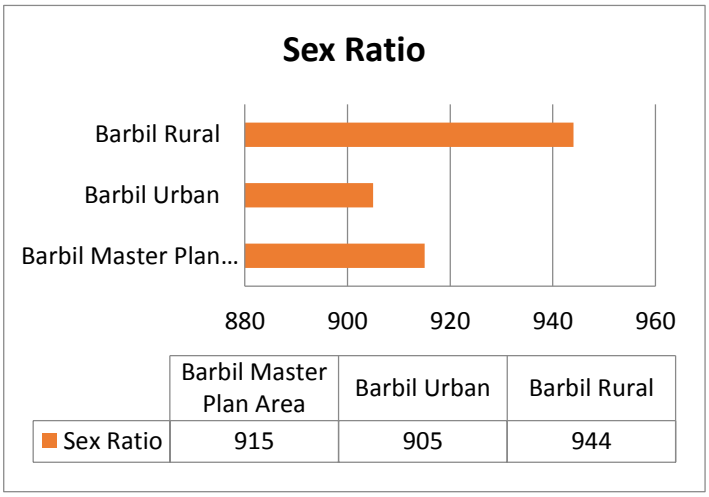
Table 3-5: Demographic details of the rural area

S. No.	Description	Number	Description	Value
1	Number of Households	2149	Average HH size	4.72
2	Total population	10136	Sex Ratio	944
3	Total Male population	5213	Sex Ratio (0-6 Year)	929
4	Total Female population	4923	Proportion of SC (in %)	11
5	Population in 0-6year age group	1896	Proportion of ST (in %)	52.62
6	SC Population	1115	Literacy Rate (%)	63.06
7	ST Population	5334	Work Participation Rate	31.5
8	Literates	5196	% of Main Worker	3.25
9	Illiterates	4940	% of Marginal Worker	1.55
10	Total Worker	3193	% of Non-worker	10.43
11	Main Worker	2163	Rural area includes all 9 revenue villages notified in Master Plan of Barbil	
12	Marginal Worker	1030		
13	Non Worker	6943		

Source: PCA DATA

The above table shows that key parameters like sex-ratio, Schedule tribe and schedule caste population and the work force participation of the rural areas. As seen above the percentage of SC and ST population in the rural area nearly 11 and 52% respectively. The work force participation rate is around 31% and the percentages of non-workers are low as 10%.

Figure 3.4 Sex Ratio Comparison



3.4 Socio- Economic Profile

Socio economic profile indicates the characteristic of the educational background, employment status, sex ratio and household characteristics.

3.4.1 Sex Ratio

The sex ratio is an important indicator for assessment of social profile in a given area. It gives an overall distribution and ratio of male and female population. As per the 2011 census data, the sex ratio of the Barbil Master Plan Area is 915 compared to the state figure of 979.In rural areas of the Barbil Master Plan Area, the sex ratio is

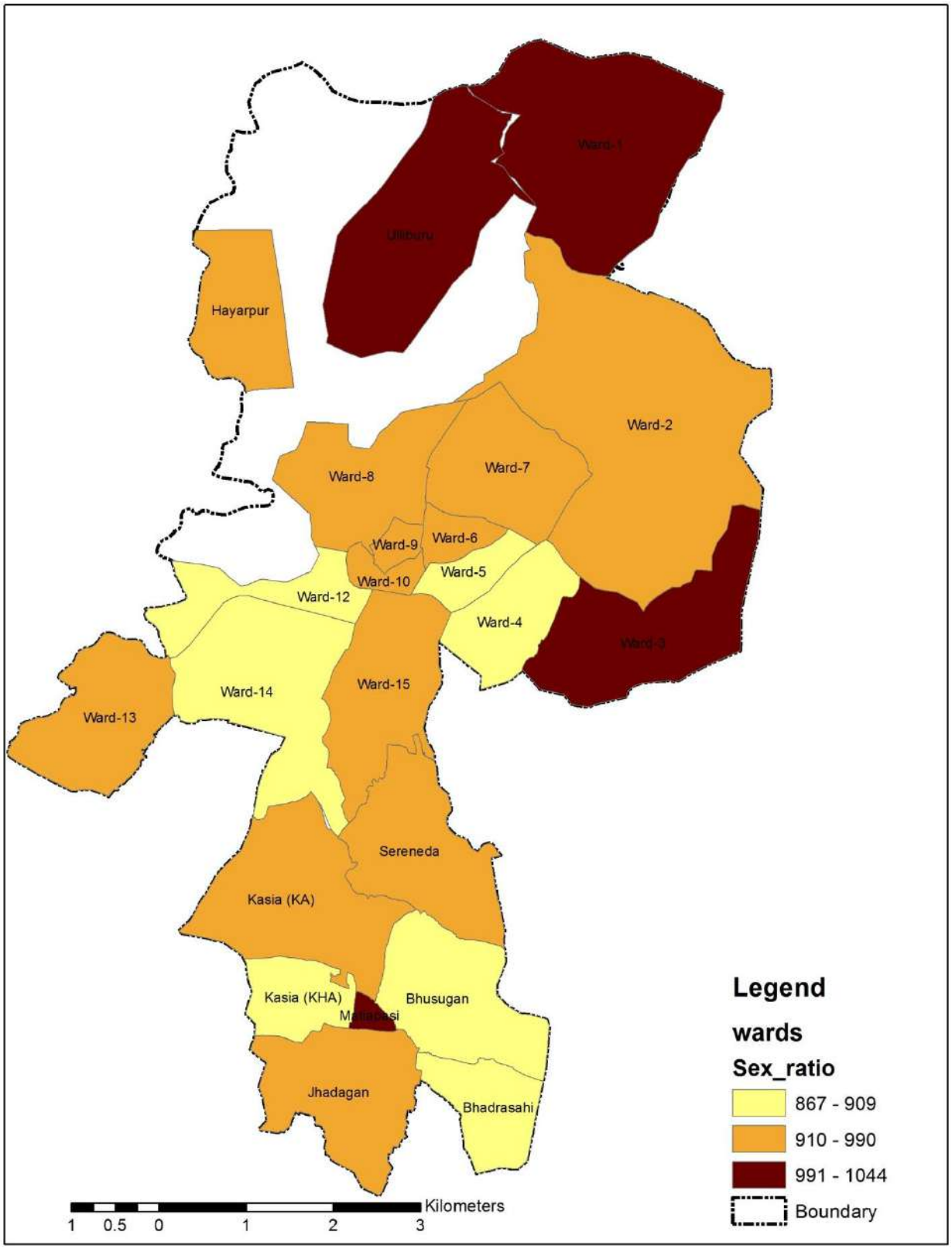
comparatively higher than that of urban areas. In rural areas, the sex ratio is 944 whereas in urban areas the figure is 905.

Table 3-6 Urban and Rural Population and Sex Ratio of Barbil

Total Population	Absolute		
(Barbil MPA)	**Total**	**Rural**	**Urban**
Persons	76,676	10,136	66,540
Males	43,934	5,213	34,938
Females	40,196	4,923	31,602
Sex Ratio	**915**	**944**	**905**

Source: PCA Data.

Map 3-2 Sex Ratio in Barbil Master Plan Area



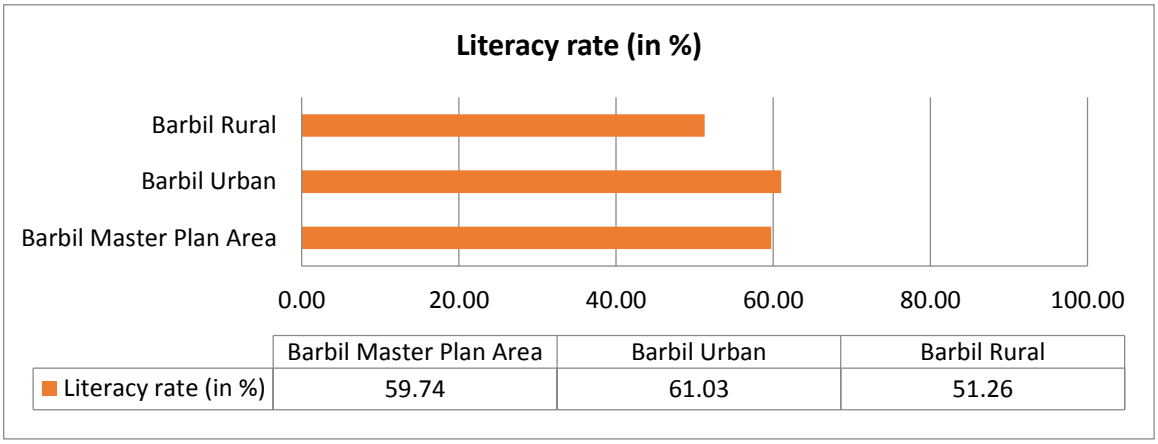
3.4.2 Literacy Rate

The literacy level in the town represents the quality of life of the population along with their accessibility to their educational facilities. The literacy rate of Master Plan area is 59.74 percent. As against the literacy rate in urban Barbil is 61.03% & rural is 51.26% out of the total literates, about 51% are male literates and 49% female literates as shown in Table 3-7 below:

Table 3-7 Literacy Rate of Barbil

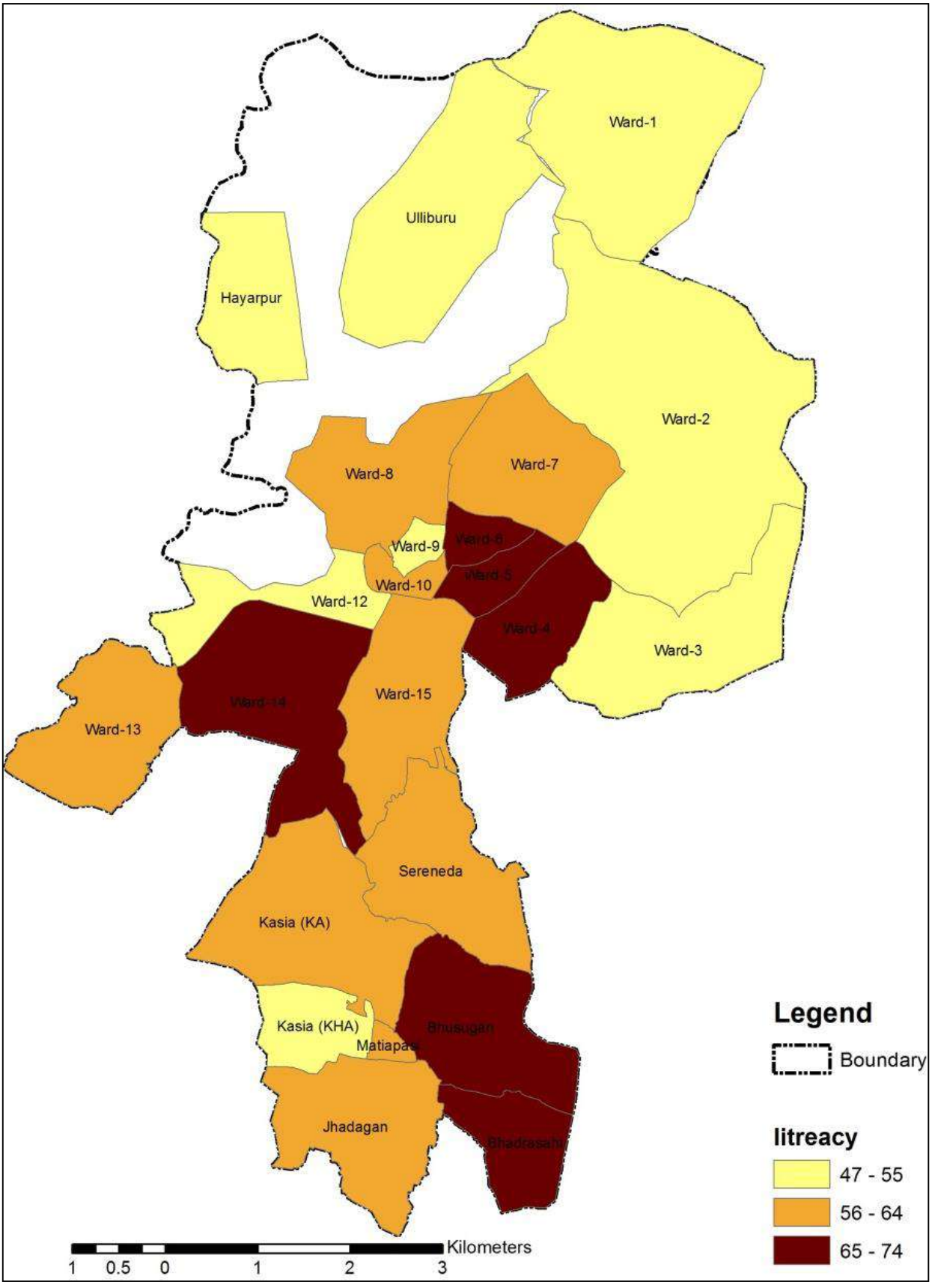
	Total Literates	Male Literates	Female Literates	Literacy rate (in %)
Barbil Master Plan Area	45803	27059	18744	59.74
Barbil Urban	40607	23946	16661	61.03
Barbil Rural	5196	3113	2083	51.26

Figure 3.5 Literacy Rate in Barbil



While analysing the urban and rural literacy rates, it is observed that urban areas are having better literacy rate (61.03%) than rural areas (51.26%) although it is lower than the State literacy rate of 73.45% and National literacy rate74.04% as well. Low literacy rate in the Master Plan area may be attributed to lack of public awareness, gender inequality, unemployment and low economic status of the people.

Map 3-3 Literacy Rate in Barbil Master Plan Area



3.4.3 Broad Age and Sex Composition of Population- 2011

Total population of the Planning Area is 76,676 out of which 87% is urban population and 13% is rural population. Out of the total urban population, 15% population is under 0- 6 year and 19% population of the total rural area is under 0- 6 year.

In planning area, 52% is male population and 48% is female population. In urban area, 53% is male population and 47% is female population whereas in rural area, male population is 51% and 49% is female population.

Table 3-8 Sex Composition in Barbil Planning Area

Description	Population	Male	Female
Total	76676	40151 (52%)	36525 (48%)
Urban	66540	34938 (53%)	31602 (47%)
Rural	10136	5213 (51%)	4923 (49%)
Total (0- 6)	12181 (16%)*	6287 (52%)	5894 (48%)
Urban (0- 6)	10285 (15%)**	5304 (52%)	4981 (48%)
Rural (0- 6)	1896 (19%)***	983 (52%)	913 (48%)

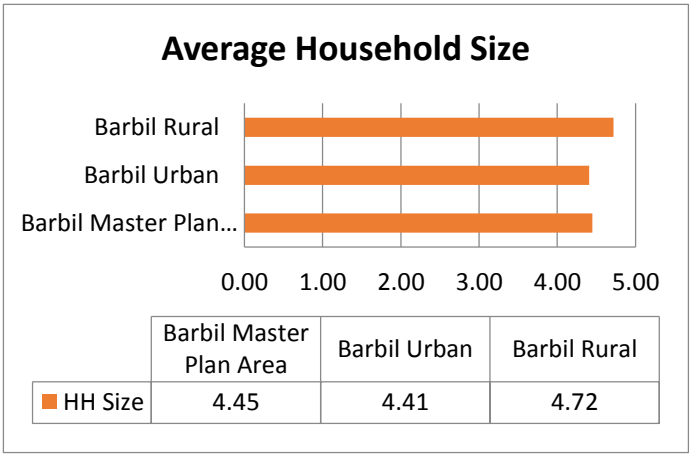
Source: Census of India, 2011
Note: Figures in parenthesis are percentage of population to Planning Area Population
**Percentage of 0-6 Population to the total population.*
*** Percentage of 0-6 Population to the urban population.*
**** Percentage of 0-6 Population to the Rural population.*

3.4.4 Average Household Size

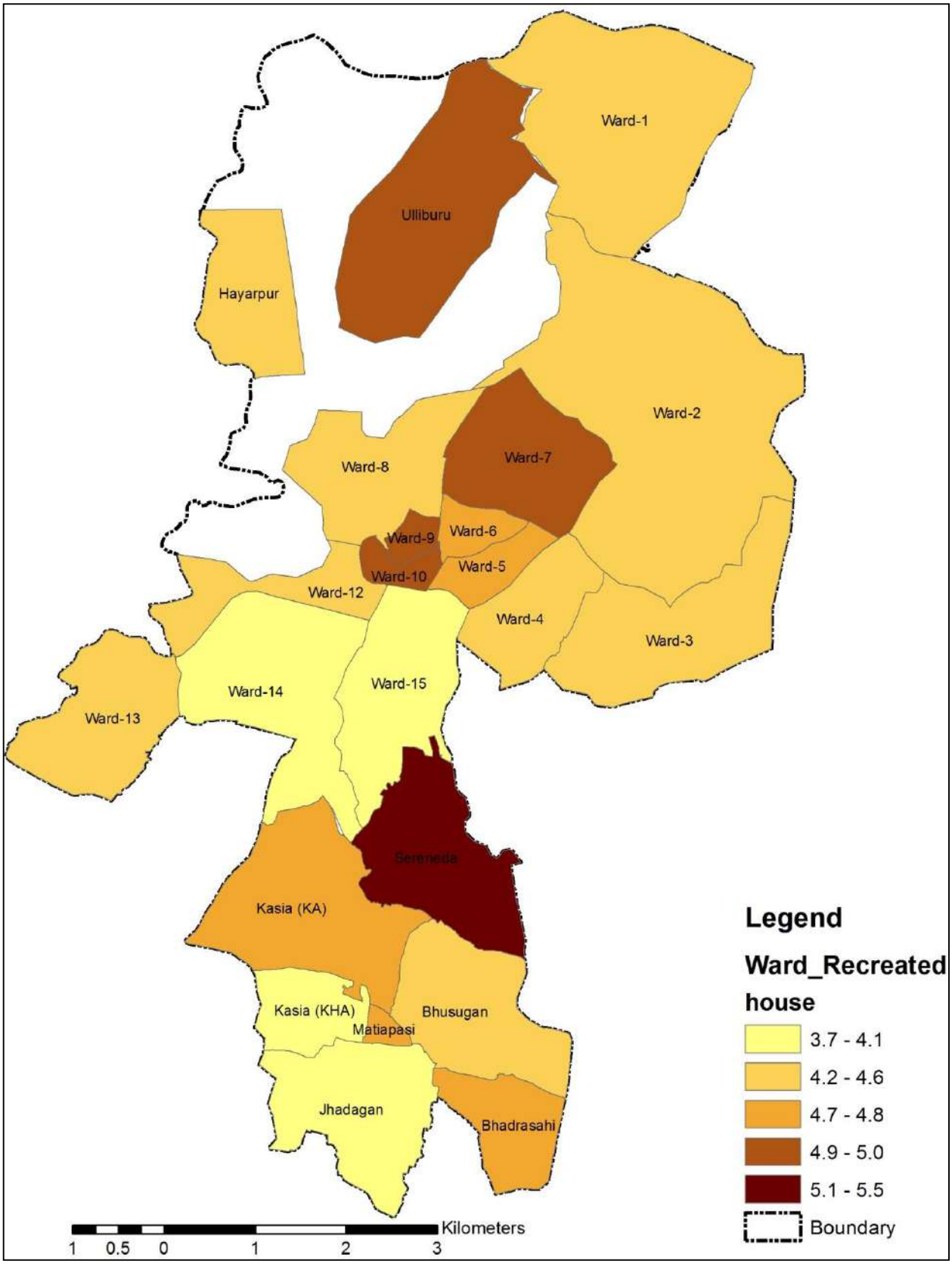
According to the Census 2011, there are 17,243 households and the population is 76676 in Barbil Master Plan area. So, based on this, the current average household size works out to be 4.45.

As per census 2011, Barbil urban area has 15,094 households which show that it has a HH size of 4.45 whereas as per census 1971, HH size was 4.28.

Figure 3.6 Household size in Comparison



Map 3-4 Household Size in Barbil Master Plan Area



3.4.5 Economy

The economic wellness of any town could be accessed through analysing the work participation rates in that area. As per census 2011, the WFPR of the master plan area is 32.87%, which increases from 30.87 of previous census year- 2001. Within the Master Plan area, the rural area shows a WFPR of 31.50 percent. The urban area i.e. Barbil Municipality have a working population of 22014, as per Census 2011 with a work force participation rate of 33.08%. Study of economic data indicates the development of an area which can be estimated through analysing the work participation rate.

Table 3-9 Working Population- Barbil Master Plan Area

Particulars	Barbil Master Plan Area		Barbil Urban		Barbil Rural	
	Census 2011	Census 2001	Census 2011	Census 2001	Census 2011	Census 2001
Total Population	76676	59297	66540	52627	10136	6670
Total Worker	25207	18306	22014	16259	3193	2047
Main Worker	21213	16423	19050	14826	2163	1597
Marginal Worker	3994	1883	2964	1433	1030	450
Non-Worker	51469	40991	44526	36368	6943	4623
WFPR	32.87	30.87	33.08	30.89	31.50	30.69

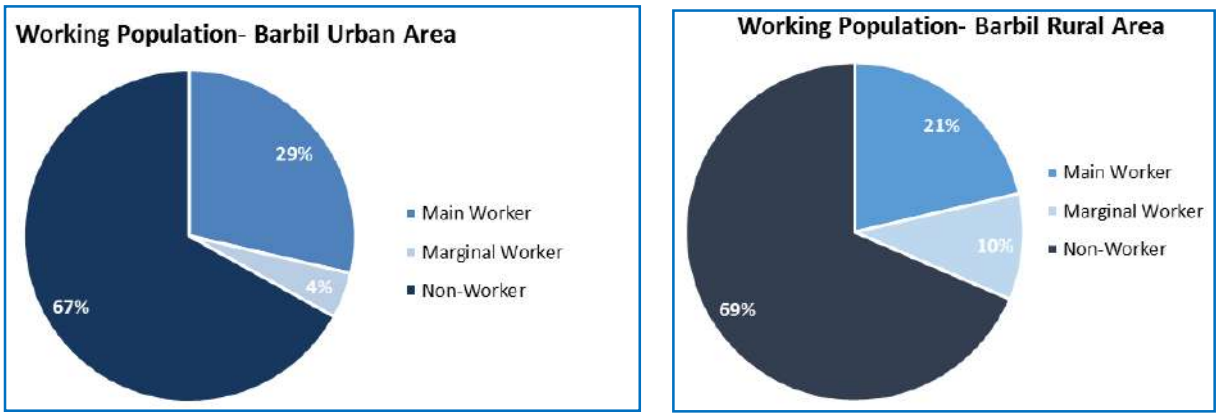
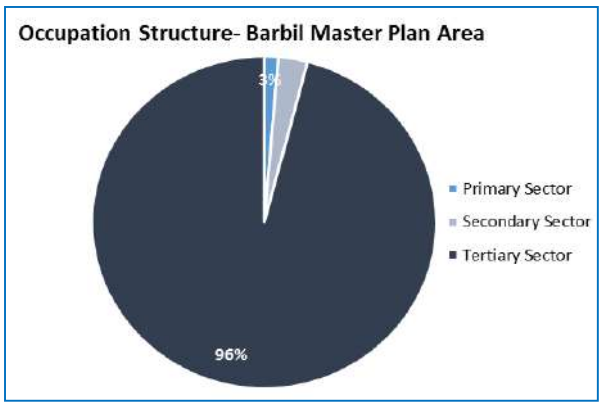


Figure 3.7 Working Population of Barbil Master Plan Area

A. Occupational Structure

The occupational structure of the Master Plan Area shows that nearly 95 percent of the workforces are engaged in tertiary sector, whereas primary sector shares only 1.33 percent of the working population. Lower rate of involvement in primary sector



reveals that most of the population are engaged in non-agricultural activities that of any other urban centres in the country.

Table 3-10 Occupational Structure- Barbil Master Plan Area

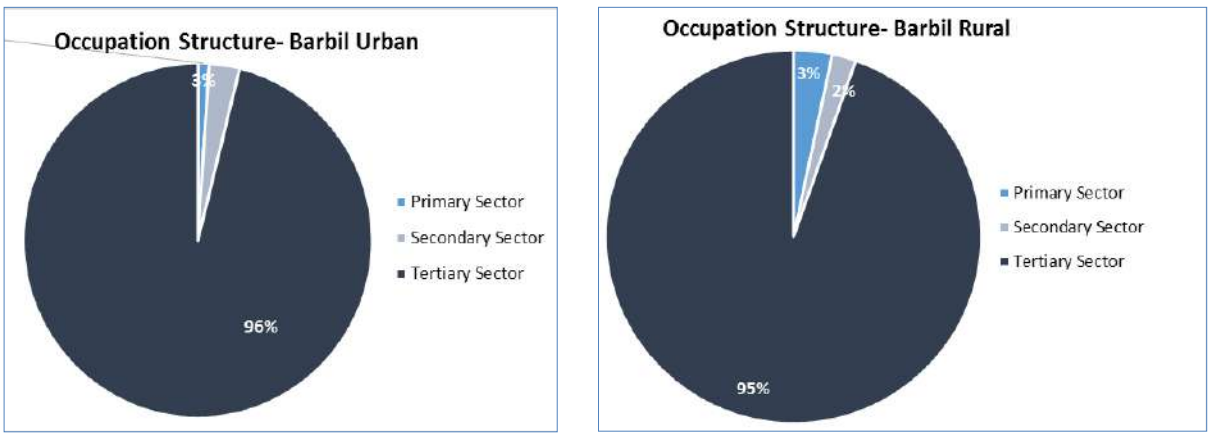
	Barbil Master Plan Area- 2001			
	Main Worker	Marginal Worker	Total Worker	Percentage
Primary Sector	147	67	214	1.17
Secondary Sector	329	79	408	2.23
Tertiary Sector	15947	1693	17640	96.59
Total	16423	1839	18262	100.00
	Barbil Master Plan Area- 2011			
	Main Worker	Marginal Worker	Total Worker	Percentage
Primary Sector	193	141	334	1.33
Secondary Sector	555	134	689	2.73
Tertiary Sector	20465	3719	24184	95.94
Total	21213	3994	25207	100.00

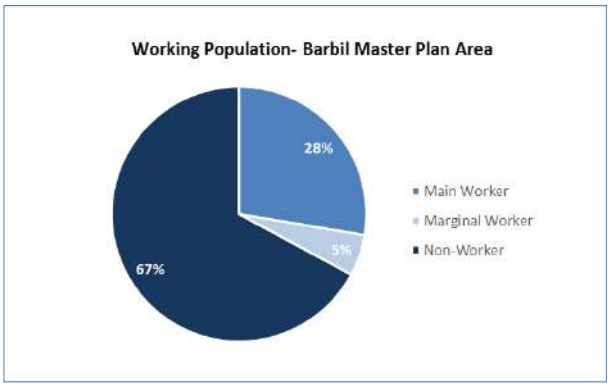
Source: Census of India 2001, 2011

Work Participation Rate refers to the number of persons usually employed. The total worker population in Barbil Master Plan area as per census 2011 is 25207. So the workforce participation rate is 32.87 percent which is much lower than state's average WFPR of 41.8 percent.

It is observed that involvement of working population is more in tertiary sector in urban areas than rural areas. In Barbil Urban, more than 95 percent are engaged in tertiary sector with 18414 working population, whereas in rural areas nearly 94.61 percent are engaged in tertiary sector. In Barbil Urban, about 1.04 percent are engaged in primary sector with 228 working population, whereas in rural areas nearly 3.32 percent are engaged in primary sector.

Figure 3.9 Occupational Structure of Barbil Planning Area





Out of the total population, 32.87% population is working population including main and marginal workers. Male population included 53.26% working population whereas female population constitutes only 10.46% working population.

Table 3-11 Working and Non-Working Population of Barbil Master Plan Area

POPULATION	TOTAL POPULATION	WORKERS	NON WORKERS	WORKERS PERCENTAGE	NON WORKERS PERCENTAGE
MASTER PLAN AREA					
Male	40151	21386	18765	53.26	46.74
Female	36525	3821	32704	10.46	89.54
Total	**76676**	**25207**	**51469**	**32.87**	**67.13**
URBAN					
Male	34938	18868	16070	54.00	46.00
Female	31602	3146	28456	9.96	90.04
Total	**66540**	**22014**	**44526**	**33.08**	**66.92**
RURAL					
Male	5213	2518	2695	48.30	51.70
Female	4923	675	4248	13.71	86.29
Total	**10136**	**3193**	**6943**	**31.50**	**68.50**

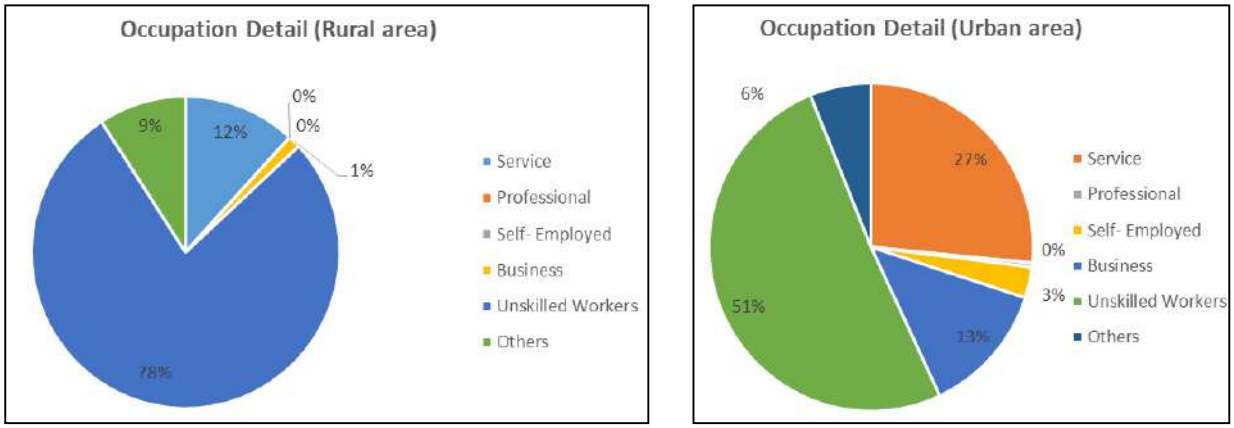
Source: Census of India, 2011

B. Barbil Economic Base

The important features of the economy of the area is its mineral and forest resources. Barbil is an industrial town with a number of plants, crushers and mines around. Barbil is very rich in iron ore, other minerals found are manganese ore. Demand for iron ore fines are increasing day by day which are being exported to China. Steel is manufactured and liquid oxygen is also produced here. In this area, a large number of industries have grown up mainly steel Plant industries and mining industries has a great potential for development as shown in Table 3-14 and Table 3-18.

Also it has the advantage of connectivity and locational advantageous to grow economically and keeping trade relation with other towns of the State and outside State as well. Majority of the workforce is semi or low skilled.

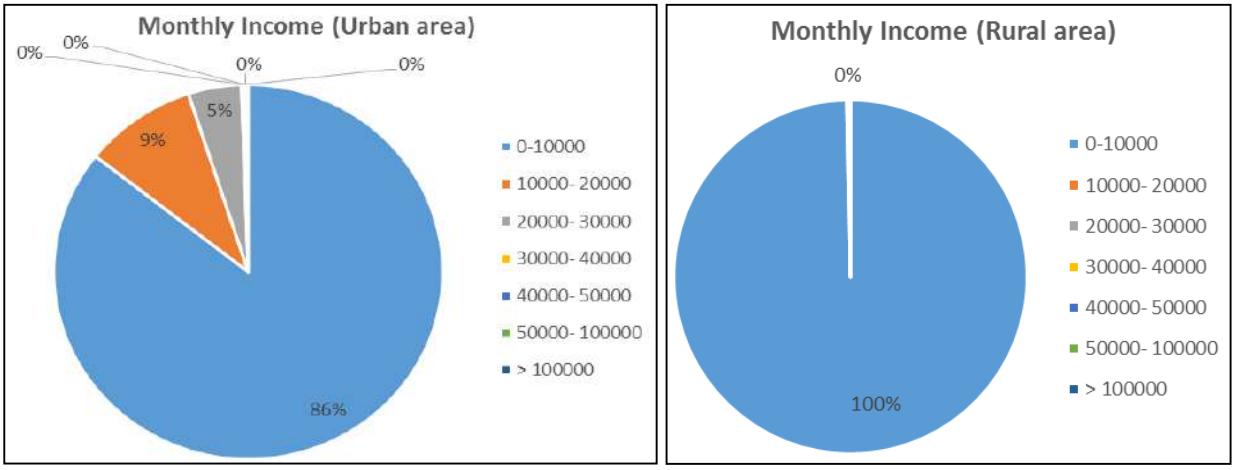
Figure 3.10: Occupational details as per the Socio- Economic Survey



Source: Primary Survey

As observed from the survey data the numbers of others and unskilled labour was very high in the rural area and constituted nearly 80% in the rural working population Around 27 percent of the working population were employed in service in urban areas and 12% in rural areas while a miniscule 1% were working as professional in urban areas, this number in rural areas were nearly zero. Around 16% of the population in the urban area were either self-employed or doing business, while in the rural areas the number of persons who were either self-employed or doing business was 1% which was much lower than urban areas. The scarcity of business in the rural areas requires

Figure 3.11: Household Monthly Income and Expenditure in Urban and Rural Area

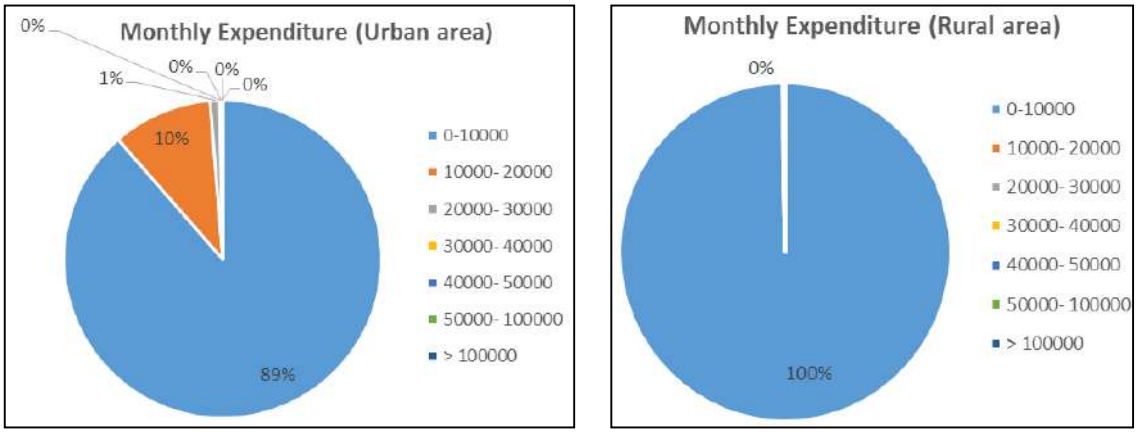


Source: Primary census

Entrepreneurship activity to be taken up in the area. Similarly, the income expenditure pattern in the area also shows the low-income pattern in the rural areas which is different much lower than urban areas. In the urban area around 86% of the household have monthly average income of less than Rs. 10000 furthermore 9% and 5% of the households are having an average income of Rs. 10000-20000 per month

and Rs. 20,000-30,000 per month respectively. Whereas in the rural areas, nearly all the household is having an average income of less than Rs. 10000 per month. The breakup can be seen in the chart below.

Figure 3.12: Monthly expenditure pattern Urban and Rural Areas



Source: Primary census

Similarly, the expenditure pattern of nearly all the households in rural area lies below 10 thousand rupees per month as shown in Figure 3.12. Whereas 89% of households in urban area are below 10 thousand monthly expenditures. Around 10% of households the monthly expenditure is between 10-20 thousand rupees. This data show difference in purchasing power both in urban and rural Barbil.

The urban and rural economies both are dependent predominantly on the mining activity. The agricultural activity which is the mainstay of any agrarian economy is almost negligible as most of the land is now unsuitable for agriculture due to mining. The farmers have become mine labourers and semi-skilled workers. The town as such is so deeply dependent on the mining resources that it has no other activity to support its economy. If the town does not develop its other sectors it is likely to become a shanty town once the mining activity ceases to happen due to some reason.

3.4.6 Projection of Workforce and Occupational Structure in Master Plan Area, 2030

Employment pattern has changed from service to industrial sector with the operation of mining and industrial activities since 1961. With this change of employment system, transportation related services have also taken pace. But, after the Government order to stop the mining activities in the region, many of the industries closed down.

However, mining activities have again started due to which industrial and transportation sector will again speed up which will affect the transport sector also.

Considering the same trend as that of 2001- 2011, major worker participation is assumed to remain same in tertiary sector till 2030.

Table 3-12 Workers Projection and Occupational Structure till 2030

Sector	Workers Participation		Growth Rate	Workers Participation	
	2001	2011		2021	2030
Primary	214	334	56.07	521	732
Secondary	408	689	68.87	1164	1768
Tertiary	17640	24184	37.1	33156	40910
Total	**18262**	**25207**	**38.03**	**34841**	**43410**

Source: REPL Analysis

3.5 Industries

The availability of minerals and other resources have seen the related industry crop up in the area. However, Barbil is the town which has been ignored or overlooked by various constraints which exists in the area. The area has been exploited for minerals and the related value addition has been overlooked by the industries. The neighbouring town of Joda has received much more focus than Barbil.

Table 3-13: Industrial Units Developed by Government

Sl. No.	Name of area	Total area industrial sheds	Land allotted	Land Cost per acre (in lakhs)	Total sheds	Sheds allotted	Vacant	Units in Production.
1	Barbil	4.172	2.928	20	15	15	-	-

Source: IDCO

The town has 3-4 large industrial units like Arya steel, IMTC plan, Pankaj Steel etc. which are currently in production. They are mostly involved in enrichment of Ores and their value addition. Most of the ore is then exported to other plants for further processing. With all the value addition, not being done locally the local community is not able to reap the benefits of the mining activity in the area.

Some industries which have also developed as a result of the existing mining activity in the area are Transport industry, Automobiles sectors especially goods based, Mining equipment sector and electrical and mine equipment and goods, Repairing and servicing of light automobiles etc. Some of the heavy industries located in the area are shown below.

Table 3-14: Heavy industries located in and around Barbil.

Sumrit Metalics (P) Ltd., Soyabali, Barbil
Deepak Steel and Power Pvt. Ltd., Topadihi, Barbil
Grewal Associates (P) Ltd., Matkambeda , Barbil
Sree Metalics Ltd., Loidapada , Barbil
Rungta Mines Ltd. (Sponge Iron Division), Korakota, Barbil, Keonjhar.
B.K. Steel and Power (P) Ltd., Ulliburu, Nalda, Keonjhar
East India Minerals (P) Ltd., Barbil
Kay Pee Enterprises (P) Ltd., Barbil
Jindal Steel & Power Ltd., Deojhar, Barbil
Arya Iron & Steel Ltd., Matkambeda, Keonjhar

Source: Directorate of Industries, Odisha

As per the Annual Action Plan on Brief Industrial Profile of Keonjhar District for the year 2014-15, Keonjhar district is rich in mineral resources. Barbil is having manganese deposit. Barbil Municipality target and achievement on Gone Into Production (GIP), EM- I (Entrepreneur Memorandum) and EM- II for the year 2013- 14 and proposed GIP, EM- I and EM- II target for 2014-15 is shown in table below:

Table 3-15 Target and Achievement on GIP, EM- I and EM- II in Barbil Municipality

Year	GIP		EM- I		EM- II	
	Target	Achievement	Target	Achievement	Target	Achievement
2013- 14	11	07	28	20	07	05
2014- 15	15	NA	25	NA	08	NA

Source: Annual Action Plan on Brief Industrial Profile of Keonjhar District for the year 2014-15

Note: NA- Not available

In Keonjhar district, 31 large and medium scale industries exist. Status of Industrial Estates in Barbil is as follows:

Table 3-16 Status of Industrial Estate (I.E.) in Barbil Master Plan Area

Name of I.E.	Total (in Acre)		Allocable	Allotted	No. of Entrepreneurs Allotted	Vacant Position	Remarks
Barbil (3.40 Acre)	Land	1.70	1.33 Acre	1.33 Acre	4 Nos.	Nil	
	Shed	15 Nos. 1.70	15 Nos. 1.70 Acre	13 Nos. 1.70 Acre	11 Nos.	2 Nos.	Vacant 2 sheds are available for allotment

Matkambeda (178.45 Acre)	Land	178.45	175.95 Acre	157.42 Acre	14 Nos.	18.50 Acre	5.5 Acre land is encroached 10.03 acre of land is under dispute
	Shed	Nil	Nil	Nil	Nil	Nil	

Source: Annual Action Plan on Brief Industrial Profile of Keonjhar District for the year 2014-15

In Keonjhar district, one of the proposed Industrial Estate is in Serenda. Detail of proposed I.E. is as follows:

Table 3-17 Proposed Industrial Estate in Barbil Master Plan Area

Proposed I.E.	Location	Village	Area in Acre	Acquisition of Land
Serenda	Along NH 215	Serenda	27.60	Leased deed no. 1329, dated 24.03.1984

Source: Annual Action Plan on Brief Industrial Profile of Keonjhar District for the year 2014-15

Table 3-18 Large and Medium Scale Industries in Barbil Master Plan Area

S. No.	Name of Industry	Location	Item of Product	Installed Capacity	Project cost (Rs. In Crore)	Employment	Remarks
1	M/s Kalinga Iron Work	Matkambeda	Pig Iron Spun Pipe Granulated Slag Gas Based Power Plant	13110 TPM 1683 TPM 3312 TPM 16 MWT	97.27 7.30	1463	Large
2	M/s Sesagoa Ltd. Enterprises (Sri S.C Singh)	Dalaki Barbil	Sized Iron Ore	150 TPH	14	127	Large
3	M/s N.K. Bhujani (P) Ltd.	Rugudi, Barbil	Sponge Iron M.s Ignot	120 TPD 4400 TPM	5	42	Large
4	M/s Shree Metalikes Ltd.	Loidapada, Barbil	Sponge Iron CPP	800 TPD 8 MWH	100	376	Large
5	M/s Grewal Associate(P) Ltd.	Topadihi, Barbil	Sponge Iron	400 TPD	15	120	Large

6	M/s Deepak Steel & Power Ltd.	Topadihi, Barbil	Sponge Iron	300 TPD	5.21	129	Large
7	M/s Rungta Mines Ltd.	Karakela, Barbil	Sponge Iron	500 TPD	6.16	60	Large
8	M/s OMDC Sponge Iron Plant	Dalaki, Thakurani	Sponge Iron	100 TPD	13.45	65	Large
9	M/s Jagannath Steel (P) Ltd.	Uliburu, Barbil	Sponge Iron & M.s Billet	300 TPD 8000 MTW	30	141	Large
10	M/s Deepak Steel & Power Ltd.	Uliburu	Sponge Iron	200 TPD	15.91	54	Large
11	M/s Arya Iron & Steel Ltd.	Matkambeda	Iron Ore Pillets	1.2 Million TPY	99.00	500	Large

Source: Annual Action Plan on Brief Industrial Profile of Keonjhar District for the year 2014-15

Table 3-19 Proposed New Large Scale Industries under Pipeline in Barbil Special Planning Area

S. No.	Name of Industry	Location	Item of Product	Capacity	Investment (Rs. In Crore)	Employment
1	M/s International Marbles Trading Co. Ltd.	Matkambeda	Iron Ore beneficiation	1.5 million Tonnes	100	250

Source: Annual Action Plan on Brief Industrial Profile of Keonjhar District for the year 2014-15

Tentative Projects identified under PMEGP in Barbil Master Plan Area are as follows:

i. Mineral based- Stone crusher, Cottage pottery, Limestone, Lime product Industries

ii. Engineering & Non- Conventional Energy- Blacksmith, carpentry, Solar & wind energy implements, voltage stabilizer, motor winding, and lathe work etc.

iii. Forest based- Collection, processing & packing of forest product, leaf cup plate, broom making, book binding, manufacturing gum & resin.

iv. Chemical based- Shampoo, hair oil, detergent powder & cake.

v. Service Industry- Dhaba, hiring of sound system, band party, auto garage, automobile, garage laundry, beauty parlour, welding work.

In Barbil Special Planning Area, ITI Barbil is the only Government technical training institute for the trades like stenography, electrical, electronic, machinist, fitter, turner, machinist, wireman, welder, mechanic, machine tool, maintenance (MMTM) having

total intake capacity of 251. Apart from the government institute, M/s Deepak Steel & Power (P) Ltd, Barbil is likely to operate ITI.

3.6 Commercial Activity

The commercial activity is mostly concentrated to a single stretch of road in the town which runs from Bangla chowk to Barbil auto stand. The area houses many commercial and retail units such as eateries, apparel shops, wholesale shops, stationary and papers shops, leather and other household items. There has also been investment in hospitality and entertainment sector and there are couple of luxury hotels and one mall in the town.

3.6.1 Population Projection

The different statistical methods of population projection (Arithmetic, Geometric, Exponential and Incremental) have been used to generate scenarios of population growth both in rural and urban areas. These results are obtained through mathematical calculations which do not consider interventions for conscious efforts for induced development. The projected population for urban and rural area of Barbil is given in Table 3-20 & Table 3-21 respectively. As the population derived from all the four methods does not have much deviation hence, average of these populations has been taken for the Special Planning Area. Total population of the Barbil Master Plan area is given in Table 3-22.

Table 3-20 Population Projection of Barbil Urban Area

Year	Arithmetic	Geometrical	Incremental	Exponential	Average (2+3+4+5)
1	**2**	**3**	**4**	**5**	**6**
2015	70316	73412	70940	73454	72030
2020	75036	83009	76941	83114	79525
2021	75980	85073	78208	85194	81114
2025	79756	93860	83499	94046	87790
2030	**84476**	**106129**	**90613**	**106414**	**96908**

Table 3-21 Population Projection of Barbil Rural Area

Year	Arithmetic	Geometrical	Incremental	Exponential	Average (2+3+4+5)
1	**2**	**3**	**4**	**5**	**6**
2015	10,698	10,741	10,755	11,140	10,833
2020	11,400	11,549	11,575	12,535	11,765
2021	11,540	11,717	11,745	12,834	11,959

2025	12,102	12,417	12,446	14,105	12,768
2030	**12,804**	**13,350**	**13,368**	**15,872**	**13,849**

Table 3-22 Population Projection of Barbil Master Plan, 2030

Year	Urban/ Rural/ Master Plan Area	Arithmetic	Geometrical	Incremental	Exponential	Average (3+4+5+6)
1	**2**	**3**	**4**	**5**	**6**	**7**
2015	Urban	70,316	73,293	70,679	73,454	70,316
	Rural	10,698	10,741	10,755	11,140	10,833
	Master Plan Area	81,014	84,034	81,434	84,593	82,769
2021	Urban	75,980	84,728	77,276	85,194	75,980
	Rural	11,540	11,717	11,745	12,834	11,959
	Master Plan Area	87,520	96,446	89,021	98,028	92,754
2030	Urban	**84,476**	**1,05,312**	**88,046**	**1,06,414**	**84,476**
	Rural	**12,804**	**13,350**	**13,368**	**15,872**	**13,849**
	Master Plan Area	**97,280**	**1,18,663**	**1,01,415**	**1,22,287**	**1,09,911**

C. Natural Increase & Net Migration Method:

Natural Increase & Net Migration method depends upon the factors like birth rate, death rate and the net migration rate. In this process of projection, the growth rate could be dynamic based on the socio-economic situation, the surroundings, the development possibilities etc. To calculate the growth rate, the natural increase rate of the planning area has been derived by subtracting Death Rate from Birth Rate, which is later compared with the district, state, national average to derive the final figures. It has been assumed that the natural growth rate will increase as there will be better health facilities and better economic condition (affordability) than the present. The following Table 3-23,Table 3-24Table 3-25) describe the present situation of the area with comparison with district and state. From these tables, it is clearly visible that the annual natural growth rate of the area varies between 1.12 and 1.18 (yr. 2011). Therefore, for the purpose of projection, the natural growth rate of the area has been taken as 1.15 in 2015 as shown in Table 3-25.

Table 3-23 Population, Birth Rate, Death Rate, Natural Growth Rate & Migration

Description	1991	2001	2011
Population	51,694	63,024	76,676
Growth Rate (Annual)	3.62	2.19	2.17

Birth Rate of State (Annual)	2.88	2.34	1.98
Death Rate of State (Annual)	1.28	1.02	0.82
Natural Growth Rates (Annual)	1.6	1.32	1.16
Migration (Annual)	2.02	0.87	1.01

Source: Census of India

Table 3-24 Crude Birth Rate & Crude Death Rate – District Keonjhar

Description	2011	2012	2013
Crude Birth Rate District (per 1000 population)	20.50	20.30	20.40
Crude Death Rate District (per 1000 population)	9.40	9.30	9.20
Natural Growth (per 1000 population)	11.10	11.00	11.20
Natural Growth Rates	**1.11**	**1.10**	**1.12**

Source: Annual Health Survey

Table 3-25 Crude Birth Rate & Crude Death Rate – State Odisha

Description	2011	2012	2013
Crude Birth Rate State (per 1000 population)	20.00	19.80	19.60
Crude Death Rate State (per 1000 population)	8.20	8.20	8.10
Natural Growth (per 1000 population)	11.80	11.60	11.50
Natural Growth Rate	**1.18**	**1.16**	**1.15**

Source: Annual Health Survey

Table 3-26 Number of Migrants by Place of Last Residence – India 2001

	Category	Migrations by Place of Birth	Percentage (Decadal)
A.	Total Population	1,02,86,10,328	
B.	Total Migrations	31,45,41,350	30.58
B.1	Migrants within the state of enumeration	26,82,19,260	**26.08**
B.11	Migrants from within the districts	19,35,92,938	18.82
B.12	Migrants from other districts of the state	7,46,26,322	7.26
B.2	Migrants from other states in India	4,11,66,265	4.00
B.3	Migrants from other countries	51,55,423	0.50

Source: Census table 11: number of migrants by place of last residence – India 2001

In the similar way, the net migration rate of the area has been derived by subtracting Natural Growth Rate from the Total Growth rate of the Town (refer Table 3-26). The migration rates derived show a high migration rate in the year 2001 and 2011 because of the mining activities in the area. Many workers from Orissa and the adjoining states have migrated in to this area in search of livelihood. But in the present situation many of the mining activities are stopped, which has reduced the in migration and influenced out migration from the town. Thus, for projection purpose, the migration rate is kept low, even less than the present rate. The net migration of the town is envisioned to be increased with time

Considering all the above-mentioned issues and concept the population of the planning area for the horizon year 2030 has been proposed as-

Table 3-27 Population Projection 2030

Description	2011	2015	2020	2025	2030
Population	76,676				
State Natural Growth Rate (Annual) (Census)	1.16				
State Natural Growth Rate (Annual) (AHS)	1.18				
District Natural Growth Rate (Annual) (AHS)	1.11				
Natural Growth Rates annual	1.15	1.15	1.2	1.27	1.37
Net Migration Rate (Annual)	1.71	1.2	1.3	1.35	1.4
Net Growth Rate	2.86	2.35	2.5	2.62	2.77
Projected Population		**83,884**	**92,272**	**1,01,942**	**1,13,237**

Source: (REPL Estimation)

The population projection for Master Plan area is calculated in all the five methods, of which Natural Increase and Net Migration Method appears to be realistic and has been taken as final. All the further calculations for the Master Plan Proposals will be based on the number derived by this method i.e. 1,13,237.

3.6.2 Population Projection of Broad Age Composition

Final population projection for planning area is taken based on Natural Increase and Net Migration method. As per the census 2011 population, projection for population above 6 years and below 6 years has been done.

Table 3-28 Population Projection till 2030 for Population above 6 Years

	2011	2015	2020	2025	2030
Population (Above 6 yrs.)	64,495				
State Natural Growth Rate (Annual) (Census)	1.16				
State Natural Growth Rate (Annual) (AHS)	1.18				
District Natural Growth Rate (Annual) (AHS)	1.11				
Natural Growth Rates annual	1.15	1.15	1.2	1.27	1.37
Net Migration Rate (Annual)	1.71	1.2	1.3	1.35	1.4
Net Growth Rate	2.86	2.35	2.5	2.62	2.77
Projected Population		**70,558**	**77,613**	**85,747**	**95,248**

Source: REPL Analysis

Table 3-29 Population Projection till 2030 for Population below 6 Years

	2011	2015	2020	2025	2030
Population (0-6)	12,181				
State Natural Growth Rate (Annual) (Census)	1.16				
State Natural Growth Rate (Annual) (AHS)	1.18				
District Natural Growth Rate (Annual) (AHS)	1.11				
Natural Growth Rates annual	1.15	1.15	1.2	1.27	1.37
Net Migration Rate (Annual)	1.71	1.2	1.3	1.35	1.4
Net Growth Rate	2.86	2.35	2.5	2.62	2.77
Projected Population		**13,326**	**14,659**	**16,195**	**17,989**

Source: REPL Analysis

3.7 Observations

3.7.1 Economic Potential

The industrial units can be established in the area due to availability of the raw materials and space. There is potential for establishment of iron based engineering and fabrication industry for manufacture of light goods and services like M.s Pipes, Cables, GI wires, Nails and screws, Cast iron fittings, fly ash bricks and general machine parts. Apart from that there is potential in tourism and excursion, in service industry like nursing homes, cooling equipment and expertise, clean energy service and equipment and industrial and educational and CSR based consultancy.

3.7.2 Lack of Entrepreneurship and Skilled Resources

The town though having an ITI still lacks technical manpower as the rural population is uneducated and the entrepreneurship is negligible. The areas require development and education in entrepreneurship development.

3.7.3 New Jobs Required

At this pace and rate of urbanization thousands of new jobs need to be created in the town for the growing population. The development of the industry and strong sense of entrepreneurship is the only way forward for meeting the demands of the growing population.

3.7.4 Entrepreneurship and Industrial Development

Due to the area's strategic and industrial development the Barbil town should have its own branch of DIC and entrepreneurship school for skill, education, training and credit purposes.

CHAPTER-4 LAND USE VALIDATION

4.1 Introduction

Land use pattern delineated by area of various functions on the land and are basic factors in determining the spatial expansion. It also provides a base for understanding the city structure and guiding to achieve a sustainable form of urban development. The study on the existing land use pattern helps in assessing the spatial structure of the master plan area & its growth characteristics which are prime factors for framing the future planning proposals within the master plan limit. This section of master plan deals with the different components such as existing spatial growth trends, existing land utilisation, land use categorization etc. along with the future proposals for the horizon year 2030.

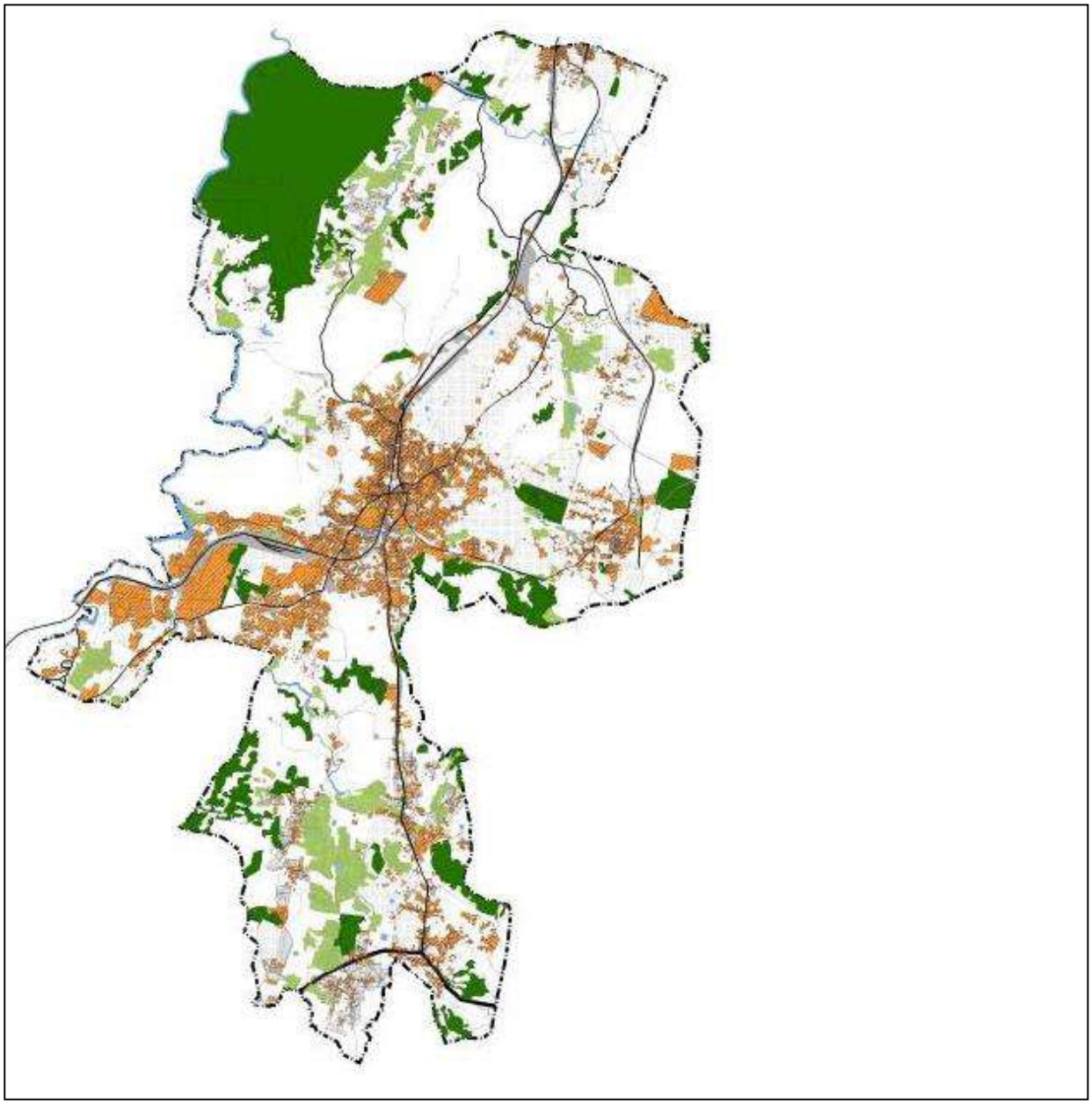
The existing land use was prepared by the interpretation of the satellite imagery with ground verification on the year 2014. In an initiative for preparing GIS enabled base map of the Barbil Master Plan Area, the Govt. of Odisha had engaged ORSAC to prepare the map for the respective areas. The land use map prepared by ORSAC is used as the base for the assignment. The provided base map of ORSAC is extensively studied & analysed by ground verification and final base map is prepared by considering the deviation on existing use, for framing the future spatial proposals.

4.2 Existing Spatial Growth Trend

In the previous Master Plan, area for development was allocated in the central part and along the NH and SH. But with the due course of time, it has been observed that built up area spread in other parts of the city also mainly in the western part. There are lot of vacant plots, waste land and land under other uses available which can be put to effective use for development of the Master Plan area.

During the land use validation for the master plan area of Barbil, it is noticed that there are a number of changes in land use in the form of new residential, commercial, mix land use etc. Also, it is seen that some of the non-built up areas such as agriculture, vacant lands in the outskirt area are converted to built-up masses as the town is expanding in these areas.

Map 4-1: Existing Urban Sprawl- Barbil Master Plan Area



4.3 Existing Land Use in Barbil Master Plan

4.3.1 Change in Developed Area

It is observed that there is marginal increase in the developed land within the master plan area. Developed land has increased from 13.60 sq.km (1360 ha) to 13.71 sq.km (1371 ha), as new development has come up in the form of new residential development, public facilities, transportation etc. in the master plan area. At the same time, the amount of vacant urban as well vacant rural land decreased to fulfil the requirement of new developed land.

Table 4-1: Change in Developed Land after land use validation

Particulars	Before Land Use Validation	After Land Use Validation
Developed Area (in Sq.km)	13.60 (1360 ha)	13.71 (1371 ha)
Un-developed Area (in Sq.km)	44.27 (4427 ha)	44.16 (4416 ha)
Total Master Plan Area (in Sq.km)	**57.87 (5787 ha)**	**57.87 (5787 ha)**

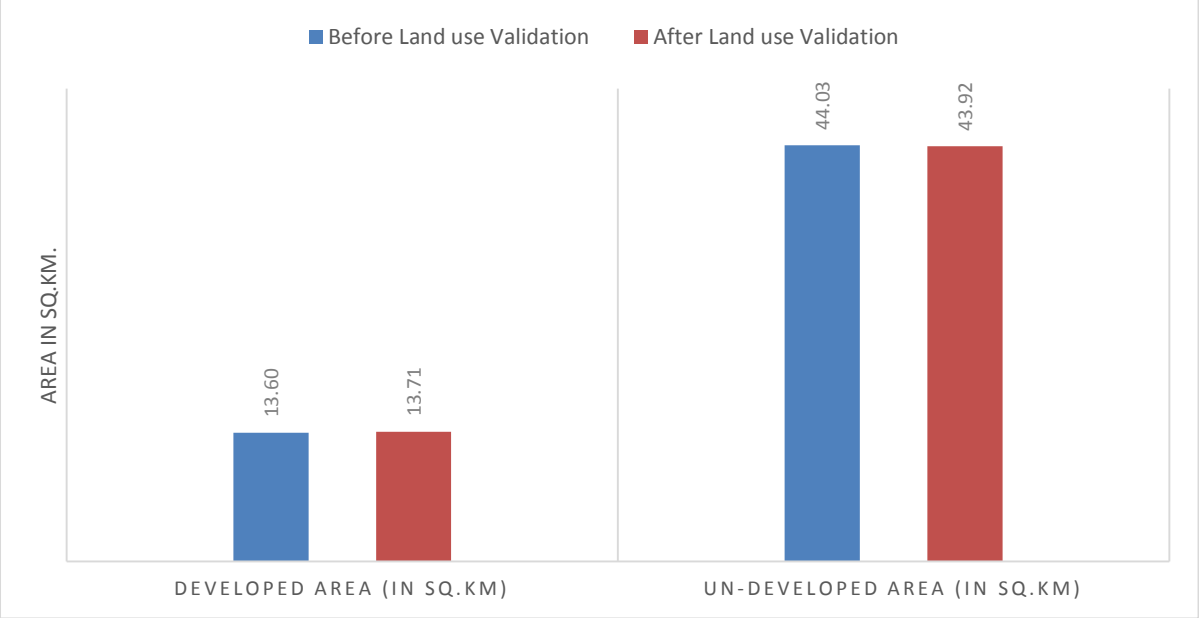


Figure 4.1: Change in Developed Land after Validation

4.3.2 Change in Land Utilization

The analysis on the land utilisation of the master plan area shows that there is a marginal increase in the built-up area from the last surveyed year – 2008. The built-up area has increased from 10.71 sq.km (1071 ha) to 10.81 sq.km. (1081 ha) with a proportion of only 18.76 percent in the whole master plan area. The land utilisation under water bodies, agriculture and forest use remains almost same, whereas there is a decrease in open areas. Open areas and waste land shares a major portion in the master plan area due to existence of large chunk of vacant land (urban and rural) and waste land such as land with scrub, rocky/ stony waste area within the master plan limit. As per the land use database before validation, the open areas share around 55 percent of the master plan area which reduced to 54.97 percent with a marginal change of 0.10 sq.km. (10 ha) While carrying out, the ground v of the supplied GIS database, it is seen that some areas has been developed to new bus stop terminals/ bus parking/ truck parking areas etc., which resulted in increase of 0.01 sq.km (1 ha) of land under Transportation use. After validation, it is seen that transportation use shares 5.02% of the master plan area which is mainly confined to

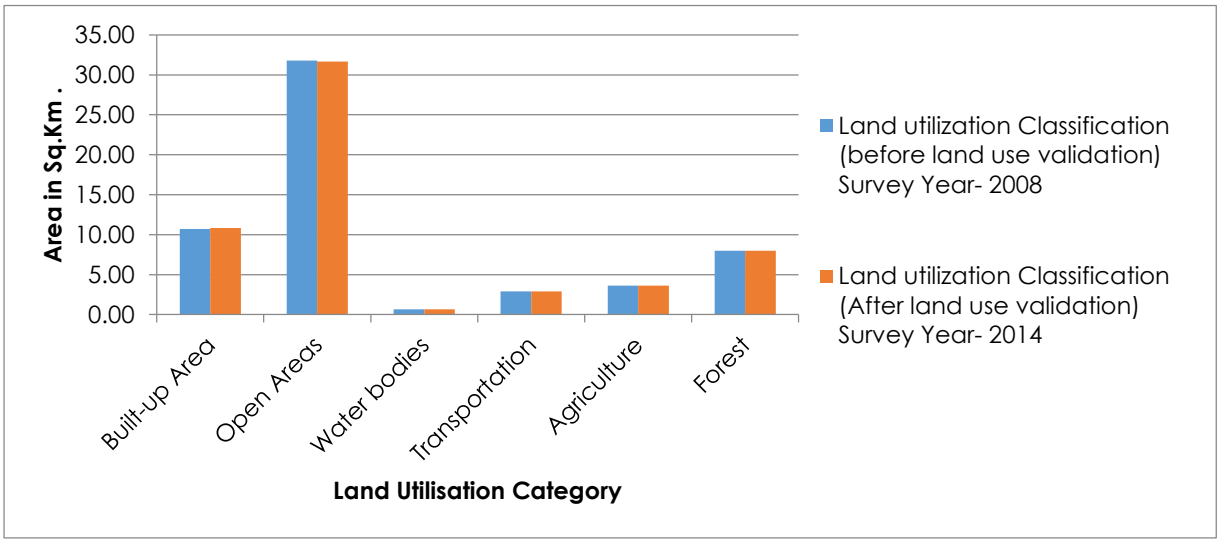
National Highways, state highways, urban roads, rural roads, parking areas, bus stop, truck terminals etc.

The following table shows the changes in land utilization in the master plan area of Barbil from last surveyed GIS database to the existing validation database of 2014.

Table 4-2: Land utilization Classification- Before and After LU Validation

Sl. No.	Particulars	Land utilization Classification (before land use validation) Survey Year- 2008			Land utilization Classification (After land use validation) Survey Year- 2014			Remark
		Area in Sq.km.	**Area in ha**	**%age**	**Area in Sq.km.**	**Area in ha**	**Percentage**	**Change in Area (sq.km.)**
1	Built-up Area	10.71	1071	18.59	10.81	1081	18.76	-0.1
2	Open Areas	32.03	3203	55.15	31.65	3165	54.97	(+) 0.38
3	Water bodies	0.65	65	1.13	0.65	65	1.13	0
4	Transportation	2.89	289	5.01	3.17	317	5.02	-0.28
5	Agriculture	3.62	362	6.29	3.62	362	6.29	0
6	Forest	7.97	797	13.82	7.97	797	13.82	0
	TOTAL	**57.87**	**5787**	**100**	**57.87**	**5787**	**100**	0

Note: Negative area (-) in change of area shows that there is a decrease in the land utilization of that particular use, whereas the positive sign (+) shows that there is a increase in the land utilization after ground measurement and verification of the land use database.



4.3.3 Change in Land Use

The land use distribution in the Barbil Master Plan area is calculated over the whole master plan area of 57.87 sq.km. of land area, considering both urban and rural areas. The built-up mass of the area is divided into different land use category such as residential, commercial, industrial, recreational, public & semi-public, mining areas, transportation & communication and Other Urban use (Mixed built-up, embankment, brick kilns/quarries, construction sites etc.) which spread over the master plan area.

The analysis on the change of land use shows that there are changes in almost all land use categories from the previous GIS database of 2008. The land use classification before land use validation (as per the GIS database provided by SPA, Barbil) is given below:

Table 4-3: Land use Classification- Before LU Validation

LAND USE CLASSIFICATION BEFORE LAND USE VALIDATION					
Sl. No.	**Land use Description**	**Area in Sq.km.**	**Area in Ha**	**% of Total Area**	**% of Developed Area**
1	Residential	4.27	427	7.38%	31.37%
2	Commercial	0.42	42	0.73%	3.09%
3	Industrial	1.6	160	2.76%	11.76%
4	Public and Semi-public	0.63	63	1.09%	4.63%
5	Recreational	0.2	20	0.35%	1.47%
6	Transportation and Communication	2.89	289	4.99%	21.23%
7	Mining	3.08	308	5.32%	22.63%
8	Other Urban	0.52	52	0.90%	3.82%
Developed Area (A)		**13.61**	1361	23.52%	100.00%
9	Agriculture	3.62	362	6.26%	
10	Vegetation/ Forest land	7.97	797	13.77%	
11	Waste Land / Vacant Land	32.02	3202	55.33%	
12	Water bodies including Wetlands	0.65	65	1.12%	
Un-developed Area (B)		**44.26**	4426	76.48%	
Total Master Plan Area (A+B)		**57.87**	5787	100.00%	

Figure 4.2: Land use Distribution - Before LU Validation

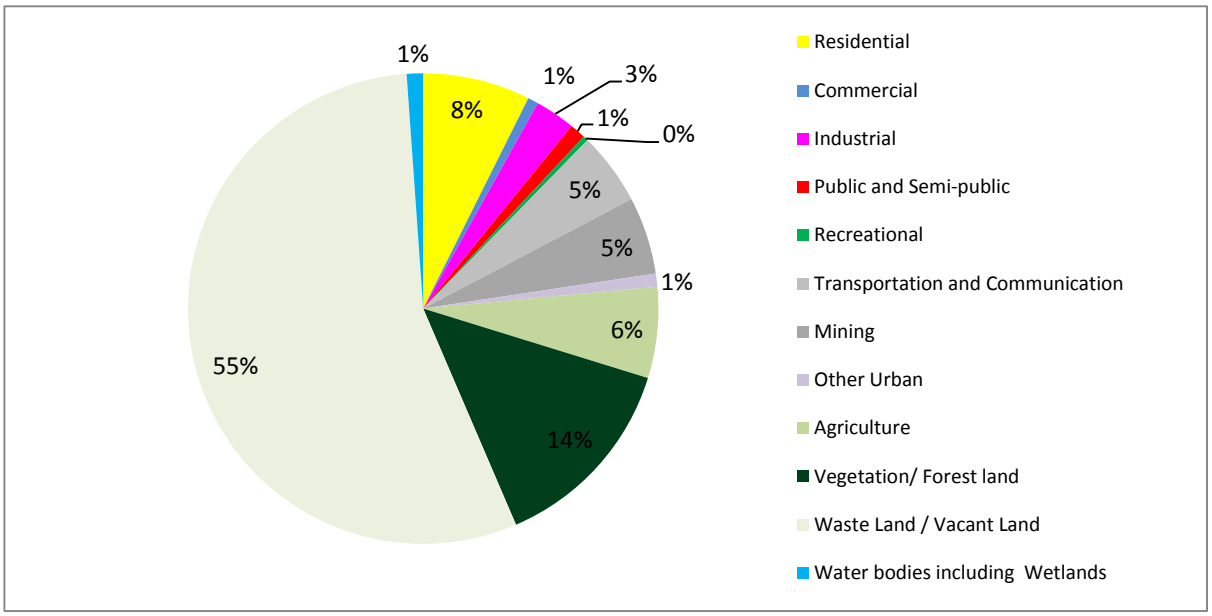
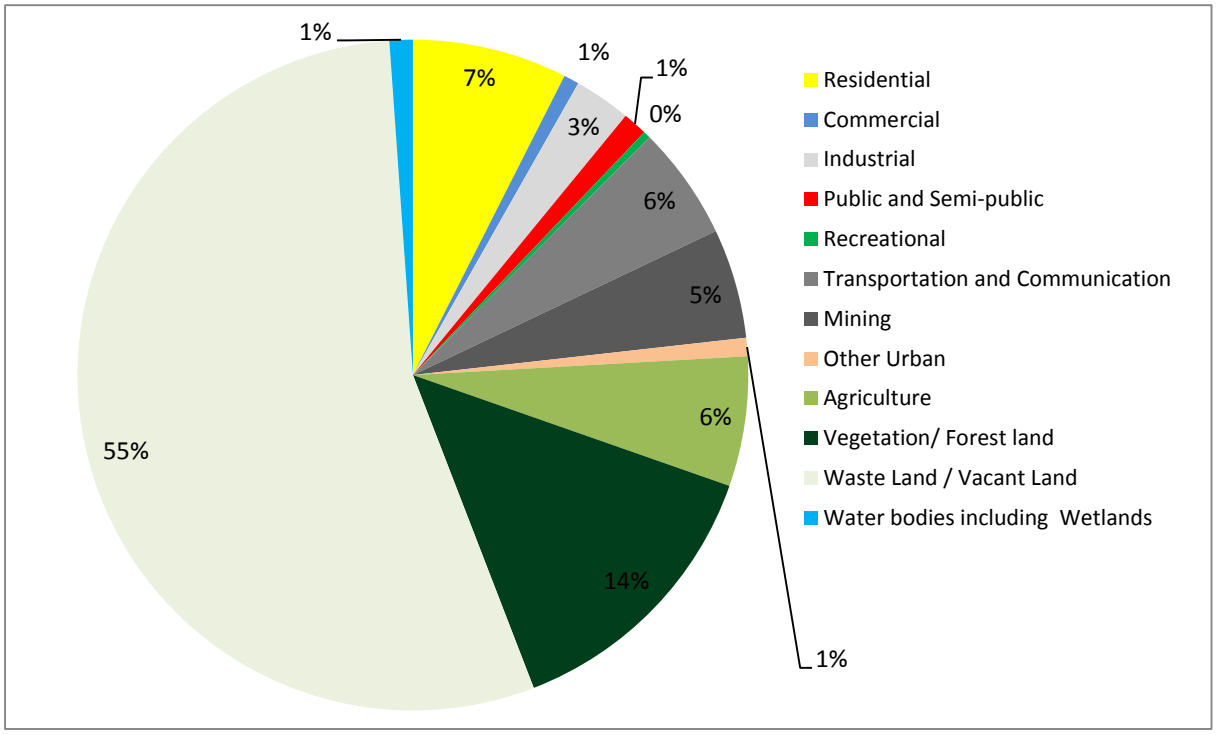


Table 4-4: Land use Classification- After LU Validation

	LAND USE CLASSIFICATION AFTER LAND USE VALIDATION				
Sl. No.	**Land use Description**	**Area in Sq.km.**	**Area in ha**	**% of Total Area**	**% of Developed Area**
1	Residential	4.32	432	7.47%	31%
2	Commercial	0.43	43	0.74%	3%
3	Industrial	1.58	158	2.73%	11%
4	Public and Semi-public	0.68	68	1.18%	5%
5	Recreational	0.2	2	0.35%	1%
6	Transportation and Communication	3.17	317	5.48%	23%
7	Mining	3.06	306	5.29%	22%
8	Other Urban	0.51	51	0.88%	4%
Developed Area (A)		**13.95**	1395	24.11%	**100%**
9	Agriculture	3.62	362	6.26%	
10	Vegetation/ Forest land	7.97	797	13.77%	
11	Waste Land / Vacant Land	31.68	3168	54.74%	
12	Water bodies including Wetlands	0.65	65	1.12%	
Un-developed Area (B)		**43.92**	4392	75.89%	
Total Master Plan Area (A+B)		**57.87**	**5787**	**100.00%**	

Figure 4.3: Land use Distribution - After LU Validation



From the above two table, it is evident that there is marginal increase in the residential land use of the master plan area, which has increased from 4.27 sq.km (427 ha) to 4.32 sq.km. (432 ha) of land area which is only 7.47% of the master plan area and 30.97 % of the developed area. There is a marginal increase in the commercial area to 0.42 sq.km (42 ha) from 0.43 sq.km. (43 ha) which is 3.08% of the developed area. Likewise, there is minimal increase in the public/ semi-public use with an addition of 0.05 sq.km. (5 ha) of land area under this use. Public/ semi-public facility shares 4.63% of the developed area which includes administrative offices, educational centres, healthcare facilities, public utilities/services/communication and religious centres. As per the existing ground situation, it is also seen that some areas in the residential areas are being used as commercial use. So the proportion of use of mixed land use increased from the previous land use of 2008. Also the amounts of urban and rural vacant lands are decreasing due to the spatial expansion in the master plan area in the form of residential, public facilities and mixed use development.

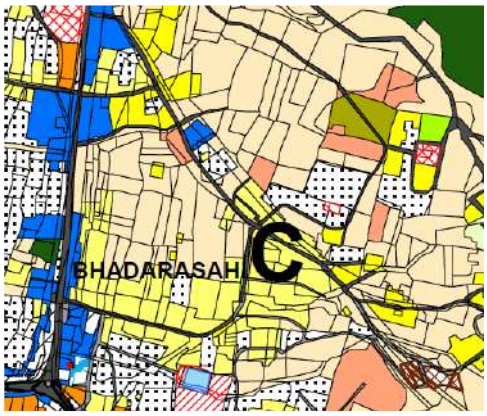
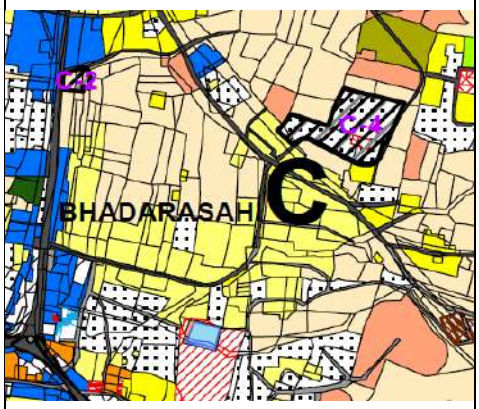
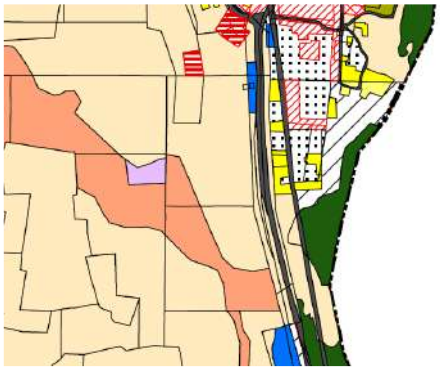
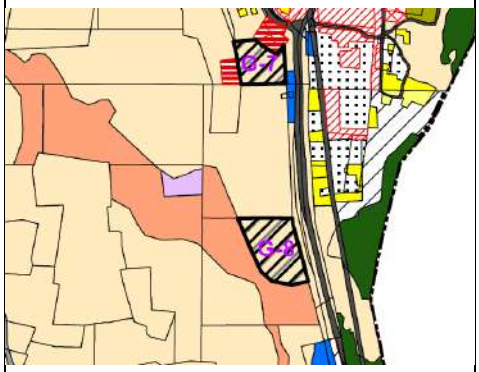
Some of the land use changes/ deviations from the previous surveyed land use of 2008 are as follows:

Table 4-5: Example- Change of Land use

Previous Land use - 2008	Existing Land use – 2015	Remark

Waste Land	Residential- urban & rural, Commercial, Public/semi-public, Mixed use, Transportation	New residential development, Shops, Petrol Pump, GSI Camp Office, Excise Office New Building, OFDC Timber depot, Truck Parking area, Construction site- indoor stadium etc.
Vacant Urban/ Rural	Residential- Urban & Rural, Institutional, Religious Centres, Mixed use, Administrative Offices, Public utilities etc.	New residential developments, Mixed use development with residential as well commercial activity, Municipal dumping yard, Staff quarters – SJSPL, Thakurani Temple etc.
Residential- Urban & Rural	Commercial, Institutional, Mixed Uses, Administrative offices, Religious centres etc.	Shops, Mixed use with commercialisation on residential development, Primary schools, temples, Serenda High school etc.

Table 4-6 Change in Land Use in ORSAC Data and REPL validation

Previous land use	Existing Land Use	Remark
Vacant Urban 	Commercial 	Revenue Village – Bhusugaon Deviation Code- C2 Existing Petrol Pump
Waste land 	Administrative Office 	Revenue Village – Sundara Deviation Code- G8 Existing OFDC Timber Deport

Source: REPL Analysis

The change in the land use in each category is shown in the following matrix:

Table 4-7: Change of Land Use Matrix Showing the Deviation from One Use to Another (From 2008 to 2014)

LAND USE BEFORE VALIDATIONs / LAND USES	LAND USE AFTER VALIDATION												TOTAL AREA IN SQ.KM. (BEFORE VALIDATION
	Agriculture	Circulation	Commercial	Industrial	Other Urban	Mining	Public/ Semi-public	Recreational	Residential	Vacant/ Waste Land	Forest	Water body	
Agriculture	3.62	0	0	0	0	0	0	0	0	0	0	0	3.62
Circulation	0	2.89	0	0	0	0	0	0	0	0	0	0	2.89
Commercial	0	0	0.42	0	0	0	0	0	0	0	0	0	0.42
Industrial	0	0	0	1.584	0	0	0	0	0.023	0	0	0	1.61
Other Urban	0	0	0	0	0.51	0	0	0	0.01	0	0	0	0.52
Mining	0	0	0	0	0	3.063	0	0	0	0.014	0	0	3.08
Public/ Semi-public	0	0	0.005	0	0	0	0.626	0	0	0	0	0	0.63
Recreational	0	0	0	0	0	0	0	0.196	0	0	0	0	0.20
Residential	0	0	0.003	0	0	0	0.003	0	4.261	0	0	0	4.27
Vacant	0	0.28	0.004	0	0	0	0.051	0	0.023	31.665	0	0	32.02
Forest	0	0	0	0	0	0	0	0	0	0	7.966	0	7.966
Water body	0	0	0	0	0	0	0	0	0	0	0	0.654	0.654
TOTAL AREA IN SQ.KM. (AFTER VALIDATION	**3.62**	**3.17**	**0.43**	**1.58**	**0.51**	**3.06**	**0.68**	**0.20**	**4.32**	**31.68**	**7.966**	**0.654**	**57.871**

Source: REPL Analysis

4.4 Proposed Land Use -2030

In order to build robust Landuse Plan, holistic approach has been taken. The scope of the master plan is not just limited to the broad planning and allocation of land for various usages such as residential, commercial, industrial, institutional, public semi-public etc rather it proposes landuse plan for successful functioning and economic development of the city. Planning of transportation facilities for safe and better traffic circulation system, Conservation of natural resources and heritage such as water body, forest, etc. It also includes zoning regulation for controlled development in each zone. Therefore, Master Plan is important instrument for regulating and guiding development of the city over a period of time and contributing to planned development. Master Plan of Barbil comprises following components:

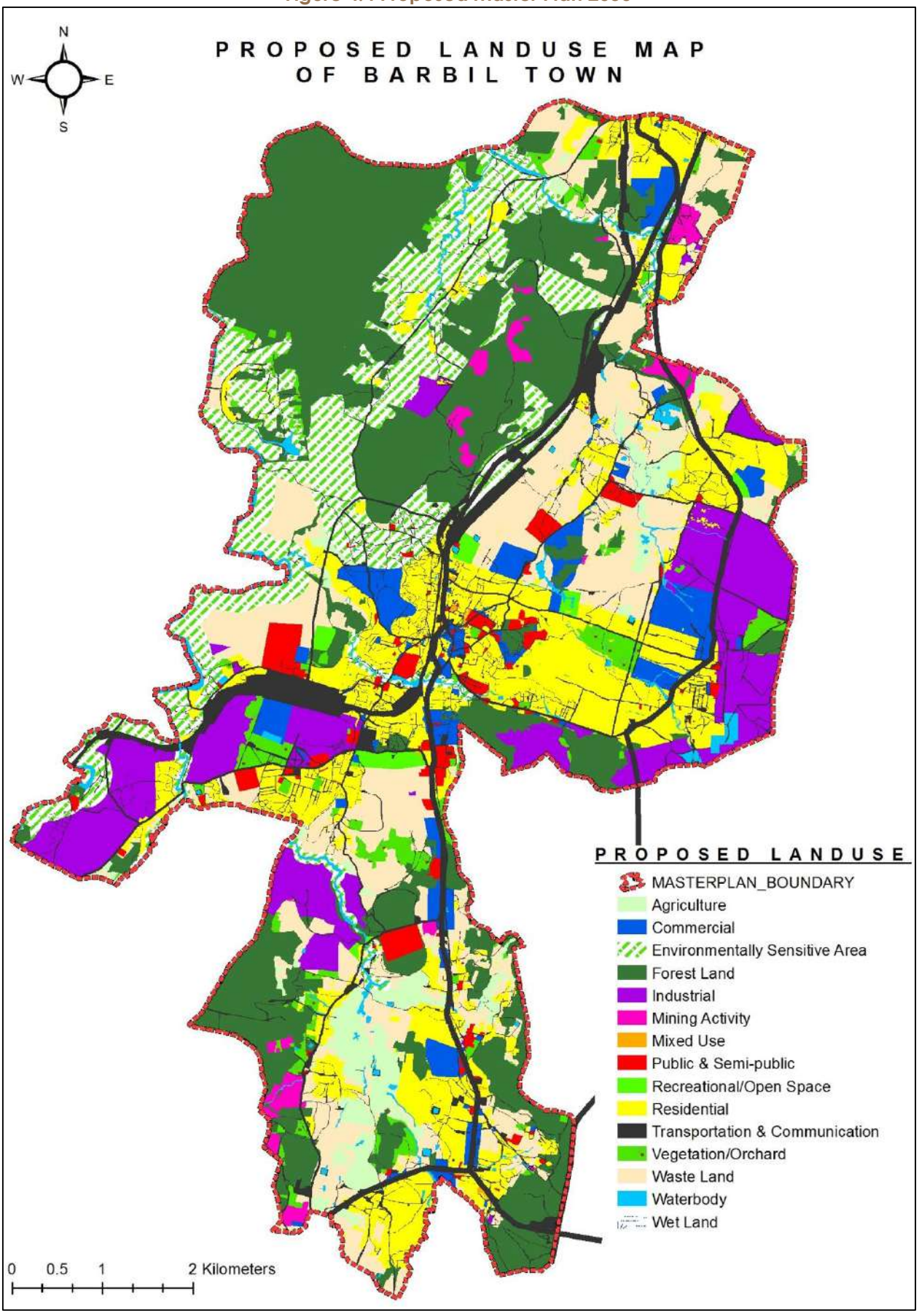
1. Proposed Land use plan
2. Zoning Regulations
3. Heritage and conservation Plan

4.4.1 Land Requirements

Land is very scarce resource, on which entire infrastructure and human settlement is created. Before proceeding to prepare Landuse planning optimum utilization of land is to be worked out on the basis of norms and standards.

The land requirement for the future development has been worked out on the basis of analysis of future demand for various uses and is in line with the URDPFI guidelines

Figure 4.4 Proposed Master Plan 2030



The breakup of the proposed landuse can be seen in the table given below.

Table 4-8 Proposed Land Use Distribution- Master Plan Area 2030

Sl. No.	Land use Description	Percentage of Developed Area, as per URDPFI Guidelines	Area (in Sq.km.)	Area (In ha)	Percentage to the Planning Area
1	Residential	20 to 25	8.92	892	15.3%
2	Commercial	3 to 4	2.04	204	3.5%
3	Mixed use		0.04	3.9	0.1
4	Industrial	30 to 35	5.00	500	8.6%
5	Public and Semi-public	6 to 8	1.12	112	1.9%
6	Recreational/Open Space/ Environmentally Sensitive Zone	12 to 15	8.52	852	14.6%
7	Transportation and Communication	10 to 12	6.10	610	10.5%
Developed Area (A)			**31.74**	**3174**	**55.5%**
8	Agriculture		1.79	178.8	3.1%
9	Forest land		14.54	1453.8	25%
10	Waste Land		8.36	836.2	14.4%
11	Water bodies including Wetlands		1.16	115.8	2%
Un-developed Area (B)			**25.85**	1129	44.5%
Total Master Plan Area (A+B)			**58.24**	**5824**	**100%**

Source: URDPFI guidelines and REPL Analysis

4.4.2 Residential use:

The existing land utilization of the master plan area shows that the developed area constitutes around 24.11% of the master plan area with 1395 Ha of land area, with a gross density of 55 persons per Ha. For the plan period of 2030, it is estimated that the population of the master plan area will be increased to 1.13 lakhs of population with an absolute increase of about 36561 persons from 2011. For accommodating the increase population, a design density of 80 persons per hectare has been considered. It is estimated that an additional land of 458 ha. will be required to suffice the housing need of the additional population of 2030.

A total of 890 ha land will be required to suffice the housing need of the population of 1.13 lakh persons by 2030. Since, current area of Barbil Municipal+ OG is 5787 ha and most of the wards are under populated, accommodation of the future population shall be confined to existing ward boundaries only.

Residential sectors have been planned such that they integrate socio-economic development by proposing people of different income categories such as EWS, LIG, MIG and HIG to reside in each sector.

4.4.3 Commercial use:

As per the guideline for the industrial city, a range between 3-4 percentages can be taken for town like Barbil.

The total area under existing commercial land use is 0.43 sq.km. (43 ha) which is 3 % of the developed area. Other than this there is a component of commercial in mixed use also making it in line with the percentage of commercial as per URDPFI guidelines.

Table 4-9 Area of commercial centres

SL. NO.	CATEGORY	AREA PER 1000 PERSONS (SQ.M)	NUMBER OF SHOPS
1	Convenience Shopping	220	1 for 110 persons
2	Local shopping including service centre	300	1 for 200 persons
3	Community Centre with service centre	500	1 for 200 persons
4	District centre	880	1 for 300 persons
	Total	**9000**	

As shown in the table above a total of 9000 sq. m. area has been proposed per 1000 of population thus 1.9 sq.m. area is required per person for different commercial activities.

Therefore, keeping in mind the projected population of 1.13 lakh for Barbil city and urban fringe, convinces, the city would remain small-medium size town. Considering the same, as per URDPFI guidelines 2-4% of the total planning area should be utilized under commercial area. Therefore, 3.5% of the total planning area has been proposed under commercial zone which estimates around 204 ha.

A. Social Infrastructure

Provision of social infrastructure is one of the key principles of planned development. These are provided in a hierarchical manner. Whereas the lower order facilities are included as part of the residential areas, higher order facilities have been incorporated for area calculations for public and semi-public facilities.

Provisions have been made for public and semi-public offices and institutions. A total area of 1.12 sq.km. (112 ha) has been allocated for facilities for education, health care, religious functions, cultural activities, fire-fighting, police protection, cremation and burial grounds,

distributive services such as petrol pumps, LPG godown, and host of other facilities normally needed by residents of a town.

Educational facility

The facilities at the level of Nursery, Primary and Higher Secondary Schools have been made available in every sector, additional facilities have been provided at higher levels. Following are the list of provisions that are made as per the URDPFI guidelines.

Table 4-10: Proposed Educational Facilities

Facilities	*Population requirement for 1 facility*	*Proposed Facilities (No.)*	*Min. Area Required for each Unit (Ha)*	*Total Approx. Area Required (Ha.)*
Educational Facilities				
Pre-primary, nursery school	2500	43	0.5	21.5
Primary school (class 1 to 5)	5000			
Senior secondary school (class 6 to 12)	7500	NOT Required	1.8	0
Integrated school without hostel facility (class 1 to 12)	90000	2	3.5	7
Integrated school with hostel facility (class 1 to 12)	90000	2	3.9	7.8
School for physically challenged	45000	3	0.7	2.1
College	125000	NOT Required	5	0
Technical Education	100000	1	4	4
Sub total				**42.4**

Source: URDPFI Guidelines & REPL Analysis

Health facilities

Dispensaries have been provided at the residential sector level. Additional facilities will be made available at the level of the community and the city level. For each community of one lakh population, an intermediate hospital category A for general treatment facilities and an intermediate hospital category B including a maternity ward have been propose. Additionally, provision has been made for a polyclinic and a nursing home. At the city level,

a general hospital as well as a specialized hospital has been suggested as shown in the table below.

Table 4-11: Proposed Health Care Facilities

Facilities	*Population requirement for 1 facility*	*Proposed Facilities (No.)*	*Min. Area Required for each Unit (Ha)*	*Total Approx. Area Required (Ha.)*
Health Care Facilities				
Dispensary	15000	2	0.08	0.16
Nursing home, child welfare and maternity Centre	45000	1	0.2	0.2
Polyclinic with some observation beds	100000	2	0.2	0.4
Intermediate hospital (category A)	100000	2	3.7	7.4
Intermediate hospital (category B)	100000	2	1	2
Multi-specialty hospital	100000	1	9	9
Specialty hospital	100000	2	3.7	7.4
Family Welfare Centre	100000	3	0.08	0.24
Diagnostic Centre	100000	3	0.08	0.24
Dispensary for pet animals and birds	100000	1	0.03	0.03
Sub total				**27.07**

Source: URDPFI Guidelines & REPL Analysis

Socio-cultural facilities

Space has been allocated for socio-cultural facilities centre, which should contain an auditorium for performing arts, institutional buildings for spiritual and meditation activities; and institutions related to music, art and culture. The area would also include an open-air theatre and a central public library. This area would also accommodate an art township where studios can be provided to various artists for promotion of Indian classical music, art and culture as shown in figure.

Table 4-12: Proposed Socio-cultural Facilities

Facilities	*Population requirement for 1 facility*	*Proposed Facilities (No.)*	*Min. Area Required for each Unit (Ha)*	*Total Approx. Area Required (Ha.)*
Socio-cultural Facilities				
Community room	5000	23	0.08	1.84
Community hall	15000	8	0.2	1.6

Recreational club	100000	1	1	1
Music, dance and drama Centre	100000	1	0.1	0.1
Meditation and spiritual Centre	100000	1	0.5	0.5
Sub total				**5.04**

Source: URDPFI Guidelines & REPL Analysis

4.4.4 Open and Recreation Spaces

Approximately 540-hectare green area (11.6 % of the total planning Area) is allocated under organized green spaces.

Recreational facilities too have been provided at different level the facilities are namely:

I. Tot lots at housing cluster level
II. Park and Playground at the sector level
III. Recreation clubs sports Centre, and major green space at the community level.

The area required for open spaces has been calculated from the URDPFI norms for organised open spaces for plain areas as shown in the table below.

Therefore, keeping in mind the projected population of 1.13 lakh for Barbil city and urban fringe area required for Open Space has been worked out as shown in the table below:

Table 4-13 Area required for Sports Facilities as per URDPFI guidelines

Facilities	***Population requirement for 1 facility***	***Proposed Facilities (No.)***	***Min. Area Required for each Unit (Ha)***	***Total Approx. Area Required (Ha.)***
Sports facilities				
District sport Centre	100000	1	8	8
Neighborhood play area	15000	8	1.5	12
Residential unit play area	5000	23	0.5	11.5
Sub total				**31.5**

Source: URDPFI Guidelines & REPL Analysis

4.4.5 Industrial

As per the guideline, a range between 30-35 percentages can be taken for medium size town. But keeping in consideration the context of the Barbil town and demand assessment

for the industrial use a total of 642 ha (13.8 % of the developed area) has been allocated under Industrial land use.

The industrial units should be facilitated with provision of commercial area, public and semi-public facilities, green and recreational areas etc. CETPs, solid waste separation/ treatment plant etc. should be provided for the industries so as to minimize water pollution. The land distribution for the above-mentioned requirements shall conform to the norms given below;

Table 4-14 Norms for Land Distribution in Industrial Area

S. No.	Use Premises	Percentage
1	Industrial plots	70-75
2	Green and Recreational (Parks, Water Bodies, Green Belts etc.)	5-7
3	Commercial Area (Shopping Centres, Petrol Pumps, Guest House, Services and Repair Shops etc.)	2-3
4	PSP facilities (Fire Station, Police station, Police Chowki, Night Shelter, Day Care Centre etc) Utilities (Electric Substation, CETPs, Pumping Station, Water Reservoirs etc.)	5-7
5	Transportation (Circulation, Loading/Unloading Area, Parking Facilities etc.)	10-15
	Total	**100**

Source: URDPFI Guidelines

4.4.6 Traffic and Transportation

Total area allocated under this use is 458 ha which is 9.8 % of the total developed area and is in line with the URDPFI guidelines (10-12 % of the developed area)

B. Proposed Road Network:

The proposed road network for LPA, Barbil has been developed in concurrently with the proposed land use pattern as shown in the Plan. In order to provide relief to the city roads and keeping in view the existing roads and the increased volume of traffic in future, the concept of ring radial road pattern has been followed. A new ring road has been proposed. The existing roads have been adopted as radial roads. Efforts have been made to follow existing roads wherever available. The vast areas falling within the ring and radial roads have been proposed. The following hierarchy of roads has been proposed:

R-1 200 feet wide

R-2 150 feet wide

R-3 80 feet wide

R-4 60 feet wide

C. Bypass Road

Looking forward for the year 2030 and keeping in view the proposed city structure of Barbil and with the stakeholder consultation, a bypass road having a right of way of 200 feet has been proposed.

This proposed bye-pass road starts from NH and then interconnecting the various existing local and regional roads like. The alignment of this outer ring road has been shown in proposed land use plan. The length of this proposed outer ring road is approximately 55.43 km.

D. Existing Roads:

The existing Master Plan roads have been kept intact. It is also proposed that roads of this hierarchy may also be carved out at the time of preparing zonal plans. It is further proposed that roads of further lower hierarchy than 60' would be carved out while preparing zoning plans of the proposed zones.

E. Proposals for Urban Roads:

The study of existing city road network reveals that most of the existing roads are not Overcrowded as these are carrying less volume of traffic than their respective capacity. However, in future, some of these roads may become overcrowded due to increase in traffic volume. Although, there is no possibility or scope of widening of Right Of Way (R.O.W.) of some of these roads in thickly built up areas of the city, but still some measures of road engineering can be adopted for improving the capacity of these roads, as per the guidelines for capacity enhancement of Urban Roads in plain areas published by the Indian Road Congress. Some of the measures that could be considered for enhancement of capacity of roads are as under:

Prohibiting on–street parking of vehicles, and simultaneously developing off– street parking facility;

- Segregating the bi-directional traffic flow through central verge/median wherever it is possible;
- Provision of segregation of slow moving vehicles such as animal drawn carts, rickshaws/ tongas etc.
- Imposing restrictions on the movement of animal drawn /other slow moving vehicles, and/ or heavy commercial vehicles on these roads during selected periods, specially the peak hours;
- Reduction of roadside congestion through control of abutting land–use and roadside commercial activity;

- Provision of adequate facilities for pedestrians and cycles wherever it is possible;
- Banning certain conflicting movements at major intersections, particularly during peak hours;
- Controlling the cross traffic and side–street traffic by regulating the gaps in medias;
- Improving traffic discipline such as proper lane use and correct over taking, through appropriate road markings, education and publicity.

F. Proposed roads for capacity enhancement in Urban Areas -2030

- Road passing through Kasia(Kha) No. 17 and connecting NH 215 and SH 10B.
- Road connecting Santabahal No. 10 to SH 10B and passing through Nalda No.2.

Road passing through Serenda No.20 to Kiriburu Road.

4.4.7 Mixed Use

In earlier Master Plan of Barbil, mixed use is not provided in proposed Land use plan. Due to the trend of development and scarcity of land, mixed use is promoted in potential areas. 92 ha of land has been allocated for Mixed use introduced at major intersections, along major roads or as per the requirement of the area. Mixed use will be permitted in the new development zones with certain conditions as per the Government rules and regulation. In Barbil, most prominent location for mixed use will be along Bye pass because this area is vacant and if planned properly from the initial stage then problem of haphazard growth will be solved.

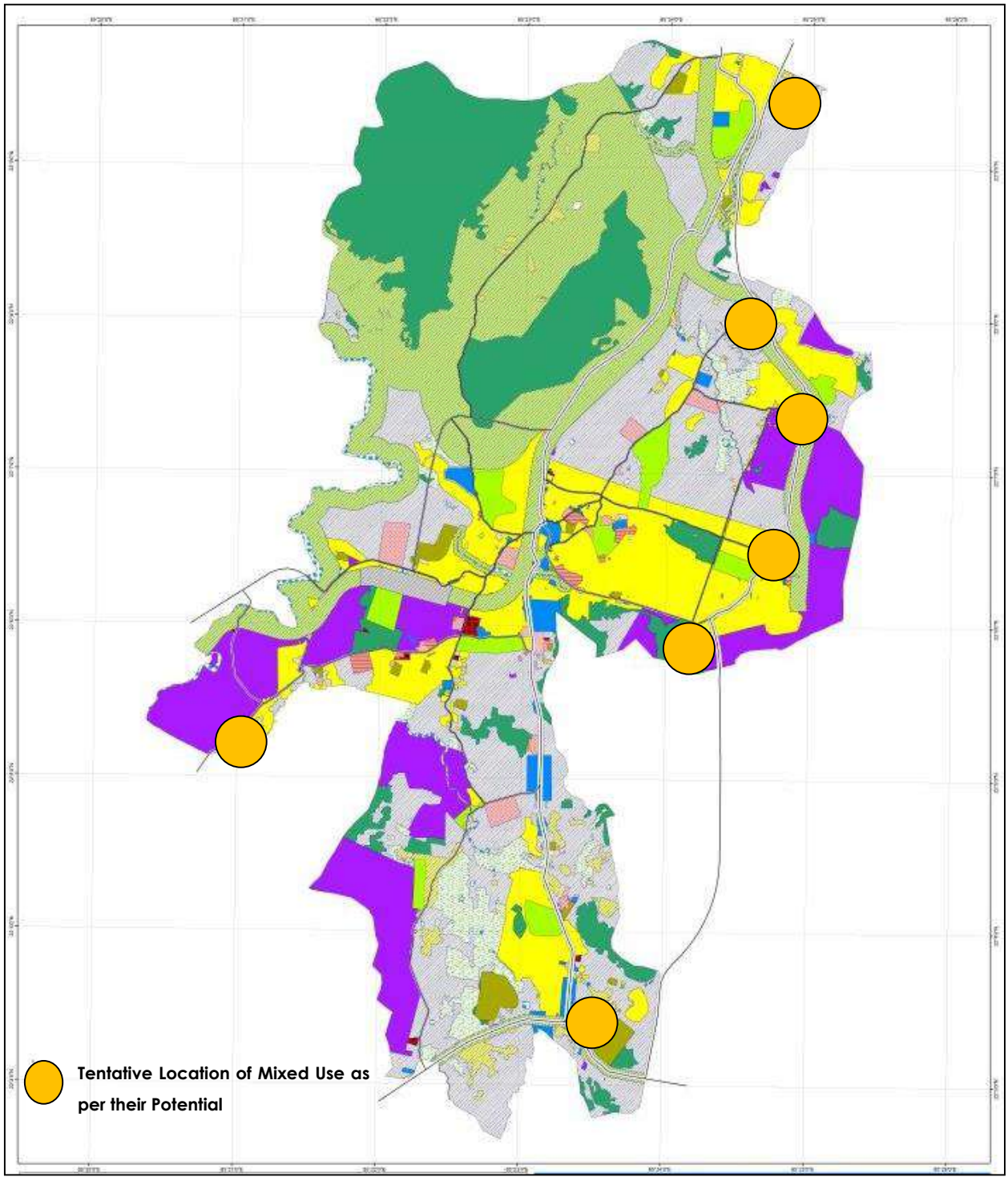


Figure 4.5 Tentative Location of Mixed Use

4.5 Land suitability

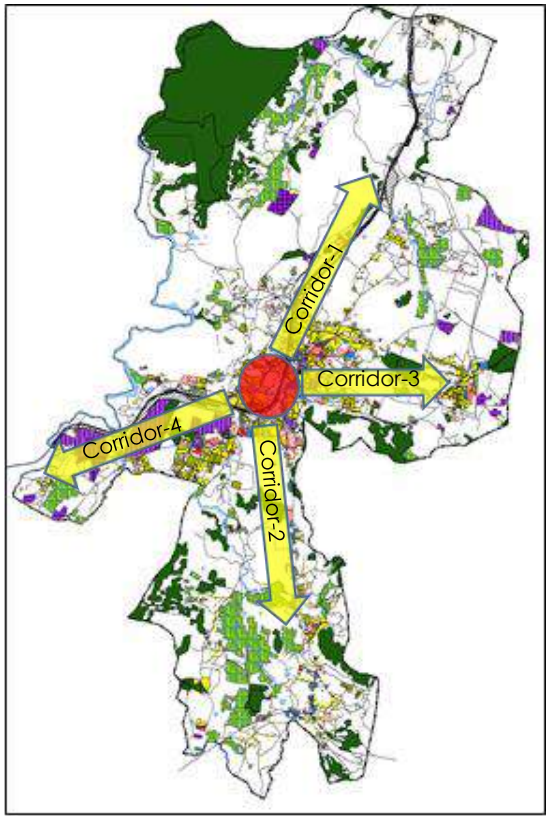
The growth of the town is limited due to the presence of physical constraints such as Karo River on the western side and forest area in north western side of master plan area. Apart from natural constraints the availability of land is also analysed and it is found that for spatial growth, there is huge scope on the eastern and southern side of region. The central part of

master plan area is growing at a faster rate, mainly around railway line and state highway. Similarly, residential and commercial areas are coming at faster rate along state highways in southern part of master plan area.

4.5.1 Growth Corridors

The spatial expansion in Barbil is mainly governed by the transport corridors. The identified growth corridors are as follows:

- Corridor 1: State Highway- 10 B
- Corridor 2: From Core city to Proposed bypass
- Corridor 3: Barbil- Bhadrasahi
- Corridor 4: Barbil – Madkambeda- Planning boundary

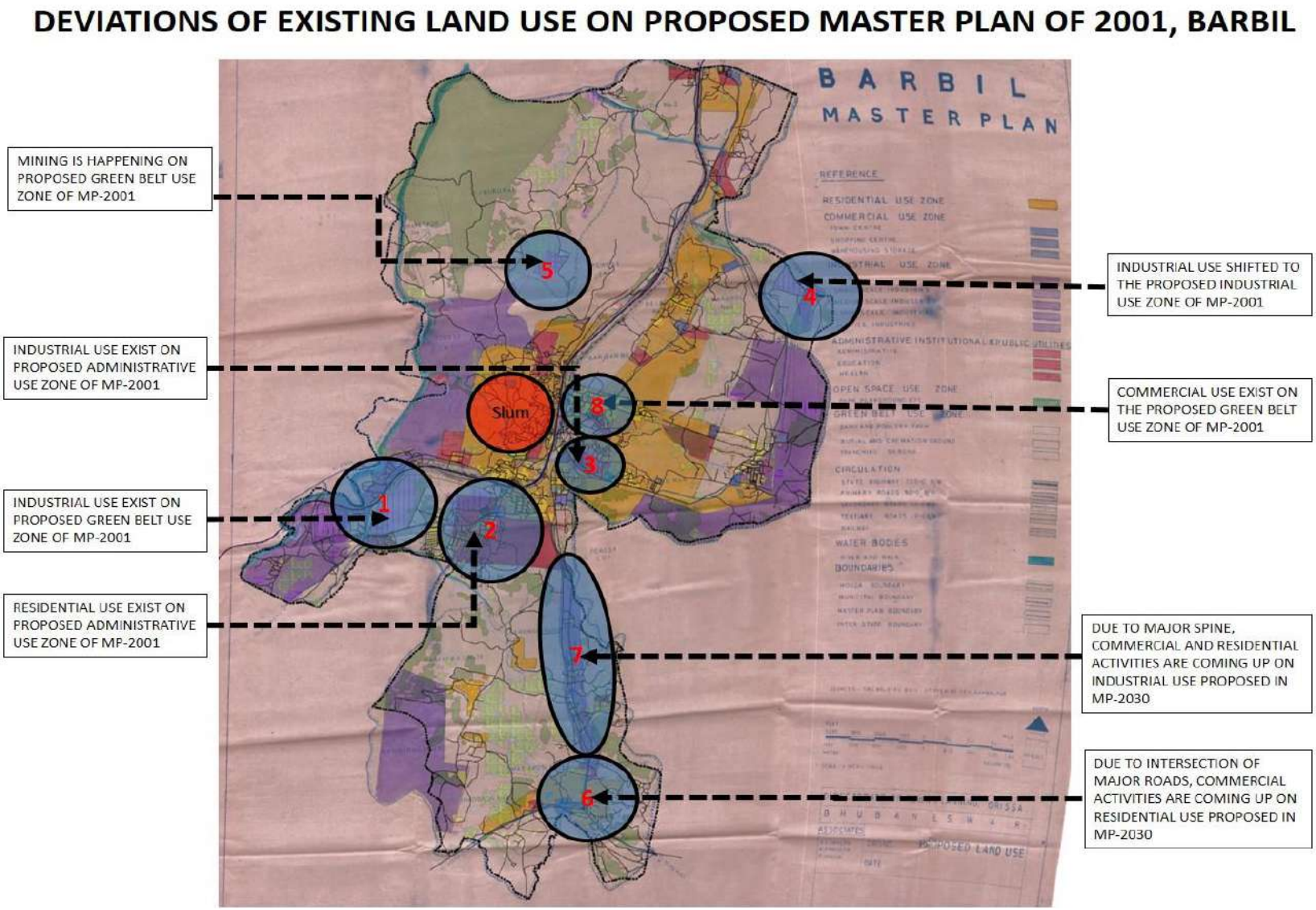


It is seen that most of the residential developments were developed along the eastern side of the State Highway and railway line as well as in the north direction. Similarly, towards western side maximum industrial areas are coming up and towards south mainly commercial and residential are developing. In the core area along western side of railway line major slum has developed.

4.5.2 Deviation in Land Use from Master Plan 2001 and Existing Land uses

Comparing the existing land use of Barbil master plan area and the land use proposed in master plan 2001, it has been observed that at various places there are deviations. Existing land use has developed in deviation from whatever proposed in Master Plan 2001. All the major deviations have been shown in below map.

Figure 4.6: Deviation in Proposed Master Plan 2001 and Existing land use



From the above map it is observed that in area 1 marked on the map was proposed for green belt use in proposed master plan 2001 but currently it is under industrial landuse, similarly in area 2 deviation is from administrative/institutional/public utilities use to residential use, in area 3 deviation from administrative/institutional/public utilities uses to industrial use, in area 4 deviation is from green belt use to industrial use, in area 5 deviation is from green belt use to mining activities, in 6 deviation is from residential use to commercial use, in area 7 deviation is from industrial use to commercial & residential, in area 8 deviation is from green belt use to commercial use and in the centre of city major slum has developed.

These issues regarding deviation from proposed master plan 2001 are very crucial and need to be resolved at master planning committee level as it has legal obligations and binding. Keeping in mind the already developments came on the ground, in the proposed master plan 2030 the existing developments has been kept intact.

CHAPTER-5 HOUSING AND SLUM

5.1 Introduction

Housing is a basic need of man and ranks third after food and clothing. The importance of housing was universally accepted from the dawn of history. The World Health Organisation (WHO) defines housing as "*an enclosed environment in which man finds protection and feels safe and secured from hostile forces and can function with comfort and satisfaction as regards privacy to the individual and his family. The environment must include all necessity services, facilities needed for physical and social well-being of the family.*"

Housing has been termed as the "Engine of growth for the economy" and has a direct impact on employment and income generation opportunities for a large variety of skilled and unskilled workforce. Creation of new housing stock is also an essential feature of the development strategy for any area to achieve a sustainable growth. In this context, the existing housing situation of the master plan area has been analysed for framing strategies in housing sector.

5.2 Overview of Housing Scenario

In order to access the housing condition in the Master Plan area housing survey was also conducted as a part of the socio-economic survey. The main parameters of housing survey are to assess the existing housing situation with respect to number of houses, qualitative status of housing, residential property typology, tenure status, availability of sanitary facility etc. An extensive housing study is carried out with a sample size of 15% of the total HHs in a ward/ village that was considered for the socio-economic survey, covering only residential properties. Some of the key findings of the primary survey are outlined below.

5.3 Primary Survey Findings

5.3.1 Type of Residential Property

According to the housing survey, it is observed that the Master Plan Area has very less proportion of group housing units, which mainly confined to Barbil urban. About 97% of the surveyed HH are residing on plotted type residential development. Only about 3% reside in group housings. It is seen that the group housings are low rise structure that are mainly staff housings of different government and private organisations. Also, few low-rise group housings by private developers are found in some localities of the urban area. While individual plotted development is majorly found in rural areas like Serenda, Bhadrasahi, Uliburu, Hayarpur etc.

Figure 5.1: Type of Residential Property- Barbil MP Area

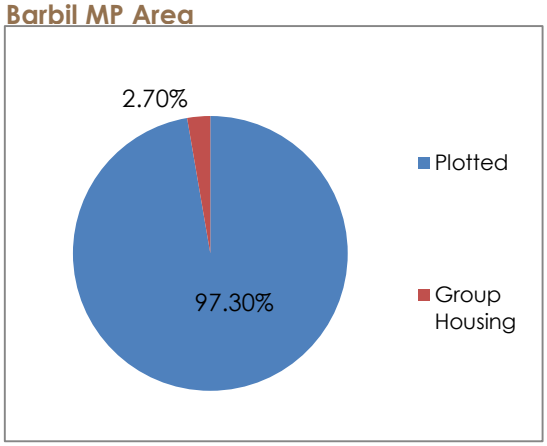
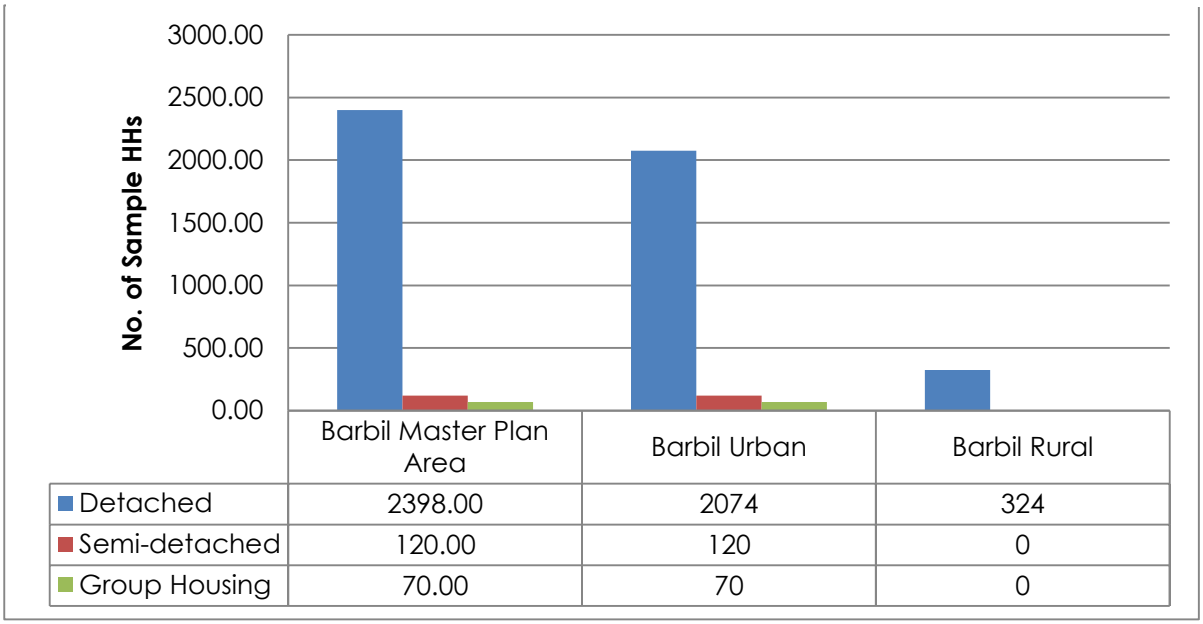


Table 5-1: Residential Property Typology- Sample HHs

Type of Residential Property	Barbil Master Plan Area	%	Barbil Urban	%	Barbil Rural	%
Plotted	2518	97.30	2194	96.91	324	100.00
Group Housing	70	2.70	70	3.09	0	0.00
Total	**2588**	**100.00**	**2264**	**100.00**	**324**	**100.00**

Most of the residential areas in the Master Plan Area, especially in the rural areas are wide spread and relatively less densely built than what is found in the towns of similar sizes. About 92.66% of the plotted developments are of detached type with separate entrance and setbacks from adjacent property, while 120 surveyed HHs share common wall and/or entrance which resulted 4.64% of semi-detached property. These semi-detached properties are mainly seen in urban core areas and it could be concluded that higher density in these areas resulted for such type of residential development.

Figure 5.2: Details of Plotted and Group Housing Typology - Surveyed HHs



	Barbil Master Plan Area	Barbil Urban	Barbil Rural
Detached	2398.00	2074	324
Semi-detached	120.00	120	0
Group Housing	70.00	70	0

5.3.2 Built-up Area

Primary survey on housing status revealed that both in rural and urban area of Master Plan more than 34% of the HHs have built-up area between 400 ft² to 600 ft². Around 24.12% in urban area and 44.14% in rural area have built-up area of 201 to 400 ft². There are very few houses (only 2.87%), in urban area which have built up area more than 1000 ft². 33.3% HHs in rural area and 7.99% in urban area have built up area less than 200 ft², which indicates that in rural area though more land area is available, but the economic condition not permits them to build larger dwelling units.

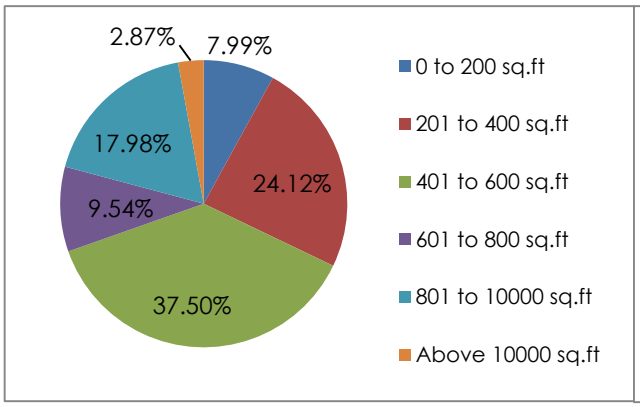


Figure 5.4; Details of Built up area- Barbil Urban

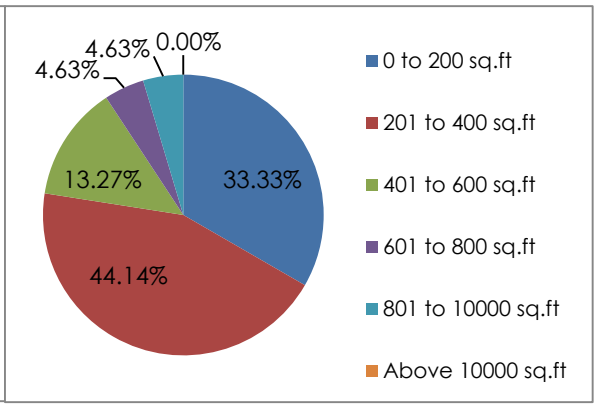


Figure 5.3: Details of Built up area- Barbil Rural

5.3.3 Dwelling Unit Situation

G. Number of living rooms

From the surveyed HHs, it is noticed that most of the HHs do not have separate living room and the figure counts to be 47.60% of the sample size. Nearly 52% of the HHs have at least one separate room available for the sole purpose of living room, whereas only 0.46% have two living room units. None of the surveyed HHs have more than two living room. The data on Urban Barbil reveals that more than 50% of the surveyed HHs do not have separate living room, which indicates that availability of land area for separate living room is limited in urban areas than rural areas.

Figure 5.5: No. of Living Rooms- Barbil Urban

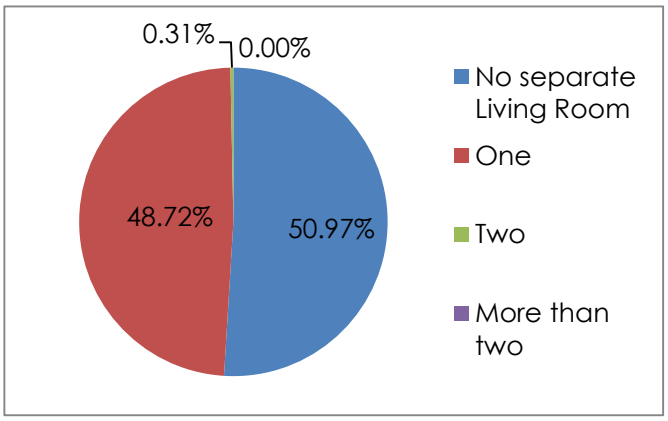
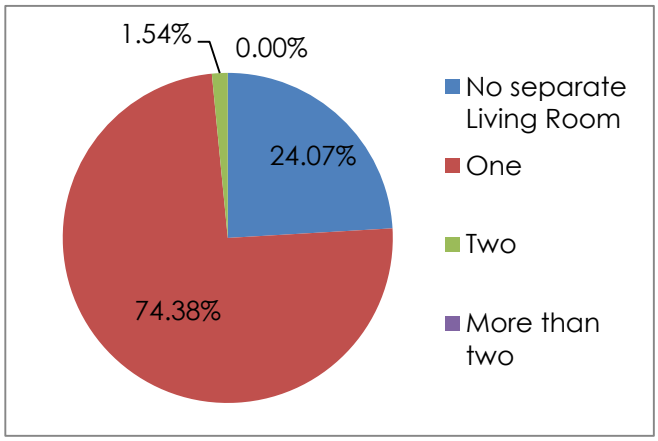


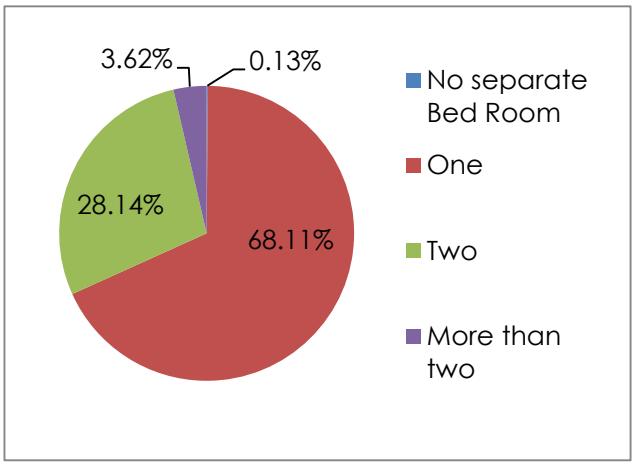
Figure 5.6: No. of Living Rooms- Barbil Rural



H. Availability of number of bedrooms per dwelling units

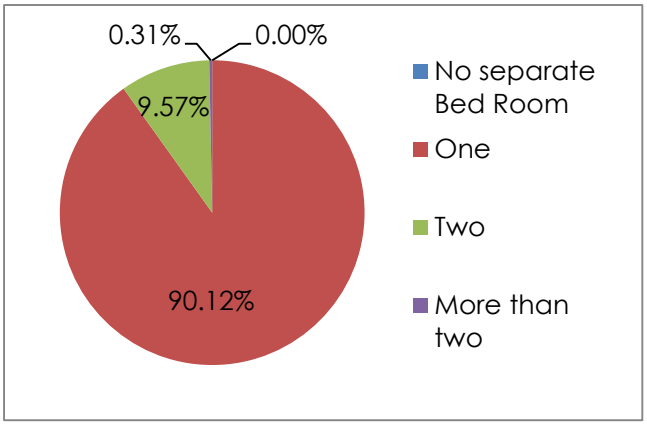
As shown in the below figure separate bed room is present in most of the surveyed households in the town. About 68.11% of the houses in the urban and 90.12% of the surveyed HHs in rural areas have a separate room available for the sole purpose of a Bed room. Also, around 28.14% of the households in the urban areas and 9.57% of the houses in the rural areas have facility of two-bedroom house. About 3.62% of the surveyed HHs have access to more than two bed room in the urban areas.

Figure 5.7: Availability of Bed Room- Barbil Urban



As it is apparent the percentages of such houses were slightly higher in urban areas, as certain affluent households with higher income level are residing in Barbil Urban.

Figure 5.8: Availability of Bed Room- Barbil Rural



I. Availability of Kitchen Facility

As shown in the adjacent figure separate kitchen was present in most of the surveyed households in the town. More than 76 % of the houses including both urban and rural areas have a separate room available for the sole purpose of a kitchen. A small percentage of the household surveyed in urban area had more than 1 room available for kitchen. But proportionately the numbers of such households were below 1% of the total households surveyed. About 22.5% of the surveyed households do not have separate kitchen facility in their dwelling units. This shows that the presence of a kitchen is often considered as a necessity in every household.

Figure 5.9: Availability of Kitchen- Barbil Urban

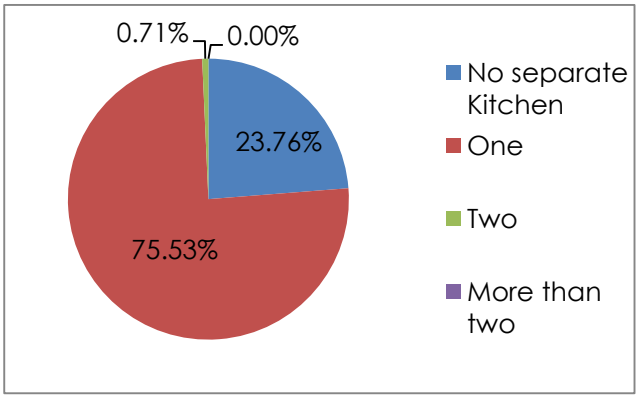
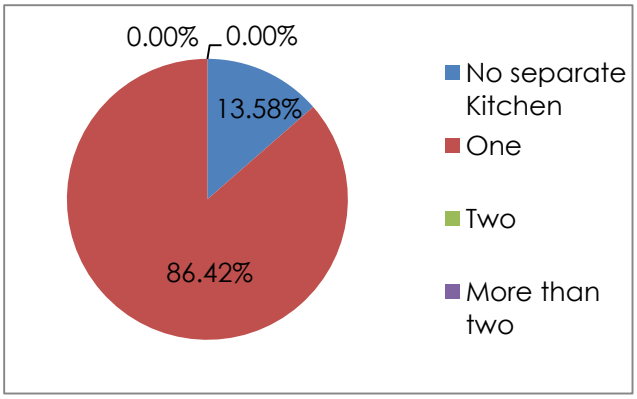


Figure 5.10: Availability of Kitchen- Barbil Rural



J. Availability of Toilet

The rural area of the Master Plan Area has a problem of open defecation as it is evident from the surveyed HHs that nearly 60% of the HH do not have separate toilet facility. Nearly 41% of the HH in rural areas have at least one toilet for sanitation purpose; whereas in urban Barbil, the figure is quite high with nearly 86.4% have at least one toilet. From the above stated facts, it could be concluded that the urban people are quite aware about the sanitation than the rural HH. Also, the general

practice for open defecation is a habit among the villagers which need to be changed through different awareness programmes on sanitation.

Figure 5.11: Availability of Toilet Facility- Barbil Urban

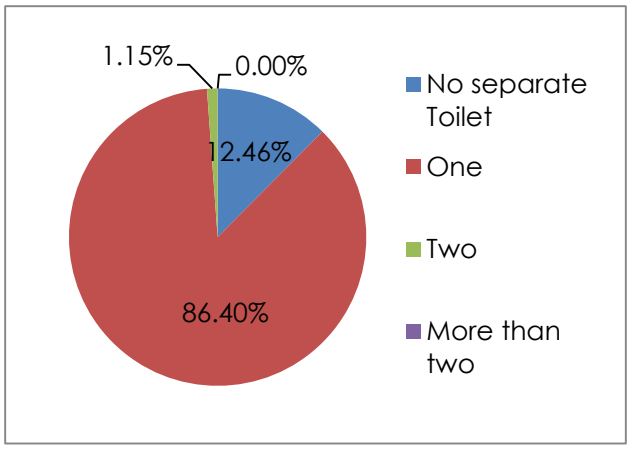
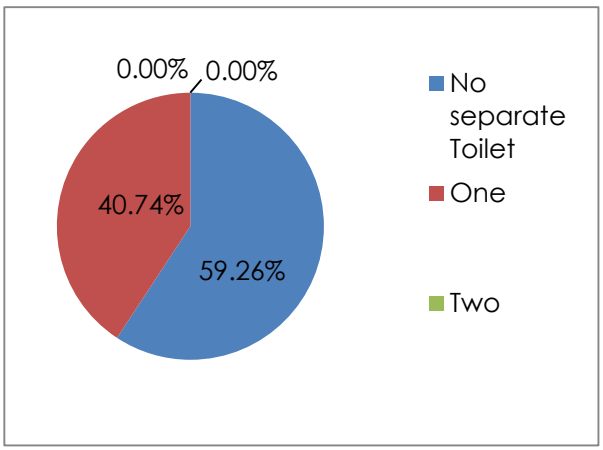


Figure 5.12: Availability of Toilet Facility- Barbil Rural



5.3.4 Qualitative Status of Housing

As per the analysis of the surveyed sample households according to qualitative status, it is observed that Barbil Rural has highest no. of kutcha structures with 72.53% of the sample size. The urban area also has higher number of kutcha structures than the semi-pucca & pucca structures. In Barbil Urban 39.97% of the sample HH are kutcha in nature, whereas the percentage of semi-pucca & pucca structures are 29.48% and 30.57% respectively. The pucca structures in the rural area are confined to only 10.19%, while semi-pucca structure shares 17.28% of the housing stock. From the above stated figures, it is evident that housing condition in the master plan area is a matter of concern and necessary strategies need to be framed for up gradation of existing housing stock in the master plan area.

Figure 5.13: Type of Structure - Barbil Urban

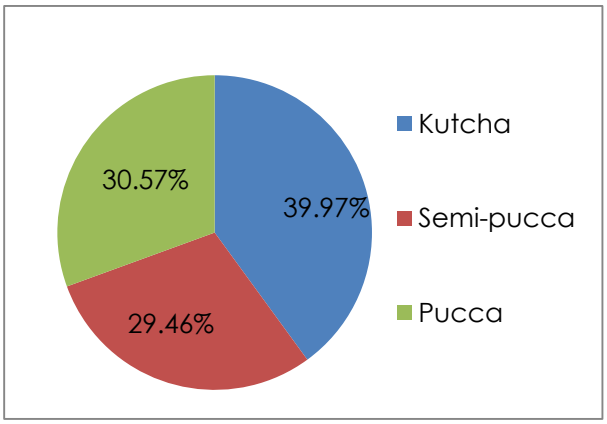
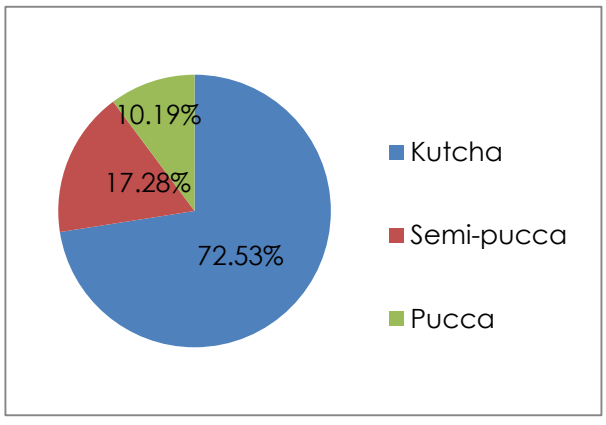


Figure 5.14: Type of Structure - Barbil Rural



K. Material of Roof

Information on types of roof was also collected during the sample survey to know the predominant materials that are used for roofing purpose in the master plan area. The survey output reveals that most of the houses in the urban area have titled roof with a total 50.44% of houses. In rural area, the figure is quite high with 89.20% of HHs having tile roof. Next to it, asbestos roofed structures share major portion with 24.03% to the total surveyed HH. In Barbil Urban, there are quite a good number of houses (22.48%) where RCC slabs are used as a roofing material. From the survey figure, it could be concluded that tiles roof shares a major portion in both urban and rural households as a main material for roofing and intervention need to be taken up for improvement of structural stability of the households.

Figure 5.16: Predominant Materials for Roof- Barbil Urban

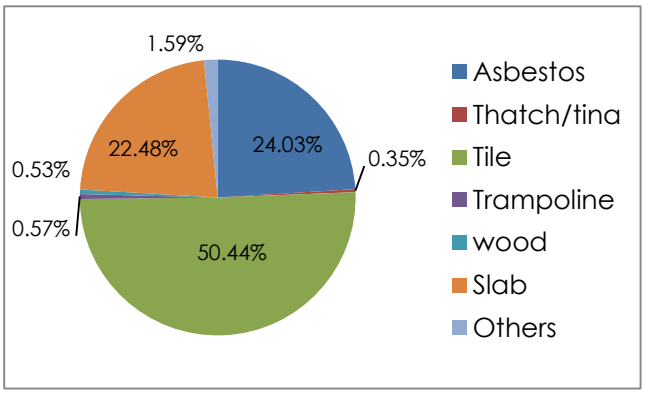
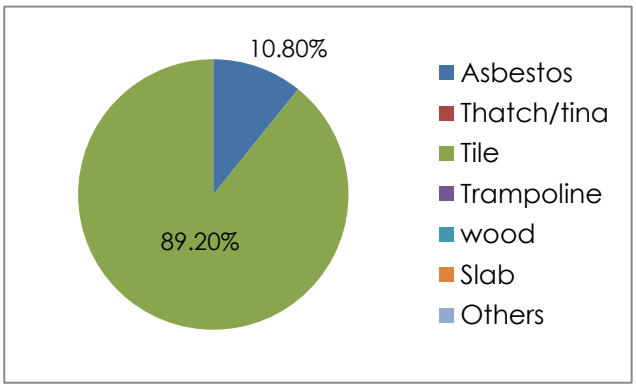


Figure 5.15: Predominant Materials for Roof- Barbil Rural



L. Material of Wall

From the below figure, it is seen that in majority of the houses, the walls are made up of mud and it accounts 61.36% of the total surveyed households. In rural areas, the proportion of mud built walls are more than the urban area with 96.91%, while in urban areas 56.27% of the surveyed HHs are made up of mud as a predominant wall material. In rural area, the portions of brick built walls are very marginal and is confined to only 3.09%. The use of mud as a major roofing material shows that the construction techniques in the rural areas are still primitive and people use mud over bricks as it is cheaply available and required less skilled man power.

M. Material of Floor

In case of using floor materials in master plan area, the situation is quite different in urban and rural areas. From the below illustration, it is noticed that in the urban areas

of the master plan about 44% of the surveyed HHs are made up of cement against the 11.1% figure of rural area. In rural areas, most of the houses use mud as a major flooring material and shares 88.89% among all rural surveyed HHs. The use of tile as a predominant flooring material is limited to only 0.84% and is found in urban area only. In rural areas, there is hardly use of any tile for flooring purpose. Also, the use of stone is very marginal and confined to only 0.19% in the master plan area.

Figure 5.20: Predominant Materials for Wall- Barbil Urban

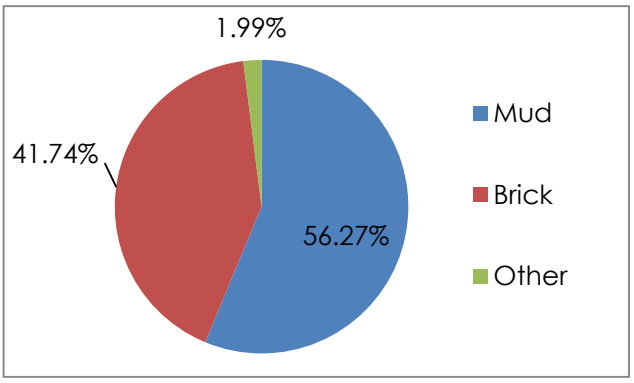


Figure 5.19: Predominant Materials for Wall- Barbil Rural

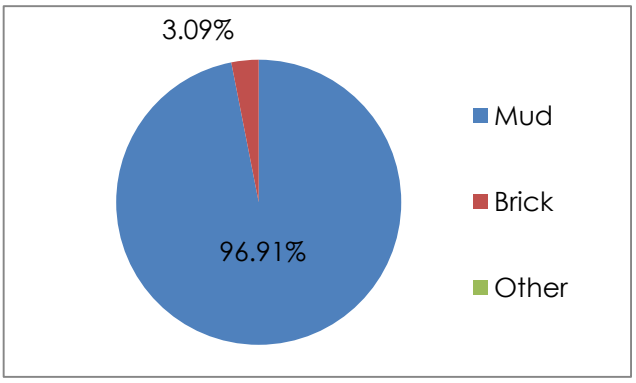


Figure 5.18: Predominant Materials for Floor- Barbil Urban

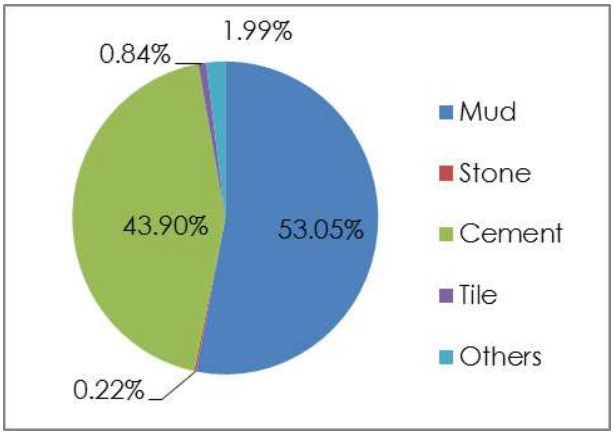
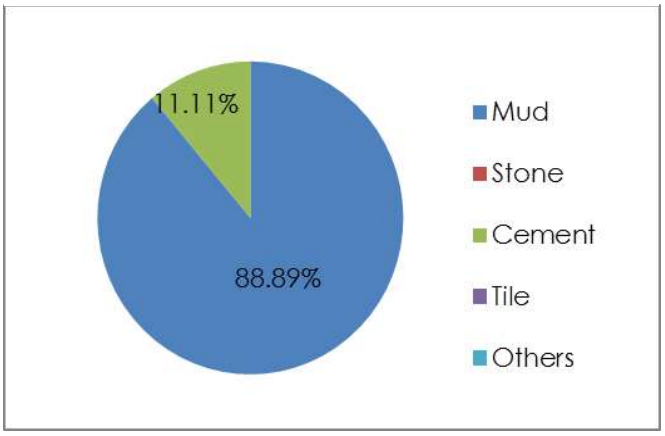


Figure 5.18: Predominant Materials for Floor- Barbil Rural



N. State of Structure

As a part of sample housing survey, an effort is made to know the state of the structure in which the respondents are living in. The respondents rated their structure as good, average and bad. It is noticed that most of the HHs are living in structures that are

Figure 5.22; State of Existing Structure- Barbil Urban

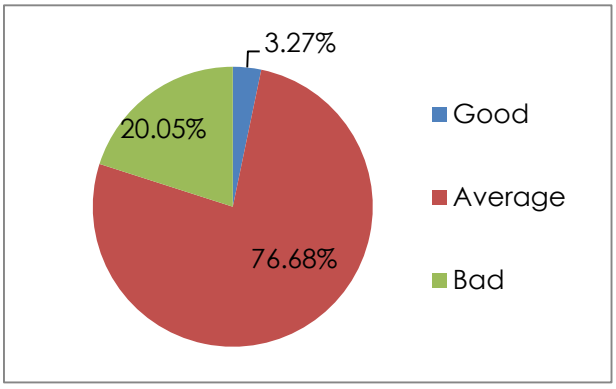
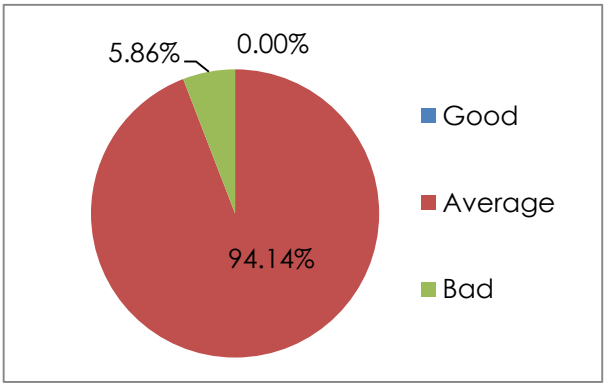


Figure 5.21: State of Existing Structure- Barbil Rural



average in condition with 78.86% of the total surveyed HHs. It is also seen that in urban areas, many houses are in bad condition with 20.05%. The HHs having good structural condition is limited to only 3.27% of the surveyed sample in the Barbil urban area.

O. Age of Structure

As per the response of the surveyed households it is found that majority of the houses in the master plan area are between 21 to 40 yrs., and accounts 48.19% of the whole master plan area. In Barbil Urban about 40% of the surveyed houses are aged below 20 years, which shows that in urban area the structure of houses is quite better than the rural areas. In Barbil rural, nearly 39% of the HHs are living in structures that are more than 40 yrs. and resulted in average state of structures.

Figure 5.24: Age of Structure - Barbil Urban

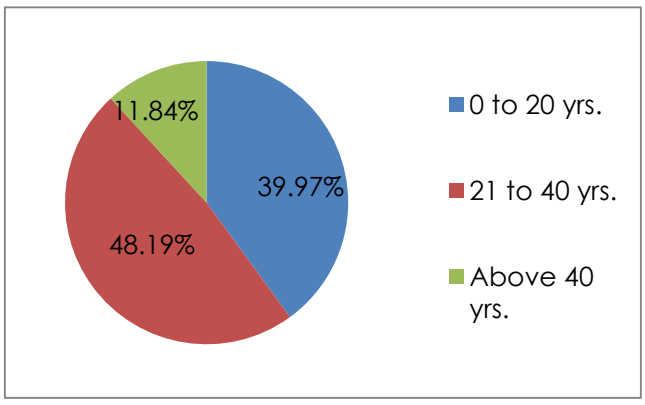
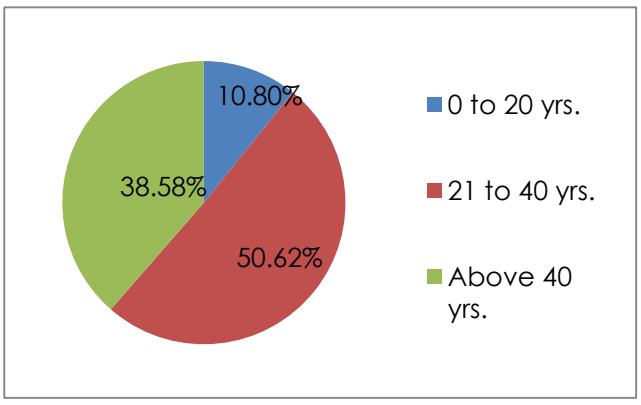


Figure 5.23: Age of Structure - Barbil Rural



5.4 Existing Scenario and Housing Trends

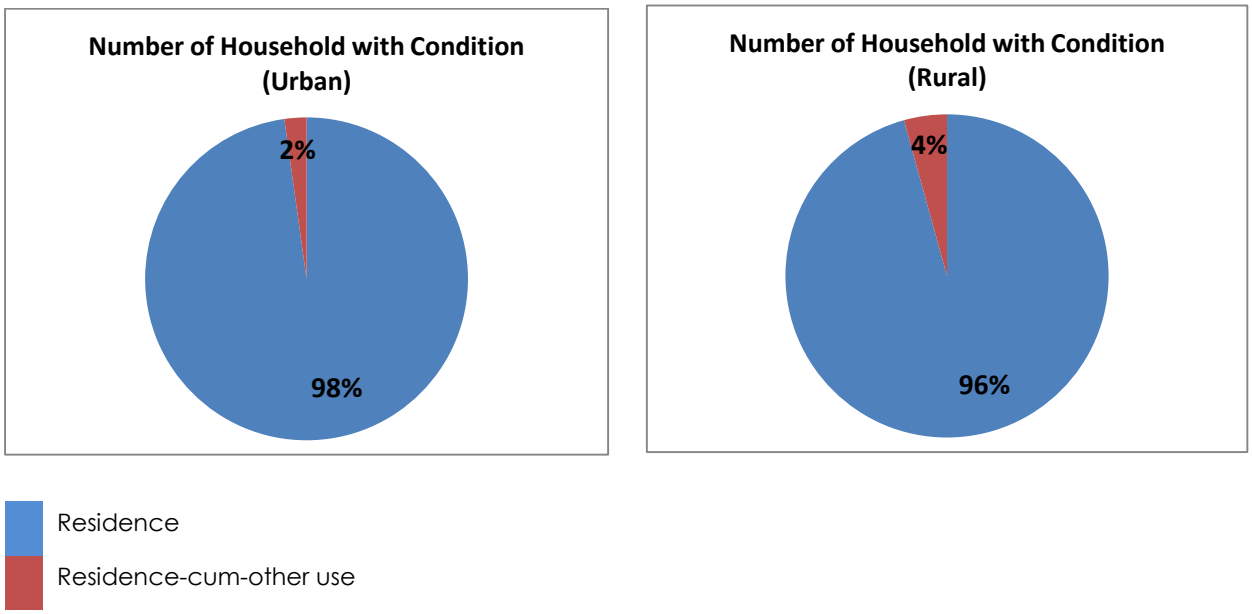
5.4.1 Use of Houses

As per the Census 2011 about 97.8% of the census houses have been utilised for residential purposes with 14,762 nos. of houses used for residential whereas only 2.2% are used as residential-cum-other use in Barbil urban. Rural area show a percentage of 95.7% used as residences and 4.3% used as residential-cum-other use.

Table 5-2: Census Households and their Uses

Area Name	Number of households with condition of Census House as								
	Total	Residence				Residence-cum-other use			
		Total	Good	Liveable	Dilapidated	Total	Good	Liveable	Dilapidated
Barbil (Urban) %	100	97.8	38.9	52.1	6.8	2.2	1.2	0.9	0
Numbers	**1,5094**	**14,762**	5,872	7,864	1,026	**332**	181	136	0
Barbil (Rural) %	100	95.7	76.8	17.4	1.4	4.3	4.3	0	0
Numbers	**3,795**	**3,632**	2,915	660	53	**163**	163	0	0

Source: (Census of India)



P. Households Condition

Figures on condition of households reveals that out of the total households 40% are residing in good condition and 53.10% households have access to liveable state houses; whereas only 6.90% of the HH are residing in dilapidated structures. Therefore, in the future housing strategy, redevelopment of dilapidated structures and semi-permanent structures need to be addressed. Barbil rural figure tells that majority of the households are residing in good condition.

Figure 5.26: No. of HHs with condition of Census Houses- Barbil Urban

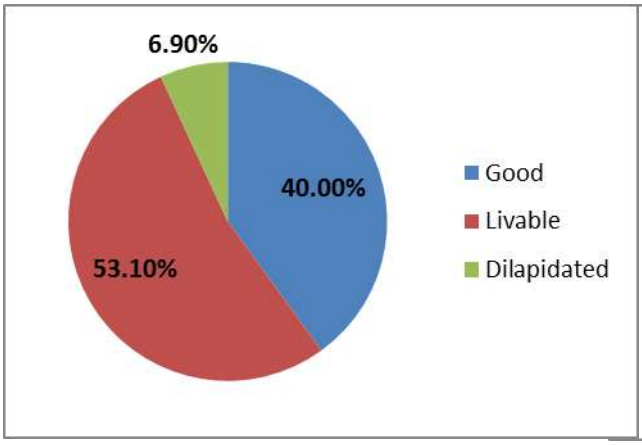
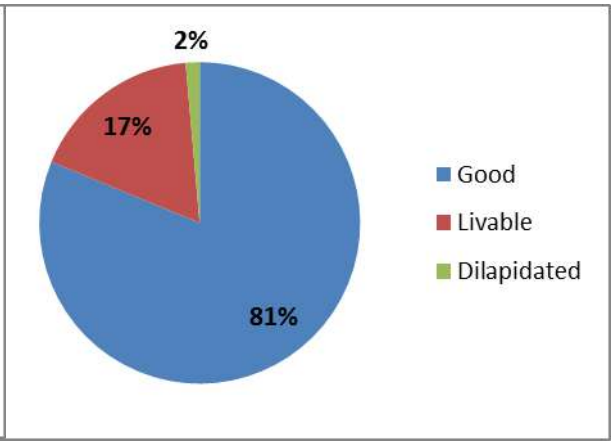


Figure 5.25: No. of HHs with condition of Census Houses- Barbil Rural



5.4.2 Material of Roof

While considering the use of material of roof, the census 2011 figure tells that majority of the households are living in census houses that are made up of roof. Roof made up of handmade tiles accounts to only 14% of the total households, while those with asbestos sheets and grass/thatch/ bamboo roof shares only 48%. From the stated figure, it could be noted that quite a good number of HHs are residing in houses that are structurally in poor condition. So, proper intervention need to be taken for the

Figure 5.27: Material of Roof- Barbil Urban

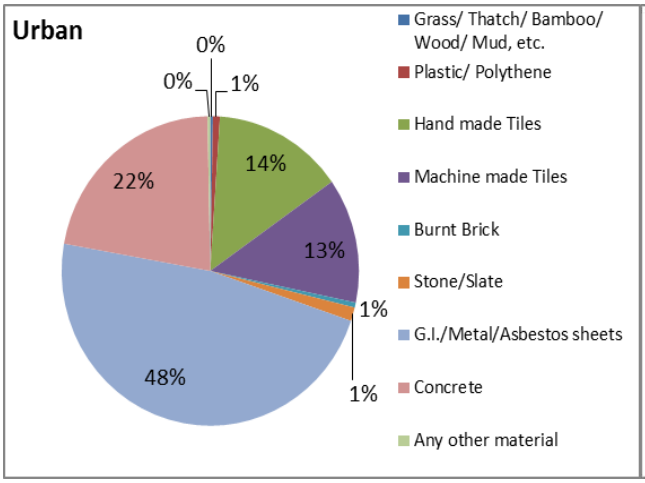
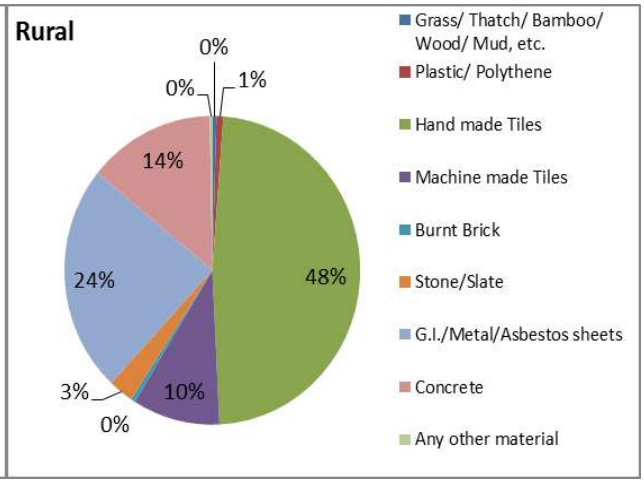


Figure 5.28: Material of Roof - Barbil Rural



future housing strategies. In Barbil Rural, households with roof made up of asbestos sheets and grass/thatch/ bamboo roof shares 24%. The share of handmade tiles accounts to be 48.0% of the residential households.

5.4.3 Material of Wall

As per Census 2011, in Barbil urban households residing in census houses that are made up of burnt bricks accounts to be 55%. Walls that are made up of mud/ unburnt bricks account to be 34% of the total HHs in urban area. In Barbil rural which mainly comprises of the rural revenue villages notified in Master Plan, it is found that most of the households are residing the houses that are made up of mud/ unburnt bricks while burnt bricks shares 56%.

Figure 5.30: Material of Wall- Barbil Urban

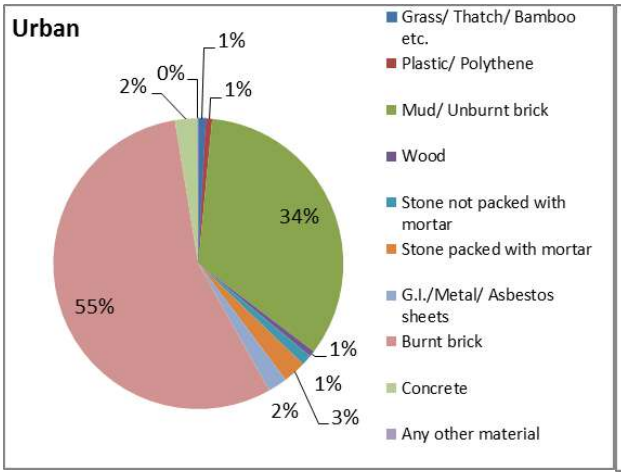
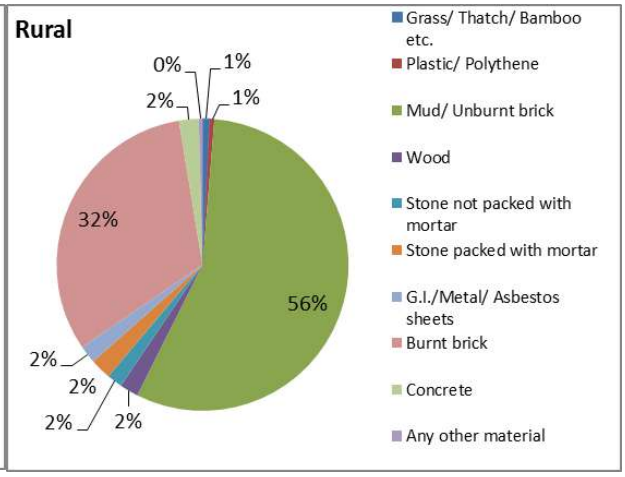


Figure 5.29: Material of Wall- Barbil Rural



5.4.4 Material of Floor

As per Census 2011, in Barbil urban households residing in census houses have floor made up of cement accounts to be 58%. Walls that are made up of mud account to be 36% of the total HHs in urban area. In Barbil rural the situation is approximately reverse, i.e., only 33% HHs have floor made of cement while 62% have floor of mud.

Figure 5.31: Material of Floor- Barbil Urban

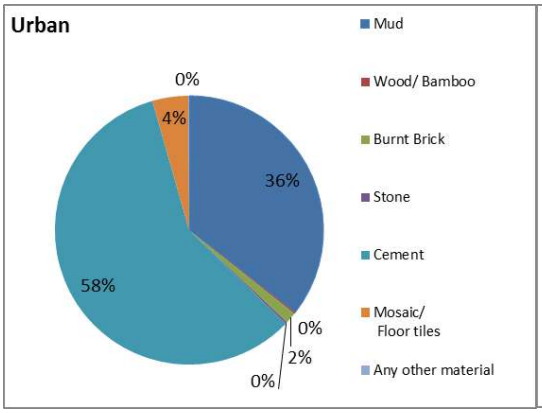
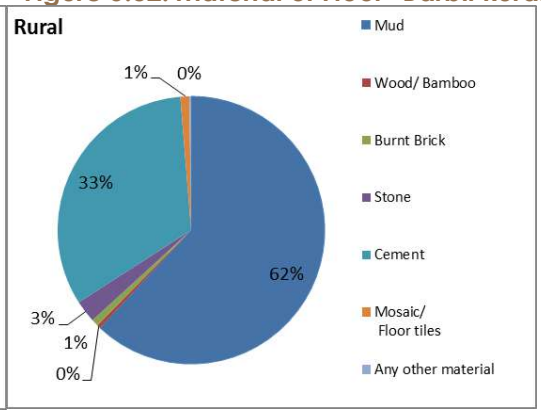


Figure 5.32: Material of Floor- Barbil Rural



5.4.5 Number of Dwelling Units

Percentage of HHs to total HHs by amenities & assets reveals that in Barbil urban most of the HHs are using 1-2 rooms dwelling units with about 75% of the HHs of which around 38% of the HHs reside in one room dwelling units. In urban area, only 1.5% of the HHs have no exclusive room. In Barbil rural majority of the HHs have access to one room and two rooms dwelling units i.e., 81%.

Very less proportion of HHs have access to three rooms or more rooms, which shows that affordability of people is very limited in both rural and urban areas.

Figure 5.33: Number of Dwelling Rooms- Barbil Urban

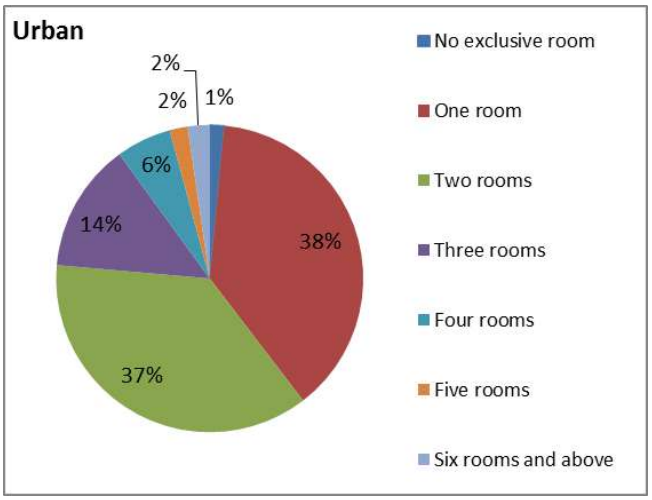
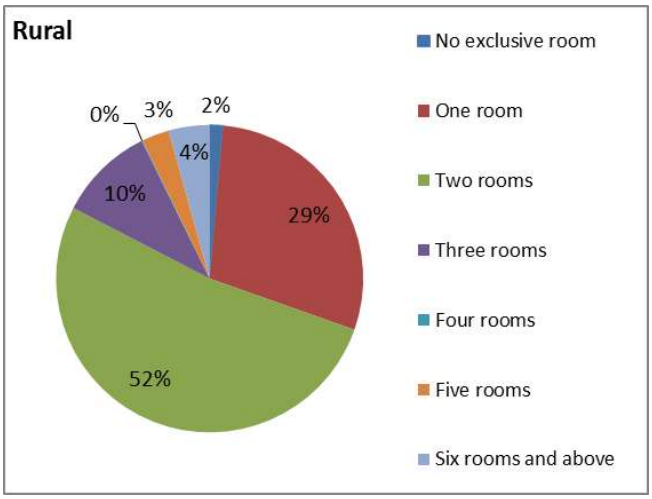


Figure 5.34: Number of Dwelling Rooms- Barbil Rural



5.4.6 Ownership Status

The ownership status in the urban area shows that 59% of the HHs have access to owned houses whereas 32% have rented houses. All HHs in rural area are owned and no rental housing exists. This is one of the reason there is 0% dilapidated structures in the rural area.

Figure 5.35: Ownership Status of HHs (Barbil Urban)

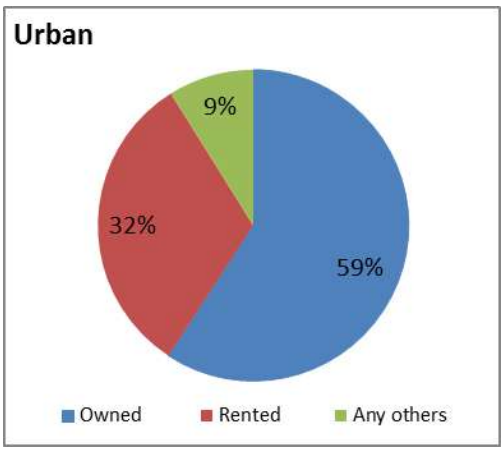
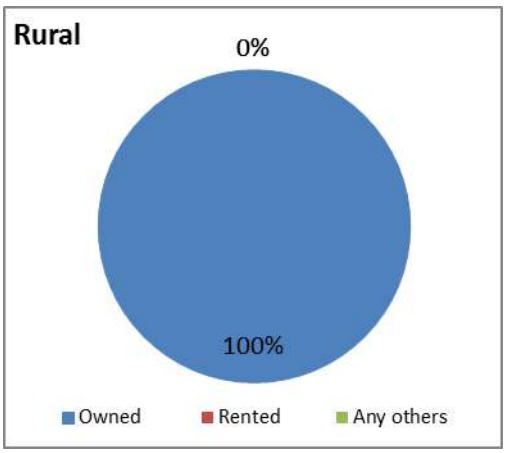


Figure 5.36: Ownership Status of HHs (Barbil Rural)



5.5 Slum

5.5.1 Introduction

Increasing urbanisation is emerging as the most universal and dominant challenge as well as opportunity facing our country, today. Cities and towns are centres of agglomeration economies, investments, technology, innovation, economic growth and tertiary jobs, thus hopes of millions of migrants from the rural hinterland and smaller settlements. As a result the population pressure on cities is intensifying. The urban centres are increasingly face the negative consequences of rapid urbanisation, such as polarisation of population in large urban areas, high density, acute shortage of housing and basic amenities, degradation of environment, poverty, unemployment and slums & squatter settlements etc. As per the Report of the committee on Slum Statistics, MoHUPA, GoI an estimated 13.70% of urban population (531.25 lakh in 2011-12) still lives on incomes that are below the poverty line. Eighty percent of their major earnings go towards food and energy, leaving very little for meeting the cost of living in an increasingly monetized society, which force them to live in slum and squatter settlements.

The concept of slum and its definition vary from country to country depending upon the socio-economic conditions of each society. Physically, an area of the city with inadequate housing, deficient facilities, overcrowding and congestion etc. are the characteristics of slums.

As per the 2011 Census of India, "a slum is a compact area of at least 300 population or about 60-70 households of poorly built congested tenements, in an unhygienic environment usually with inadequate infrastructure and lacking in proper sanitary and drinking water facilities".

The Government of Odisha defines Slums as follows:

"Slum area" means any predominantly residential area, where the dwellings which by reasons of dilapidation, overcrowding faulty arrangements or designs, lack of ventilation, light or sanitary facilities or any combination of these factors, are detrimental to safety and health of the inhabitants or others and which is defined by development plan as a slum area.

5.6 Existing Slums in Barbil Urban

The growth of slums and squatters in Barbil is mainly due to industrialization. As Barbil is an industrialized town with a number of plants, crushers and mines around, it is very rich in iron ore, other minerals found are manganese ore. Due to this, huge migration from rural hinterland, surrounding towns of Keonjhar district and bordering villages of Jharkhand and West Bengal as the study area act as a major employment generation centre with ample of opportunities in tertiary sector. In Barbil, nearly 95 percent of the workforces are engaged in tertiary sector, whereas primary sector shares only 1.33 percent of the working population. With the absence of affordable decent housing, these migrant populations are forced to live in slums and squatters. Most of the slums in the city are located on unutilised government land and railway area. Basic characteristics of these slums are dilapidated housing structure with poor ventilation, overcrowding, inadequate facilities such as portable water, sanitation facility etc.

As per the figure from Barbil Municipality, the slum population in Barbil is quite high and shares more than 68% of the total city population with a slum population of 45487. Almost all the 15 wards have slum population in the municipal area. The detail of ward-wise slum population is depicted as follows:

Table 5-3 : Slum population –Ward-wise

Sl. No.	Ward Name	Ward Population	Slum Population	% of Slum Pop. to Ward Pop.
1	Ward No.-1	3,578	3,654	102.1
2	Ward No.-2	4,845	4,515	93.2
3	Ward No.-3	3,278	1,649	50.3
4	Ward No.-4	4,057	3,983	98.2
5	Ward No.-5	3,216	-	-
6	Ward No.-6	3,173	877	27.6
7	Ward No.-7	5,387	1,117	20.7
8	Ward No.-8	4,999	4,590	91.8
9	Ward No.-9	4,877	4,985	102.2
10	Ward No.-10	5,274	5,081	96.3
11	Ward No.-11	2,547	367	14.4
12	Ward No.-12	6,397	4,582	71.6
13	Ward No.-13	4,054	1,979	48.8
14	Ward No.-14	5,644	3,728	66.1
15	Ward No.-15	5,214	4,380	84.0
16	**TOTAL**	**66,540**	**45,487**	**68.4**

Source: (Barbil Municipal Corporation)

Barbil Municipality identified 47 slums based on the criteria framed under Govt. of Odisha and Census of India. The list of slums along with their location and population details is given below:

Table 5-4 : Slum list with population

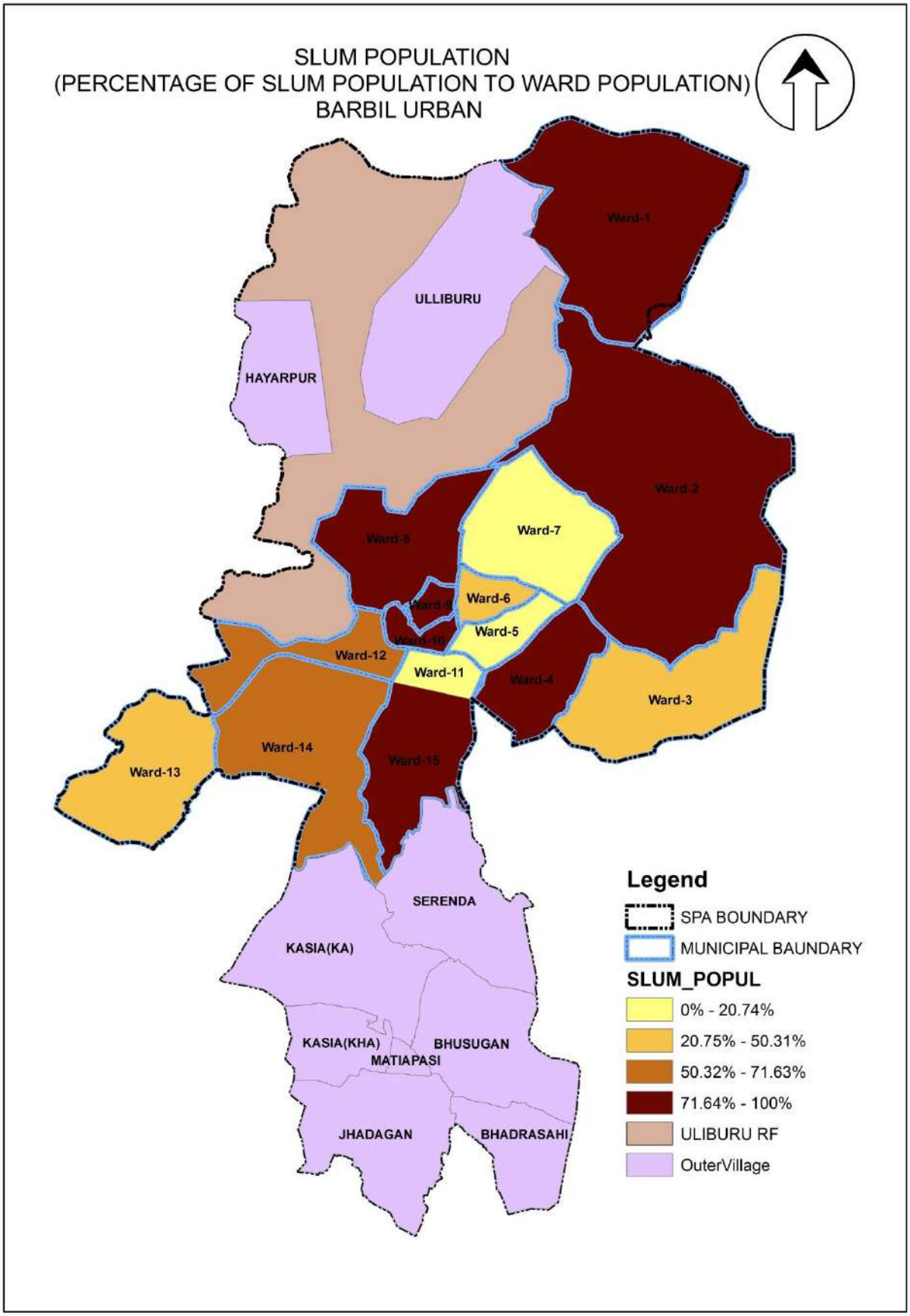
Sl. No.	Ward No.	Name of the Slum	Population
1	1	Hesaburu Oriya Basti, Munda Sahi	1,538
2		Hirakud Colony & Muslim Basti	1,493
3		Nepali Hutting & Gate Area	623
4	2	Dhipa hutting and Jahira Hutting	532
5		Belkundi Gopal Sahi & Munda Sahi	821
6		Kara Munda Sahi & Kara Sahi	700
7		Chatmba Sahi	316
8		Berega Sahi & Sirajjudin Hutting	818
9		Dalki Munda Sahi, Patra Sahi, Gopal Sahi & Naik Basti	849
10		Kharapa hutting	479
11	3	Seding Basti	591
12		Buru Hutting	596
13		Nepali Hutting & Majhi Hutting	462
14	4	Upper Basti & Sweeper Colony	552
15		S. Lal Hutting & SriRam Nagar	1,972
16		Sedding Hutting	1,459
17	6	Tara Hutting & Patra Sahi	877
18	7	Paul Hutting	1,117
19	8	Lebe Hutting	513
20		Santabahal Basti	562
21		Megazine Hutting	569
22		Bakal Hutting	703
23		Maharana Sahi	609
24		Bhanja Colony & Kalandi Sahi	1,634
25	9	Bagiaburu Hutting & NAC Hutting	2,374
26		Barkat Nagar	832
27		Dressing Hutting & Tiria Hutting	981
28		S. Lal hutting	798
29	10	Azad Basti	2,042
30		Dhobi Hutting	1,456
31		Gada Hutting	1,583
32	11	Sundara Basti	367
33	12	Chatei Hutting	1,254

34		Laxminagar	818
35		Indira Colony	902
36		Industrial Area	377
37		Jhupudi Hutting	254
38		Railway Siding Area	977
39	13	Champua Basti	527
40		Durbey Chaak	388
41		Uttamsingh Hutting	1,064
42	14	Weighing bridge Hutting	1,559
43		Mandir Hutting	991
44		Tapan Hutting	1,178
45	15	Damu Hutting	1,502
46		Sundara Basti	597
47		Sadhusing Hutting	2,281
		Total Slum population	**45,487**

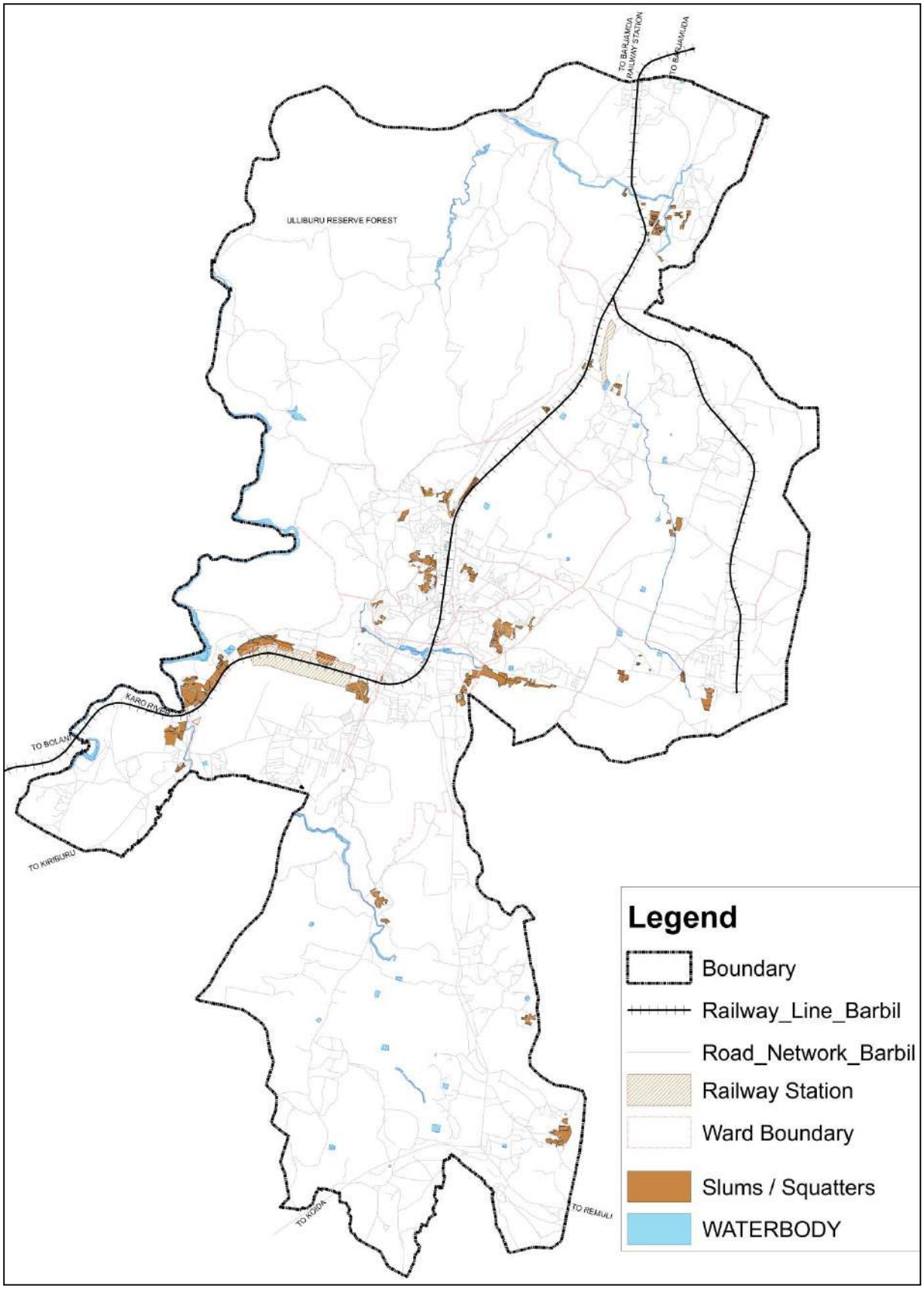
Source: (Barbil Municipal Corporation)

Below is a map showing the variation of slum population ward-wise. Highest slum population percentage (between 71.6%- 100%) is seen in the Wards-1, 2, 4, 8, 9, 10 and 15. Least percentage of slum population can be seen in Wards-5, 7 and 11 with slums ranging between 0% to 20.7%.

Map 5-1 Percentage Slum Population-Ward wise



Map 5-2 Location of Slums in Barbil



Map 5-3: Slum Areas of Barbil




As per the 2011 Census, the slum population in Barbil Urban is 45,487 which include both municipal area and OGs, constituted about 59.32 percent of the city's population.

5.6.1 Slum upgrading/ development initiatives

Till date no slum redevelopment programme has been initiated in Barbil Municipal Area. Therefore, it should be given high priority for slum improvement and different slum rehabilitation programmes of the state as well central government need to be incorporated to achieve a slum free sustainable environment.

5.7 Slum Upgrading/ Development Approaches

5.7.1 Objectives for Redevelopment Strategies

A. Access to secure land tenure-

Slum formation takes place because access to affordable land is denied to the slums. They do not have an access to the formal housing, for which they seek informal housing. Once the land and housing become affordable and easily accessible, the phenomenon of slum formation will automatically get curbed.

5.7.2 Reduction of Housing Poverty

Housing poverty refers to the people who are denied housing because its supply does not match the demand and the right kind of affordable housing is not available. Housing poverty is a problem arising out of economic distress. The inflows therefore must be regulated in a planned way.

5.7.3 Shelter Improvement

The strategy not only aims at reduction of housing poverty but also towards improvement of the existing shelters. The shelter condition can also be upgraded by renovation through construction programmes.

5.7.4 Access to Basic Infrastructure

Basic urban services that are considered bare minimum for a healthy living like water supply, sanitation, garbage disposal, etc. should be made accessible. Improved access to social services would help in empowering the slum population to improve their own living condition and quality of life.

5.7.5 Employment Security

One of the objectives of the strategy is to ensure Employment security for all. This shall be achieved by conducting various skills up gradation programmes, providing loans, etc.

The previous attempt of slum redevelopment with provision of housing & infrastructure has not able to cover much on ground due to the piecemeal approaches of the schemes. Therefore, for the holistic development of the slums Rajiv Awas Yojna was launched with a vision of "Slum free India" in selected cities of India with a total of 116 no. of mission cities. The criteria laid in the guidelines made Barbil out-reached of the slum redevelopment programme.

As per the Technical Group on Housing Shortage, there was a housing shortage of 18.78 million in 2012, which mainly because of increased urbanisation and migration. More than 95% housing shortage is for EWS/LIG houses and the slum growth is an indicator of the same. A multi focused approach is therefore necessary to answer the problems and improving the life in slums.

5.7.6 Housing for All

In the recent past, the central government launched "Housing for All" with an objective to provide decent pucca house to every family with necessary infrastructure facilities such as water connection, toilet facility, electricity supply and access. The mission seeks to address the housing requirement for urban poor including slum dwellers through following approaches:

- Slum rehabilitation of slum dwellers with participation of private developer
- Promotion of affordable housing for weaker section through credit linked subsidy
- Affordable housing in partnership with public & private sector
- Subsidy for beneficiary-led individual house construction

Some of the salient features of the programme are as follows:

- All 4041 statutory towns as per Census 2011 with focus on 500 Class I cities would be covered in this scheme.
- The mission will support construction of houses upto 30 square meter carpet area with basic civic infrastructure.
- Slum redevelopment projects and Affordable Housing projects in partnership should have basic civic infrastructure like water, sanitation, sewerage, road, electricity etc.
- The minimum size of houses constructed under the mission under each component should conform to the standards provided in National Building Code (NBC). If available area of land, however, does not permit building of such minimum size of houses as per NBC and if beneficiary consent is available for reduced size of house, a suitable decision on area may be taken by State/UTs. All houses built or expanded under the mission should essentially have toilet facility.

- The houses under the mission should be designed and constructed to meet the requirements of structural safety against earthquake, flood, cyclone, landslides etc.
- The houses constructed/acquired with central assistance under the mission should be in the name of the female head of the household or in the joint name of the male head of the household and his wife, and only in cases when there is no adult female member in the family, the house can be in the name of male member of the household.

The opportunity of providing housing to all under the scheme need to be taken for the development of existing slums in Barbil along with creating affordable housing schemes as a preventive strategy for future growth of slums. Out of the total residential area i.e. 747.79 ha, 20% land i.e. 149.56 ha will be reserved for affordable housing. 20% land will be spatially allocated in the entire Master Planning area which will be detailed out at layout level plan. Barbil is having lot of industrial and mining related activities which will have population of different economic class therefore, affordable housing will solve the housing problem for EWS/ LIG sector population.

5.7.7 Slum Networking

Slum networking requires a detail study of the existing slums, especially those along the main submerged areas along with the contours of the area. This will not only improve the slums but integrate this approach with the overall physical infrastructure and social development of the area. It is a method for integrated up gradation of the entire city using the slums as an urban net and not as isolated islands. The spatial spread of slums over a city together with contiguity between slum settlements gives an opportunity to strengthen the city level infrastructure networks. There is a close correlation between the slum locations and the natural drainage path of a city. This helps to build up low cost service trunks, particularly for gravity based systems of sewerage and storm drainage, together with environmental improvements such as creation of fresh water bodies, cleaning up of polluted rivers, and development of green pedestrian spines and restoration of waterfront structures. The net effect is holistic development, which changes the functional, physical, socioeconomic and environmental qualities of a city at a fraction of the costs of a conventional approach.

5.7.8 Slum Relocation

Slums located on environmentally hazardous areas such as slums along nallas, river, and railway area; or near mines and industries; can be relocated to suitable sites closes to the working spaces of the existing population living in the slum. The relocated site has to be well connected by affordable transport mediums so that these residents can travel at an affordable cost. Land assembly shall be done compulsorily by the government and handed over to the corporation for any kind of resettlement or slum improvement schemes. Clear workout approaches of community integration and work-home relation is to be ensured in redevelopment and resettlement process.

5.7.9 Social and Economic up gradation

By providing social infrastructure like schools, anganwadi, health care etc., and by addressing to other social issues in slums, social development could be achieved. Community Based organisations to be strengthened for sustainable local Self-Governance. Basic services of health, education and access to credit are crucial for human capital development and reduce the incidence of poverty. Improved access to social services would also help building up the capacities of poor and empowering them to improve their own living conditions and quality of life.

Income generation activities in slums which are non-polluting activities (tailoring, making toys, handicrafts etc.) need to be encouraged on mixed land use basis. The provision of vocational training facilities, implementations of savings and credit schemes for self-employment need to be taken up for economic upliftment of the slum dwellers. Empowering communities to participation in identification, planning and monitoring of slum development, form and strengthen Mohalla Samities as formal and legal mechanism to promote community participation in local development. Slum dwellers, women group and SHGs for micro finance need to be ensured for livelihoods and economic upliftment of slum dwellers.

5.7.10 Creating Affordable Housing Stock

To address shortage of EWS, LIG, LMIG and MIG housing in a time bound manner and to promote affordable housing thro' multiple cost reduction measures such as, making available land at reasonable cost, cross subsidization thro' higher FAR and TDR, stamp duty exemption etc. has been taken by the state government thro' its Affordable Housing Policy – 2013. Some of the salient features of the scheme is outlines below:

- Minimum 20% of developed land earmarked for residential purposes in the city development plan/ master plan/ zonal development plan shall be reserved for EWS, LIG and LMIG housing
- Development authority, Special Planning Authorities and ULBs to earmark at least 30% of developed land earmarked for residential purposes under their possession for EWS and LIG housing in all their group housing projects
- Liberal building regulation for EWS and LIG housing in term of FAR, ground coverage set back, approach roads etc.
- Encouragement of PPP for creation of EWS housing stock

It is need to recognise that the urban poor are active agents of an urban centre and need to be empowered through proper slum redevelopment intervention for creating a sustainable environment.

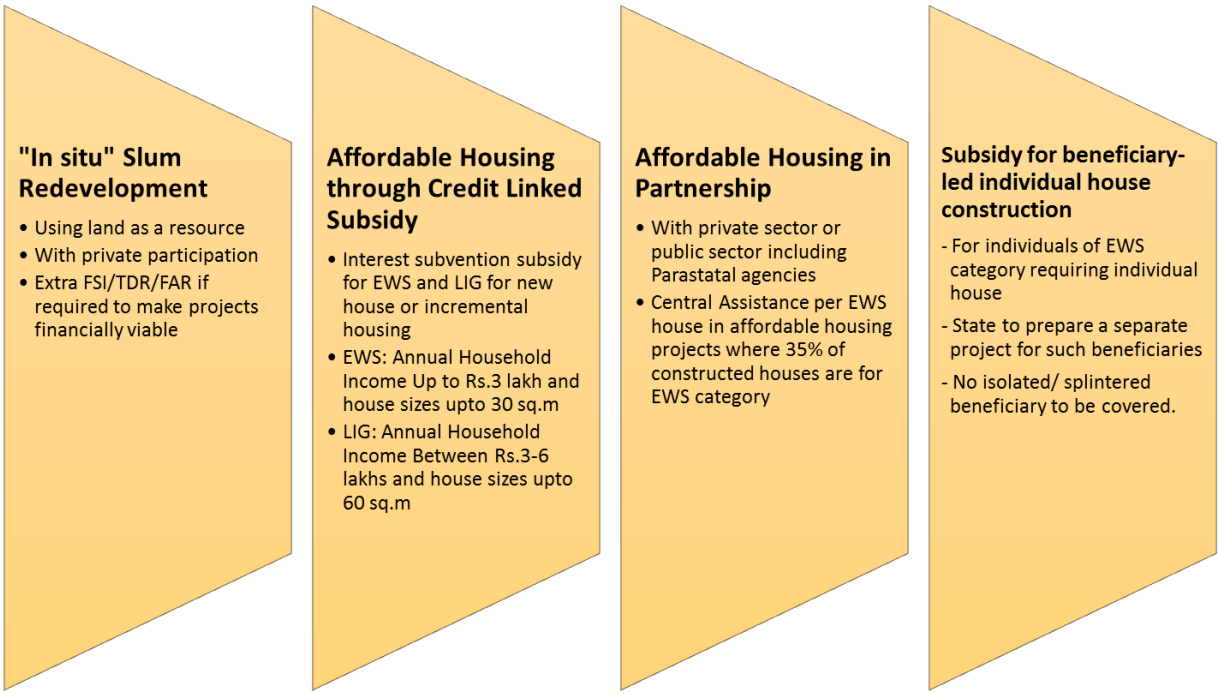
5.8 Future Housing Strategy

As mentioned above majority of the houses in the study area are small sized, semi-permanent structures which are highly vulnerable and offer little shelter during disasters like heavy rain, storms and cyclones. The situation of some of the areas like slums and under connected villages is quite desperate. At present, there is imperative need for intervention in development of affordable group housing for the underprivileged sections and upgrading of kutcha structures to semi-permanent structures, that better shelter can be provided to large number of people. Some of the plan programmes which can be immediately taken up can be upgradation and resettlement of slums in most vulnerable condition. Identification of government land and financial sources for development of subsidized housing and exploring PPP model for the same can be some initiatives taken to solve the housing shortage of Barbil town.

5.9 Vision

The vision of the Master Plan is to make the city of Barbil a sustainable city with sufficient infrastructure, utilities and minimal housing shortage.

The housing scheme will help provide housing for urban poor i.e., slum dwellers, urban poor living in non-slum areas, prospective migrants, homeless and destitute. Thus, it will cover each and every aspect of housing shortage and will offer action against them.



5.10 Demand Assessment

The housing need for the master plan area has been estimated considering the existing housing shortage and future housing requirement for the horizon year 2030. The shortage is based on the number of existing households, housing stock, excess of HHs over housing stock, congestion in households, obsolescence in households and up gradation of semi-pucca/ liveable housing stock.

For estimating the future housing need for the estimated population of the Master Plan Area is considered with an estimated household size of 4.0. More trends towards urbanisation, diminishing HH size and an increasing trend towards more nuclear families resulted in an estimated HH size of 4.0 for the year 2030.

Table 5-5: Future Housing Need for Master Plan – 2030

A	Existing Housing Shortage	Amount	Remark
i	No. of Households	18,641	
ii	No. of Census houses used as residential and residential-cum-others	15,094	Census houses used for residential purpose
	Numeric shortage	3,547	(i - ii)

B	No. of Dilapidated Structure	1,026	Total dilapidated structures in housing stock
C	No. of HHs in Congestion status	373	Assuming 2% congestion
D	Structure up-gradation	3,146	Considering 40% of the livable housing stock (i.e., 40% of 7,864)
1.	Existing Housing Shortage (A+B+C+D)	8,091	
E	Future Housing Need		
	Projected Population - 2030	1,13,237	
	Existing Population	76,676	
	Additional Population	36,561	
	No. of Houses required to fulfil the future need	9,140	Considering the future HH size to be 4.0, considering the trend in change in HH size.
2.	TOTAL HOUSING REQUIREMENT (1+E)	17,232	

The housing shortage is thus calculated and estimated as 17,232 for the year 2030.

5.11 Housing strategies

The housing strategies are framed in accordance with the PMAY strategies for providing housing for all. These are as follows:

5.11.1 New Residential Development

The new residential development will target the urban poor not living in slums and also the future migrants. Such households will be catered by Affordable Housing by private sector and state board. Efforts have to be made to augment supply of houses otherwise prices will go up, enhancing supply of urban land. The Affordable housing schemes shall give the following incentives:

- Extra FAR/ TDR
- Relaxation of density norms

- Deemed NA permission if land falls in residential zone in Master Plan
- Single window clearance for building permissions
- Deemed layout and building permission for pre-approved designs
- Improvement in construction technologies
- Project finance to private developers

As the availability of suitable and sufficient urban land is most critical, land should be with basic civic and social infrastructure. Steps to augment land supply are as follows:

- Government/ ULB land within city limit be kept for affordable housing
- Land on fringe of city to be converted into urban land by developing and expanding trunk infrastructure
- Land pooling of such other methods to be adopted
- Mandatory 10-15% reservation of land in new layout for EWS/LIG housing
- Additional FAR/ TDR and relaxed density norms for EWS/LIG housing

For the migrant families, the main strategy will be to purchase affordable house with interest subvention. They also avail temporary rental accommodations and in case of single migrants may prefer dormitories etc.

The planning authority shall solely or with the help of private developers adopt the following strategy for providing housing for the migrants. These are as follows:

- Rental units & dormitories to be available to individual / family for 3-5 years at subsidized rent
- Rental housing and dormitories by ULBs with GoI support (60-75%)
- Labour welfare boards, construction worker's welfare boards etc. to be involved

All the above discussed strategies will help decrease the housing shortage for the city of Barbil.

5.11.2 Redevelopment Strategy for Core City

The main strategy for core city shall include re-densification of the old city areas based on the availability of infrastructure and the scope of enhancement of the existing facilities.

Road widening within the core areas will be will be done wherever there are bottlenecks formed creating an obstruction in the proper flow of traffic. These roads will be declared by the Planning Authority time-to-time and measures will be taken to avoid any demolition as far as possible.

The infrastructure enhancement is one of the main factors of the redevelopment strategy for the core city area. The Master Plan shall aim on providing basic infrastructure and amenities to the existing households.

Another main factor will be redeveloping properties which are in dilapidated and non-liveable conditions so that at the time of any natural calamity or disaster there is no loss of life or property.

CHAPTER-6 TRAFFIC AND TRANSPORTATION

6.1 Introduction

Barbil is an industrial town due to large number of steel plants, iron ore pallet plant, ore crushers and mines. Presence of industries however showing cosmopolitan culture due to influx of people from almost all states. This lead to large traffic volume on existing roads which consist of passenger and goods vehicular traffic.

There are several mediums of road transport which connects the planning area with rest of the cities of the state and nearby state as well. The National Highway-215 from Panikoili to Rajamunda passes at the out skirt of the town. This road connects the town with Rourkela and on the other hand to the district headquarters.

This section of the report deals with the status of traffic and transportation network in the study area. A study of the regional connectivity in the area has been carried out. This is followed by a brief discussion of the existing transit facilities in the town. The network characteristics have been analysed, to assess the sufficiency of the system. Through the course of studies parking and traffic load on some of the roads has been found to be one of the major issues, especially in the urban areas. Solutions for the same have been examined in the subsequent sections and finally proposals have also been given for the same.

Ongoing and proposed projects have also been studied to get the picture of future transportation scenario in the town. Future mobility pattern has been studied accordingly for the town for the year 2030. The planning of transport system for the town of Barbil is done along the following principles:

- Capable and multi-modal Public Transport System
- Developing the right of way for safe and secure mobility of slow moving vehicles
- Connecting the commercial spine with sprawling residential sectors
- Providing adequate and continuous pathways in all activity zones
- Implementation of innovative Traffic Management Techniques along with augmenting new capacity systems
- Segregation of local and regional traffic w.r.t. space and time
- Providing continuity and uniformity in the corridors and Intersections

- Utilising the unused Right of Way for Multi Utility Zones as per the needs of abutting landuse.

Map 6-1: Regional setting of Barbil and road connectivity

Source: Google Map

6.2 Regional Connectivity

6.2.1 Roads

Based on importance in the city network, four types of roads have been identified, namely arterial, sub-arterial, collector and local roads.

a) **Arterial Roads** – Barbil- Bada Jamda road which originates near Bhadrasahi, is connecting the town with NH-215 and Bada Jamda of Jharkhand. This road also acts as a major spine for mining transportation activity.

b) **Sub-arterial Roads** – SH-10 B passes through the entire planning area from North to South which connects Barbil from Nalda in the north and meet NH 215 in the south. Another major road that add on to the regional connectivity of the town is the Barbil- Bolani and Barbil- Kiriburu road, which connects the city with the mining potential areas of the region.

c) **Collector Roads and Local Roads** – There are many collector and local roads in Barbil which fulfil the requirement of traffic. Some of the roads are insufficient to carry the traffic volume. Barbil Station road is one of the major collector road which need immediate solution. Belkundi road is also one of the major collector road.

Local roads collect traffic from different areas and diverge it to collector roads.

6.2.2 Rail

South Eastern Railway division provides rail connectivity to the town. The rail line passing through Barbil, connects the town with Ranchi, Chakradharpur, Rourkela and Howrah, which are important centres of commerce and industry; they render immediate influence on it as outward traffic of iron, manganese and other minerals. The area around Barbil has a number of private iron ore mines. The Barbil-Joda region is the highest iron ore producing region in the country. It is the basic raw material for sponge iron and steel producers, many of whom who do not have access to captive mines. Moreover, India exports nearly two third of its iron ore production. Iron ore transport is a major task of the railway network in the region. Other than the goods trains, a good number of passenger trains ply to Barbil from major towns of the country. Jan Shatabdi Express connects Barbil with Howrah. Also Puri- Chakradharpur Express connects the town with the state capital and the division headquarter. Other than these trains, passenger trains to Tatanagar and inter-city express to Chakradharpur are the trains that facilitate passenger movement.

6.2.3 Air

The Birsa Munda Airport in Ranchi is the nearest domestic airport to Barbil. Also Biju Patnaik International Airport at Bhubaneswar is located at a distance of 272 km from

Barbil. Barbil Tonto Aerodrome is also an available option for air traveller which is located in Tanto village adjacent to Master Plan boundary. It is a private/ public airstrip owned by Jindal Steel and Power. The regional linkage of the town along with the mining and industrial potential has marked Barbil a special position in the mineral map of the country.

6.3 Travel Scenario in Barbil Planning Area

The transport scenario of the Barbil town has been explained in the different sections below as per the field surveys on the various aspects of traffic and transportation. The load on the different network and their current capacities, the bottlenecks in the network, parking areas, speed and delay in major networks, have been studied and their results have been presented below.

Existing Mobility Scenario

The main spine of the city is the market area running from Bhadrasahi Chowk towards Jamda and there are other sub arterial roads.

Map 6-2 Existing Transport Network in Barbil Planning Area

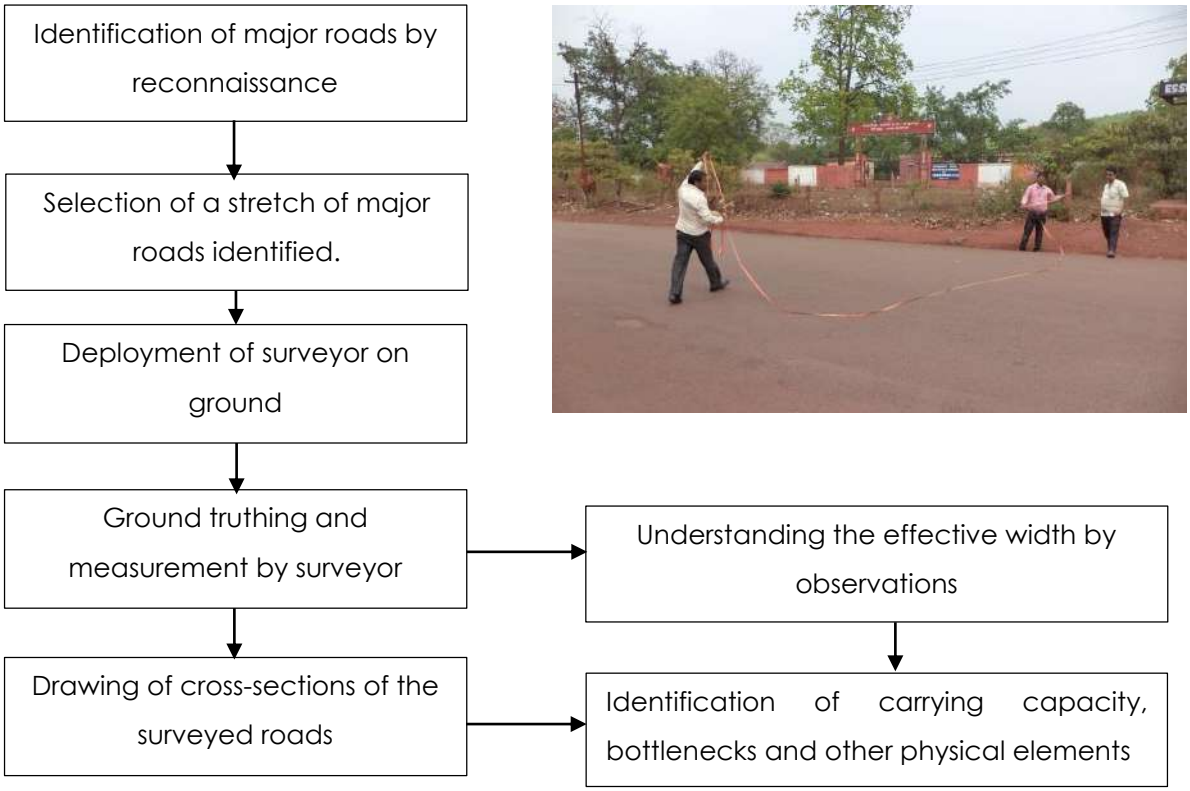
6.3.1 Types of Surveys and their Purpose

Cross-sectional elements	Dimensions and capacity of roads
Classified Traffic volume count	Traffic load on network and traffic composition
Parking survey	Estimation of parking demand and supply
Speed and Delay	To understand the journey speed and delay
Origin Destination survey	To understand the traffic movement pattern

6.3.2 Cross-sectional Elements of Major Roads

In order to understand the characteristics of major networks within the city and have an idea about their carrying capacity and dimensions cross-sections of various major roads in the Barbil town were studied. In order to carry out the survey following methodology was adopted.

Figure 6.1 Cross-Sectional Survey Methodology and Survey Being Conducted in Barbil



After taking up the reconnaissance survey about 9 roads were selected for the purpose of the cross-sectional elements survey. Out of the 9 roads 4 were those roads which handled the outside inside traffic of the planning area, and 5 were roads which

handled inside traffic of the area. Care was taken to include all the exit roads of the area and all heavy traffic roads in the survey. The roads taken in the survey are as follows.

6.3.2.1 Jamda road near Auto stand

The road characteristics are that of the highway with very little developed land adjoining the road. Most of the surrounding land use is residential and small scale commercial consisting of repair shops and eateries. The ROW is approximately 16 m with around 5.8 m of carriage way with shoulders on both sides. No other significant street feature is present apart from electric line running parallel to the road.

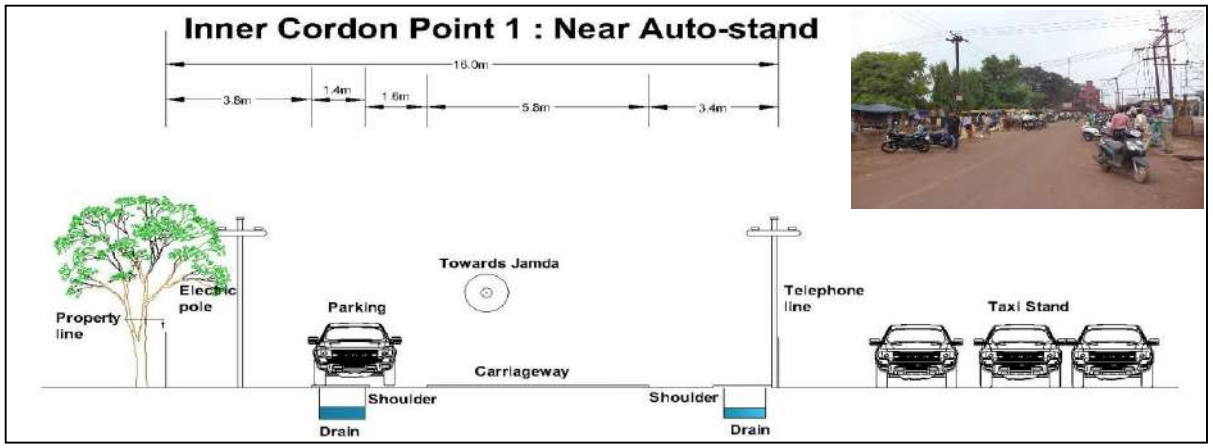


Figure 6.2: Cross-section and view of ICP 1

6.3.2.2 Bhadrasahi road near Tehsil office

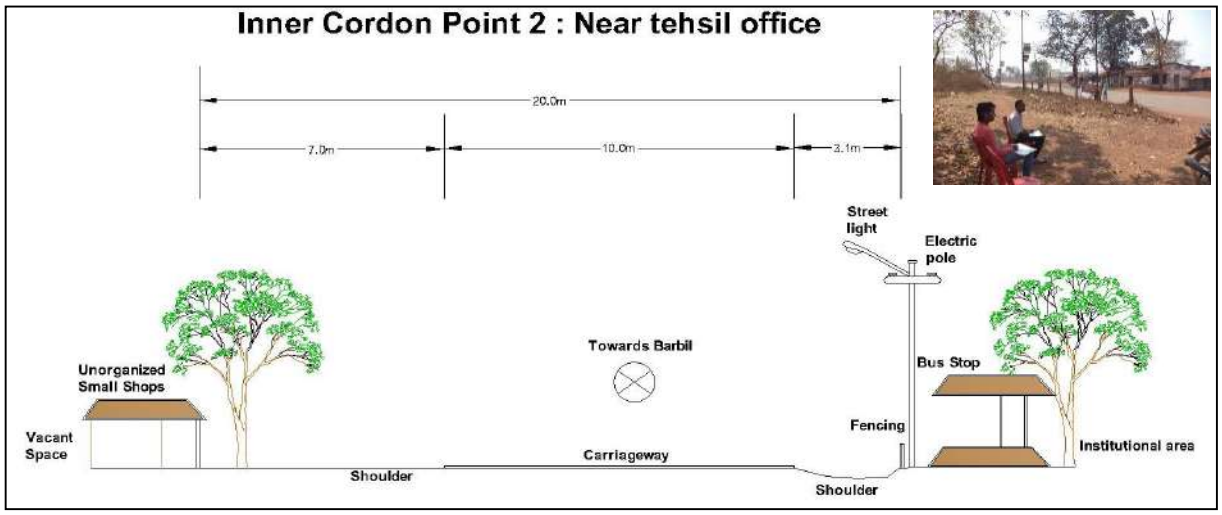


Figure 6.3: Cross-section and view of ICP 2

6.3.2.3 Thakurani Mines road near Shani Mandir

The road characteristics are that of the highway with very little developed land adjoining the road. Most of the surrounding land use is institutional and small scale commercial consisting repair shops and eateries. The ROW is approximately 15.8 m with around 5.3 m of carriage way with shoulders on both sides.

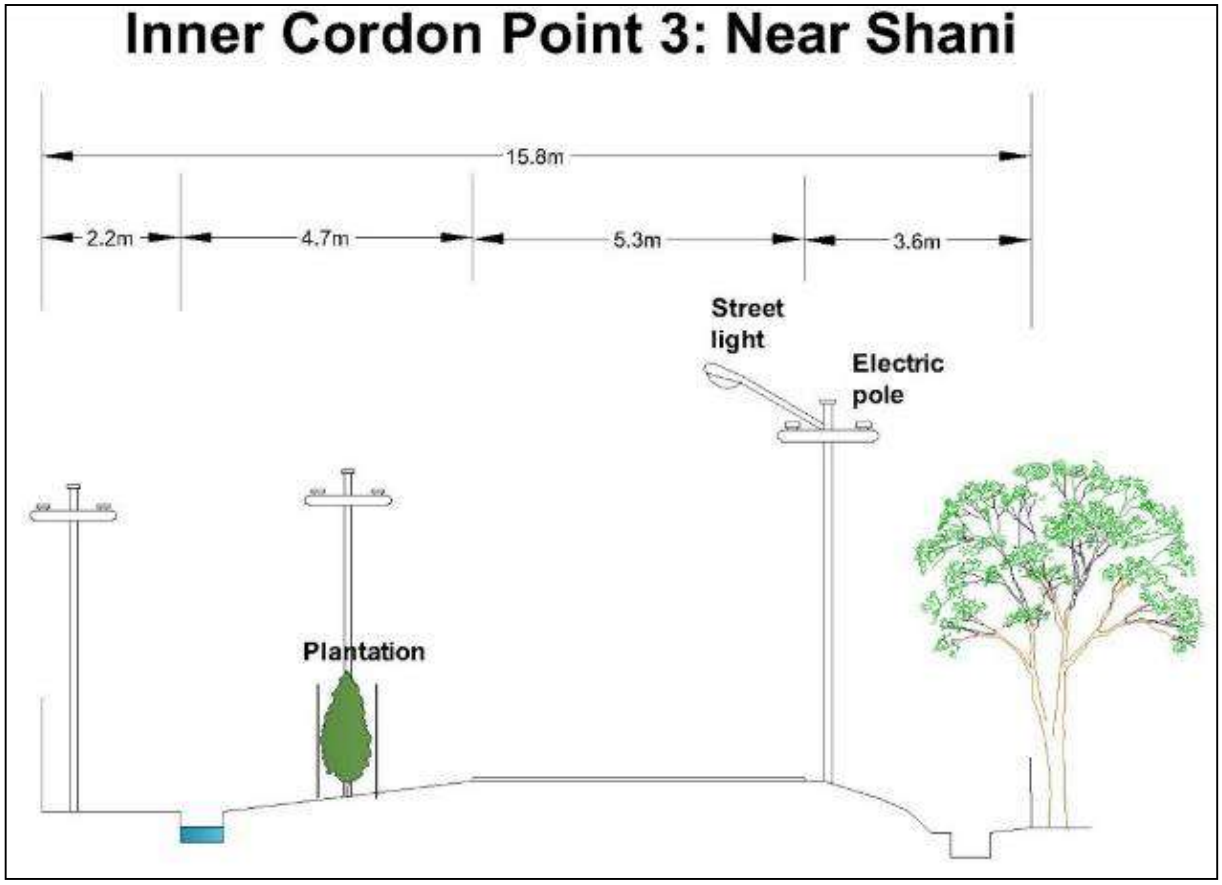


Figure 6.4: Cross-section and view of ICP 3

6.3.2.4 Municipality Office Road

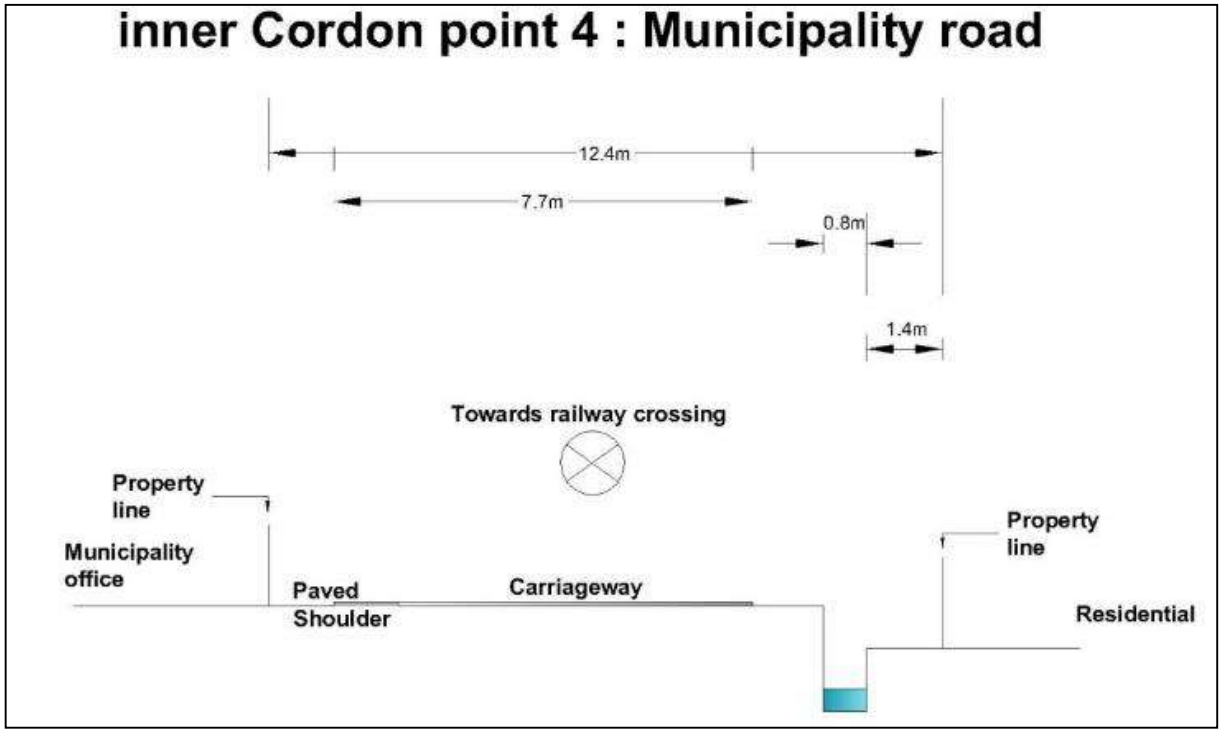


Figure 6.5: Cross-section and view of ICP 4

6.3.2.5 New Bus Stand Road

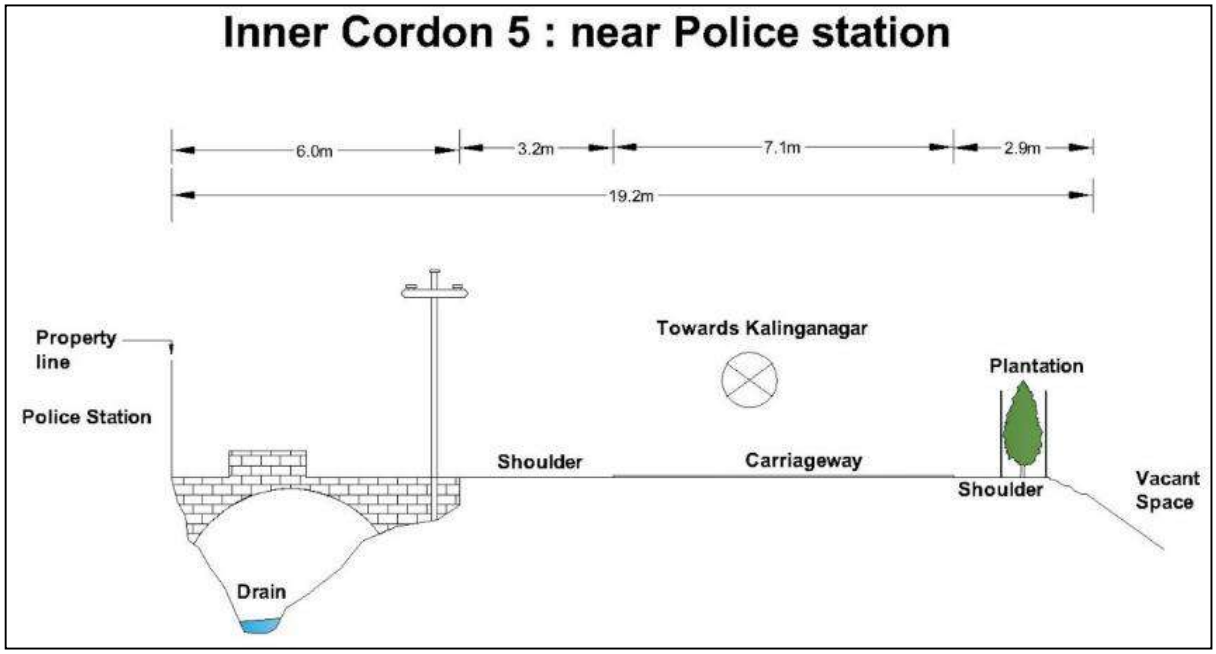


Figure 6.6: Cross-section and view of ICP 5

6.3.2.6 Outer Cordon Points

The outer cordon points were strategically chosen to tap the regional traffic entering and leaving the town of Barbil. Classified traffic Volume Count Study and Origin-Destination survey by road side interview by sampling were carried out on these locations. Following figure presents the cross – sectional details of all outer cordon points.

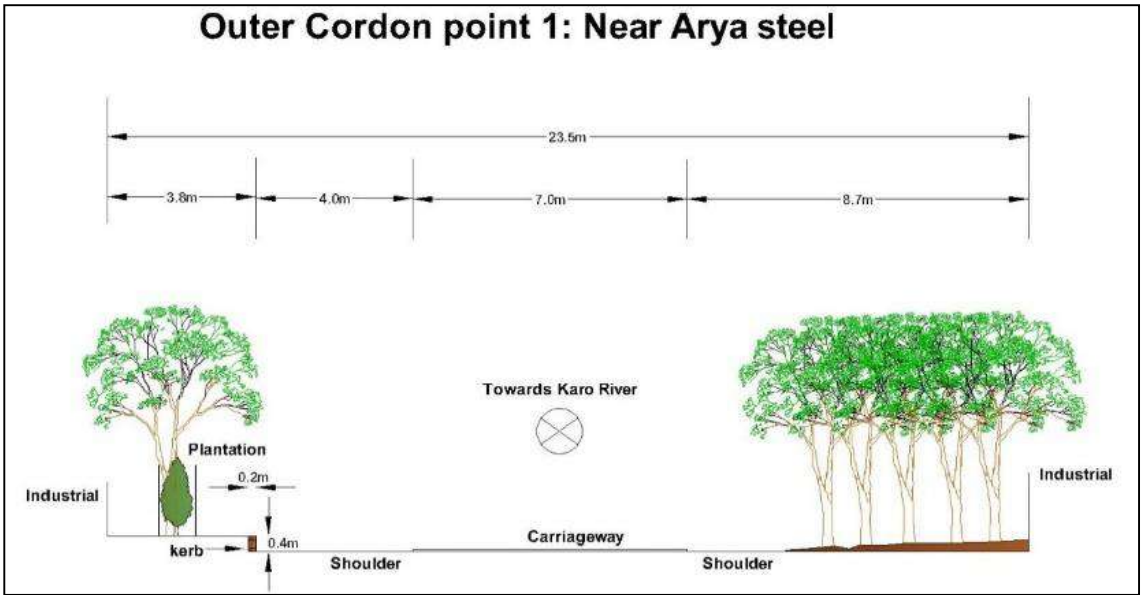
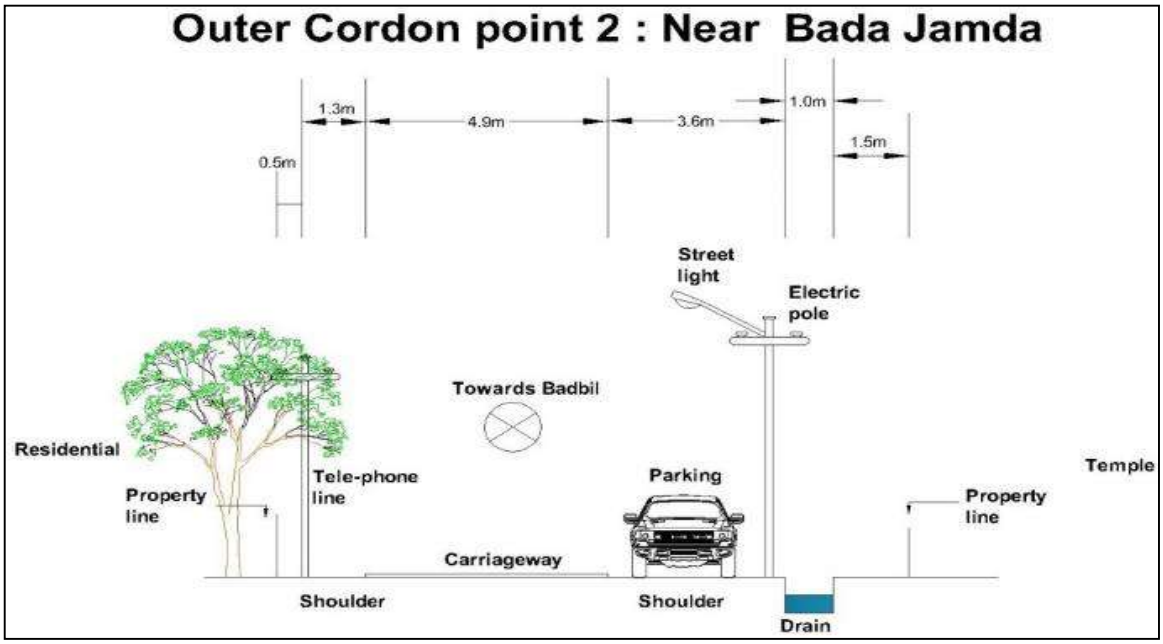
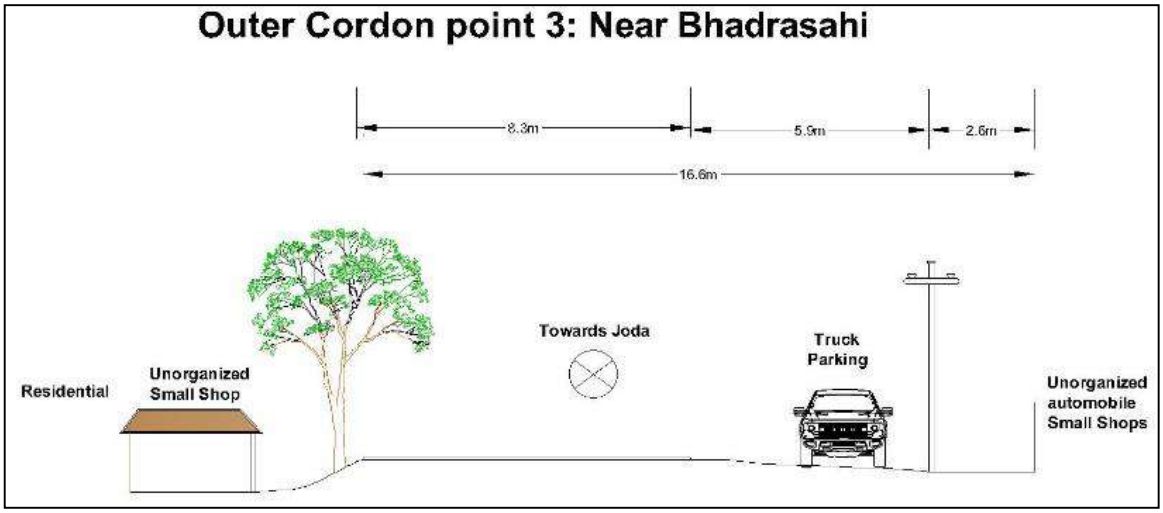


Figure 6.7 - Cross sections of Outer Cordon Points for the town of Barbil

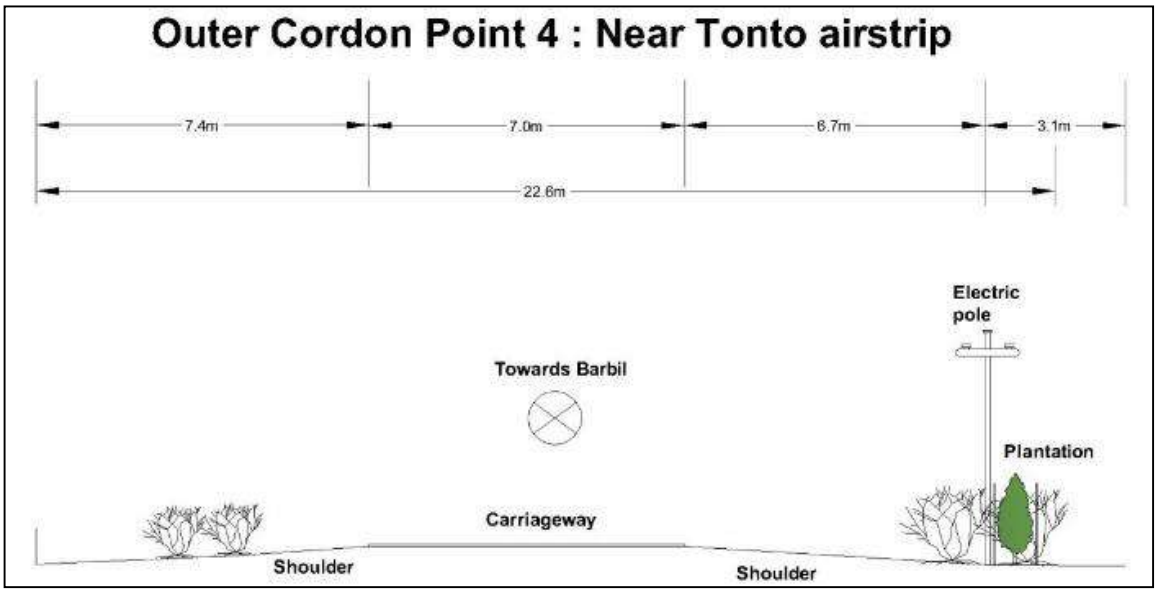
Outer Cordon point 2 : Near Bada Jamda



Outer Cordon point 3: Near Bhadrasahi



Outer Cordon Point 4 : Near Tonto airstrip



6.3.2.7 Observations

Table 6-1 - Cross-section elements of ROW at cordon points

Name and no.	Name of the Road/Area	ROW (Mtr)	Carriage way (Mtr.)	Median	Left Footpath	Right Footpath	Road Surface Type	Road Surface Quality
Inner Cordon 1_auto stand	Jmada road at municipality	16	5.8	Absent	Absent	Absent	WBM	Average
Inner Cordon 2_tehsil office	Bhadrasahi road near tehsil office	20	10	Absent	Absent	Absent	WBM	Average
Inner Cordon 3 _ shani temple	Thakurani road at shani mandir	15.8	5.3	Absent	Absent	Absent	WBM	Average
Inner Cordon 4_municipality	Municipality road	12.4	7.7	Absent	Absent	Absent	WBM	Average
Inner Cordon 5_new bus stand	opposite police station	19.2	7.1	Absent	Absent	Absent	WBM	Average
Outer Cordon 1: Karo river	Near Arya steel	23.5	7	Absent	Present	Absent	WBM	Average
Outer Cordon 2: Bada jamda road	Near krishna temple	12.8	4.9	Absent	Absent	Absent	WBM	Average
Outer Cordon 3: Bhadrasahi	Barbil road	16.6	8.3	Absent	Absent	Absent	WBM	Average
Outer Cordon 4: Tonto Air Strip	Rourkela road	22	7	Absent	Absent	Absent	WBM	Average

6.3.2.8 Findings

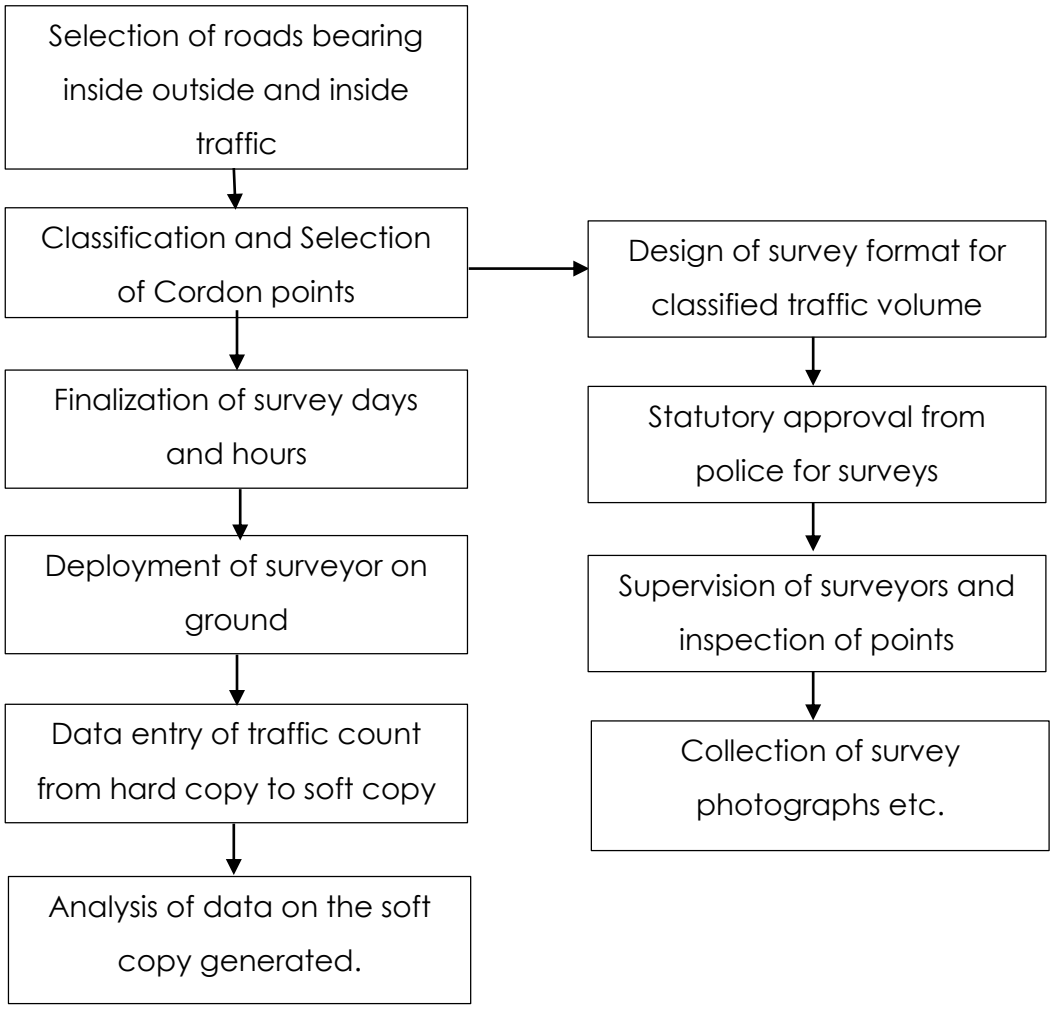
S.No	Name of the Road	Street Lights	Street Furniture	Drain	On-street parking	Electric line	Left landuse	Right landuse
Inner Cordon 1_auto satnd	Jmada road Near municipality	Absent	Absent	Present	Present	Present	Commercial	Residential
Inner Cordon 2_tehsil office	Bhadrasahi road near tehsil office	Present	Absent	Absent	Present	Present	Vacant	Small Commercial
Inner Cordon 3 _ shani temple	Thakurani road at shani mandir	Present	Absent	Present	Absent	Present	Institutional	Small Commercial
Inner Cordon_ 4 municipality	Municipality road	Absent	Absent	Present	Absent	Present	Residential	Institutional
Inner Cordon_ new bus stand	opposite police station	Absent	Absent	Absent	Absent	Present	Institutional	Vacant
Outer Cordon 1: Karo river	Near Arya steel	Absent	Absent	Absent	Present	Present	Industrial	Industrial
Outer Cordon 2: Bada jamda	Near krishna temple	Absent	Absent	Absent	Absent	Absent	Institutional	Rural Residential
Outer Cordon 3: Bhadrasahi	Barbil road	Absent	Absent	Absent	Present	Present	Commercial	Commercial
Outer Cordon 4: Tonto Air Strip	Rourkela road	Absent	Absent	Absent	Present	Present	Vacant	Vacant

- Most of the roads in the town have an organic underdeveloped cross-section. There seems to be little design intervention with respect to the street cross-section in the town and a large scale design effort is needed.

- The Service lines in the town are not carefully planned according to the street cross-section and surrounding land use.
- Unregulated street parking contributes to the existing conditions of congestion on the internal roads.
- Median is not present on a stretch of road in the town similarly the provision for pedestrians and bicycles are completely overlooked in the street cross-sections.
- Street lighting is essential for most of the roads as they are either makeshift or not present at all.
- The design of the roads is done in such a manner that drainage from the roads becomes an issue. Subsequent water logging during the rain damages the roads and degrades the surface quality.
- No street furniture is present on the roads; neither is provision for solid waste disposal etc.
- Creation of service road might be necessary to prevent the outer to outer through traffic impact on the town.
- The existing shoulder needs to be carefully used for non-spontaneous purposes.

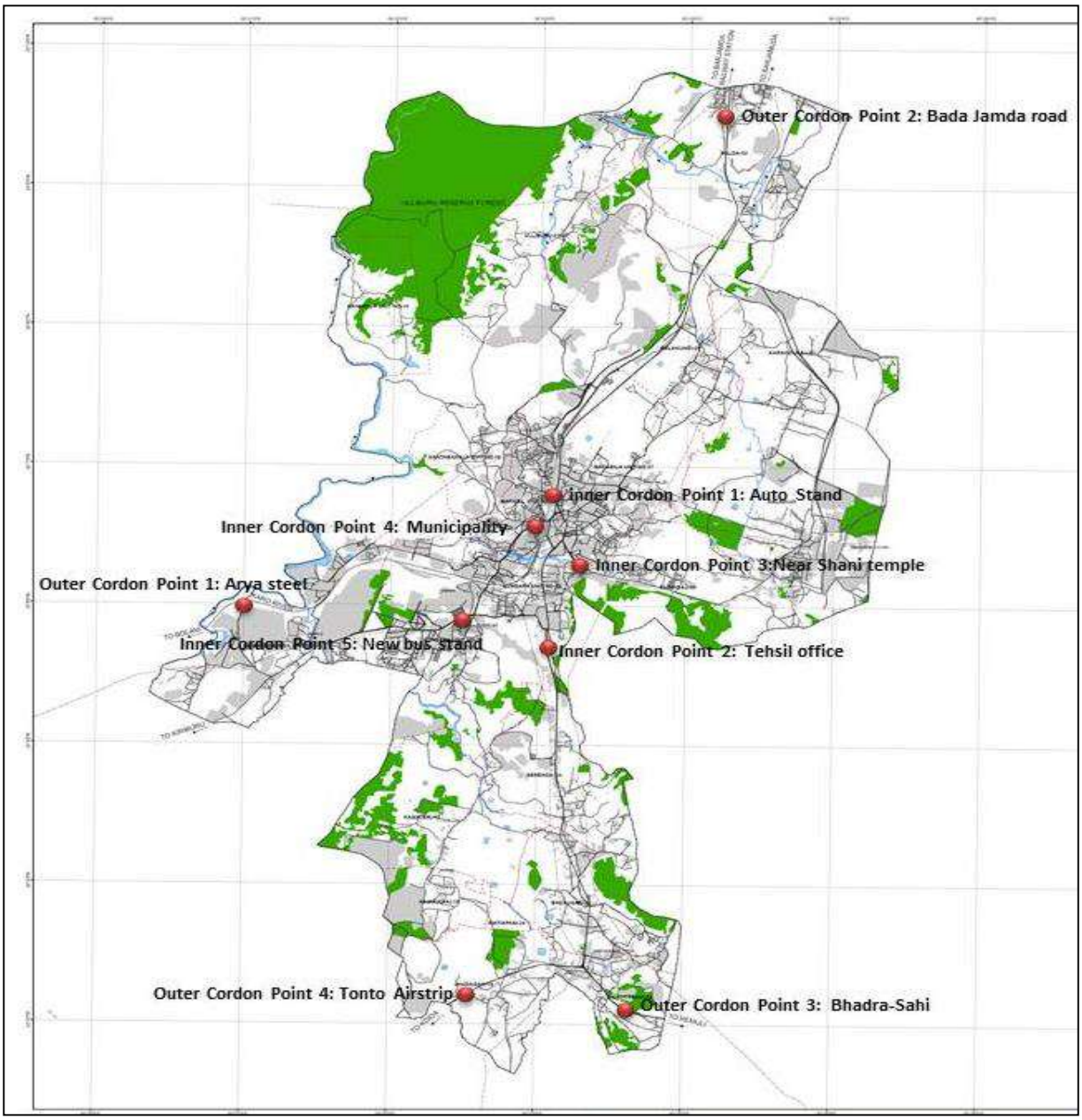
6.3.3 Traffic volume count

In order to gauge the traffic load on the network it is imperative to conduct a classified traffic volume count survey on the major roads of the Barbil town. The aim was to determine the classified traffic for at-lest a period of 12 hours on both sides of the cordon point. Following methodology was adopted for the process.



Cordon points were carefully selected to include exit points from the planning area through which outside traffic enters and leaves the town. Along with the same the inside points were selected in relation to the various physical boundaries present within the planning area so that the inter-zonal traffic within the planning area can be known. The major classification was done to measure passenger, goods and Non-Motorised Transport vehicles in the town. There were in total 4 Outer cordon Points and 5 inner cordon points taken up in the survey which are given below along with the analyses. The cordon points are represented in the following figure -

Map 6-3 Location of Cordon Points for the town of Barbil



6.3.3.1 Inner Cordon point 1: Auto stand

The inner cordon point 1 displayed peak hour between 10-11 am. Most of the traffic is composed of passenger vehicles which constitutes 96% of the vehicular count. Slow moving vehicles constitute 6% of the total traffic. Most of the fast-moving vehicles are 2- wheelers and during peak hour it constitutes 70% of the vehicular traffic.

6.3.3.2 Inner Cordon point 2: Tehsil office

The inner cordon point 1 displayed peak hour between 6-7 pm. Most of the traffic is composed of passenger vehicles which constitutes 89% of the vehicular count. Slow

moving vehicles constitute only 1% of the total traffic. Most of the fast moving vehicles are 2- wheelers and during peak hour it constitutes 50% of the vehicular traffic.

6.3.3.3 Inner Cordon point 3: Near Shani Temple

The Inner cordon point 3 has 2 major peaks during morning and evenings suggesting to and from movement of the surrounding villages to the town for work. Most of the traffic is composed of passenger vehicles which constitutes 92% of the vehicular count. Slow moving vehicles constitute 15% of the total traffic. Most of the fast moving vehicles are 2- wheelers and during peak hour it constitutes 44% of the vehicular traffic.

6.3.3.4 Inner Cordon point 4: Near Municipality

The Inner cordon point 4 has peak hour between 12 pm- 1 pm. Most of the traffic is composed of passenger vehicles which constitutes 95% of the vehicular count. Slow moving vehicles constitute 10% of the total traffic. Most of the fast moving vehicles are 2- wheelers and during peak hour it constitutes 67% of the vehicular traffic.

6.3.3.5 Inner Cordon point 5: Opposite Police station

The Inner cordon point 5 has 2 major peaks during morning 8-9 am and evening 5-7 pm. Most of the traffic is composed of passenger vehicles which constitutes 95% of the vehicular count. Slow moving vehicles constitute 6% of the total traffic. Most of the fast moving vehicles are 2- wheelers and during peak hour it constitutes 64% of the vehicular traffic.

6.3.3.6 Outer Cordon point 1: Near Arya steel

The outer cordon point 1 has 2 major peaks during afternoon 1-2 pm and evening 5-6 pm. Most of the traffic is composed of passenger vehicles which constitutes 91% of the vehicular count. Slow moving vehicles constitute 3% of the total traffic. Most of the fast moving vehicles are 2- wheelers and during peak hour it constitutes 62% of the vehicular traffic.

6.3.3.7 Outer Cordon Point 2: Bada Jamda Road.

The outer cordon point 2 has peak hour between 8-9 am. Most of the traffic is composed of passenger vehicles which constitutes 88% of the vehicular count. Slow

moving vehicles constitute 1% of the total traffic. Most of the fast moving vehicles are 2- wheelers and during peak hour it constitutes 53% of the vehicular traffic.

6.3.3.8 Outer cordon Point 3 : Bhadrasahi

The outer cordon point 3 has peak hour between 10-11 am. Most of the traffic is composed of passenger vehicles which constitutes 88% of the vehicular count. Slow moving vehicles constitute 1% of the total traffic. Most of the fast moving vehicles are 2- wheelers and during peak hour it constitutes 61% of the vehicular traffic.

6.3.3.9 Outer Cordon Point 4: Tonto Airstrip

The outer cordon point 4 has peak hour between 4-5 pm. Traffic is equally distributed among goods and passenger vehicles with passenger vehicles having a share of 48% of the vehicular count. Slow moving vehicles constitute 2% of the total traffic. Most of the fast moving vehicles are trucks and during peak hour, 2 axle and 3 axle trucks constitute 22% and 9% respectively of the vehicular traffic.

6.3.3.10 Traffic Volume and Capacity estimation

Following table presents the traffic volume and V/C ratio for various cordon point locations-

Table 6-2 Traffic Volume and V/C ratio for various Cordon Point Locations during Day time

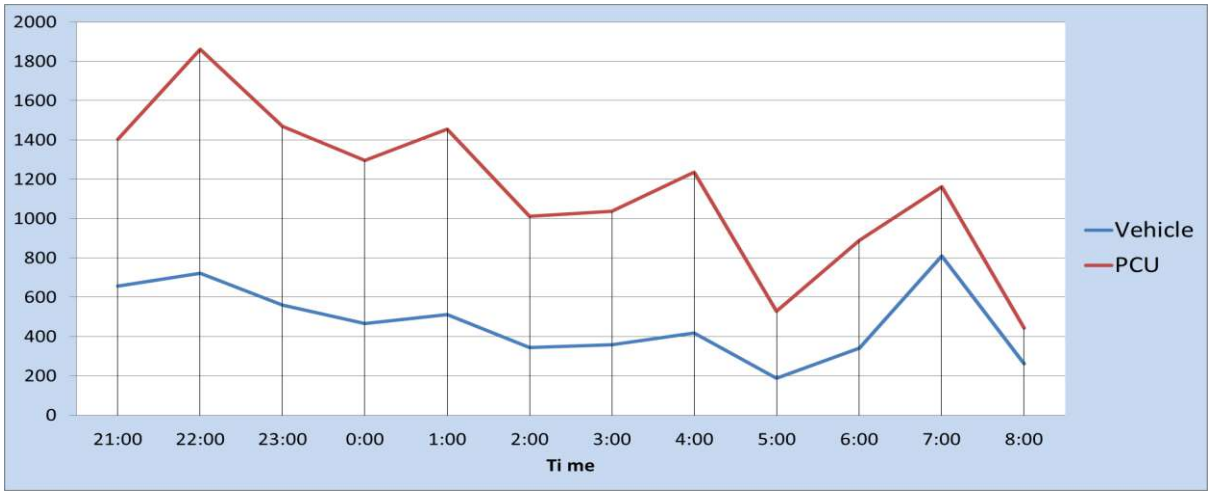
Cordon Points	12 hour Vehicular Count			12 hour PCU Count			Peak hour PCU count			Capacity	V/C ratio
	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3		
Inner Cordon 1	9161	7863	13363	6254	11556	8975	1429	944	942	750	**1.91**
Inner Cordon 2	9125	7745	10127	8300	7745	8170	1442	851	948	1200	**1.20**
Inner Cordon 3	4642	5044	4033	3886	3798	2916	738	547	446	1200	**0.62**
Inner Cordon 4	8443	11972	13590	8237	7384	8218	1038	854	1166	750	**1.55**
Inner Cordon 5	5838	6544	6680	4664	4289	6680	790	487	511	1200	**0.66**
Outer Cordon 1	3440	3615	3883	3367	4687	3016	414	511	378	1200	**0.43**
Outer Cordon 2	2581	2944	2574	1989	2944	2028	310	272	313	750	**0.42**
Outer Cordon 3	6047	5851	5056	5294	4776	4189	626	536	426	1200	**0.52**
Outer Cordon 4	3226	3865	5770	4191	5488	9341	734	639	1089	1200	**0.91**

- The volume by capacity of most inner cordon points is shown above which shows the un-satisfactory level of traffic load on the existing road. Only Inner cordon 3 and 5 had traffic lower than the capacity among all inner cordon points.
- The volume by capacity of all outer cordon points are below 1 which shows the traffic lower than the capacity on the existing road during day time.

Traffic Volume Count mentioned above is done in day time but in Barbil due to mining activity lot of goods vehicle movement is happening in night time. Therefore, traffic volume count survey was done in night from 8:00 pm to 8:00 am in the morning. Survey was done at 3 cordon points.

6.3.3.11 Cordon 1- Tonto: From Rourkela side to Barbil and Barbil to Rourkela side

Traffic volume in Cordon 1 which passes through Bhadrasahi rotary shows peak hour in 9-10 pm while moving from Rourkela side to Barbil and at 12- 1 am in night while moving from Barbil to Rourkela side. Passenger traffic movement is highest at 6-7 am and goods traffic movement is highest at 9- 10 pm while moving from Rourkela side to Barbil whereas passenger traffic movement is highest at 8-9 pm and goods traffic movement is highest at 12- 1 am while moving from Barbil to Rourkela side.



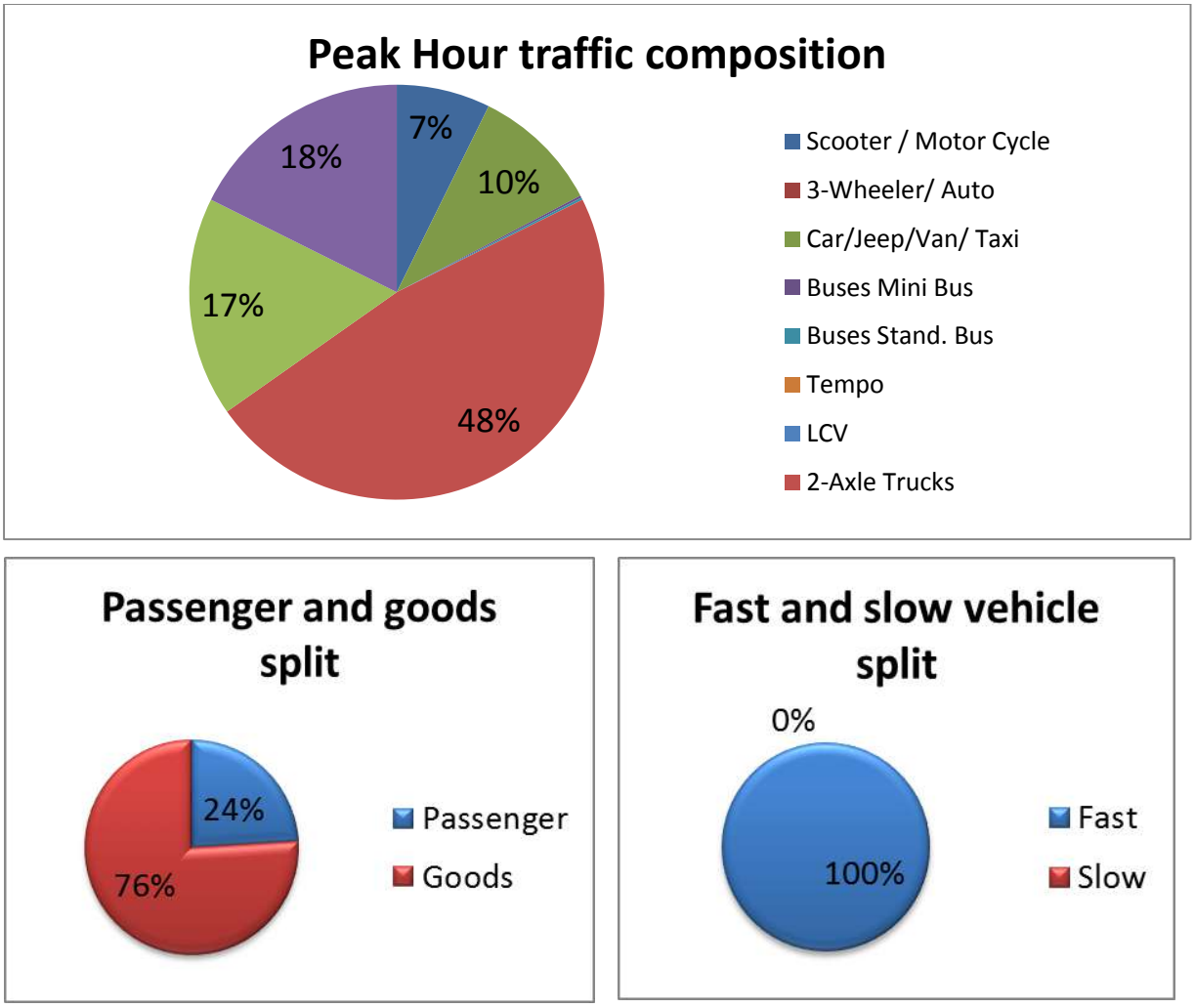


Figure 6.8 Traffic Volume Survey at Cordon 1

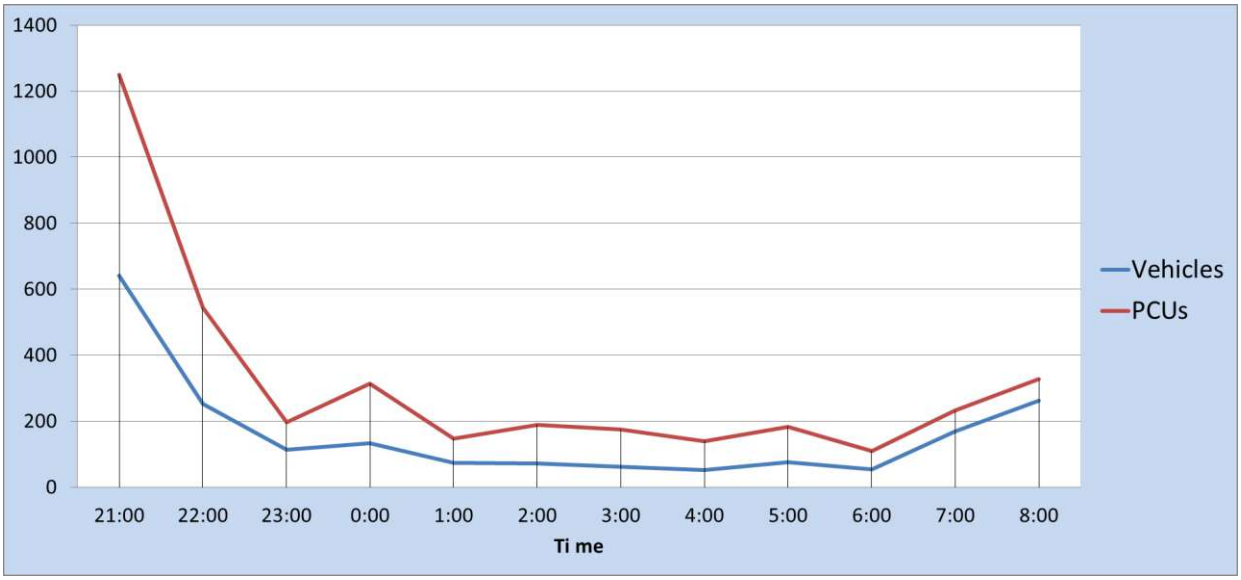
Highest occupancy during peak hour is by 2 axle trucks. Fast moving vehicles constitute 100% vehicles and passenger vehicle constitute 76% whereas goods vehicle constitute 24% vehicular traffic.

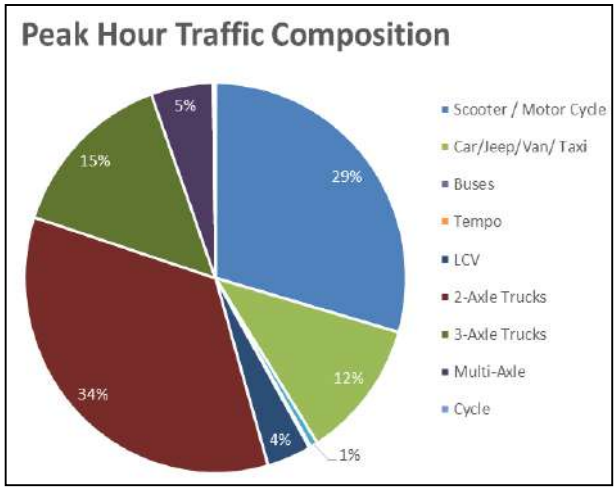
6.3.3.12 Cordon 2- From Barbil to Keonjhar and Keonjhar to Barbil

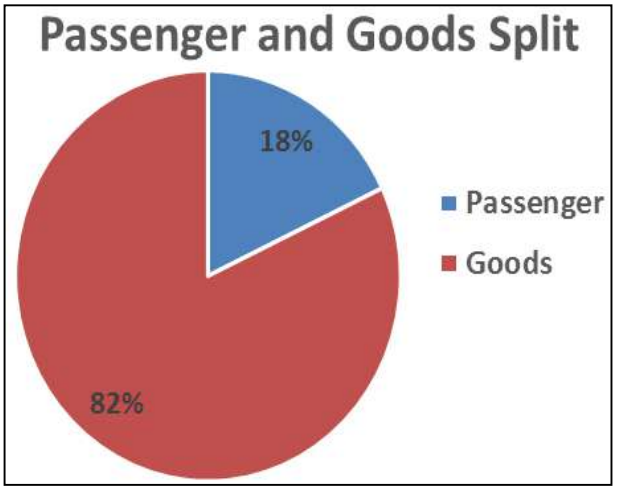
Traffic volume in Cordon 2 shows peak hour in 8-9 pm while moving from Keonjhar to Barbil and also at 8- 9 pm while moving from Barbil to Keonjhar. Passenger vehicle movement is highest at 10-11 pm and goods traffic movement is highest at 12- 1 am while moving from Keonjhar to Barbil whereas passenger traffic movement is highest at 7-8 am and goods traffic movement is highest at 1-2 am while moving from Barbil to Keonjhar.

Highest occupancy during peak hour is by 2 axle trucks. Fast moving vehicles constitute 100% vehicular traffic and passenger vehicle constitute 82% whereas goods vehicle constitute 18% vehicular traffic.

Figure 6.9 Traffic Volume Survey at Cordon 2

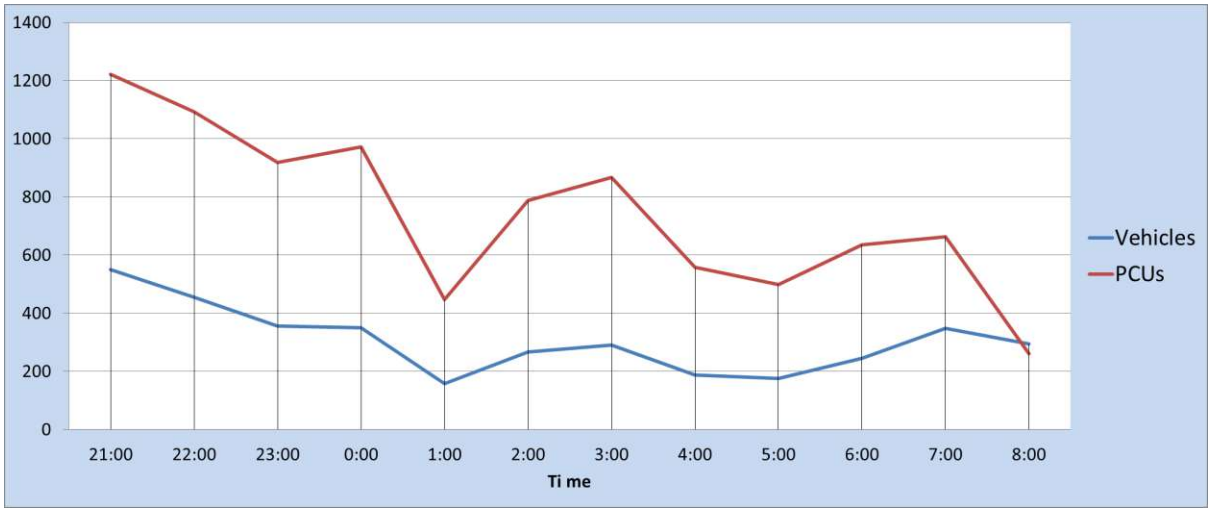


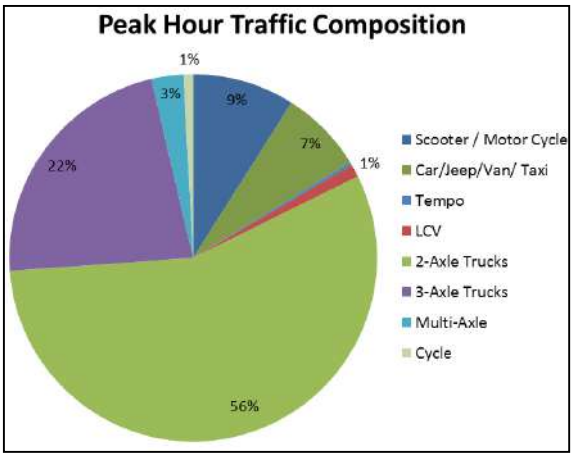




6.3.3.13 Cordon 3- From Barbil to Nalda and Nalda to Barbil

Traffic volume in Cordon 3 shows peak hour in 2-3 am while moving from Barbil to Nalda and also at 8- 9 pm while moving from Nalda to Barbil. Passenger vehicle movement is highest at 7-8 am and goods traffic movement is highest at 2- 3 am while moving from Barbil to Nalda whereas passenger traffic movement is highest at 7-8 am and goods traffic movement is highest at 8-9 pm while moving from Nalda to Barbil.





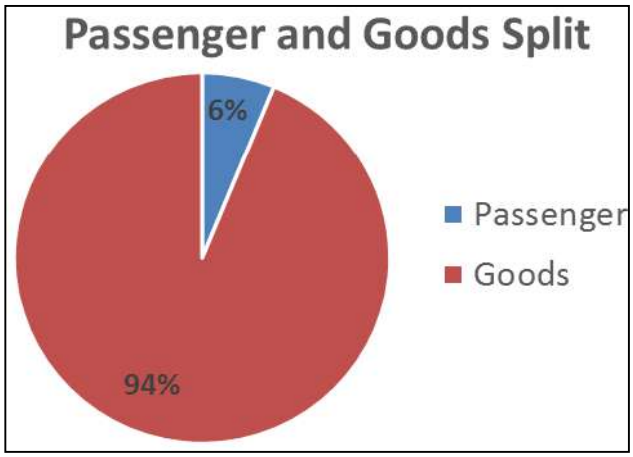


Figure 6.10 Traffic Volume Survey at Cordon 3

Highest occupancy during peak hour is by 2 axle trucks. Fast moving vehicles constitute 100% vehicular traffic out which passenger vehicle constitute 94% whereas goods vehicle constitute 6% vehicular traffic.

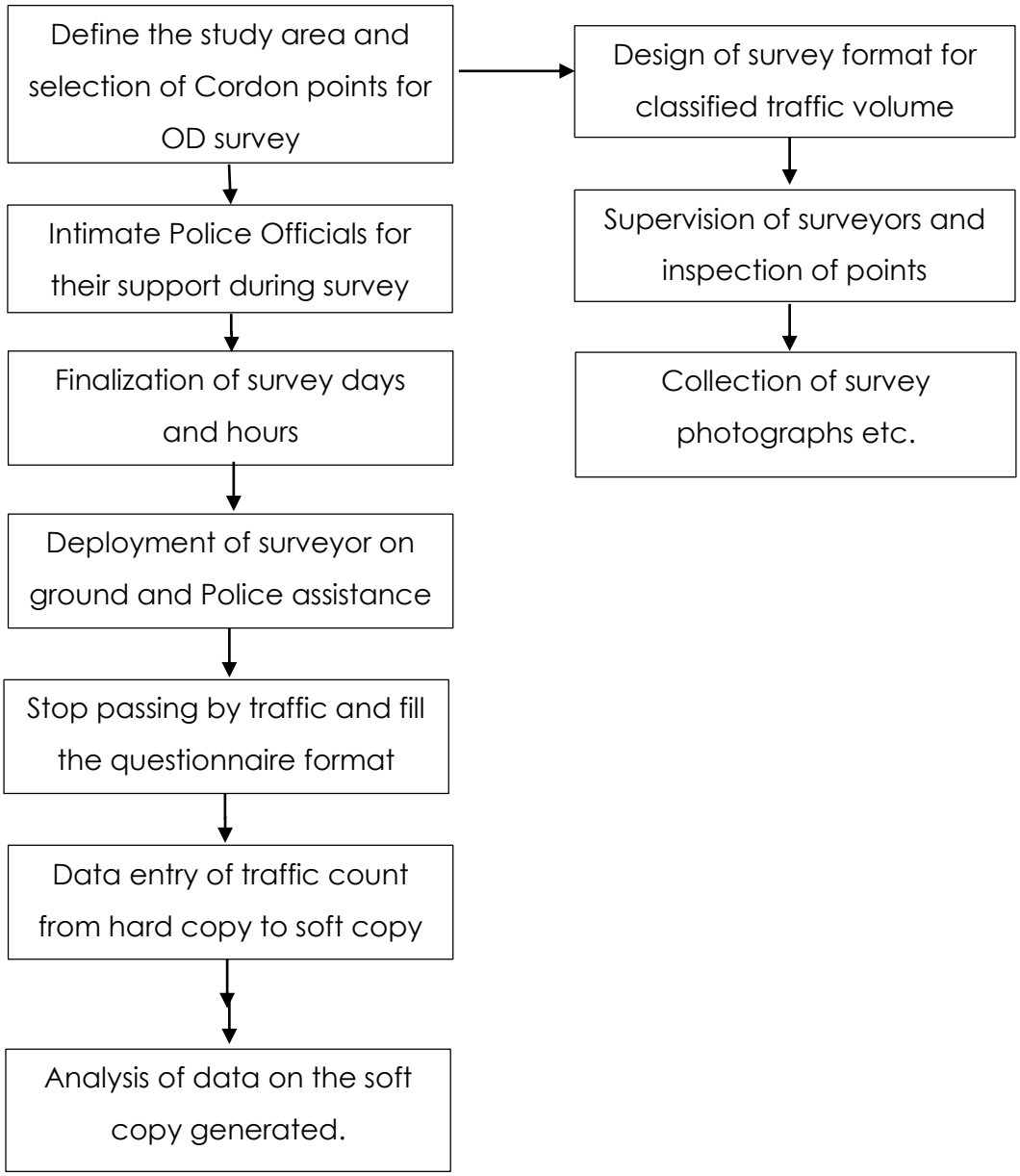
Table 6-3 Traffic volume and V/C ratio for various cordon point locations during Night

Cordon Points	12-hour Vehicular Count	12 hour PCU Count	Peak hour PCU count	Capacity	V/ C ratio
Inner Cordon 1	5638	13791	1469	1200	1.22
Inner Cordon 2	1967	3808	1250	1200	1.04
Inner Cordon 3	3680	17846	919	750	1.23

The volume by capacity of all the cordon points are above 1 during night time which shows the un-satisfactory level of traffic load on the existing roads.

6.3.4 Origin Destination (OD) Survey

In order to know about the movement of traffic in and out of the Master Plan Area, OD survey is necessary to conduct. The aim was to determine the Origin- Destination, number of trips made by vehicles, distance travelled by vehicles and purpose of travel, occupancy of classified traffic for at-lest a period of 8 hours on both sides of the cordon point. Following methodology was adopted for the process.



Survey points were carefully selected to know the movement of traffic on major roads which enter and exit the Master Plan area. The major classification was done to measure passenger vehicles, goods vehicles and buses in and outside the town. There

were in total 6 Outer cordon Points taken up in the survey which are given below along with the analyses.

6.3.4.1 Outer Cordon Point-1

A. Barbil to Karo River

On this point, most of the trip frequency is of two- wheeler who travel daily (up-down) followed by occasional movement of traffic. Average trip length is covered highest by Car/ Jeep/ Van (other than taxi) and most of the people travelled for other purposes. Car/ Jeep/ Van (other than taxi) carry the average highest occupancy. Most of the traffic moves from Barbil to Bolani at this point. 2 Axle trucks are having the highest average occasional and weekly trip frequency. 3 - axle trucks are having the highest average trip length. Most of the Goods vehicle travel from Barbil to Bolani. Highest commodities are carried by 2 Axle trucks which mostly carries chemicals and fertilizers. Private buses are having the highest average passenger occupancy. Most of the buses travel from Barbil to different places like Arya Steel, Bolani, Kiriburu etc. through this point.

A. **Karo River to Barbil**

On this point, most of the trip frequency is of two- wheelers who travel occasionally followed by Daily (Up/ down). Average trip length is covered highest by Car/ Jeep/ Van (other than taxi) and most of the people travelled for business purpose. Car/ Jeep/ Van (other than taxi) carry the average highest passenger occupancy. Most of the traffic moves from Bolani to Barbil at this point.2 Axle Truck is having the highest average weekly trip frequency. 3- Axle trucks are having the highest average trip length. Most of the Goods vehicle travel from Bolani to Barbil. Highest commodity vehicles are 2 Axle trucks which are mostly empty. Private buses are having the highest average passenger occupancy. Most of the buses travel from Bolani to Champua which passes through this point.

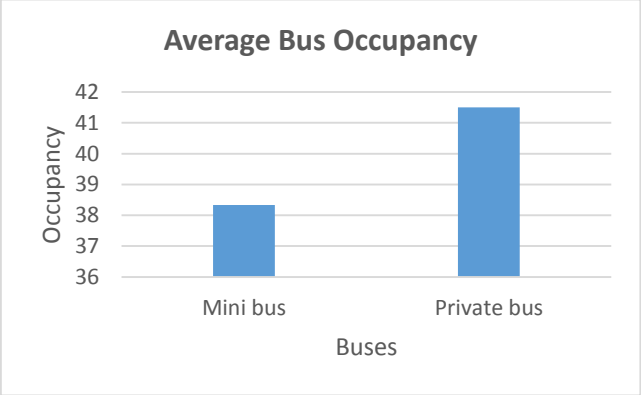
6.3.4.2 Outer Cordon Point-2

B. Barbil to Jamda

On this point, most of the trip frequency is of two- wheelers who travel occasionally followed by daily (up and down) traffic. Average trip length is covered highest by taxi and most of the people travelled for health purpose. Auto rickshaw carries the

average highest occupancy. Most of the traffic moves from Barbil to Jamda at this point.

LCV/ Tempo is having the highest average occasional trip frequency. 3 Axle trucks are having the highest average trip length. Most of the Goods vehicle travel from Barbil to Jamda on this route. Highest commodity vehicles are LCV/ Tempo which are mostly empty.



Private buses are having the highest average bus occupancy. Most of the buses travel from Barbil to Chakradharpur, Jamda and Nuamundi which passes through this point.

C. Jamda to Barbil

On this point, most of the trip frequency is of two- wheelers who travel occasionally. Average trip length is covered highest by Car/ Jeep/ Van (other than taxi) and most of the people travelled for entertainment/ recreational purpose. Taxi carries the average highest occupancy. Most of the traffic moves from Jamda to Barbil at this point.

3 Axle trucks are having the highest average daily (up- down) trip frequency. 3 axle trucks are having the highest average trip length. Most of the Goods vehicle travel from Jamda to Barbil on this route. Highest commodity vehicles are 3 Axle Trucks which are mostly empty. Other State buses are having the highest average occupancy. Most of the buses travel from Tata to Barbil which passes through this point.

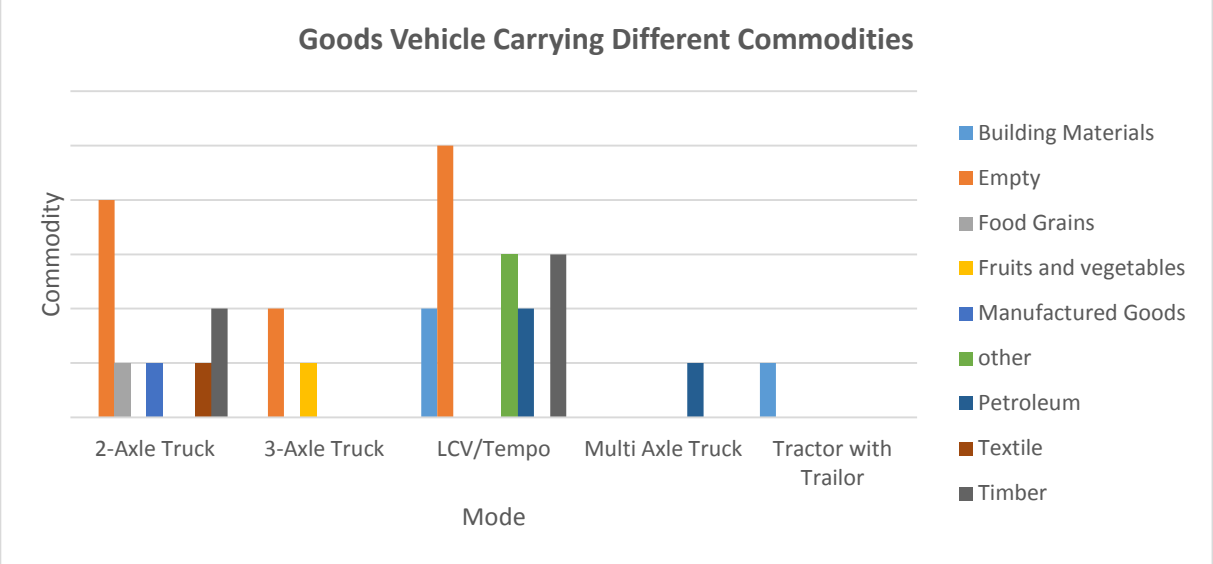
6.3.4.3 Outer Cordon Point-3

A. Barbil to Keonjhar

On this point, most of the trip frequency is of two- wheelers who travel occasionally. Average trip length is covered highest by car/ jeep/ van (other than taxi) and most of the people travelled for entertainment/ recreational purpose. Auto rickshaw carries the highest average occupancy. Most of the traffic moves from Barbil to Joda at this point.

LCV/ Tempo is having the highest average 1 times per day trip frequency. Multi axle trucks are having the highest average trip length. Most of the Goods vehicle travel from Barbil to Joda on this route. Highest commodity vehicles are LCV/ Tempo which are mostly empty.

Figure 6.11 - Goods Vehicle Carrying Different Commodities



Only Mini buses travel on this route. Most of the buses travel from Barbil to Champua through this point. The lead-load profile is represented by the following figure.

B. Keonjhar to Barbil

On this point, most of the trip frequency is of two- wheelers who travel occasionally. Average trip length is covered highest by car/ jeep/ van (other than taxi) and most of the people travelled for social purpose. Car/ jeep/ van (other than taxi) carries the average highest occupancy. Most of the traffic moves from Joda to Barbil at this point.

LCV/ Tempo is having the highest average trip frequency of occasional visits. Multi axle trucks/ other vehicles are having the highest average trip length. Most of the Goods vehicle travel from Joda to Barbil on this route. Highest commodity vehicles are 3 Axle Trucks which are mostly empty.

Stand buses are having the highest average bus occupancy by passengers. Most of the buses travel from Joda to Barbil which passes through this point.

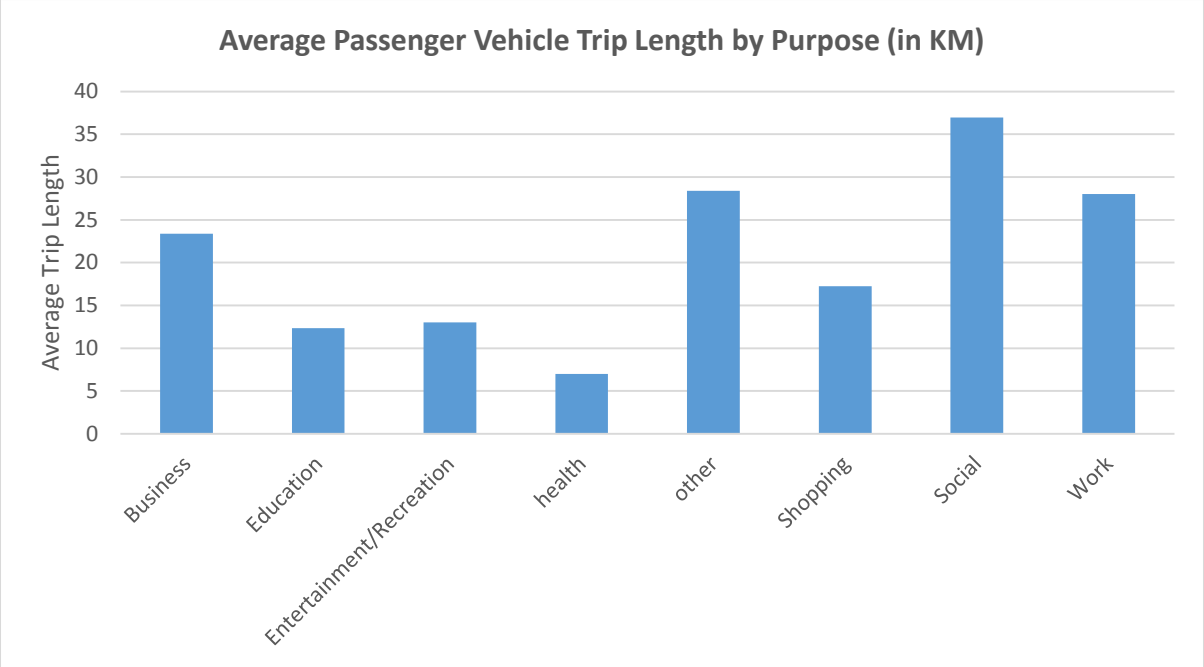


Figure 6.12 : Trip Purpose Profile

6.3.4.4 Outer Cordon Point-4

C. Barbil to Rourkela

On this point, most of the trip frequency is of two-wheelers which travel weekly followed by daily (up/ down) movement of traffic. Average trip length is covered highest by Car/ Jeep/ Van (other than taxi) and most of the people travelled for business and other purposes. Car/ Jeep/ Van (other than taxi) carry the average highest occupancy. Most of the traffic moves from Barbil to Koida at this point.

2- Axle Trucks are having the highest average daily (up/down) trip frequency. 3- axle trucks are having the highest average trip length. Most of the Goods vehicle travel from Bhadrasahi to Koida. Highest commodity vehicles are 2 Axle Trucks which are mostly empty.

Other State buses are having the highest average bus occupancy by passengers. Most of the buses travel from Barbil and Joda to Rourkela.

D. Rourkela to Barbil

On this point, most of the trip frequency is of two- wheeler that travels daily (up and down). Average trip length is covered highest by car/ jeep/ van (other than taxi) and most of the people travelled for entertainment/ recreational purpose. Car/ jeep/ van

(other than taxi) carry the average highest occupancy. Most of the traffic moves from Guali to Barbil at this point.

LCV/ Tempo is having the highest average trip frequency of occasional visits. 3 axle trucks are having the highest average trip length. Most of the Goods vehicle travel from Koida to Barbil on this route. Highest commodity vehicles are LCV/ Tempo which are mostly empty.

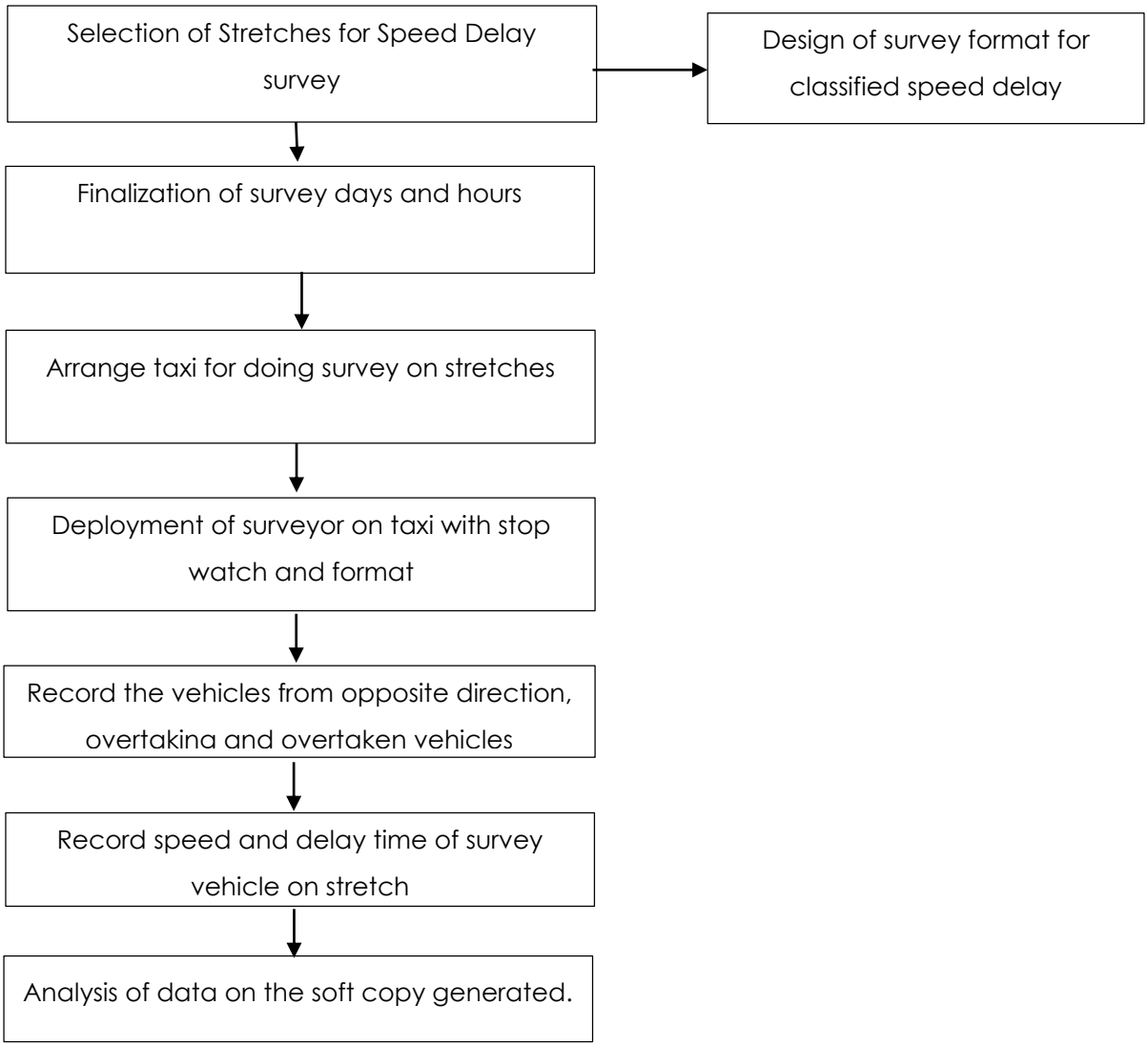
OSRTC buses are having the highest average bus occupancy by passengers. Buses travel from Rourkela to Barbil which passes through this point.

6.3.4.5 Observation

- Most of the passenger vehicles that travel in and outside the town are having highest trip frequency of two wheelers which travels occasionally and daily (up-down).
- Highest average trip length by Passenger vehicles are covered by Car/ Jeep/ Van other than taxi.
- Highest average trip length covered by passenger vehicles is for entertainment/ recreational, business and other purpose.
- Highest average passenger vehicle occupancy is of Car/ Jeep/ Van other than taxi.
- LCV/ Tempo is having the highest average occasional and weekly trip frequency.
- 2- Axle trucks are having the highest average trip length.
- Most of the Goods vehicle journey originate and terminate to Barbil.
- Mini buses are having the highest average passenger occupancy.
- Highest Goods Commodity vehicles LCV/ tempo which are mostly empty.

6.3.5 Speed Delay Survey

Speed is the most important characteristic of traffic and its measurement is a frequent in traffic studies. Speed, journey time and delay studies are used for measuring spot speeds, journey speeds and delays. Survey stretches were carefully selected to know the moving traffic in opposite direction, vehicles overtaken by test car and vehicles overtaking test car. This survey also helps to determine the speed and delay time of test car.



The major classification was done to measure average journey speed and flow of traffic in particular direction. There were in total 5 stretches/ routes taken up for survey which are given below along with the analyses.

6.3.5.1 Flow of traffic in Stretches

Flow of traffic in different stretches can be vehicles met with from the opposite obtained by travelling in a car against and with the flow of traffic, noting down the journey time, the number of vehicles overtaking the test vehicle. Formula used for calculating the flow of traffic is:

$$q = \frac{x + y}{t_a + t_w}$$

Where, q= flow of vehicles in one direction stream

x= total number of vehicles met in section while travelling against the stream

y= number of vehicles overtaking the observer minus the number he overtakes when travelling with the stream

t_a= journey time in opposite direction of stream

t_w= journey time in same direction of stream

Flow of morning traffic in various stretches are as follows:

Route No.	Journey Time (Seconds)	Stopped Time	Vehicles met with in the Opposing	Vehicles in Same Direction		Flow of traffic (in PCU/ Hr)
				Overtaking Vehicles	Overtaken Vehicles	
Route No. 1 (Up)	1116.0	78	157	3	8	208
Route No. 1 (Down)	1016.0	25	128	0	10	248
Route No. 2 (Up)	791.0	0	59	44	6	368
Route No. 2 (Down)	373.0	377	81	2	9	161
Route No. 3 (Up)	169.0	34	28	3	2	72
Route No. 3 (Down)	133.0	6	5	1	1	334
Route No. 4 (Up)	101.0	0	15	1	0	287
Route No. 4 (Down)	112.0	0	16	0	0	254
Route No. 5 (Up)	301.0	42	45	0	1	198
Route No. 5 (Down)	336.0	0	36	0	1	249

Flow of evening traffic in various stretches are as follows:

Route No.	Journey Time (Seconds)	Stopped Time	Vehicles met with in the	Vehicles in Same Direction		Flow of traffic (in PCU/ Hr)
				Overtaking Vehicles	Overtaken Vehicles	
Route No. 1 (Up)	1155.0	30	149	6	30	240
Route No. 1 (Down)	1093.0	10	174	1	27	196
Route No. 2 (Up)	419.0	10	194	58	8	1029
Route No. 2 (Down)	788.0	396	295	3	9	561
Route No. 3 (Up)	163.0	0	73	2	2	1386
Route No. 3 (Down)	150.0	0	121	1	2	828
Route No. 4 (Up)	103.0	0	11	0	4	166
Route No. 4 (Down)	103.0	0	14	0	3	140
Route No. 5 (Up)	264.0	10	42	2	1	437
Route No. 5 (Down)	275.0	8	65	1	3	264

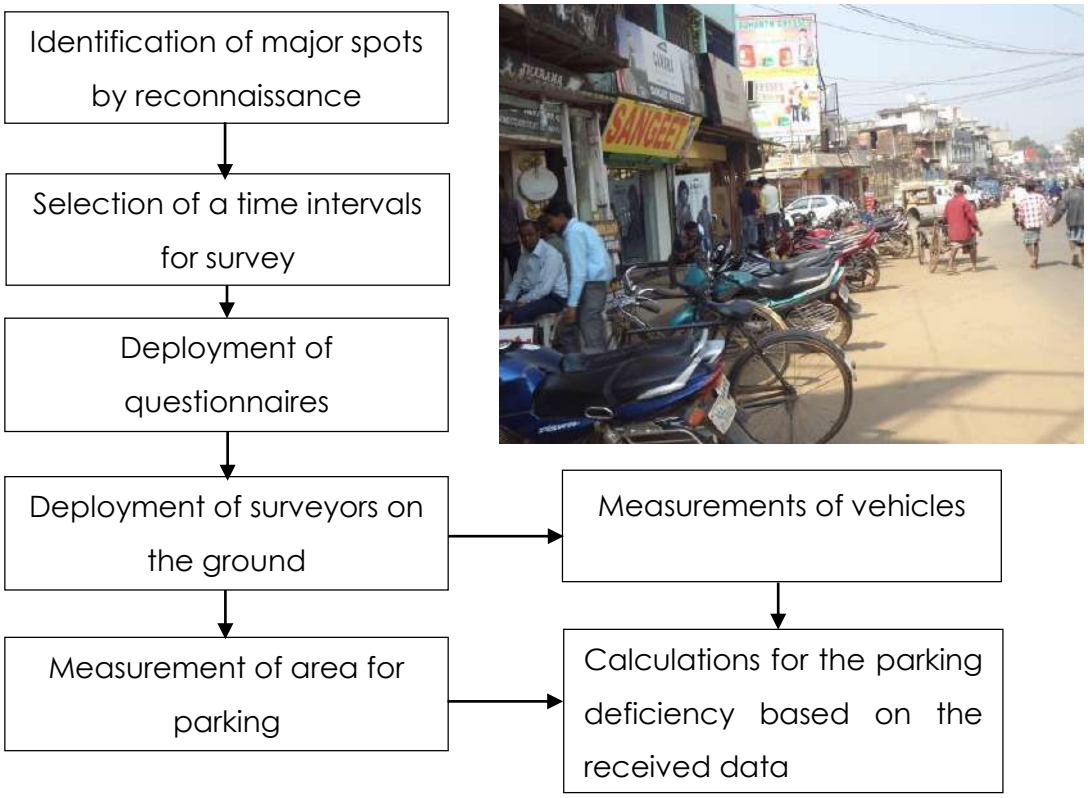
6.3.5.2 Observation

- Flow of traffic in different routes varies from 259 PCU per Hour to 1652 PCU per Hour.
- Flow of evening traffic in different routes varies from 140 PCU per Hour to 1386 PCU per Hour.

6.3.6 Parking survey

In order to understand the accumulation of vehicle at different places in the town during the entire day parking survey is necessary. The survey consisted of identification of the areas of high vehicle parking and their subsequent numbers in order to access the parking demand and supply in the Barbil town.

Figure 6.13: Methodology for Parking survey and Example of on street parking in Barbil



The parking survey was conducted for two types of parking areas, namely organized parking and unorganized street parking. Survey points selected for on street parking purposes were at Kalinga bus stand, Auto stand road, Park square, Birsa Munda square and at Nalda railway square. 10 Off street parking survey points were selected. The only organized public parking spaces found were near the bus stand and railway station which were taken for organized parking spaces survey. The survey was done for morning and evening during the late periods to see the accumulation. The details are given below:

Figure 6.15: Mode wise Parking volume in Morning hours

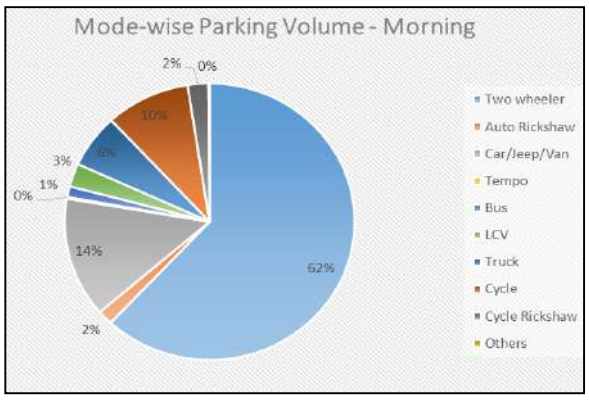
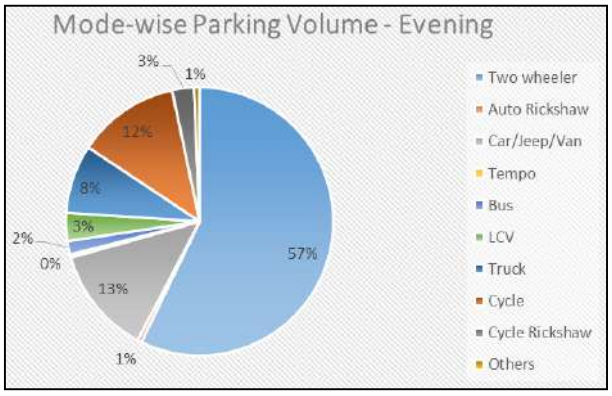


Figure 6.14: Mode wise Parking volume in Evening hours



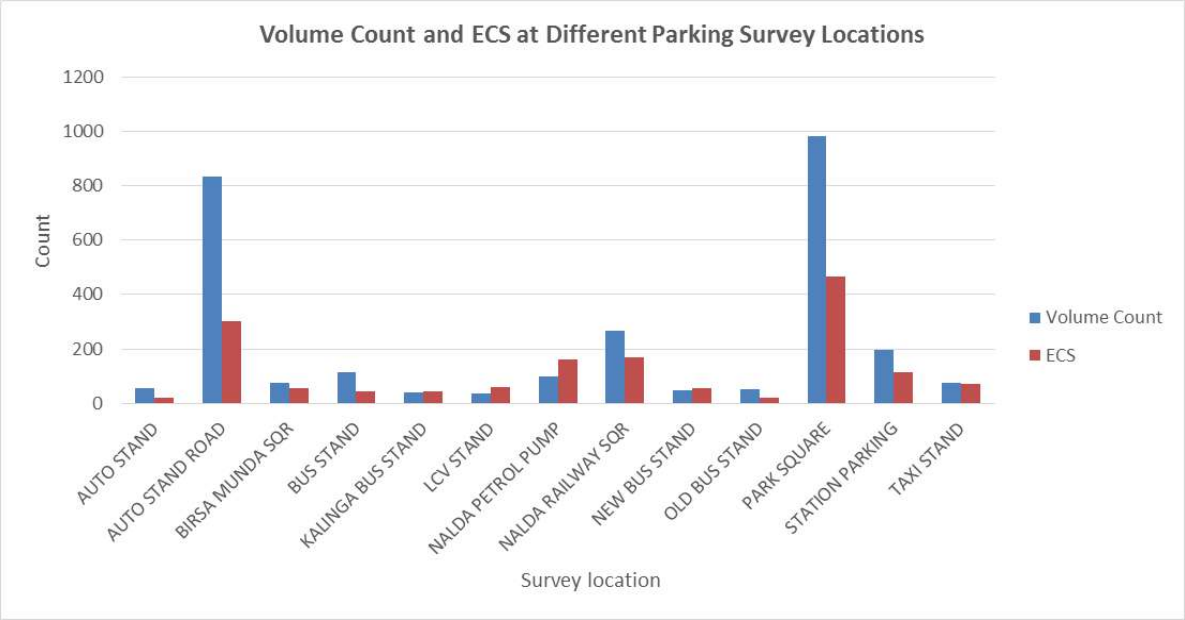


Figure 6.16: Volume Count and ECS at different Survey Location

In the morning hours, highest vehicle volume is of two wheelers i.e. 62% followed by 14% car/ jeep/ van volume.

In the evening hours, highest vehicle volume is of two wheelers i.e. 57% followed by 13% car/ jeep/ van volume.

In both morning and evening hours, about 75% vehicles are parked on-street.

Highest parked vehicles count is at Park square followed by Auto stand road. Highest ECS is also at Park square followed by Auto stand road.

At park square, two wheeler vehicles are highest in number followed by at auto stand road.

The parking accumulation and projection for major locations is as follow –

Table 6-4 Parking Accumulation and Projection for Major Locations

Location	2015	2020	2025	2030
AUTO STAND	22	32	45	60
AUTO STAND ROAD	303	446	625	837
BIRSA MUNDA SQR	57	83	116	156
BUS STAND	42	62	87	116
KALINGA BUS STAND	43	64	89	119
LCV STAND	61	90	126	168
NALDA PETROL PUMP	162	237	333	446
NALDA RAILWAY SQR	170	250	350	469

NEW BUS STAND	56	82	116	155
OLD BUS STAND	20	29	41	54
PARK SQUARE	467	686	963	1288
STATION PARKING	115	169	237	317
TAXI STAND	71	104	146	195

Parking demand at Auto stand road, Nalanda Petrol pump – Nalanda Railway Square and Park square is maximum and require a well-regulated off-street parking facility. For ground open parking, 18sqm. per ECS space can be allocated while 32-35 sqm. of floor area per ECS for multi-level parking is needed. Apart from off-street parking, suitable regulations like pricing and restriction for on-street parking is also needed.

6.3.7 Summary of Issues related to Traffic and Transportation

Most of the roads in the town are without median which handle two-way traffic. There are number of encroachments on various sections of the roads especially the ones with large scale commercial activity. The cross-section of the road is not clearly defined and planned. There is also lack of any pedestrian movement facility on any of the roads in the town. Many roads in the town have water logging problems. Major roads are Tarmac roads and the lower hierarchy roads are mostly concrete roads. The road surface quality is generally good.

6.4 Proposed Mobility Plan

The Transport system of a town needs supporting infrastructure to function smoothly. This includes appropriate capacity augmentation, geometric improvement, public facilities like Public transport terminals and halts, parking, public convenience, illumination, information dissipation etc. The facilitation of these support systems is a time-consuming process and once augmented they need to be backed by policy framework. The transport system of Barbil is envisaged to be developed as a smart mix of Traffic Management Technique, Infrastructure and Geometric Improvements along with policy formulations.

6.4.1 Geometric Treatments and Capacity Augmentation

Various design strategies which can be incorporated in the geometric improvement plans described herewith:

6.4.1.1 Improvement in Intersection design

Most of the intersections need to be redesigned so as to facilitate better and continuous layout of carriage way along with better turning radius and superior visibility distance.

Also at certain 3 arm intersections the non- conflicting straight traffic needs to be segregated so as avoid the delay associated with such traffic. In other words, merging and diverging shall be segregated for straight moving traffic. In case of traffic signals operating on such intersections, since the straight moving flow is separated, the effective cycle time gets reduced which in turn reduces the delay and enhances the overall experience of mobility.

6.4.1.2 Uniformity in carriageway design

It is seen that V/C Ratio for Jmada road, Bhadrasahi road and Municipality road is exceeding unity. With time to come traffic is going to increase. Sufficient Right of Way is available along some of the corridors. The existing 2 lane carriageway shall be upgraded based on the traffic expansion rates as shown in following table –

Table 6-5 - Traffic Growth Rate (Mode wise)

Transport Demand Elasticity Values w.r.t NSDP of Odisha				
Mode	2015-2020	2020-2025	2025-2030	2030-2035
2w	1.6	1.4	1.2	1.1
Car	1.4	1.3	1.2	1.1
Bus	1.5	1.4	1.3	1.2
Truck	1.3	1.2	1.1	1
Traffic Growth Rates				
Mode	2015-2020	2020-2025	2025-2030	2030-2035
2w	12.00%	9.80%	7.80%	6.60%
Car	10.50%	9.10%	7.80%	6.60%
Bus	11.30%	9.80%	8.50%	7.20%
Truck	9.80%	8.40%	7.20%	6.00%

Table 6-6 - Extrapolated values of V/C for major locations

Corridor / Stretch	V/C Ratio				
	2015	2020	2025	2030	2035
		CAGR - 8.25%	CAGR - 8%	CAGR - 7.5%	CAGR - 7%
Jmada road_IC_1	1.91	2.84	4.17	5.99	8.40
Bhadrasahi road_IC_2	1.2	1.78	2.62	3.76	5.28
Thakurani road at shani mandir_IC_3	0.62	0.92	1.35	1.94	2.73
Municipality road _IC_4	1.55	2.30	3.39	4.86	6.82
opposite police station _IC_5	0.66	0.98	1.44	2.07	2.90
Near Arya steel_OC_1	0.43	0.64	0.94	1.35	1.89
Near krishna temple_OC_2	0.42	0.62	0.92	1.32	1.85
Barbil road_OC_3	0.52	0.77	1.14	1.63	2.29
Rourkela road_OC_4	0.91	1.35	1.99	2.85	4.00

Considering not so optimistic growth rates, still the Jamda road and Bhadrasahi road need quick intervention in terms of carriageway widening. Wherever Right of Way is a constraint 4 lane undivided carriageway and otherwise 6 lane divided carriageway shall be proposed on these two corridors. All four regional roads shall be upgraded to 4 lane divided carriageway so as to sustain the heavy vehicle movement in large quantum.

Apart from increasing no. of lanes, it is of prime importance to make sure that cross section is uniform throughout the stretch. Any aberration from the approved cross-section acts as bottleneck to traffic system and whole purpose of carriageway widening gets defeated. Hence it is beneficial to develop the cross section of stretch at the site of minimum Right of Way of that road. A typical cross section of 24 m Right of Way as suggested by UTTIPEC with Multi-function zone (MFZ) is as follow-

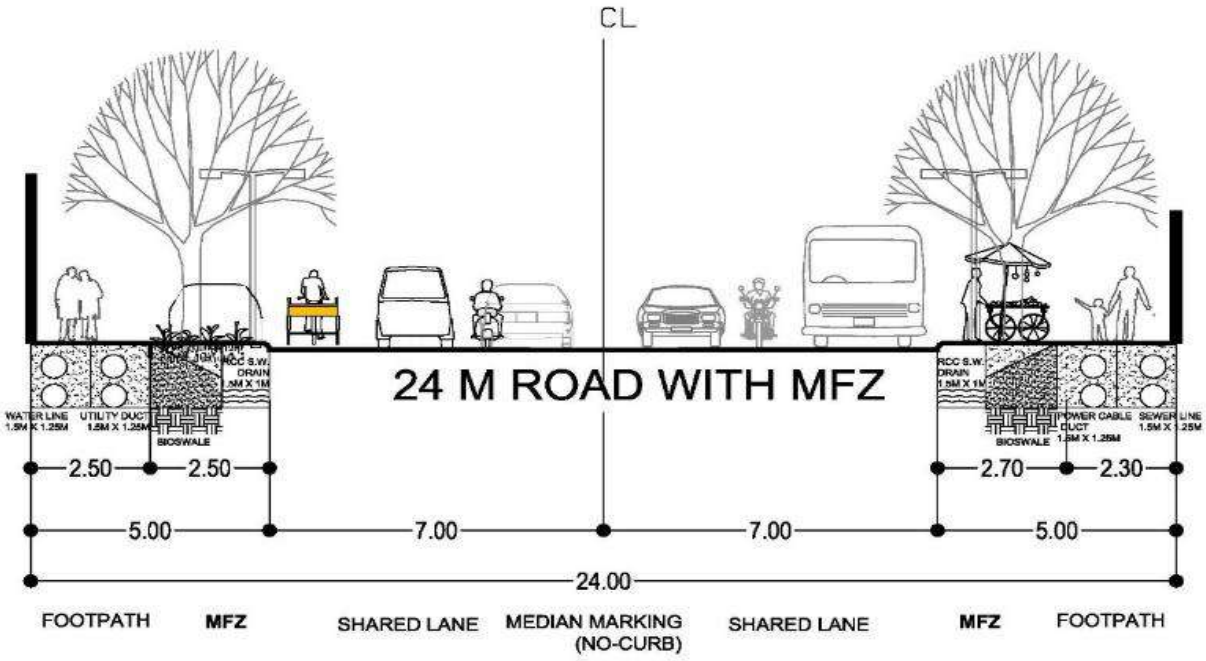


Figure 6.17 Typical Cross section of 24 m ROW

6.4.1.3 Access Control

The travel profile reveals an unsafe mixing of local and regional traffic along the arterial and sub arterial roads. Frequent punctures, ribbon development and Street Bazaar system is the primary cause for such turbulence. It is preferable to have access for arterial and sub arterial roads at a spacing of 0.5 – 1km and 0.2 – 0.5 km respectively. Delineation of service roads, parking lanes, Multi-Utility zones out of Right of Way also helps in segregating local and regional traffic

6.4.1.4 Continuity in Along and Across pedestrian facility design

No urban mobility improvement intervention is complete without facilitating the needs of pedestrians along and across the road. Pedestrian crossings at grade shall be facilitated with provisions of table top crossing and staggered Zebra crossing. Also, pedestrian sidewalk of minimum 2m width should be mandatorily provided along the arterial, sub-arterial and collector roads on both sides of carriageway. The following figure presents the attributes of at grade pedestrian crossing.

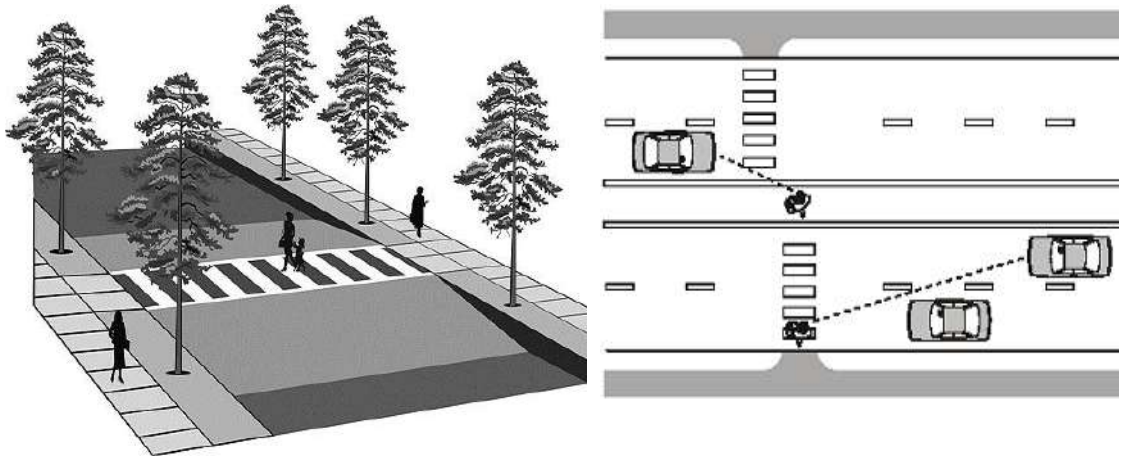


Figure 6.18: Typical features of Zebra Crossing like Table top and staggered crossing

6.4.1.5 Provisions of On-Street and Off-Street Parking

Parking provisions commercial stretches need to be regulated. Parking for IPT and loading/ unloading operations should not be encouraged along arterial roads in principle and wherever required should be scientifically planned. On street parking policy should promote short term parking wherever road Right- of -Way permits its integration with abutting parking attracting activities.

The parking accumulation and projection for major locations is as follow –

Table 6-7 Parking demand and projection in ECS

Location	2015	2020	2025	2030
AUTO STAND	22	32	45	60
AUTO STAND ROAD	303	446	625	837
BIRSA MUNDA SQR	57	83	116	156
BUS STAND	42	62	87	116
KALINGA BUS STAND	43	64	89	119
LCV STAND	61	90	126	168
NALDA PETROL PUMP	162	237	333	446
NALDA RAILWAY SQR	170	250	350	469
NEW BUS STAND	56	82	116	155
OLD BUS STAND	20	29	41	54
PARK SQUARE	467	686	963	1288
STATION PARKING	115	169	237	317
TAXI STAND	71	104	146	195

Parking demand at Auto stand road, Nalanda Petrol pump – Nalanda Railway Square and Park Square is maximum and require a well-regulated off-street parking facility. For ground, open parking, 18sqm. per ECS space can be allocated while 32-35 sqm. of floor area per ECS for multi-level parking is needed. Apart from off-street parking, suitable regulations like pricing and restrictions for on-street parking is also needed.

It should be noted that on- street parking on carriageway is difficult to regulate and beyond sidewalk is difficult to operate. Hence ramps along with bollards should be provided wherever vehicles cross the sidewalk. The sidewalk should get preference and should run at same level while level differences are traversed by vehicles. Such punctures should also be regulated in such a way that they are not frequently crossing the sidewalk.

6.4.1.6 Grade Separated Facilities

Screen lines like Railway track and Drainage present in Barbil town demand provision of grade separated facilities. Based upon the phasing and location, periodically the railway level crossing shall be converted into grade separated crossing. As a gradient of 1 in 30 is conventionally applied for all such facilities, approximately a length of 200 m on each of the approach is dedicated to ramps. Flyover is proposed in town to decongest the area near station road.

6.4.1.7 Design Sensitivity to surroundings

The town is a living entity and the transport system design should be sensitive to local needs. Environmental, ecological and cultural practices shall always be respected and preserved in the process of infrastructure development.

6.4.2 Specific proposals

As per the URDPFI guidelines, any city should have different hierarchy of roads as per the requirement. Hierarchy of roads will be as follows:

New Road (Bypass Road): As we are presuming that the city will grow to a population of 1.13 lakhs by 2030 by the various interventions that have been made. Also the industrial activities are likely to increase which will result in inflow of Heavy Vehicles/Trucks in the city. This will congest the already congested core area and hence calling for the new bye pass road.To decongest the city from heavy traffic, by-pass road has been proposed. In Barbil planning area, this new road connects SH 10B

to NH 215 and going from Bada Jamda to Thakurani mines. Alignment of road is marked on the basis of existing kutcha road so that land acquisition will not be a problem to government.

Widening of Roads: On the basis analysis done from the primary traffic surveys, two new roads have to be developed one on the eastern side of the town connecting Bhadrasahi to Thakurani mines and one in the western side has to be developed to handle the traffic from the side of Bolani so that traffic entering from that part of the town can be by-passed. One road at the centre of the town near railway line has to be widened.

Railway Over Bridge (ROB): One ROB is proposed on railway crossing near municipality office to decongest the area.

Elevated road/flyover: An elevated road/flyover is proposed over Birsamunda chowk which will connect the Barbil railway station siding and road on the south of Birsamunda chowk. This is subject to land availability and DPR approval.

Parking: A multi-level parking site for the commercial area as well as Shiv Lal Park is proposed near the IB square.

Bus station/ terminal: Bus stop/ terminals are proposed on the existing facilities with their upgradation and some are proposed on the government land.

Railway track: There is a requirement of a railway line directly connecting Barbil railway station and Banspani station to reduce the journey time.

Truck Terminals: The truck terminal facilities have been proposed inside the industrial area for the convenience of moving and loading and unloading of the goods for the industry. The truck terminal is to be aligned with the container handling facility as proposed in the industrial policy. The alignment and land allotment is to done based on the consultation with the truck owner association of the town.

All transport proposals are shown on Map 6.19.

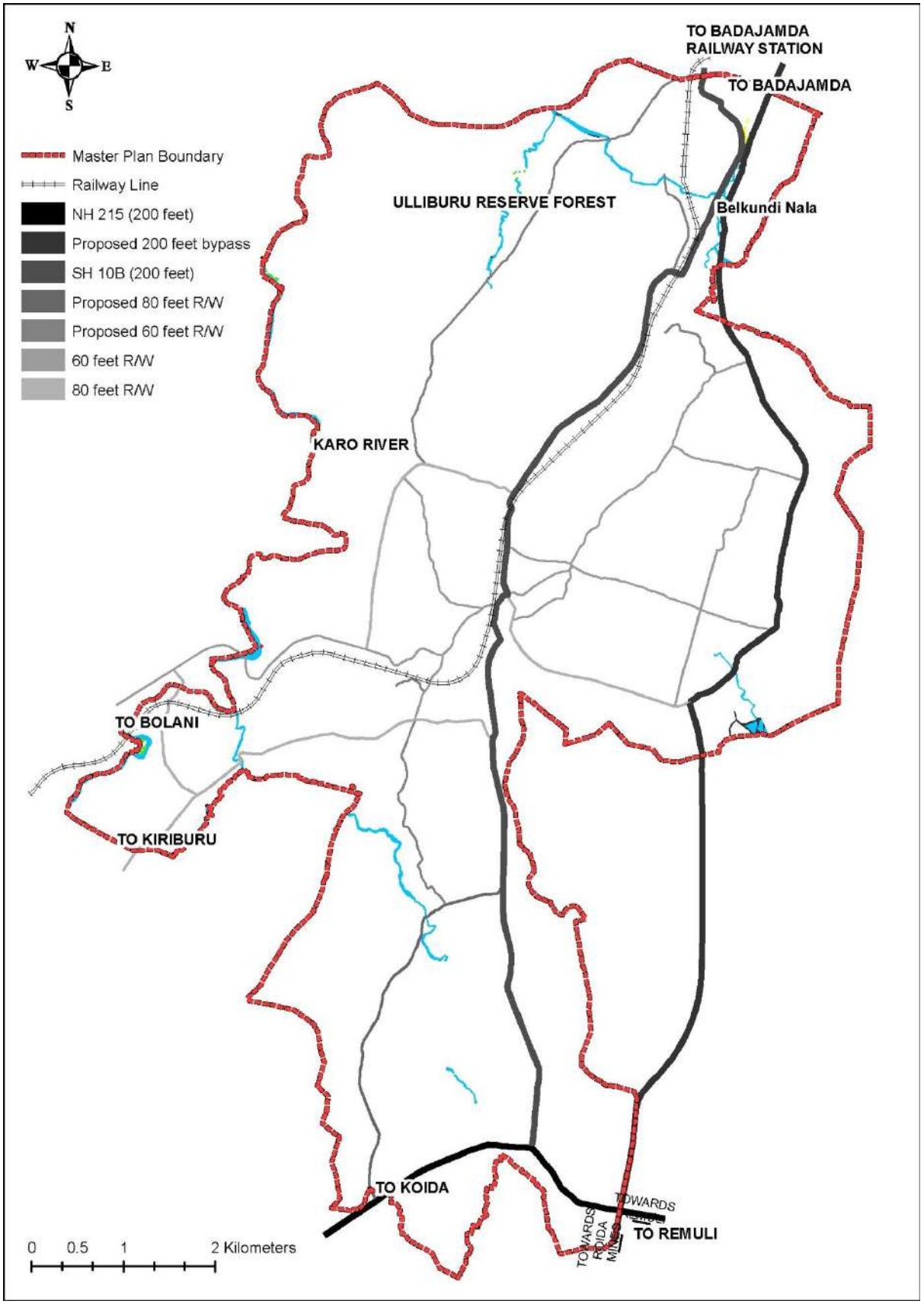


Figure 6.19: Proposed Mobility Plan of Barbil

6.4.3 Traffic Management Techniques

The traffic management techniques are generally advisable for all hierarchy of towns but implemented with segmental need. Broadly these techniques can be classified into effective carriageway improvement techniques and behavioural improvement techniques. Following are the general solutions advised under the head –

- Prohibiting on Street Parking of vehicles and simultaneously developing off-street parking
- Removal of encroachments and relocation of IPT – Rickshaw stops
- Improving Traffic Discipline such as proper lane uses and correct overtaking through signage, education and publicity.
- Reduction in roadside friction through control of abutting landuse, access and roadside commercial activity
- Provision of adequate facilities for pedestrian and cyclists
- Banning certain conflictive movements at major intersections, specifically during peak hours
- Provision of segregated right of way for slow moving and fast moving vehicles
- Imposing restriction upon movement of heavy vehicles during selected periods, specifically peak hours.

6.4.4 Other suggested measures and policies

In addition to specific strategies some other support measures and policy are needed which are proposed as under:

- Augmentation of Capacity and Level of Service for Public Transport: No corridor or town can address the challenge of ever increasing traffic without propagating the public transport. Public Transport can function better with support infrastructure like:
    - improved and strategic location of bus shelters,
    - prioritized movement on signalized intersections,
    - Support system of feeder modes and IPT along the public transport modes

- Competitive pricing and special benefits to target group

It is proposed that that a comprehensive public transport operation policy for Barbil needs to evolve on priority. This approach shall not be conventional but unique based upon the demand of the town.

- IPT and Feeder modes also need a comprehensive operation policy which should include planning of their stops, routes, timing of operation and integration of fare with the line haul mode system such as city buses.

- A comprehensive parking policy with strategic fare and slabs system to encourage and discourage (wherever/ whichever applicable) parking needs to be evolved for the town.

- A regular awareness program for Traffic discipline with the help of advertisement, special drives, Traffic Weeks, Incentives to law abiding citizens etc. need to be promoted in city in general and corridor in particular.

Effective enforcement policy needs to be evolved so as to ensure no encroachments of the right of way by informal activities, illegal parking, etc.

CHAPTER-7 PHYSICAL INFRASTRUCTURE

Access to basic infrastructure like Water Supply, Sewerage, Drainage, Solid waste Management and Power influences the quality of life in any settlement. To have a sustainable development in the area, existing infrastructure needs to be augmented and demands for future population has to be assessed and proposed for.

7.1 Water Supply

7.1.1 Existing Scenario

Barbil receives around 5 MLD water for drinking other purposes from River Karo as well as two bore wells located near MMTC ltd and Nalda. Around 46 number of hand pumps and tube wells also provide water in low pressure zones and areas not covered by piped water supply. The current rate of supplied water is around 60 LPCD in the municipal area. At present, only 14 wards, 11 wards are fully covered by piped water supply, 3 are covered partially while 1 ward isn't covered at all with water supply due to sparse habitation.

Water sourced from the River Karo is treated in a 5 MLD capacity Water Treatment Plant, located 1.8 km from the intake point, through rapid gravity sand filter. Ground water taken from bore wells is treated through manual chlorination. The treated water from the treatment plant is collected in 2 nos. of clear water sump of 4.50 MLD capacities for distribution to the households by zoning system through pumping/gravity systems consisting of 100mm to 300mm dia PVC and CI pipe distribution network. For the water that is drawn from the bore well which is located near MMTC Ltd, an underground sump of 2.25 MLD is used for storage purpose. From the other bore well that is situated in Nalda area, water is directly pumped to the distribution line to the household level. Urban area is served with an intermittent distribution system with the supply rate confined to only 3 hours in the morning and 2 hours in the evening.

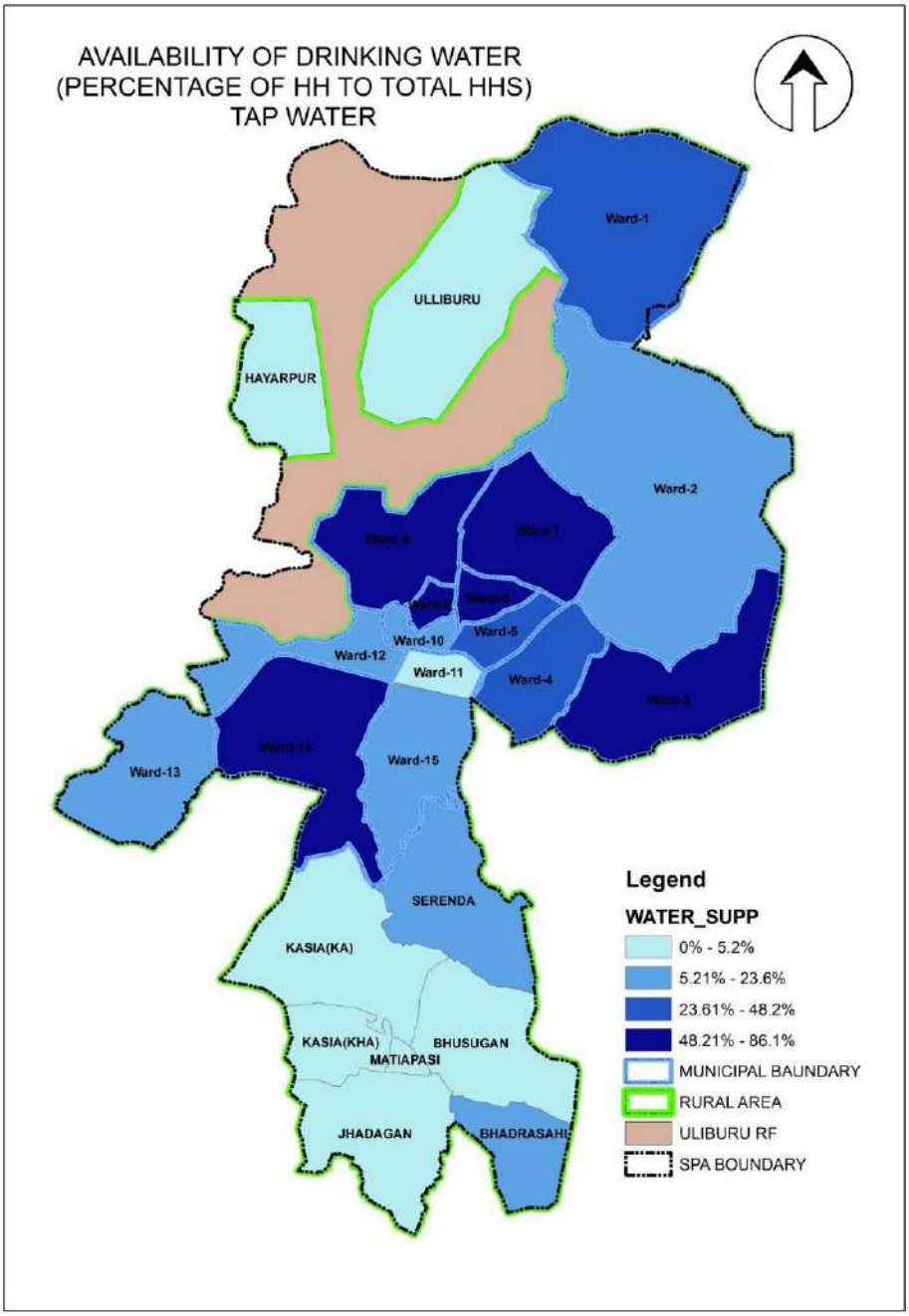
Rural areas within the Master Plan Area, however, access drinking water mainly through covered wells. These are covered under the Rural Water Supply and Sanitation (RWSS), which is entrusted with the responsibilities of water supply, its operation & maintenance and sanitation. These wells are treated through manual chlorination, twice a year. In residential areas of mining companies, like in villages Serenda, Bhusugaon, Kasia (KHA) and Bhagra Sahi, the source of water is ground

water, which is operated and maintained by the company itself and distributed through piped network.

During the summer months, Barbil faces acute water shortage, in which case, urban areas are supplied by tankers by the Municipality, while the some of the rural areas are supplied through tankers by private companies like Rungta Mining Ltd., ESSEL Mining etc.

The distribution of piped water supply in the Master Plan Area is shown below –

Figure 7.1 Coverage of piped water supply in Barbil



7.1.2 Demand Assessment for existing population

Water supply standard for a city is taken as 135 LPCD. Thus, at present, Barbil with a population of 0.83 lakh should receive 13.89 MLD water. However, only 5 MLD water is received in the city though piped network.

7.1.3 Overview of ongoing / proposed projects

Water supply network is proposed to be augmented with an additional 12 MLD supply. However, this project is only aimed for a population of 77,403 till 2041 in the Municipal Area, which is grossly inadequate.

For rural areas, PWS (Piped Water Supply) scheme is being implemented to provide drinking water facility through piped water system along with provision of overhead tank for storage purpose. Presently a proposal for installing such type of mechanism is submitted to the state govt. for the village Serenda along with a total no. of 11 proposals for the block.

7.1.4 Issues

Main issues related to Water Supply in Barbil are –

- Present per capita supply rate (60 LPCD) is grossly below standards (135 LPCD)
- Coverage of water supply network is partial and is abysmal in the rural areas

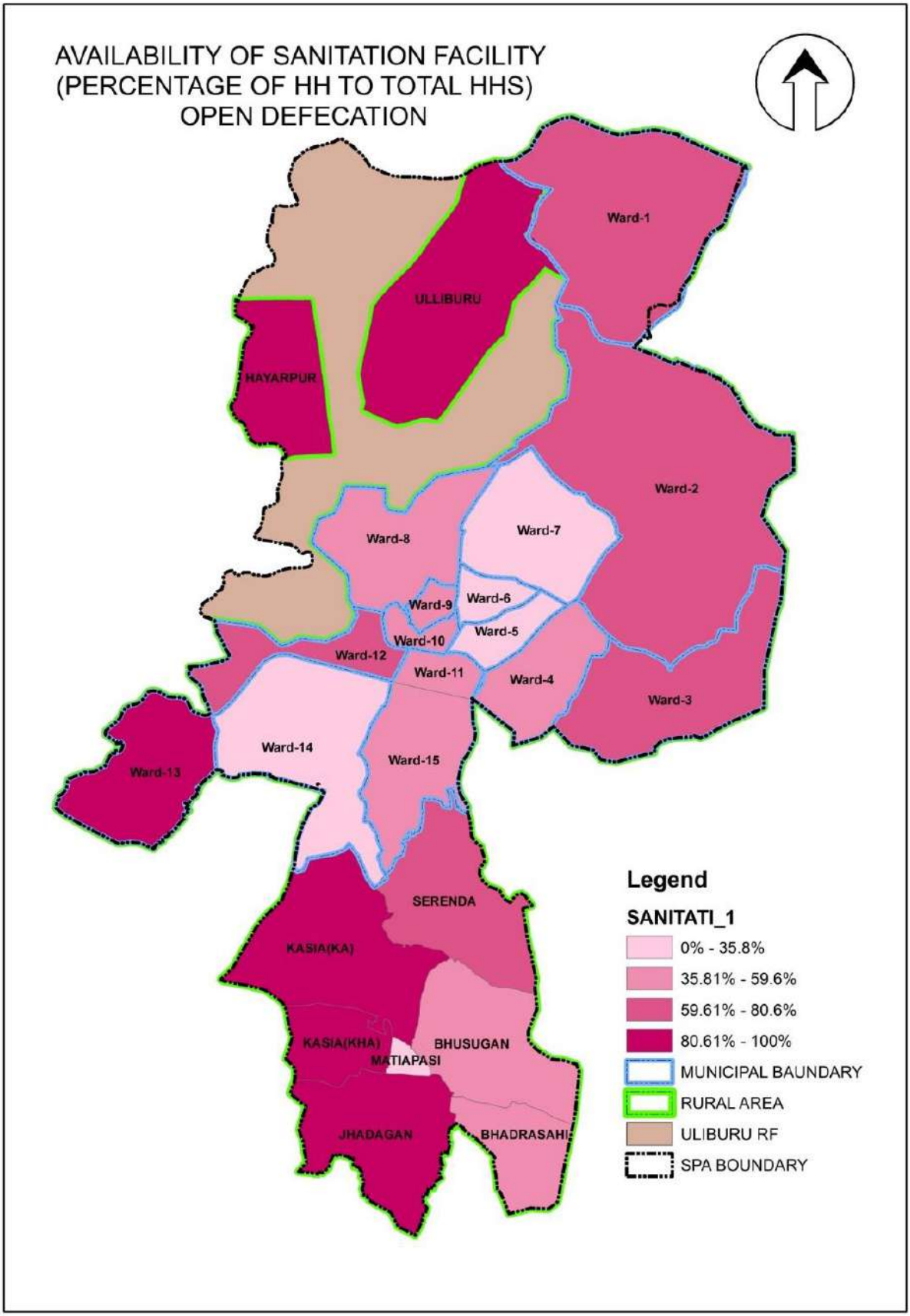
7.2 Sewerage

7.2.1 Existing Situation

Barbil, having a population of 0.76 lakh (2011 Census), presents a dismal condition of Waste Water Management. A city-wide Sewerage system is absent in the Master Plan Area and most of the households (68%) defecate in open. This figure is very high in rural areas (81%) as well as urban areas (55%). The dismal condition of sanitation is shown in Figure 4 which showcases the high rate of open defecation in the area. Around 36% of the households in the urban areas have Septic Tanks connected to their latrines.

There are 3 Public Toilets in the city having 35 number of toilet seats. These toilets function as per Pay and Use, tariff ranging from Rs. 2 to Rs. 5.

Figure 7.2 In access to Sanitation Facilities in Barbil



7.2.2 Waste Water Sewerage Assessment

Around 80% of the water demand is taken as quantity of waste water. Existing water supply is 5 MLD. Thus, around 4 MLD waste water is generated in the city at present, which is entirely left untreated and fall into drains.

7.2.3 Overview of ongoing / proposed projects

No projects have been proposed or are under construction for revamping the sewerage system in the city. However, a survey to assess the existing sanitation situation is being undertaken under Swachh Bharat Mission.

7.2.4 Issues

Main issues related to Sewerage in Barbil are –

- Absence of comprehensive sewerage disposal system
- Widespread practice of open defecation
- Disposal of septage from septic tanks into existing drains

7.3 Drainage

7.3.1 Natural Drainage Pattern

Apart from River Karo, which flows on the north-western boundary of the master plan area, there are a number of natural nallas such as Dholki Nalla, Sundara Nalla and Barapada Nalla, which form the natural drainage channel in the master plan area. It is noticed that all most all the tertiary drains have their final disposal points in the above stated primary and secondary drainage channel.

7.3.2 Manmade drainage

Barbil has a network of drainage lines which is distributed irregularly throughout the town and discharges its water to the nearest natural drainage channels. According to the municipality data the length of pucca drains in Barbil are around 46.5 kms and the length of masonary drains are 28.5 km only.

Out of the total drainage network in the municipal limit, primary and secondary drains all together form 5.80 km of drainage network, whereas the tertiary drains are 22.70 km which mainly confined to road side drains within the wards and market area etc. Most of these drains act as disposal points of sewage from households due to lack of sewerage system.

The responsibilities of construction & structural maintainance of road side drains is laid with the PWD section of the municiaplity, whereas the day to day cleasning activity is mainly carried out by the Health section of Barbil municiaplity. But in the surrounding nine rural revenue villages of municipality, the constuction of drains are mainly carried out by the Rural Development Department of Govt. of Odisha thor' the block and gram panchayat.

7.3.3 Issues

Main issues related to Drainage in Barbil are –

- Deteriorating quality of drains in the city due to open defecation and improper solid waste disposal practices
- Lack of drainage in peripheral areas

7.4 Solid Waste Management

7.4.1 Existing Scenario

At present, Barbil generates around 38.3 MT of solid waste per day as per standards. Currently solid waste management of Barbil Urban is being dealt by Barbil Municipality. With a total 126 nos. of sanitary workers (28 – Own worker + 98- Contract worker), the municipality has the responsibility for collection, transportation and disposal of solid waste in Barbil Urban. There is no organization for solid waste management in rural areas of Barbil.

Door –to –door collection of waste facility is present in 10 wards of Barbil and 130 collection points are also located in the urban areas of the city, from where the waste is collected. At present, the municipality has 8 vehicles (3 tractor trolleys, 1 Lorry and 1 Excavator are owned while 3 tractor trolleys are outsourced) and 10 tricycle for collection of solid waste from households and collection points and its transportation to the disposal site. On average, these vehicles make 14 trips per day. Road sweeping is also carried out in wards along a total road length of 60 km.

The solid waste collected in the Barbil town is not treated or segregated at any level. At present, waste is unscientifically dumped at the 5.24 Acre dumping site located in Ward 13. There is no effort to salvage materials or energy from the waste before burning.

7.4.2 Demand Assessment

Due to lack of data, waste generation is taken as per URDPFI standards for small towns for Barbil. Hence, Barbil generates 38.8 MT of solid waste.

7.4.3 Issues

Main issues related to Solid Waste Management in Barbil are –

- Door-to-door collection limited to some parts of urban area only resulting in huge amounts of uncollected waste
- Lack of vehicles for efficient collection and transportation of solid waste

7.5 Physical Infrastructure Proposals

7.5.1 Background

Physical infrastructure is an essential component for development in Barbil. As per the vision for development in Barbil, one of the focus areas is the augmentation of existing infrastructure, so as to cater to the existing as well as the projected population efficiently. Barbil, a mining town, attracts population from surrounding areas. Thus, the city should be prepared to provide better infrastructure services to the incoming population in addition to improved quality of infrastructure to its own population.

7.5.2 Water Supply

E. Demand Assessment

For provision of adequate amount of water for drinking and other activities, demand assessment for water supply has been done on the standard of 135 LPCD. An unaccountable flow of water is assumed as 15%, which is lost during transportation and other reasons such as leakages, etc. The table below shows the Water demand till 2030.

Demand for water supply is presented incorporating the demand for floating population and losses due to unaccountable flow of water.

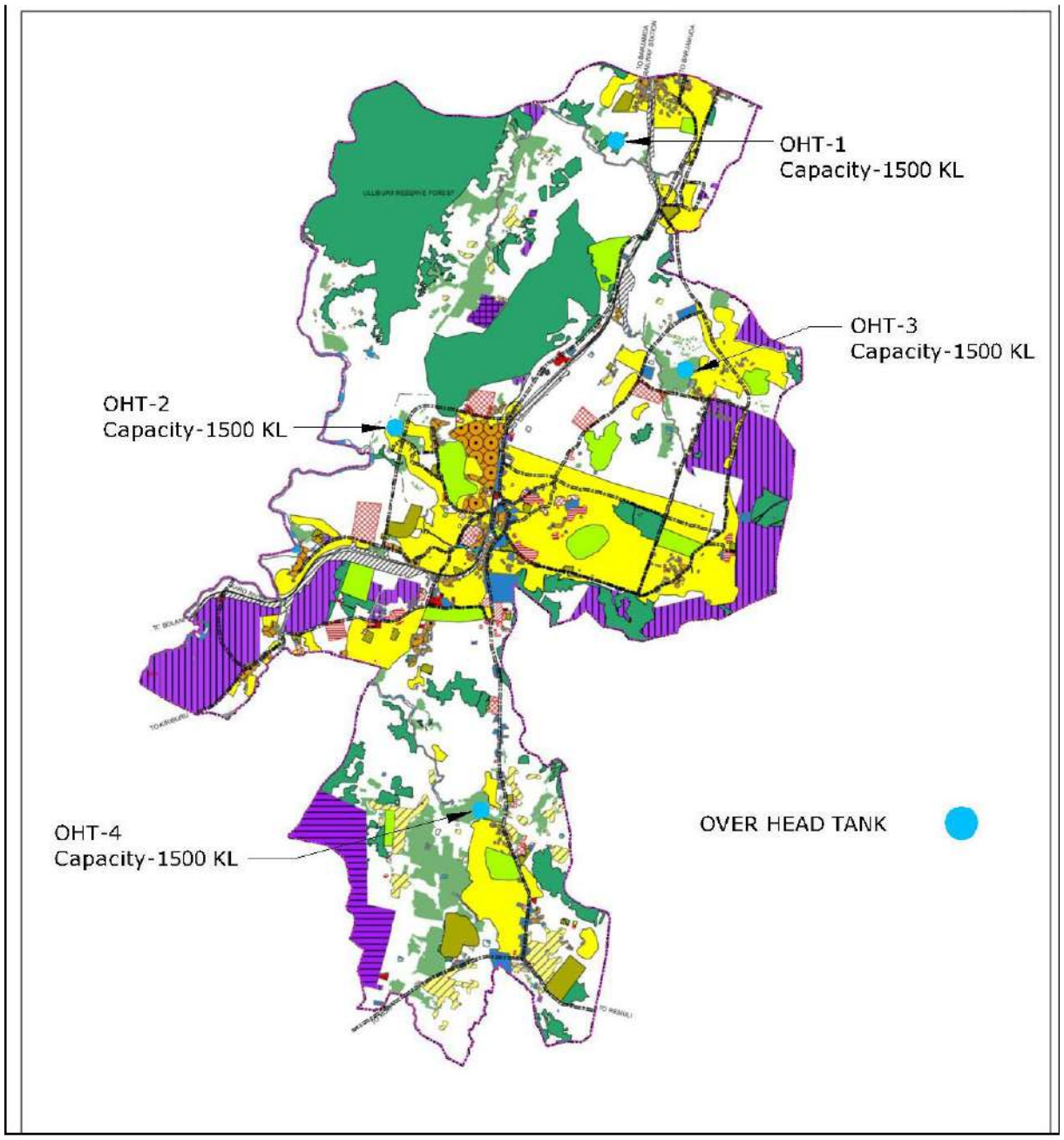
Year	Population (in Lakh)	Floating Population (in Number)	Water Demand (@ 135 LPCD + Unaccoutable flow @ 15%) mld
2015	0.84	16777	13.89
2020	0.92	18454	17.44
2025	1.02	20388	19.00
2030	1.13	22647	21.05

F. Proposed Intervention

Existing water supply system provides around 5 MLD of water, while 21.05 MLD water shall be required to satisfy water demand in 2030. Thus an additional 16.05 MLD source is to be proposed.

It is also proposed that with increased supply, storage capacity of the city shall also be increased. An additional storage capacity of 4,584 KLD is proposed in Barbil. Considering unit storage capacity of 1,500 KLD, 4 OHTs are proposed till 2030. The location of proposed OHTs is shown the figure 7-3 below.

Figure 7.3 Location of proposed OHT



G. Cost Estimate

Major cost components in the proposed water supply scheme are augmentation of source and storage, laying of network and adding of connections. It is estimated that a cost of Rs. 1.5 crores is incurred for augmenting capacity by 1 MLD. Thus, a total of Rs. 31.57 crore shall be incurred to put in place the proposed water supply system.

7.5.3 Sewerage and Sanitation

H. Sewerage Generation

It is estimated that 80% of water supplied shall be released as sewage from the households. Taking this into consideration, it is projected that around 16.84 MLD of sewage shall be generated in 2030. The table below shows the projected generation of sewage.

The table below shows the generation of waste water till 2030.

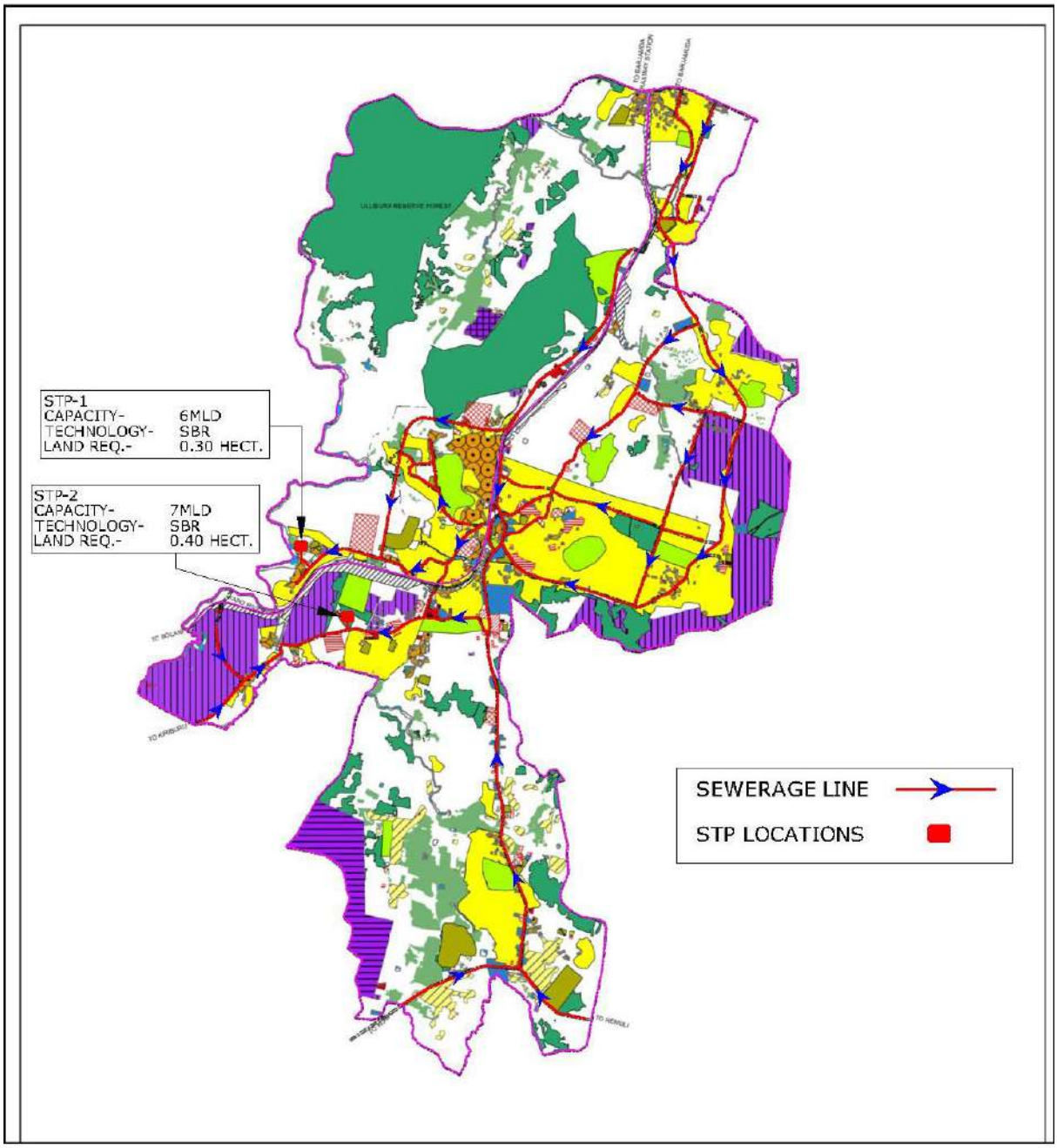
Year	Population (in Lakh)	Floating Population (in Number)	Sewage Generation (MLD)
2015	0.84	16777	9.7
2020	0.92	18454	12.22
2025	1.02	20388	13.50
2030	1.13	22647	16.84

I. Strategy for Waste Water Management

As the city lacks a comprehensive waste water management system, it is proposed that sewerage shall be laid in the city connecting each establishment. The sewage generated in the city shall be treated at a Sewage Treatment Plant with 'Sequential Batch Reactor' technology and the treated waste water shall be used for irrigation.

As per the topography of the city, two STPs are required for the city. The capacity of the STPs shall be 6 and 7 MLD respectively and shall require an area of 0.7 Hectares. Figure 7-4 shows the location of STP.

Figure 7.4 Location of proposed STPs



J. Cost Estimate

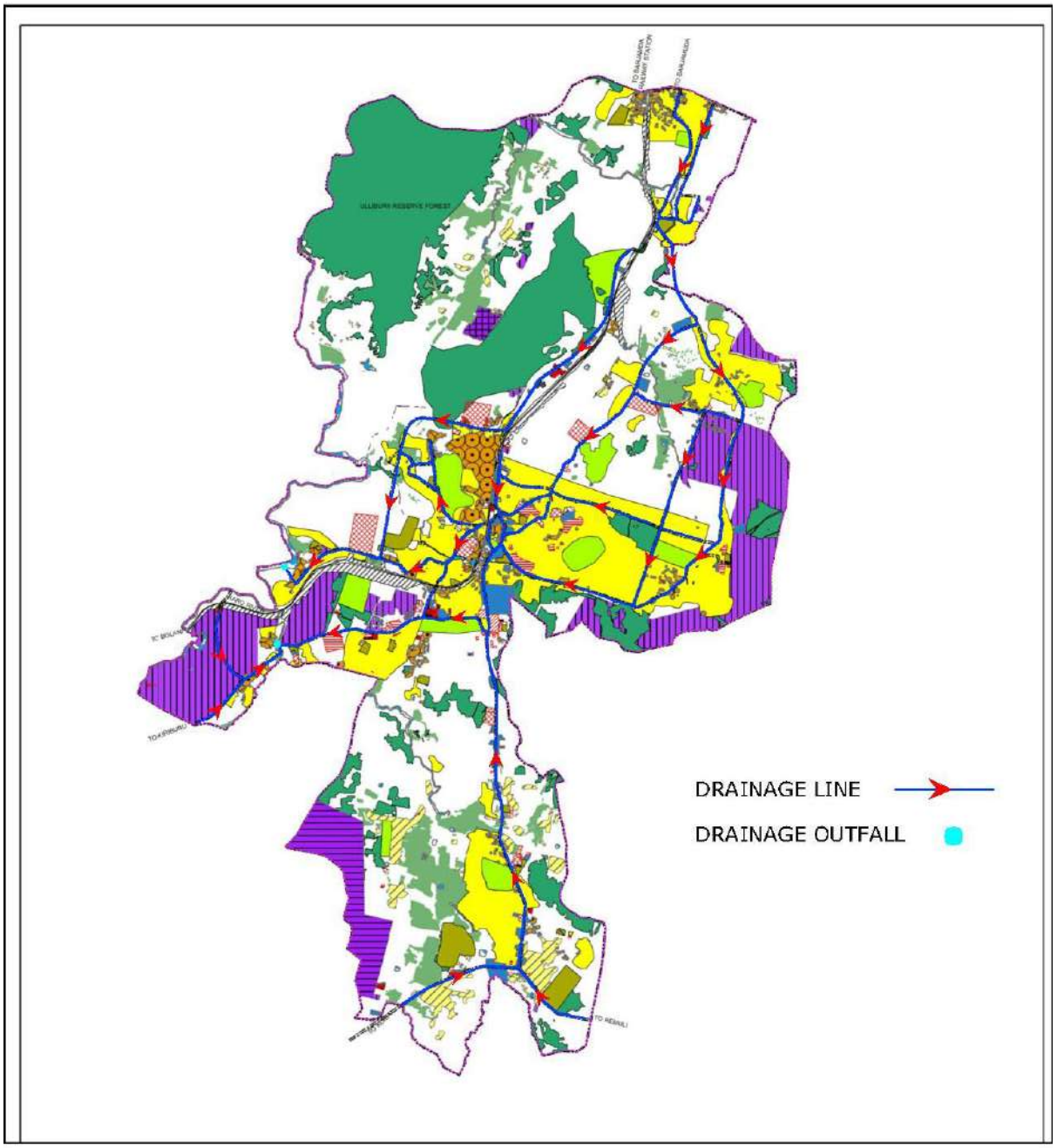
Major cost components in the proposed sewerage scheme are laying of trunk network and construction of STP. It is estimated that a cost of Rs. 2.5 crore is incurred for collecting and treating 1 MLD of sewage. Thus, for proposing sewerage network including its treatment, a total cost of Rs. 42.1 crore shall be incurred.

7.5.4 Storm Water Management

K. Drainage Proposals

A separate system for drainage is proposed in the city. All areas within the Master Plan are proposed to be covered by a network of drains. Neighbourhood level roads shall be lined with tertiary drains while all major roads shall have Primary drains. The proposed drainage network as shown in figure below follows the natural drainage pattern.

Figure 7.5 Proposed Drainage Network



L. Strategy for Storm Water Management

As the drainage network is designed to follow natural topography, the water from the drains is proposed to be discharged in Natural Drains and streams which ultimately meet River Karo outside the Municipal Limits. It is for this reason that regular cleaning of drains and proper solid waste collection practices must be followed in the city, so as to reduce the amount of pollution entering the river.

M. Cost Estimate

Major cost components in the proposed drainage network are laying of trunk network, construction of flood gate and construction of embankment as part of Riverfront Development. It is estimated that around Rs. 47 thousand is incurred for construction of drainage per acre. Thus, for construction of drainage as well flood protection measures, total cost of Rs. 669.3 crore shall be incurred.

7.5.5 Solid Waste Management

N. Solid Waste Generation

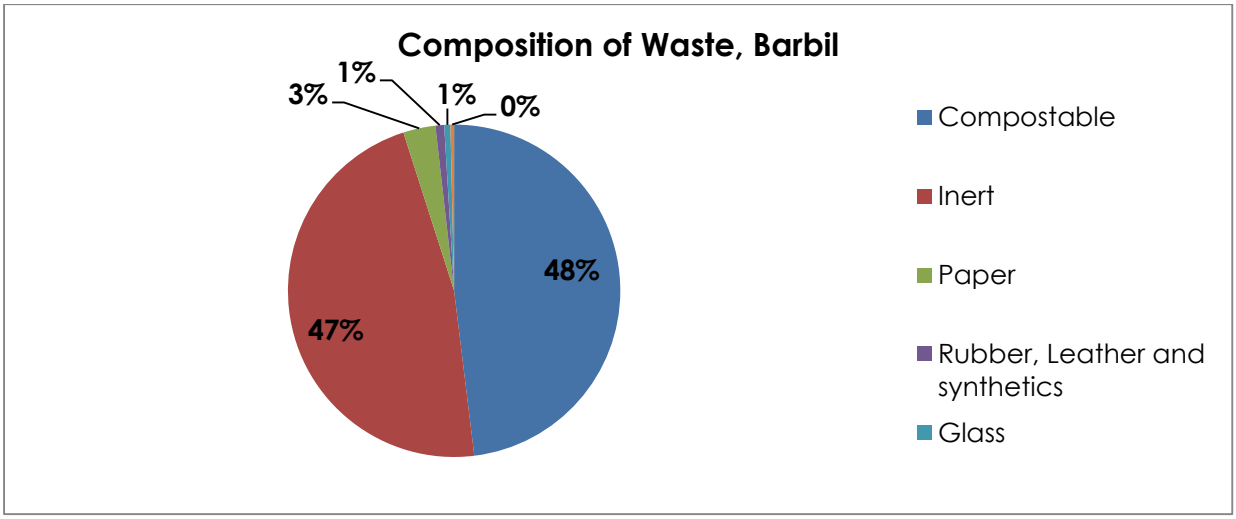
Per capita waste generation in any settlement increases with increase in population. Also, the constitution of waste becomes more complex with growth of the settlement. Thus, a bigger settlement like city would have more amount of non-biodegradable waste generated than a smaller town.

Generation of solid waste in Barbil is projected to be in the order of 47.5 MT per day by 2030. Projected Solid waste generation is shown in table below.

Year	Population (in Lakh)	Floating Population (in Number)	Solid Waste Generation (@ 0.35 Kg/Capita/Day)
2015	0.84	16777	35.2
2020	0.92	18454	38.8
2025	1.02	20388	42.8
2030	1.13	22647	47.5

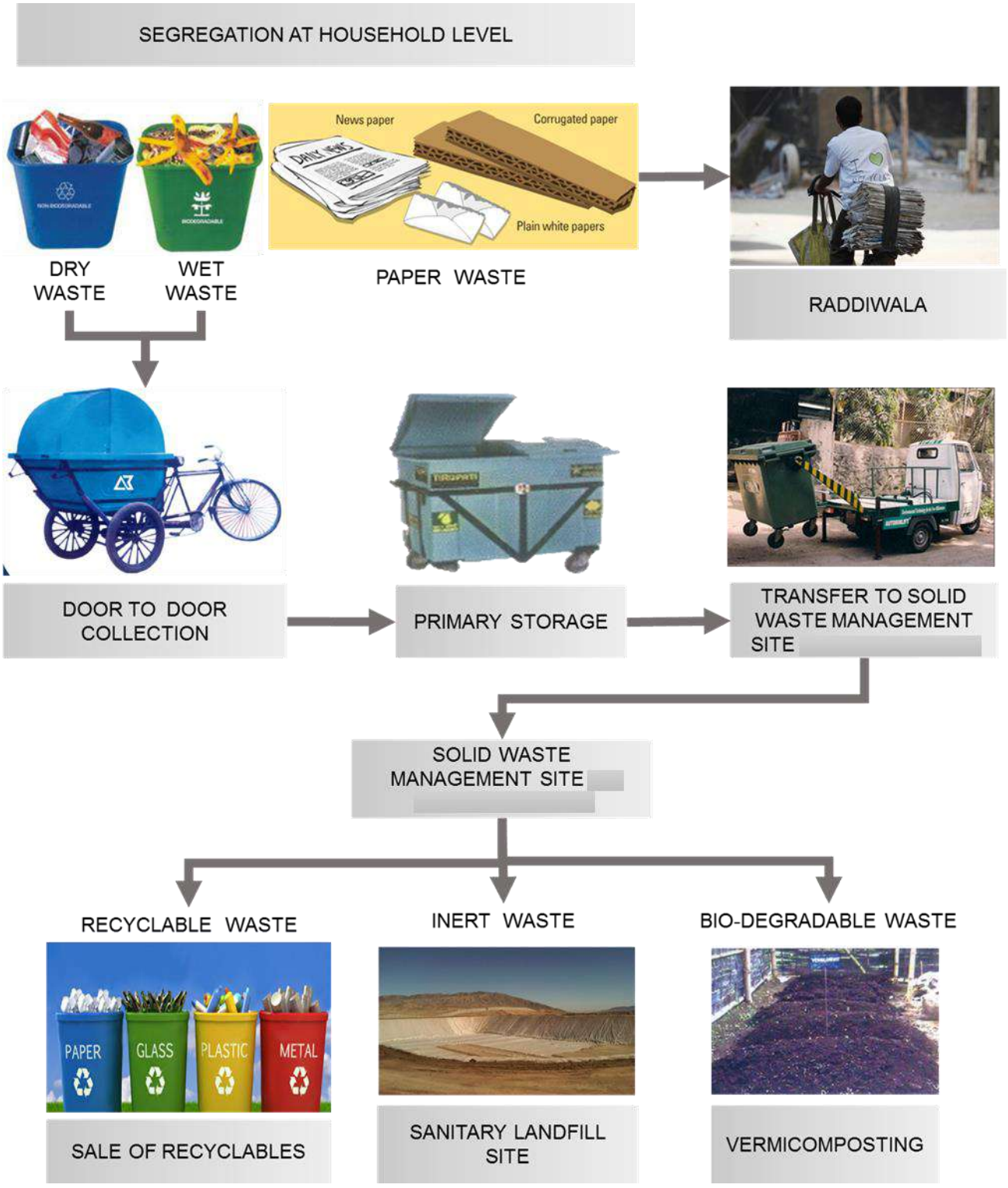
According to study by NEERI, cities with population less than 5 lakh generally have higher percentage of compostable matter. Using the study, it is projected that Barbil shall have the composition of waste as shown in the figure below.

Figure 7.6 Composition of Waste in Barbil



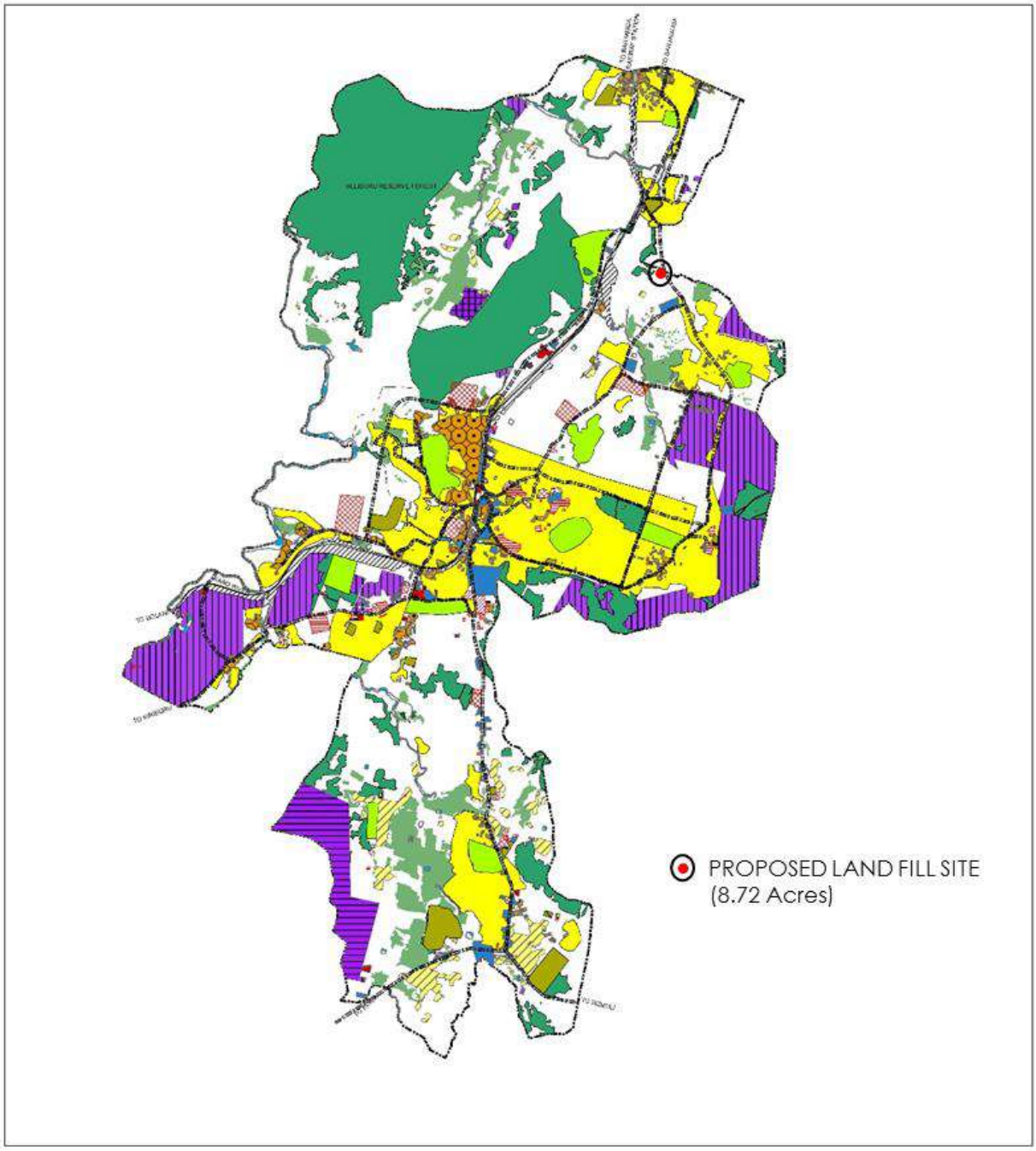
O. Proposed Intervention

Level of Solid Waste Management in any city defines the level of hygiene. It is thus proposed that a comprehensive solid waste management system shall be designed for Barbil. The proposed SWM system is shown in figure below.



The above process shall take care of domestic waste which is in general, non-hazardous. To dispose 47.6 MT of waste by 2030, an area of 8.72 Acres shall be used to develop an Integrated Solid Waste Management Site. This site shall consist of a Vermicomposting area so as to retrieve value from the Bio-degradable waste.

Figure 7.7 Location of proposed Landfill site



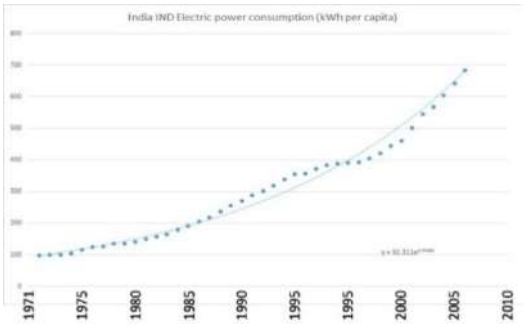
Waste from hospitals and clinics are proposed to be segregated at source and the hazardous waste is proposed to be incinerated. Waste from meat and fish market should be collected separately and be deposited in a compost pit. Construction and demolition waste should be used for pot-hole filling in the Master Plan area and responsibility of collection and transportation of such waste should be on the municipality.

P. Cost Estimate

Major cost components in the proposed SWM system purchase of equipment, vehicles and construction of Integrated SWM site. It is estimated that around Rs. 30 lakhs per MT is incurred for putting a SWM system in place. Thus, for establishing an efficient and sustainable SWM system in Barbil, total cost of Rs. 14.27 crore shall be incurred.

7.5.6 Electricity

A rate of 5.0 KWh Per capita per day including domestic, commercial, industrial and other requirements is taken which is based on increasing trend of power demand in India as reported by of World Bank which shows trend ($92.311e^{0.0488x}$) of demand per capita per day for last 40 years.



Total consumption has been calculated for the 2031 with the projected population of Barbil planning area as shown in Table 7-1.

Table 7-1: Projection of Power consumption (MWh /DAY)

Area	population for 2031	consumption in Kwh per capita per day	Total consumption KWh/ Day	Total consumption MWh / Day
Planning Area	113237	5	566185	566.18

A belt of 30-meter width (15-15-meter-wide on both sides) below all H.T. lines will be reserved as H.T. Line buffer zone, where no construction of any kind will be permissible. The extant guidelines of Power Department would be followed.

Government Proposals

As per the Keonjhar electricity department, many new sub-stations are to be set-up to cater the need of industries, domestic, commercial demand. In order to meet the requirement a number of improvement programmes has been taken up under World Bank Assistance in Barbil Planning area such as:

- Construction of new 33/11KV 2x5MVA Primary Sub-station at Sundra (Barbil)
- One number new 33KV Line from Sundra to Gosala under Barbil section.

In addition to this for improvement of supply system at Keonjhar, Champua, Joda and Barbil, provision has been made for construction of 500nos. of L.T. less Sub-stations, for which transmission loss can be reduced effectively and the voltage can be improved considerably. In this regard, already 160nos. of L.T. less Sub-stations have been completed under Joda, Barbil and Keonjhar areas. In order to reduce loss components in the distribution system, it has been decided to install new meters along with the Tamper Proof Boxes, for which the theft of energy can be reduced considerably. The work in respect of change of meters along with the T.P. Boxes has already been undertaken and about 4,500 nos. of meters have already been changed in Joda and Barbil areas.

CHAPTER-8 SOCIAL INFRASTRUCTURE

8.1 Introduction

Education, health sectors and socio- cultural facilities constitute the social infrastructure that forms the foundation for economic and human development. In the Millennium Development Goals (MDG) also, education and health are major challenges. While education provides the vital input for increasing the supply of trained and motivated manpower, health enables optimum utilisation of human resources. Thus both education and health are important components of the Human Development Index (HDI).

The provision of these requirements should cater to the regional requirements as well especially for the town like Barbil which is the district headquarter and the largest urban area in the district. Adequate social infrastructure like schools and hospitals are the basic needs of the human life which would allow for improve the standard of the living and affordability levels of the people in the area.

This chapter deals with the availability of social infrastructure facilities, focusing on health and education, at settlement level in the study area. Available of financial services at the settlement level is also dealt with. The Mouza wise summary of the infrastructure availability is presented herewith in this chapter, while the settlement level details are given in the Annexure. Assessment of service levels is undertaken based on the Census 2011 data. The analysis helps clearly identify gaps in infrastructure at settlement level and thus provides key inputs for Comprehensive development plan preparation.

8.2 Education Facilities

Education is one of the major components of social infrastructure and affects the living condition & quality of life of a citizen. Further, educational facility in an area is an extremely important indicator of social development of the residents of the concerned area.

Q. Present Elementary Educational facilities

The literacy rate in the Master Plan area of Barbil is 71.02 with literacy rate of Barbil Urban is 72.18 and Barbil Rural is 63.06. The literacy rate of urban area is higher than the district figure of 68.24. In both the urban and rural area of Master Plan, the literacy

rate among men is quite higher than the females. It is found that the literacy rate among the women in the rural areas of the Barbil Master Plan Area needs to be improved as the literacy rate is confined to only 51.95 percent. Barbil Urban has the maximum concentration of educational institutions in the master plan area. For school facility, there are 38 nos. of educational institutes present in the municipal area, whereas in Barbil rural, a total of 14 nos. of schools are available for primary, upper primary and secondary education.

The following table depicts the availability of schools in Barbil Master Plan area which includes the Municipality and notified rural revenue villages.

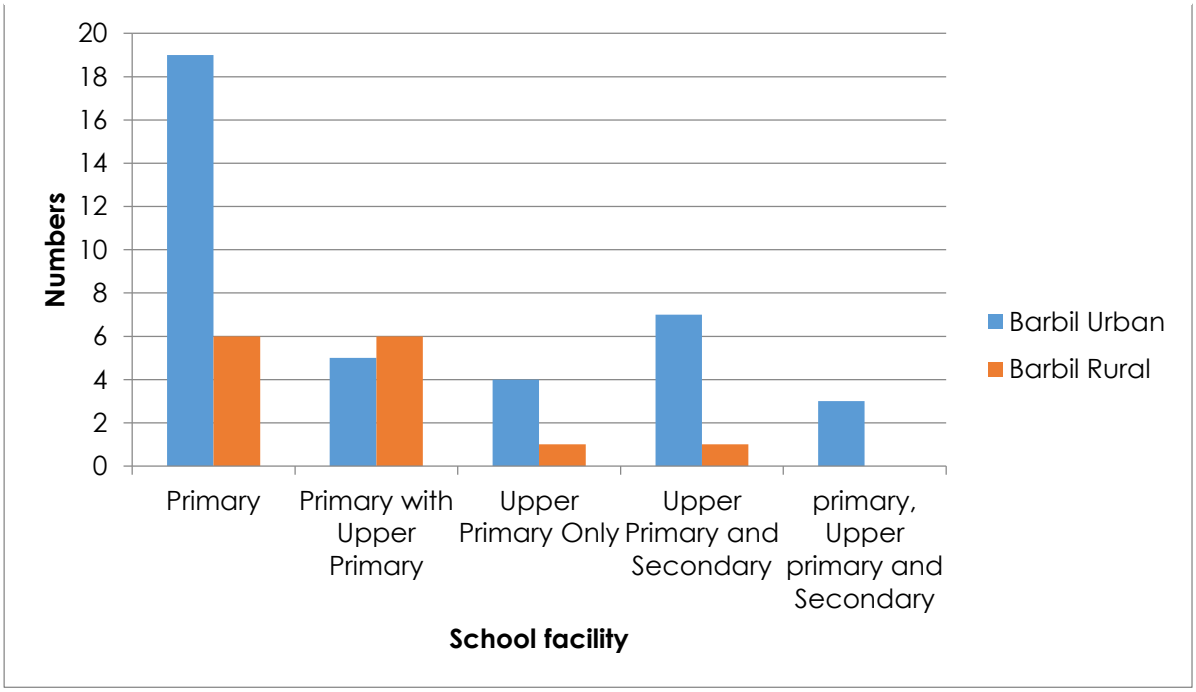
Table 8-1: Available School Education Facility - Barbil Master Plan Area

Sl. No.	Name of School	Level	Ward No./ Village Name	Student Strength			Teacher Strength		
				Boys	Girls	Total	Male	Female	Total
Barbil Urban									
1	GOPABANDHU P.S., NALDA	Primary	1	39	33	72	1	3	4
2	HESABURU P.S.,NALDA	Primary		64	67	131	1	3	4
3	MUNICIPAL H.S., NALDA	Upper Pr. and Secondary		52	44	96	3	0	3
4	BELKUNDI P.S.	Primary	2	68	43	111	3	0	3
5	KARAKOL P.S.	Primary		67	62	129	3	1	4
6	DALKI M.E. SCHOOL	Upper Primary only	3	104	104	208	2	3	5
7	DALKI P.S.	Primary		190	184	374	1	6	7
8	BARBIL BASTI P.S.	Primary	4	51	62	113	1	3	4
9	EAST BARBIL P.S.	Primary		61	86	147	1	4	5
10	MUNCIPAL (GOVT.) H.S., BARBIL	Upper Pr. and Secondary		141	75	216	2	3	5
11	S.S.V.M, BARBIL	Pr., Up Pr. and Secondary		509	437	946	4	4	8
12	RATAN PRADHAN ME SCHOOL	Upper Primary only		45	37	82	1	1	2
13	WARD NO.4 P.S.	Primary		86	86	172	3	3	6
14	BARBIL PRIMARY MUKTAB	Primary	5	45	16	61	1	1	2
15	GURUNANAK KHALSA SCHOOL	Pr., Up Pr. and Secondary		351	294	645	10	8	18
16	BARBIL GIRL'S H.S.	Upper Pr. and Secondary	6	0	118	118	0	7	7

17	BARBIL NODAL UP SCHOOL	Primary with Upper Primary		324	297	621	8	7	15
18	MAGAN SAHI N.P.S	Primary		18	14	32	2	0	2
19	P.H.D. PRIMARY SCHOOL	Primary	8	163	162	325	3	4	7
20	P.H. M.E. SCHOOL	Upper Primary only		34	46	80	1	0	1
21	PAL HUTTING N.P.S.	Primary		24	31	55	2	0	2
22	GOPABANDHU HS BARBIL	Pr., Up Pr. and Secondary	9	183	148	331	1	6	7
23	NEW BARBIL U.G.U.P. SCHOOL	Primary with Upper Primary	10	202	202	404	6	5	11
24	ST. MARY ODIA HS	Upper Pr. and Secondary		106	119	225	5	2	7
25	ST. MARY'S P.S.	Primary with Upper Primary		219	221	440	1	5	6
26	CHATAI HUTTING N.P.S.	Primary	12	83	61	144	1	4	5
27	KALINGA M.E. SCHOOL	Upper Primary only		45	49	94	1	1	2
28	KALINGA P.S.	Primary		139	125	264	3	4	7
29	MADHUSUDAN P.S.	Primary		102	96	198	1	3	4
30	CHAMPUABASTI P.S.	Primary	13	45	59	104	1	1	2
31	GOVERNMENT HIGH SCHOOL, MATKAMBEDA	Upper Pr. and Secondary		301	169	470	9	4	13
32	CHAMPAKESWAR BASTI P.S.	Primary		34	50	84	2	1	3
33	KALINGA NAGAR NODAL UP SCHOOL	Primary with Upper Primary	14	234	254	488	3	10	13
34	AUROBINDO INSTITUTE OF INTEGRAL EDN	Primary with Upper Primary		124	102	226	2	14	16
35	KALINGANAGAR H.S., MATKAMBEDA	Upper Pr. and Secondary		135	48	183	5	1	6
36	KALINGANAGAR GIRLS H.S.	Upper Pr. and Secondary		0	131	131	0	7	7
37	SUNDARA BASTI P.S.	Primary	15	45	44	89	1	2	3
38	DAMUHUTTING NPS	Primary		103	106	209	2	3	5
Barbil Rural									
1	ULLIBURU U.G.U.P.S	Primary with Upper Primary	Ullibur u	66	63	129	5	0	5
2	HAYARPUR P.S.	Primary	Hayar pur	37	32	69	3	0	3
3	KASIA N.U.P.S	Primary with Upper Primary	Kasia (KA)	103	99	202	4	2	6
4	KASHIA (KHA) NPS	Primary	Kasia (KHA)	24	27	51	2	1	3
5	JAGDASAHI N.P.S.	Primary	Seren da	22	24	46	2	1	3
6	K.B H.S, BHUSUGAON	Upper Pr. and Secondary		91	83	174	3	3	6

7	K.B. M.E. SCHOOL	Upper Primary only		62	47	109	3	1	4
8	SERENDA P.S	Primary		98	112	210	3	1	4
9	ADIVASHI VIKASH SAMITI	Primary with Upper Primary		375	313	688	6	3	9
10	BHUSUGAON P.S.	Primary	Bhusu gaon	93	94	187	2	2	4
11	MODERN SCHOOL	Primary with Upper Primary		76	65	141	3	4	7
12	BHADRASAHI P.S.	Primary	Bhadr asahi	45	27	72	0	1	1
13	JHARGAON UGUP SCHOOL	Primary with Upper Primary	Jhada gaon	127	97	224	5	2	7
14	BHADRASAHI SARASWATI SISU MANDIR,	Primary with Upper Primary		170	161	331	7	11	18

Figure 8.1 Availability of School educational facility



R. Existing Higher Education Facilities

Other than the elementary education facility in the master plan area, there are few no. of colleges and Industrial Training Institutions (ITI) that are available for higher education facility. The details of the available higher education facility are listed below:

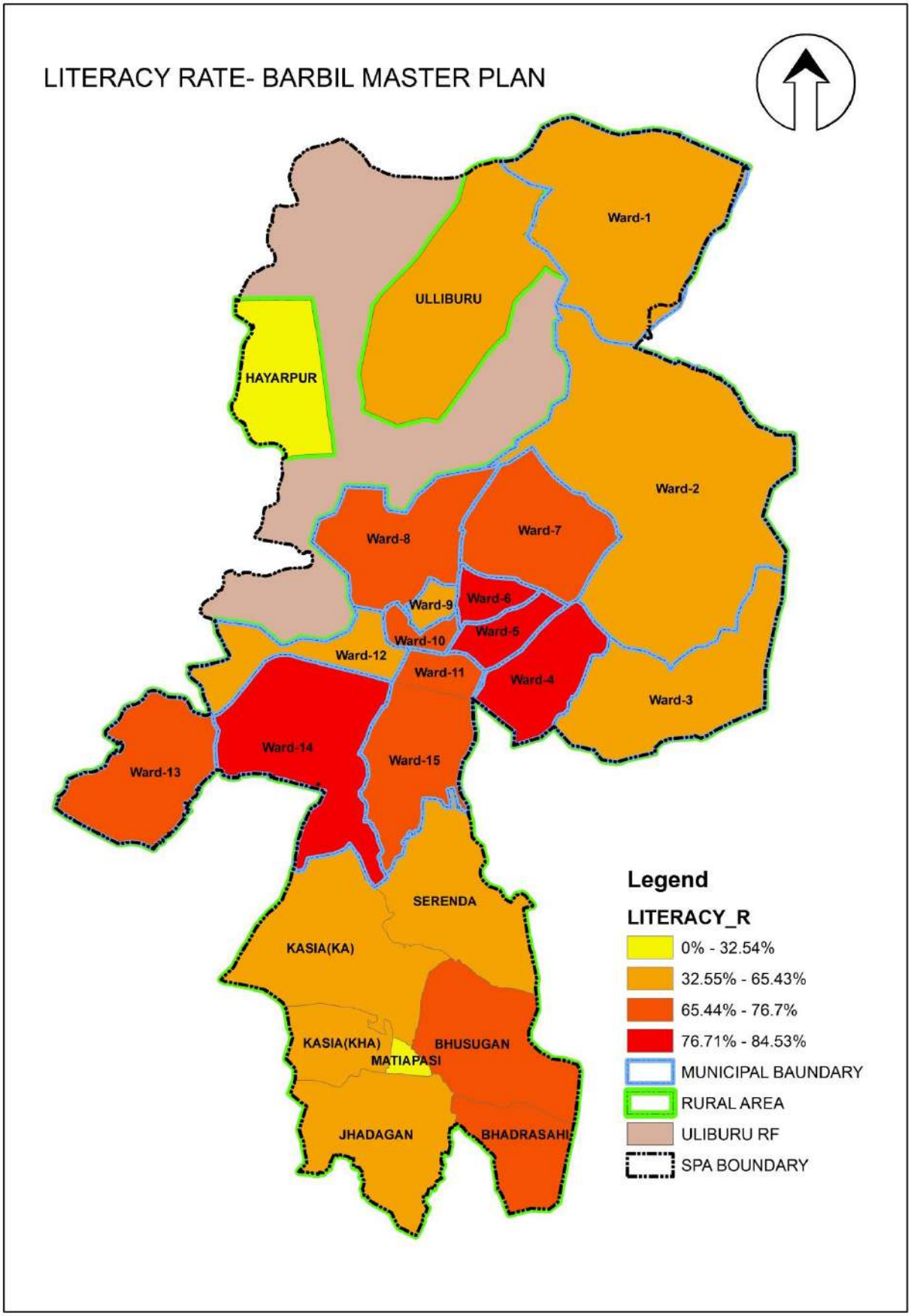
Table 8-2: Existing Higher Education Facility - Barbil Master Plan

Higher Secondary Education Facility		Total	Arts	Science	Commerce	
Barbil (MPL)	Barbil (Junior) College, Barbil	416	256	64	96	
Bachelor Degree Facility		**TOTAL**	**Arts**	**Phy. Sc**	**Bio. Sc**	**Comm.**
Barbil (MPL)	Barbil Degree (Degree) College, Barbil	304	128	48	32	96
ITI Facility						
Barbil (MPL)	Government Industrial Training Institutes (I.T.I.), Barbil	795	In ITI, technical education is provided in13 nos. of trade such as Electrician, Fitter, Wiremen, Machinist, Turner, MMTM, MMV, Electronics, IT&ESM, MR&MHV, Welder, Plumber etc. under NCVT course And MEMM trade under SCTVT course			

Figure 8.2 Availability of School educational facility

1- Shri Gopbandhu Hindi High School, 2- Barbil High School, 3- Guru Harikrishan Central Academy School, 4- SSA School, 5- St. Mary's School, 6- Kalinga High School Matkambeda

Map 8-1 Literacy Rate in Master Plan Area of Barbil



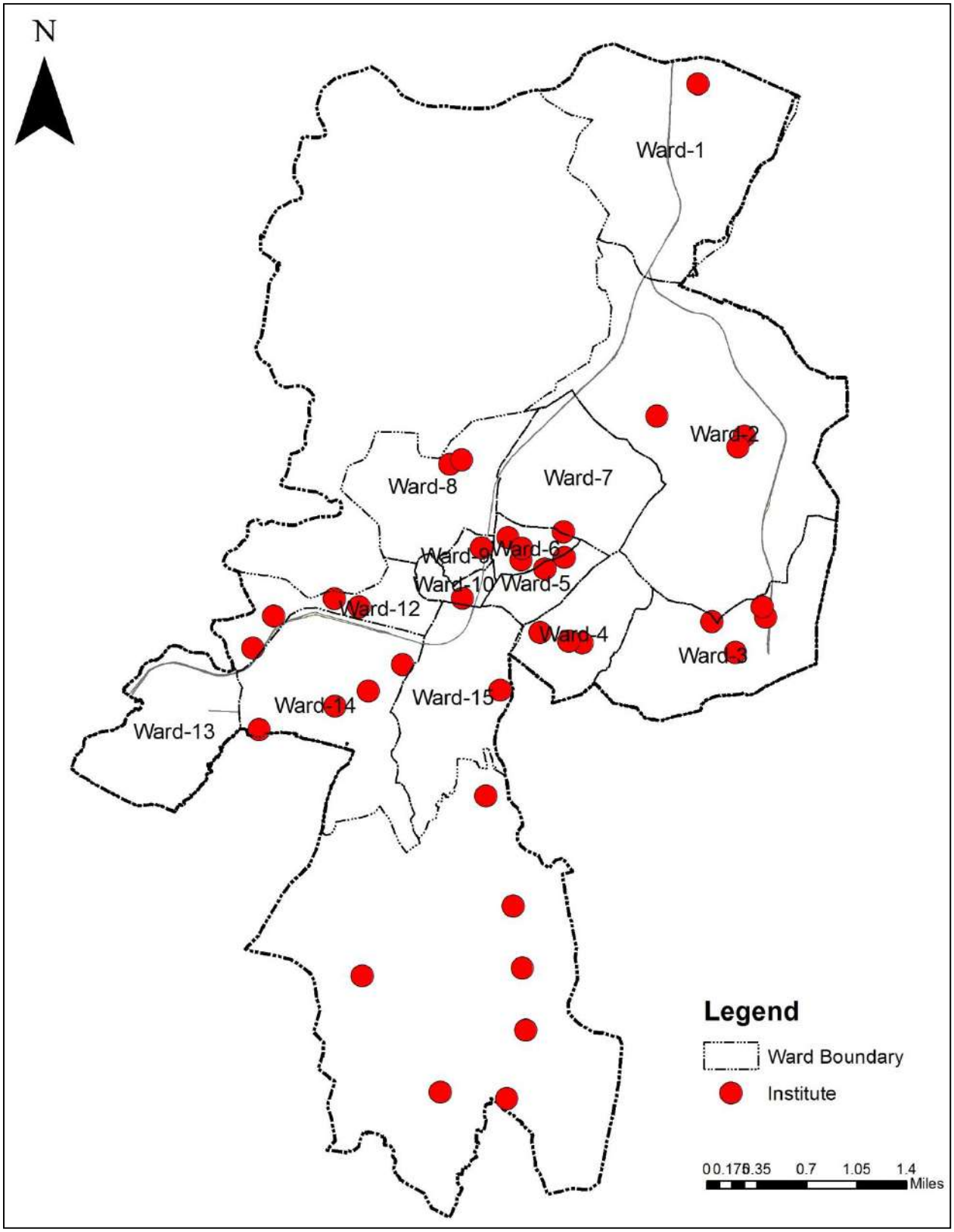
Barbil College is one of the key institutions in Keonjhar district providing both higher secondary and bachelor degree facility and is a standalone institute in the master plan area with science, arts and commerce stream. In total 27 teaching and 31 non-teaching staffs are present for different faculty and administrative support. Other than Barbil Municipal area, students from surrounding areas such as Bada Jamda (Jharkhand), Kiriburu, Bolani, some part of Champua sub-division are depend on the college for higher education facility.

Government Industrial Training Institutes (I.T.I.), Barbil is one of the pioneer institutes in the district established in 1964, providing technical education facility in the region. With a total of 795 student intakes in 13 trades, Barbil ITI is one of the largest ITI in the district. As per the guidelines of the State government, 75% of the students from state domicile have reservation in the admission process, whereas rest 25% seats are allowed for outside district. For encouraging women education in technical stream, 30% seats in all trades are reserved for women. The institute is directly funded under Director, Technical Education, Government of Odisha. The institute has hostel facility for both gents and ladies, canteen facility for both students and faculty.

Also under CSR activity, Jindal Power Ltd. has developed a Community College within the ITI campus that provides certificate course to the students. It is also noticed that students from this institute are engaged by different employer like Jindal Steel & Power Ltd., Arya Steel, Essel Mining, Rungta Mines etc. after passing out from the institute. Due to higher absorbing capacity of these employers in the mining & industrial sector, it is seen that there is a growing demand for technical education in the region and for the same a land area of 10 ac has been allotted for the Second Campus of ITI Barbil. But due to the restriction in mining activity, it is seen that there is a decline enrolment rate in the student for the last few years. However, the recent decision of the state government on opening up the mining activities would definitely helpful in student absorption by the mining employers and at the same time it would helpful for increasing of student enrolment in the institute.

In the rural environs of the master plan area, there is no availability of higher education facility. Basically, the students in these areas depend on Barbil Municipal for the same.

Map 8-2 Existing Educational Facilities in Master Plan Area of Barbil



8.2.1 Healthcare Facility

To ensure development of any region, it is significant that every resident have access to adequate health facilities and live a healthy life.

S. Existing Healthcare Infrastructure

The existing scenario on health facility in the master plan shows that the residents of Urban Barbil have better access to healthcare than the rural areas. For healthcare facility, 16 bedded Government Community Health Centre (CHC) is available in the municipal area. Other than the Government CHC, there are few private hospitals/ clinical diagnostic centres such as Aarati Hospital- Kalinga road, J.M Hospital and Tarini Diagnostics Centre that cater healthcare facility in the municipal area.

The availability of infrastructure in the Government CHC is listed below:

Government Community Health Centre, Barbil			
No. of beds - 16			
Facilities Available	Indoor – Outdoor X-Ray Pathology Emergency RNTCP NHM RSBY-BKKY NRC PM Centre	Manpower details	Doctor- 5 Staff Nurse -5 Pharmacist- 1 Lady Health Visitor (LHV) -1 Health Worker – 1 (male) + 2 (female) Radiographer – 1 Lab technician -1 Sweeper -2 Attendants – 1 Cook - 2

From both Barbil Urban and Rural, people flock in large numbers to avail themselves of the outdoor and indoor facilities of the CHC. However, the CHC lacks a lot in terms

of furnished lab, PP Center, 24 hrs drug disposing facility, separate building for administrative wing and proper drainage facility within the hospital campus etc.

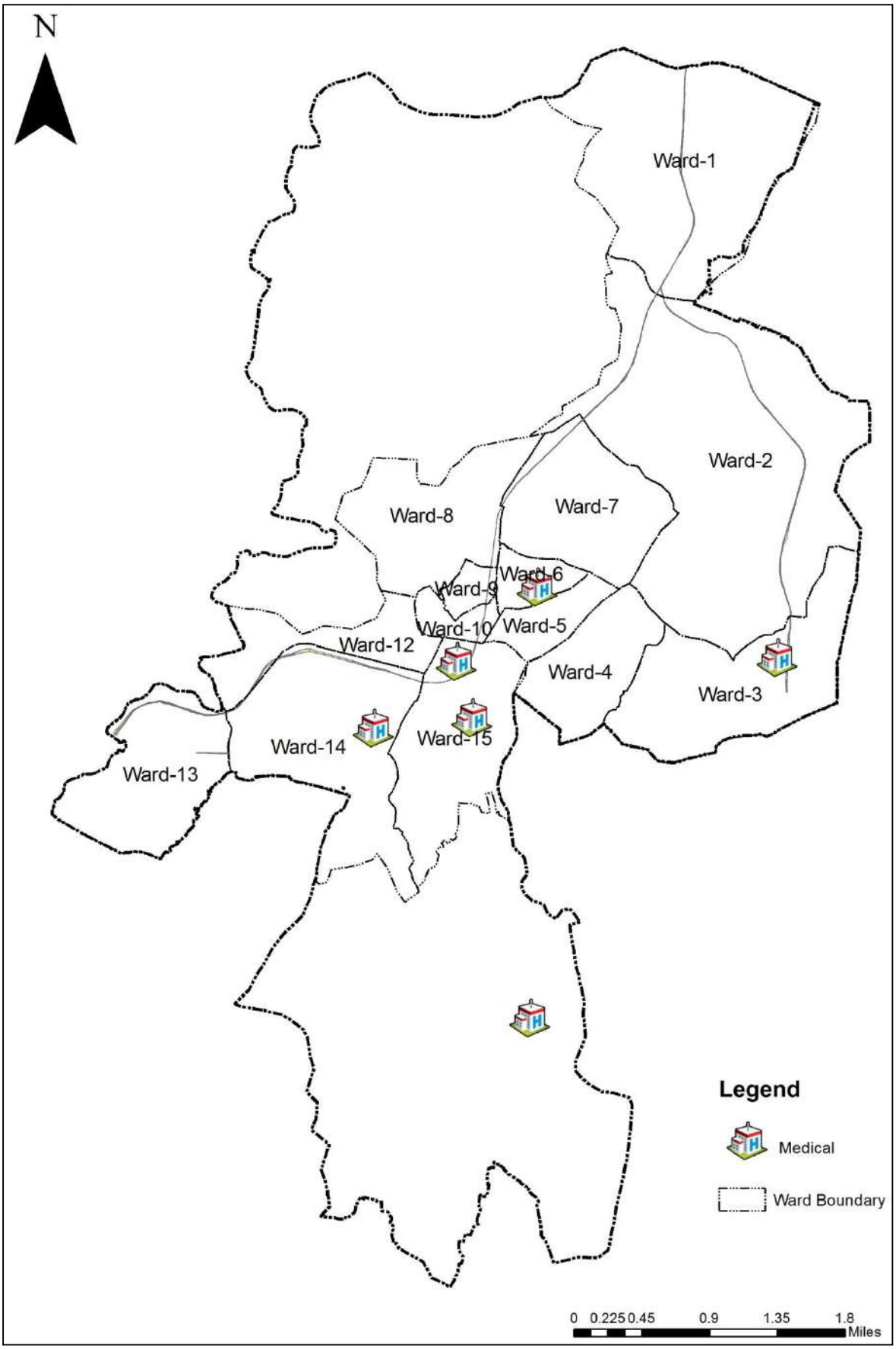
As per the guidelines of National Rural Health Mission (NRHM), provisions are made for healthcare facility in the rural areas. Auxiliary Nursing Midwives (ANM) units are provided covering 2-3 villages in each gram panchayat. Under each ANM, a trained female community health activist ASHA or Accredited Social Health Activist (ASHA) members are deployed at village level to work as an interface between the community and the public health system. In this line, ANMs are set up in Serenda, Bhadrasahi and Balaguda villages which serve all the villages within the master plan area. The mechanism for provision of healthcare facilities can be presented as follows:

Table 8-3; Rural Health system Mechanism- Barbil Rural

Block Name	Community Health Centre (CHC)	Primary Health Centre (PHC)	Name of Sector	Name of Sub-sector (ANM)	Village Covered
Joda	Basudevpur CHC	Guali PHC	Guali	Serenda	Kasia (KA) Kasia (KHA) Serenda
				Bhadrasahi	Jhadagaon Bhadrasahi
			Bolani	Balaguda	Ulliburu Hayarpur

All ANMs are used to submit Health Status Report to PHC on regular basis, mentioning the status of malaria and any other epidemics that prevailing in the area for healthcare assistance. Village Health Nutrition Day (VHND) and RBSK micro planning is held on weekly basis for providing healthcare support to the villagers. Other than that different programme such as Rastriya Swasthya Bima Yojna (RSBY), Biju Krushak Kalayn Yojna (BKKY), Janani Sishu Surakhya Yojna (JSY) etc are going on in the rural areas under NRHM.

Map 8-3 Existing Health Facilities in Master Plan Area of Barbil



8.2.2 Recreational and Socio-cultural Facility

Number of facilities in the terms of parks, playground, town halls, and marriage mandaps are present in the city meeting the recreational and socio-cultural needs of the people. Following table highlights some of the available facilities in Barbil:

Name of Park	Shiv Lal Park
Location	Ward no.-5, Near PWD Bungalow
Facilities	Children's Play area Jogging track

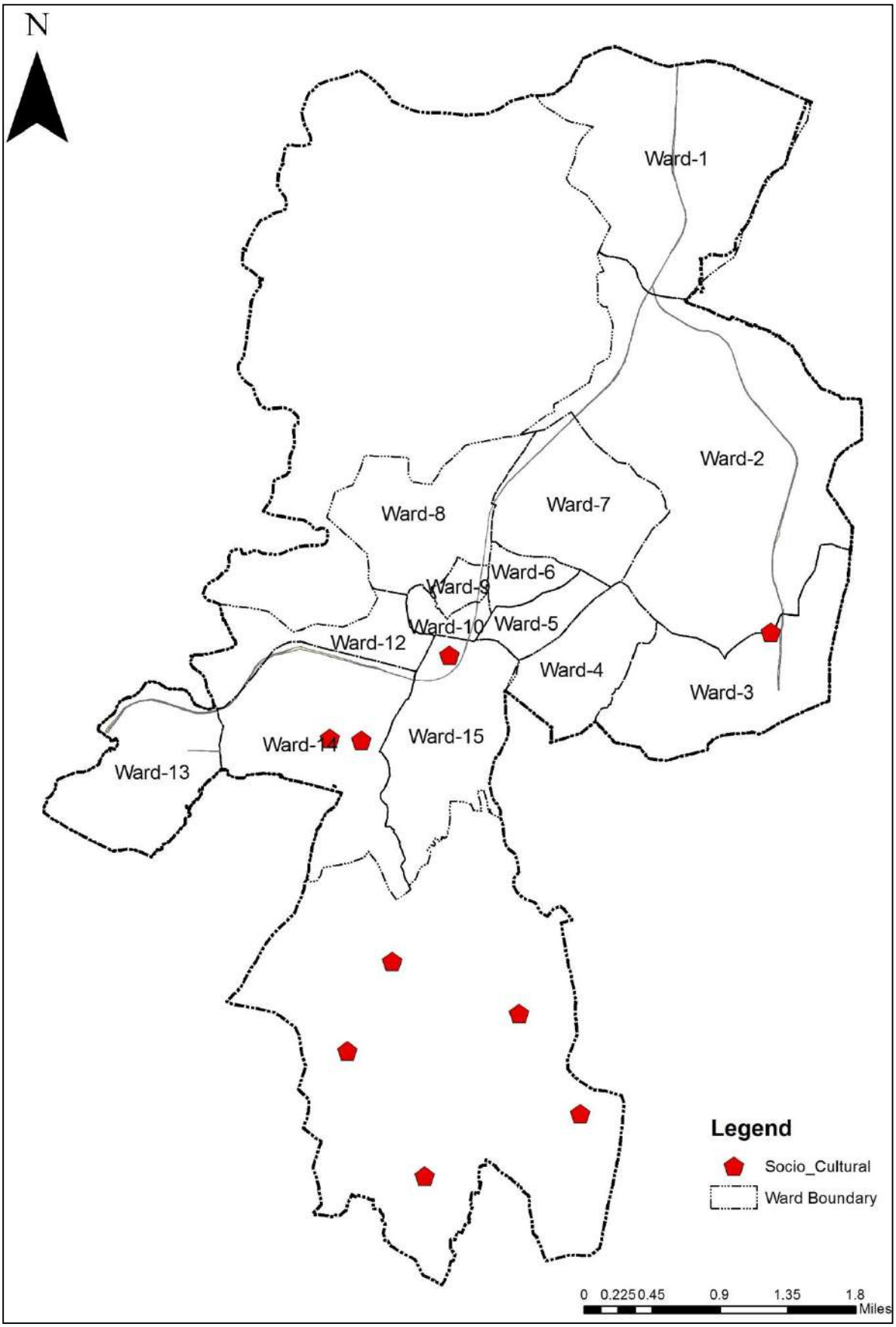
Name of Park	Forest Park in Santbahal
Location	Ward No.-8 , Near Pump House- Karo River
Facilities	Rest room Picnic spot Dense plantation

Name of Facility	Bikas Mahal Playground
Location	Ward no.-6
Facilities	Meeting hall Playground

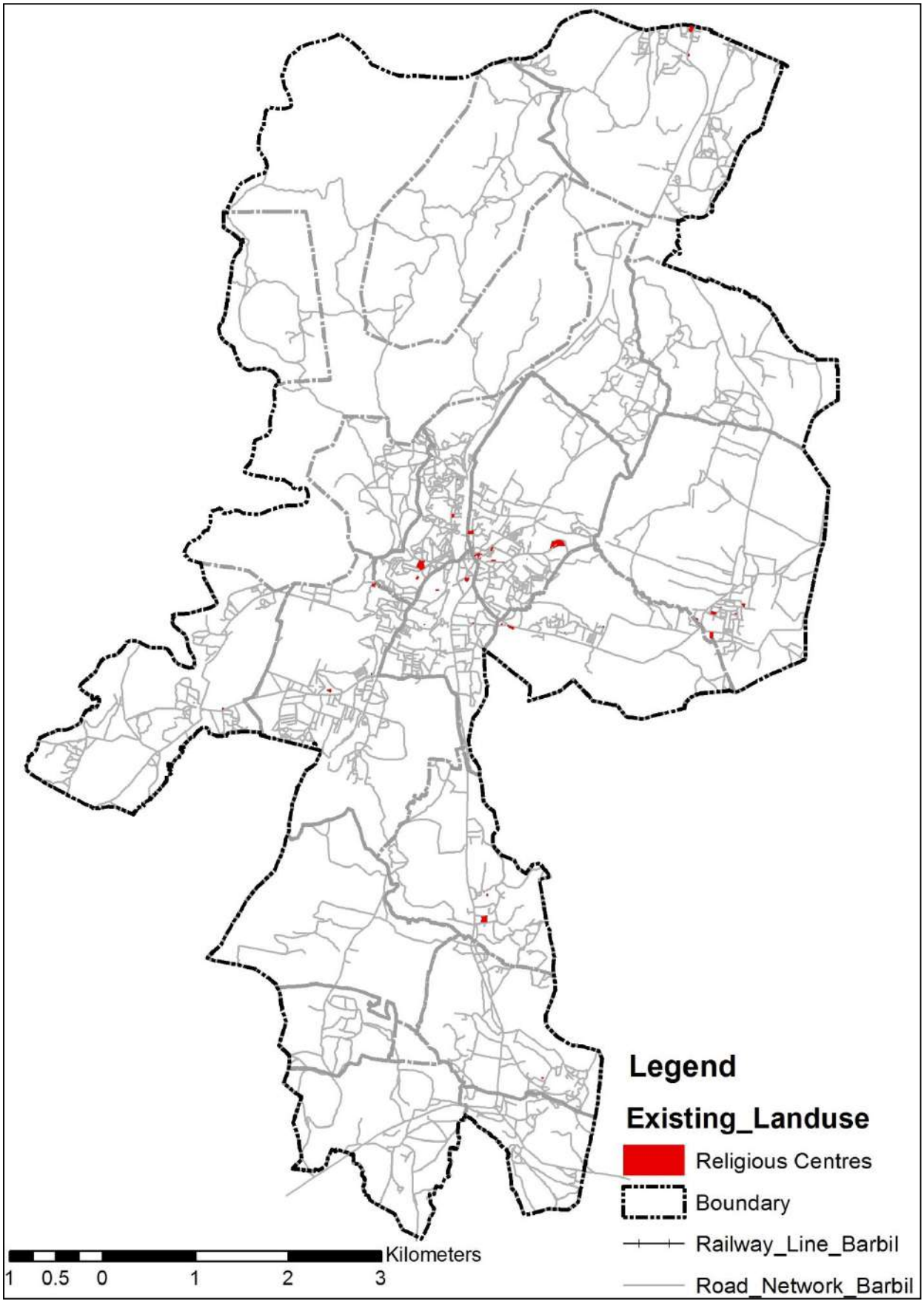
Name of Facility	Kalyan Mandap, Barbil Municipality
Location	Ward No.-6 , Near Bikas Mahal
Facilities	Space for arranging socio-cultural activities like marriages On street parking

Other than these major facilities, there are a no. of small parks and playground such as OMC Park in ward no.10, Park near Kalinga colony, neighbourhood parks in police colony etc. present within the municipal boundary. Currently a town hall is under construction in ward no.-4 near East Barbil U.P School on the way to Thakurani, by Rungta Mines Pvt. Ltd under CSR activity.

Map 8-4 Existing Socio Cultural Facilities in Master Plan Area of Barbil



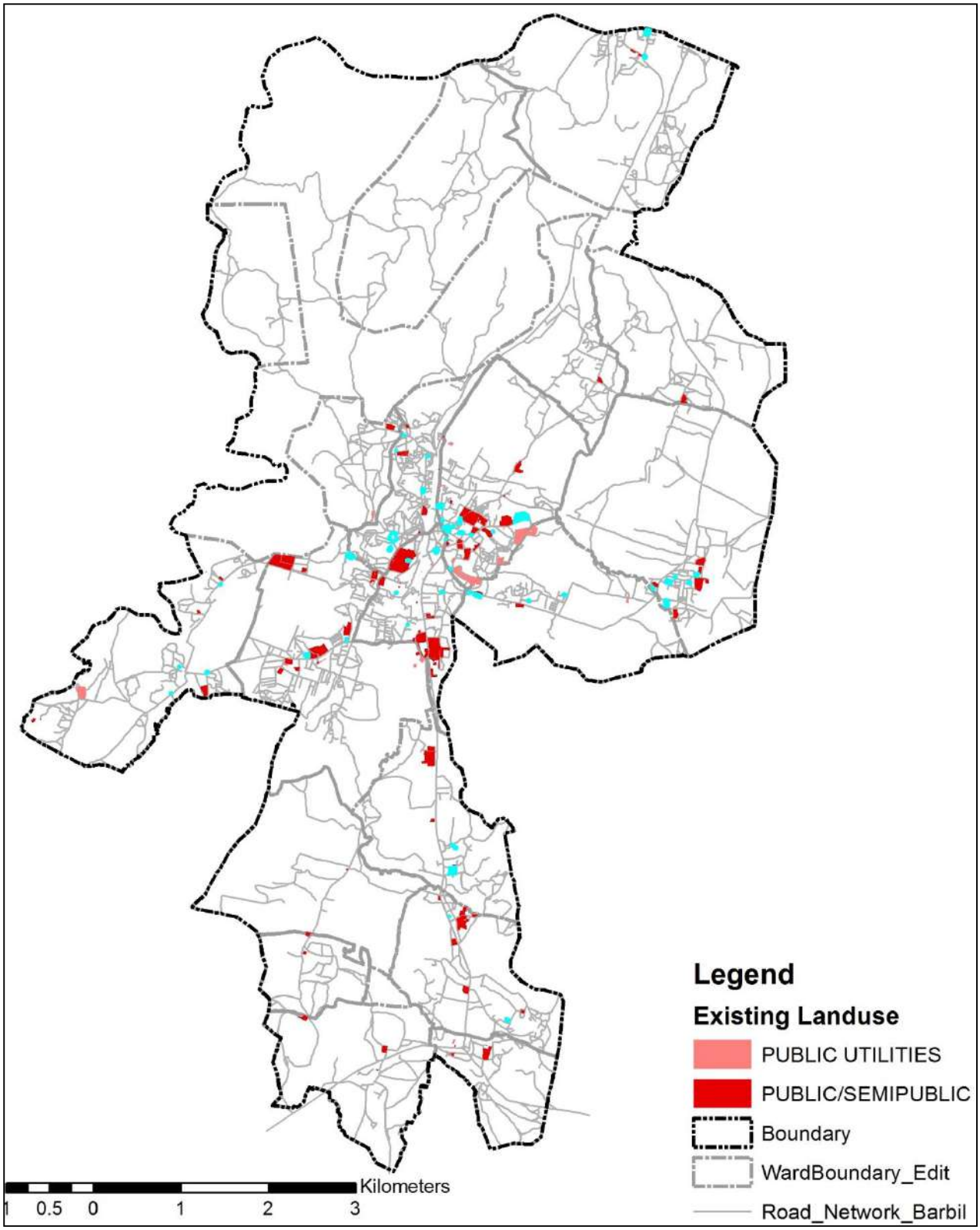
Map 8-5 Existing Recreational Facilities in Master Plan Area of Barbil



Client:
Special Planning Authority, Barbil

Consultant:
REPL, New Delhi

Map 8-6 Existing Public, Semi- Public Uses in Barbil Master Plan Area



8.2.3 Assessment of Future Educational Facility Requirement

Educational institutions are proposed based on URDPFI guidelines which are distributed spatially. Requirement of educational institutions as per URDPFI guidelines are as follows:

Table 8-4: Status of Existing Education Facility and Future Requirement in Barbil

Educational Facilities	*Norms (Population requirement for 1facility)*	*Existing Facilities in 2015 (no.)*	*Future requirement (2030) (no)*	*Proposed Facilities for 2030 (no.)*
Pre-primary, nursery school	2500	25	68	43
Primary school (class 1 to 5)	5000			
Senior secondary school (class 6 to 12)	7500	16	15	NOT Required
Integrated school without hostel facility (class 1 to 12)	90000	0	2	2
Integrated school with hostel facility (class 1 to 12)	90000	0	2	2
School for physically challenged	45000	0	3	3
College	125000	1	1	NOT Required
Technical Education (ITI)	100000	1	2	1
Engineering college	1000000	0	0	NOT Required
Medical college	1000000	0	0	NOT Required
Other Professional college	1000000	0	0	NOT Required

Source: URDPFI

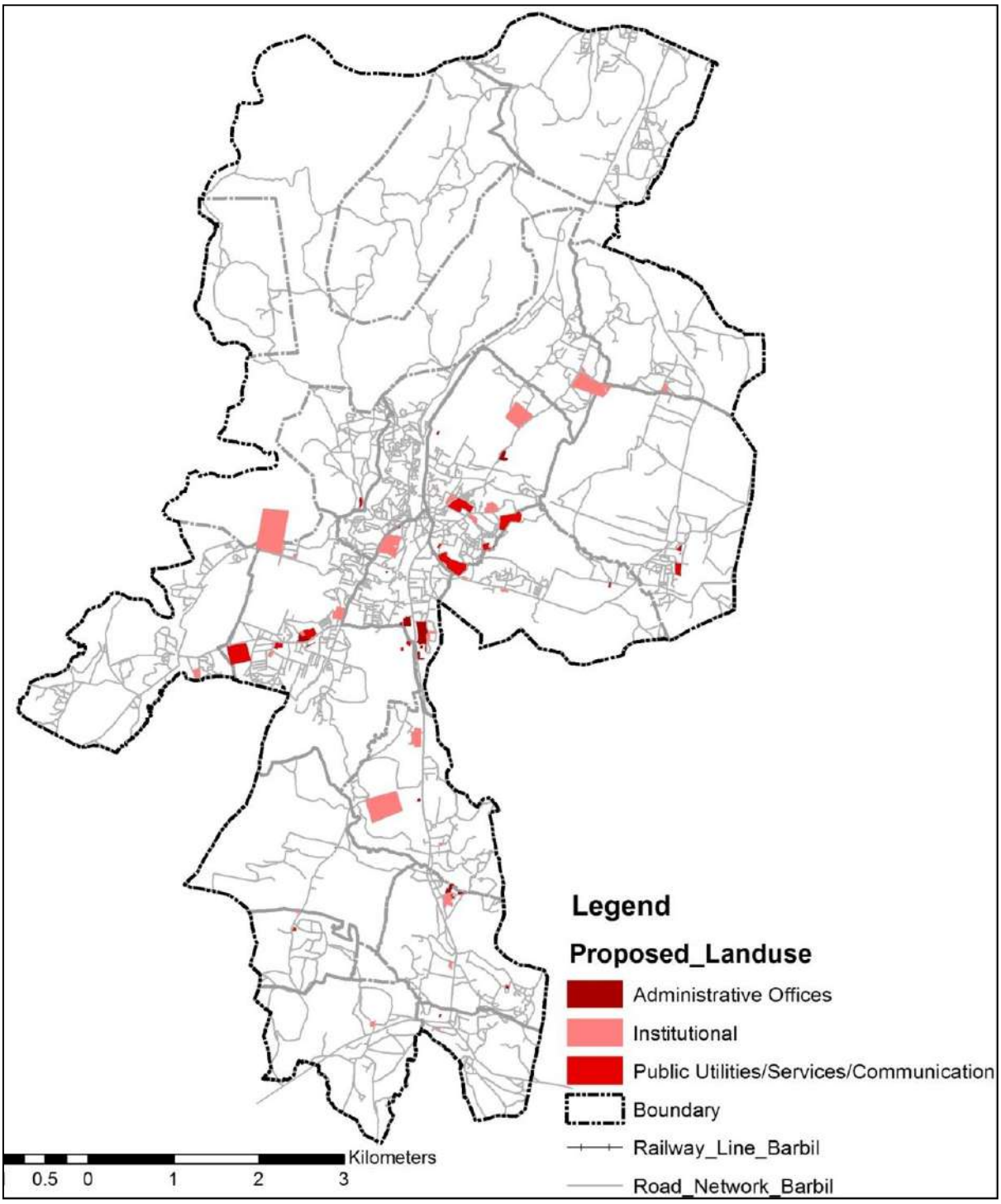
As per the table shown above, the barbil town requires higher number of pre-primary and primary school to educate the growing number of children in 2030. There are inadequate number of secondary schools at present in the Barbil town and the student teacher ratio in town is of concern at few locations. The schools are also located at small campuses which prevent students to participate in outdoor activities.

There will be a shortage of around 43 primary, 2 integrated schools with hostel facility, 3 schools for physically challenged people and 1 technical education institution in Barbil by the year 2030. The major cause of concern is the under enrolment of students in the primary and secondary schools. The primary schools in Barbil urban has an enrolment of average around 148 students while in the upper primary and secondary schools average enrolment is of around 230 students and in primary to secondary schools average enrolment is of around average 499 students these number needs to

be enhanced by 2030. In Barbil rural there are 6 primary schools with an average enrolment is of 109 students, average enrolment of around 260 students in upper primary and primary with upper primary schools whereas in upper primary and secondary school 174 average enrolment is there which needs to be enhanced in Barbil rural areas.

There is only one government ITI in the town which is not sufficient and one more has to be proposed which can be an added advantage to the economically weaker students. The area has a potential for developing as a hub for residential education in the region and as such land pooling can be done at the suitable location at the town for attracting premier educational institutions.

Map 8-7 Proposed Public, Semi-public and Utilities in Barbil Master Plan Area



8.2.4 Assessment of Future Health Requirement

As per URDPFI guidelines, health facilities are proposed based on URDPFI guidelines which are distributed spatially. Minimum area and threshold population requirement of health facilities as per URDPFI guidelines are as follows:

Table 8-5: Medical facilities requirement as per URDPFI Guidelines

Sr. No.	Medical Facilities	Threshold Population	Min. Area Required per Unit (in ha)
1	Dispensary	15,000	0.08 to 0.12
2	Nursing home, child welfare and maternity centre	45,000 to 1,00,000	0.20 to 0.30
3	Intermediate Hospital (Category B)	1,00,000	1.00
4	Intermediate Hospital (Category A)	1,00,000	3.70
5	Multi-Speciality Hospital (NBC)	1,00,000	9.00
6	Speciality Hospital (NBC)	1,00,000	3.70
7	Family Welfare Centre	50,000	500 to 800 sqm
8	Diagnostic centre	50,000	500 to 800 sqm
9	Dispensary for pet animals and birds	1,00,000	300 sqm

Source: URDPFI

There are only 4 medical facilities in the town out of which only 1 Government health facility is in the town. As per the URDPFI guidelines, 8 dispensaries, 1 number each of intermediate hospital, multispecialty hospital and speciality hospital is required in the Barbil Master Plan area.

Table 8-6: Status of Existing Education Facility and Future Requirement in Barbil

Health Care Facilities	*Norms (Population requirement for 1facility)*	*Existing condition in 2015 (no.)*	*Future requirement for 2030 (no)*	*Proposed Facilities for 2030 (no.)*
Dispensary	15000	2	11	9
Nursing home, child welfare and maternity Centre	45000	1	3	2
Polyclinic with some observation beds	100000	16	2	2
Intermediate hospital (category A)	100000	1	2	2
Intermediate hospital (category B)	100000	NIL	2	2
Multi-specialty hospital	100000	1	2	1

Specialty hospital	100000	1	2	2
Family Welfare Centre	50000	1	3	2
Diagnostic Centre	50000	0	3	3
Dispensary for pet animals and birds	100000	1	1	Not Required

Source: Census of India 2011 (Town Directory) and URDPFI

8.2.5 Assessment of Socio- Cultural Facilities for Future Requirement

As per URDPFI guidelines, socio- cultural facilities are proposed based on URDPFI guidelines which are distributed spatially. Requirement of socio- cultural facilities as per URDPFI guidelines are as follows:

Table 8-7: Socio- cultural facilities requirement as per URDPFI Guidelines

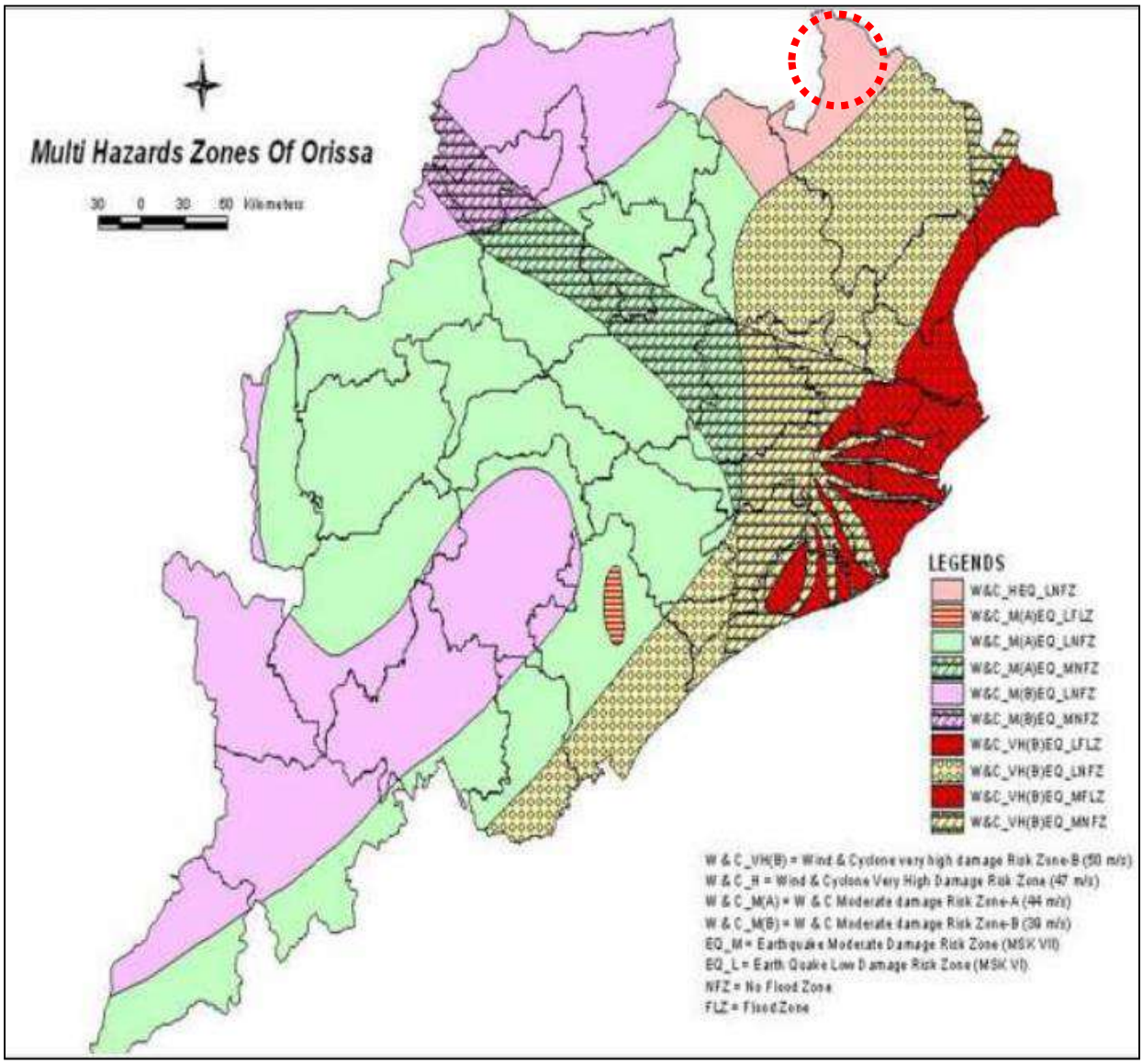
Sr. No.	Socio- cultural Facilities	Threshold Population	Min. Area Required per Unit (in ha)
1	Community hall, mangal karyayala, barat ghar/ library	5,000- 15,000	2000 sqm
2	Music, dance and drama centre	1,00,000	0.20 to 0.30
3	Recreational Club	1,00,000	0.20 to 0.30
4	Meditation and spiritual Centre	1,00,000	1.00
5	Community park	1,00,000	3.70
6	Community level Multipurpose ground	1,00,000	9.00
7	District Sports Centre	1,00,000	3.70
8	Family Welfare Centre	1,00,000	500 to 800 sqm
9	Diagnostic centre	1,00,000	500 to 800 sqm
10	Dispensary for pet animals and birds	1,00,000	300 sqm

8.2.6 Safety and Security

For maintenance of proper law and order, the security force must keep pace with the growth and development of an area. The main agency looking after security aspect in the city is Barbil Police. Fire services have to play pivotal role and be fully prepared in protecting people from fire hazards, building collapses, road accidents and other unforeseen emergencies etc. According to the Disaster Management Plan prepared

by Housing and Urban Development Department of Odisha Government, Barbil falls under the Wind & Cyclone very high damage risk zone with a wind velocity of 47 m/s, earth quake low damage risk zone and no flood zone.

Map 8-8 Multi Hazard Zones of Odisha



The Planning Norms/ Standards and Development Controls for Security (police, fire and disaster management) facilities are given in Table below:

Table 8-8: Safety facilities requirement as per URDPFI Guidelines

Sr. No.	Safety Facilities	Threshold Population	Min. Area Required per Unit (in ha)
1	Police Post	40,000 – 50,000	0.08 to 0.12
2	Police Station	90,000	0.20 to 0.30
3	Sub fire station/ Fire Post	Within 3-4 km radius	0.20 to 0.30
4	Fire Station	2 lakh population or 5-7 km radius	1.00
5	Disaster Management Centre	One in each administrative zone	3.70

8.3 Problems and Issues

i. Interestingly the access to the secondary education is much better than primary. This shows large number of resident student population in the town.

ii. As the Barbil is an industrial town but there are very few health facilities and locals have to travel to cuttack to avail the facilities hence, health facilities need to be provide in the town.

iii. Quality of education and health facilities needs to be upgraded at par with that of State and district level so as to reduce pressure on and travel to other places.

iv. Central and State Governments have formulated a number of policies and programmes aimed at improving the indices of education and health which need to be implemented effectively in a time bound manner.

v. Most of the higher educational facilities are in the private sector and the quality needs to improve in terms of facilities, infrastructure and teachers to meet competitive standards.

8.4 Potential related to Education and Health facilities in Barbil

i. The potential for optimizing use of resources using modern ICT technologies has not been fully realised especially in the healthcare sector eg. Tele-medicine for treatment of distant patients and super speciality training for health personnel. Since this area is serving at district level, the potential for linking with National Knowledge Network of high speed broadband connectivity needs to be done on priority basis.

ii. Emerging specialty areas both in education (design, animation, gaming, biotechnology) and health (cancer, wellness, trauma centres) need to be developed.

iii. Due to the availability of raw material in the region, industries can be attracted by various initiatives like policies benefitting the people, providing subsidies and loans for installing factories/ industries, providing basic infrastructure to start industries etc.

Based on the analysis of the survey data and comprehensive study of the area, the following objectives and proposals of Social Infrastructure sector emerged.

8.5 Objectives

8.5.1 Education

i. Education for All in 6-14 age group with access, retention and quality
ii. Secondary education for all
iii. Skill development for youth
iv. Improvement in quality of Higher, Technical and Medical Education

8.5.2 Health

i. Health for All by providing access to quality health facilities so as to reduce Infant Mortality Rate (IMR), Maternal Mortality Rate (MMR), Total Fertility Rate (TFR), Malnutrition Rate and Disease Prevalence Rate(DPR) and increase Contraception Prevalence Rate (CPR) and Life Expectancy.

8.6 Steps to achieve the objectives

8.6.1 Education

i. Sarva Shiksha Abhiyan (SSA) as per spatial and population norms of Programme in a time bound manner.
ii. Rashtriya Madhyamik Shiksha Abhiyan (RMSA) as per spatial and population norms of Programme in a time bound manner.
iii. National Skills Development Mission as per spatial and population norms of programme.
iv. Scheme for establishing Medical Colleges and Technical Colleges.
v. Public-Private-Partnership (PPP) for funding new institutions
vi. Technological advancement in the provisioning of social infrastructure through high speed broadband connectivity among institutes under National Knowledge Network (NKN), Extension campuses.

8.6.2 Health

i. Provision of health facilities as per norms under National Rural Health Mission (NRHM) and National Urban Health Mission (NUHM) in a time bound manner.

ii. PPPs for expansion of health facilities such as hospitals and super specialty centres, medical colleges and para medical services especially Auxiliary Nurse Midwives Training Centre (ANMTC).

iii. Technological advancement in the provisioning of health infrastructure through high speed broadband connectivity among institutes under National Knowledge Network (NKN), Telemedicine and telepreventive medicine.

In order to attain the above objectives of Social Infrastructure in Barbil Master Plan Area, proposals based on local assessment of requirements and consultation with stakeholders have been prepared. These proposals will be implemented through State Government department/ agencies/ private developers/ PPP mode.

8.7 Proposals

As per the requirement of Social Infrastructure facilities assessed in the chapter earlier, proposals for Education, Health, Socio- cultural facilities and other Socio- cultural facilities are given at appropriate location in the Master Plan for Barbil- 2030 . Within this land use total 143.49 ha land is proposed for uses which will be allowed as per Zoning Regulations. For cremation/ burial ground 2 ha land is proposed in Master Plan. Social Infrastructure Facilities are given as per URDPFI guidelines. Requirement of facilities are given in table below:

Table 8-9: Existing Infrastructure Facilities requirement as per URDPFI Guidelines

S. No.	Facilities	Existing Area (in ha)	Total Area Required (in ha)	Extra Area Required (in ha)
1	Education	25.66	59.99	34.33
2	Health	5.63	21.04	15.41
3	Socio- cultural	1.70	5.02	3.32
4	Cremation/ Burial	0.50	2.00	1.50
5	Police, Civil Defence	5.49	2.25	-
6	Safety Management	-	4.57	4.57
7	Sports	20.35	63.41	43.06
8	Post & Telegraph	0.72	- 0.37	-

Table 8-10: Social Infrastructure Facilities requirement as per URDPFI Guidelines for Barbil

Facilities	*Population requirement for 1 facility*	*Proposed Facilities (No.)*	*Min. Area Required for each Unit (Ha)*	*Total Approx. Area Required (Ha.)*
Educational Facilities				
Pre-primary, nursery school	2500	43	0.5	21.5
Primary school (class 1 to 5)	5000			
Senior secondary school (class 6 to 12)	7500	NOT Required	1.8	0
Integrated school without hostel facility (class 1 to 12)	90000	2	3.5	7
Integrated school with hostel facility (class 1 to 12)	90000	2	3.9	7.8
School for physically challenged	45000	3	0.7	2.1
College	125000	NOT Required	5	0
Technical Education	100000	1	4	4
Sub total				**42.4**
Health Care Facilities				
Dispensary	15000	2	0.08	0.16
Nursing home, child welfare and maternity Centre	45000	1	0.2	0.2
Polyclinic with some observation beds	100000	2	0.2	0.4
Intermediate hospital (category A)	100000	2	3.7	7.4

Intermediate hospital (category B)	100000	2	1	2
Multi-specialty hospital	100000	1	9	9
Specialty hospital	100000	2	3.7	7.4
Family Welfare Centre	100000	3	0.08	0.24
Diagnostic Centre	100000	3	0.08	0.24
Dispensary for pet animals and birds	100000	1	0.03	0.03
Sub total				**27.07**
Socio-cultural Facilities				
Community room	5000	23	0.08	1.84
Community hall	15000	8	0.2	1.6
Recreational club	100000	1	1	1
Music, dance and drama Centre	100000	1	0.1	0.1
Meditation and spiritual Centre	100000	1	0.5	0.5
Sub total				**5.04**
Police, Civil Defense and Home Guards				
Police station	90000	1	1.5	1.5
Police Post	50000	2	0.16	0.32
Sub total				**1.82**
Safety Management				
Fire station	200000	1	1	1
Disaster Management Centre	1 in administrative zone	1	1	1
Fire Training Institute	1 in City Level	1	3	3
Sub total				**3**
Sports facilities				
District sport Centre	100000	1	8	8
Neighborhood play area	15000	8	1.5	12
Residential unit play area	5000	23	0.5	11.5
Sub total				**31.5**
Shopping				
Convenience shopping	15000	10	0.15	1.56
Local shopping including service Centre	15000	10	0.46	4.6
Community Centre with service Centre	100000	2	5	10
Sub total				**16.16**
Total Area in ha.				***126.99***

8.7.1 Education

Education facilities in Master Plan Area are ample but in future few facilities are need to be proposed. There is deficiency in few areas, particularly secondary education facilities. With the consequent potential for availability of financial resources for this purpose, involvement of the private sector in the development of educational facilities is growing. With the limited availability of land, existing facilities need to be upgraded and extended as per policies/ norms. The educational institution premises may be permitted to function in two shifts, subject to statutory approvals and any other conditions that may be stipulated by the relevant competent authority.

8.7.2 Health

Health facilities in Master Plan Area are ample in terms of availability of beds but there is lack of dispensary and other health facilities in the area. There is deficiency in few areas, particularly secondary education facilities. With the limited land resource, existing facilities need to be upgraded and extended as per policies/ norms.

Essential provisions shall be made for Old Age Home-cum-Care Centres for Senior Citizens and Mentally Challenged by way of specialised / target group oriented facilities, which will also relieve the pressure on general hospitals to some extent. Premises earmarked for health facilities should also include other medical streams like Ayurvedic/ Homeopathic medicine, governed by any statutory code / body.

8.7.3 Socio- Cultural Facilities

A. Sports facility

Sports activities are an important part of physical and social development of an individual and, at another level sports activities have a significant aspect of, and potential in the form of congregational and competitive events at the community, city and regional levels. Keeping this in view norms and space standards separately for sports facilities at neighbourhood level and city level have been proposed with the aim of development of sports and play areas for all age groups at appropriate levels.

B. Security

For maintenance of proper law and order, the security force must keep pace with the growth and development of an area. The main agency looking after security aspect in the city is Keonjhar Police.

C. Fire

Guidelines for locating fire stations and other firefighting facilities (As per MPD):

- Fire stations should be located so that the fire tenders are able to reach any disaster site within 3-5 minutes
- Fire stations should be located on corner plots as far as possible and on main roads with minimum two entries.
- In the new layouts, concept of underground pipelines for fire hydrants on the periphery exclusively for firefighting services should be considered.
- Necessary provisions for laying underground/ over ground firefighting measures, water lines, hydrants etc. may be kept wherever provision of fire station is not possible.
- The concerned agencies shall take approval from Fire Department for firefighting measures while laying the services for an area.

D. Disaster Management Centre

Guidelines for Disaster Management Centre

With the technological advancement, to some extent mechanism can be developed to mitigate the after effects of the disaster. Areas of vulnerability can be identified and necessary measures can be proposed by the concerned agencies. The concerned local bodies should keep updating the building bye-laws to safeguard against disasters and ensure effective and impartial enforcement. Following policies and strategies for disaster management are proposed:

1. Pre-Disaster Preparedness

i. a) Micro-zonation surveys should be referred for land use planning and be considered while preparing the Zonal Plans and Layout Plans.

- Seismic micro-zonation for selected areas having high growth rates should be taken up on priority.
- On the basis of vulnerability studies and hazard identification, which includes soil conditions, probable intensity of earthquake, physiographic conditions of the area, fault traces, etc., local level land use zoning and planning should be undertaken.

b) Building bye-laws should incorporate the aspects of Multi Hazard Safety, and

Retrofitting.

- Priority should be given to public buildings (such as hospitals, educational, institutional, power stations, infrastructure, heritage monuments, lifeline structures and those which are likely to attract large congregation) for their ability to withstand earthquake of the defined intensity.
- Suitable action should be taken for retrofitting and strengthening of structures identified as vulnerable as per earthquake manuals and National Building Code. A techno-legal regime has to be adopted for provisions on Multi Hazard Safety aspects.

ii. Vulnerable areas such as areas with high density and poor accessibility in the city should be identified and suitable measures should be proposed.

iii. Sensitize people, particularly school children, about after effects of disaster.

iv. Make people aware through media campaigns and advertisements about emergency procedures and location of emergency shelters etc.

2. Post Disaster Management

i. It has been observed that any disaster is generally followed by break down of communication lines and disruption of essential services. Therefore, the key communication centres should be protected from natural disasters i.e. flood, fire and earthquake etc. and services restoration should be taken up on top most priority. Necessary set-up should be created in each of the concerned department for such eventualities.

ii. Standard type designs and layout should be prepared by the local bodies and made available to the people so that crucial time is not lost in approval of layout plans and building plans after disaster.

Disaster Management Centres have been proposed to serve people in the case of disaster and provide emergency shelters.

8.8 Policies

i. All facilities performance to service standard norms would be stated in the form of a Citizen Charter to match citizens' expectations so that they can play the expected role.

ii. Education and health facilities are primarily concentrated in Barbil among the all towns of the District and people are largely depending on these facilities. New facilities are to be encouraged in the Master Plan Area.

iii. Facilities should be well connected through public transport so that people can access easily to the facilities and reduce the risk of migration.

iv. To promote advanced technologies used in cropping, synchronized cropping pattern with optimum utilisation of available land and water, research and development based Agricultural Institutions should be established.

v. Centres for higher education should be connected to the National Knowledge Network (NKN) to avail high speed broadband connectivity to make these institutions more accessible.

vi. Facilitating academic and industrial linkages to ensure the future provision of skilled graduates in a variety of employment sectors within the region based on the available talent and vocations.

CHAPTER-9 TOURISM AND HERITAGE

9.1 Introduction

Barbil town is relatively a new town if considered in a historical perspective. The history of the town is interconnected with the discovery of minerals in the surrounding areas. Before that little history is recorded. The Barbil railway station was opened in 1925 and subsequently the small community developed into the town which is today. Since the town is based on the mining activity which is quite lucrative it attracted large number of migrant populations and workers from various parts of the country. The resultant cultural environment of the town thus has become multi-ethnic and multi lingual in nature. The different areas in the town have acquired characteristics of the ethnic population which are living in those areas. Apart from the original residents which include local Tribal population and Odia population there is large communities of Punjabis, Marwadis, Biharis, Bengalis and Other communities to name a few, which are living in the town for many many decades now.

The tourism in the town is not a significant activity even though there is a large potential for developing the tourism sector. The current tourists coming to the town generally peaks and fluctuates with the economic and mining activity. There are few places of interest near the town but most tourists happen to stay at Joda or district headquarters of Keonjhar while visiting them. Most of the tourists come to the town from neighbouring rural areas to avail services or from other parts of Odisha and India to visit family and friends.

9.2 Tourism Scenario

As per detailed observation and assessment of the regional and geographical setting of the town. We can access that there is a potential for the development of following types of tourism.

- Industrial Tourism.
- Ecological and wildlife tourism
- Religious tourism
- Cultural tourism.

Map 9-1: Types of tourism found in the Vicinity of Barbil town.

Source: Image courtesy google/Wikipedia. Analysis: REPL.

9.3 Industrial Tourism

Barbil is a town with an industrial heritage and past. The mines and related industries in the town have been functional for decades now. There are also considerable infrastructure and facilities developed as a result. In the early years of 1960s there was a government initiative to establish public sector enterprises for producing iron ore, manganese and Iron and steel. As a result the Kalinga iron works was established along with OMDC which owned number of mines in the area. As the time passed these industrial units became sick and the largest of them the Kalinga Iron works have curtailed operations. In order to enhance the production of Ores the various areas within the town vicinity was auctioned to private mine owners who have exploited the mines to extract ores. The resultant tilling and excavation of the land has created magnificent formations which resemble surface of another planet. These open pit mines are a testimonial to both industrial development and environmental degradation in the state of Odisha. Since the infamous mining scam in the country, local and regional population have become more aware of the mining activity in this area and this interest can be subsequently harvested to generate tourist activity for the industrial tourism for the town.

The tourism in this area can serve two purposes at the same time. Apart from generating the revenue for the area it can also increase awareness about industrial development, local issues and environmental degradation. The related infrastructure in the town for industrial tourism can be developed on a PPP basis in coordination with the mine and industry owners.

9.3.1 Sites for industrial tourism

In coordination with the mine owners and industry owner tourism activity can be generated for the town this can include visit to the industrial units and mines for sightseeing purposes.

Figure 9.1: Mining scenery from mines in Kiriburu, and Murgabadi

Source: Google earth

Table 9-1: Some Industrial units in Barbil town

Some of the Industrial units located in Barbil
International Mineral Trading limited
Kalinga Iron works limited
Arya iron and steel Limited
Pankaj Ferro alloys Limited
Jindal steel and power limited

Figure 9.2: Industrial units in Barbil town

Some of the Mining Areas located near Barbil
Meghatburu Mines area.
Kiriburu Mines Area.
Essel Mining Area.
OMDC mining sites.
The Mining area near JSPL Plant.

9.3.2 Adaptive Reuse of Existing Infrastructure

Adaptive reuse is seen as an effective way of reducing urban sprawl and environmental impact. Through adaptive reuse old, unoccupied buildings can become suitable sites for many different types of use. Analysis of the current use of the

major infrastructure depicts that many of the buildings are being used for nothing or lying vacant. Many of these Buildings are functioning to provide housing requirement for the town dwellers. These buildings which are not being maintained can be put into adaptive re-use through thoughtful exploration of tourism potential and utility for each building. Some of the structures Like OMDC colony and Industrial area have been used for residential and recreation purpose such as small gathering place for spiritual talks, sports events and other similar events. The already developed land in the OMDC colony can be used for re-densification activity and to provide further basic infrastructure like guest houses to tourists at affordable prices. This will also be a boon to the already cash stripped organization and its workers.

9.4 Ecological and wildlife tourism

Barbil town is located in close vicinity to the Jharkhand border. The neighbouring district west singhbhum in jharkhand is home to the saranda forest reserve which is dense forest and hilly region, full of exquisite flora and fauna. The forest covers an area of 820 Sq Km in total and can be reached through the barbil town with ease. The town can serve as base point for tourists coming from Odisha who want to travel to the Saranda region. The area is home to wild elephants, sambhar and cheetal deer breeds apart from number of lepords and other predetors.

Figure 9.3: Views of the Sarenda Forest Reserve

Source : Google Images.

The area can be reached via Barbi-Gua route and as the region has minimal hospitality options barbil can serve as a good location of choice for the incoming tourists in the area. Apart from this, the surrounding area near Barbil town is also rich in forest resources. The area east of Barbil town towards thakurani hills is full of

vegetation. The uliburu reserved forest which was once a thriving forest has experienced intense deforestation due to mining.

9.5 Religious tourism

Murgamadeva temple is situated in Champua sub division of the Keonjhar district at a close distance to the town. It is located near a perineal spring which is fed by water channel in the Thakurani hills. The Murgamadeva temple is dedicated to lord Shiva and is pious to both local tribal population and other incoming devotees. This place is bustling with devotes during the Shravan and winter months when many devotes flock to the area for holy bath and worship. People coming to the temple come from neighbouring state of Jharkhand and also from nearby districts of Odisha. Even though the temple is quite famous there is no direct route available to the temple from within Barbil town. The site does not have any facility for lodging which makes the commuting difficult and inconvenient. The existing road to this place is in bad condition and needs repair. In order to reach the site from Barbil proposal for new road and hospitality facilities can be developed.

Figure 9.4: View of the Murgamadeva shrine and nearby perineal spring

9.6 Cultural tourism

The Barbil town is home to significant tribal population. The region is home to the Bathudi, Bhuyan, Gond, Ho, Juang, Kolha, Munda and Santhal tribes which are major tribes in the district. Apart from that there are number of other tribes which are in minority. These tribes practice agriculture and in the neighbouring surrounding villages

Figure 9.5: Major tribes around Barbil

they can be found to living in their ethnic fashion. This includes their special customs and rights, ethnic wear such as dress and ornaments and special festivals. Some of them have special practices in terms of tattooing, worship and housing nature. They also practice traditional paintings and art which is generally made up of locally available material. The rich tribal welfare of the town can be used to generate tourism activity. Place should be available in the town where they can exhibition and celebrate their art and heritage. A tourist circuit should be identified in the area designating one village for each type of tribe to organize special trips.



Source: Google images

9.7 Tourist foot-fall

The Barbil town lies in the North-West corner of the Keonjhar district which is well connected by road and rail link to the rest of the country. Barbil however experiences connectivity issues with respect to tourism. It is connected by Nh-215 which runs from Keonjhar to the state of Jharkhand. The rail link of Barbil town runs from the state of Jharkhand and as such it is not connected directly with the nearby station Joda. The Keonjhar is visited by about 1.6 lakh tourists every year. Out of which Barbil shares a very small percentage.

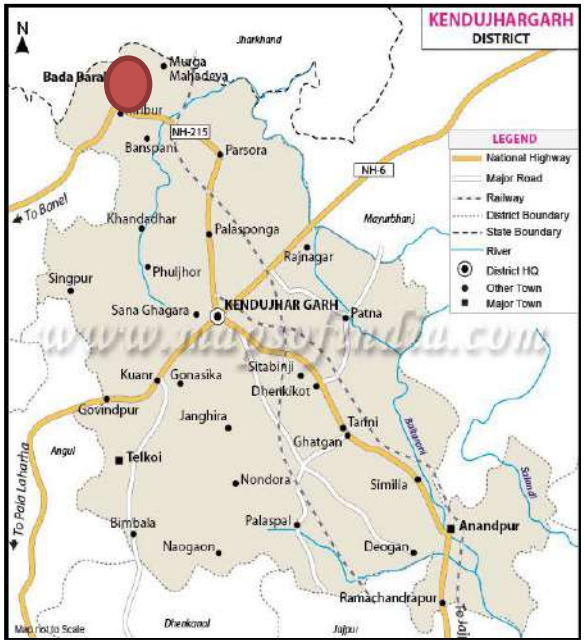


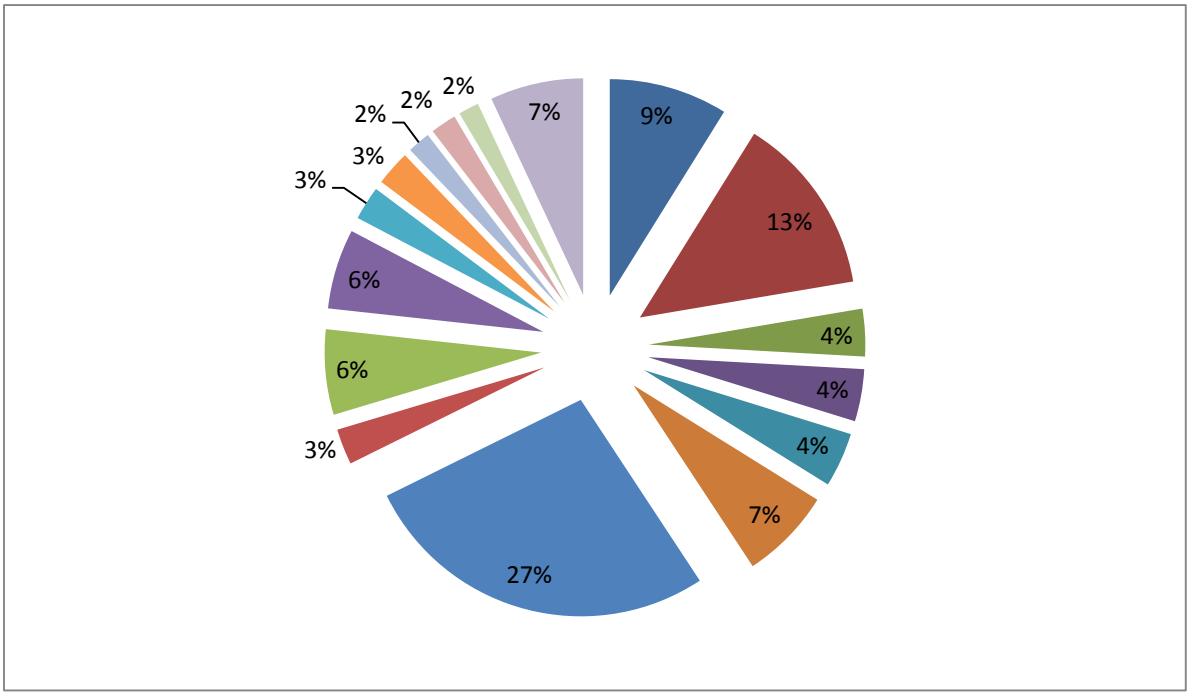
Figure 9.6: Regional setting and annual average tourist inflow in Keonjhar district.

Table 9-2: Tourist inflow by destination in Keonjhar town.

Sl. No.	Name of the Tourist Centre	2010			2011			2012		
		Domestic	Foreign	Total	Domestic	Foreign	Total	Domestic	Foreign	Total
1	2	3	4	5	6	7	8	9	10	11
KEONJHAR DISTRICT										
1	Sitabinji	139107	4	139111	143487	-	143487	146942	4	146946
2	Sanaghagara	204206	53	204259	216300	-	216300	223458	28	223486
3	Badaghagara	68975	8	68983	57657	-	57657	58810	-	58810
4	Khandadhar	62735	2	62737	63362	-	63362	64629	-	64629
5	Gonasika	77280	2	77282	66383	-	66383	67711	-	67711
6	Murgamahadev	110593	-	110593	111698	-	111698	113932	-	113932
7	Ghatagaon	388559	4	388563	434059	-	434059	447080	-	447080
8	Handibhanga	49136	-	49136	43450	-	43450	44319	-	44319
9	Deogaon-Koshaleswar	114870	-	114870	103566	-	103566	105637	-	105637
10	Keonjhar	79771	38	79209	79962	4	79966	99146	-	99146
11	Gundichaghai	39049	-	39049	41140	-	41140	41963	-	41963
12	Hadagada	58650	-	58650	42745	-	42745	43560	-	43560
13	Kanjipani	29132	-	29132	27745	-	27745	28300	-	28300
14	Podasingidi(Garh Chandi Chakratirh)	38081	-	38081	31388	-	31388	32016	-	32016
15	Rajnagar	28223	-	28223	24887	-	24887	25385	-	25385
16	Sarai (Keshari Kunda)	194656	-	194656	113314	-	113314	115580	-	115580
Total		**1683023**	**111**	**1682534**	**1601143**	**4**	**1601147**	**1658468**	**32**	**1658500**

The neighbouring location of Muragmahadeva temple alone attracts around 1.1 lakh tourists annually. With an impressive tourist inflow nearby if Barbil can attract these tourists it can develop as a regional tourist hub of the district. Barbil also has an advantage that it lies in the transit route for people travelling from Jharkhand to Keonjhar which adds to its tourist potential.

Figure 9.7: Tourist map by destination in Keonjhar district.



9.8 Tourist Accommodations

The accommodation sector in the town is relatively well developed due to the economic and mining activity. There are range of hotels and lodging facilities for the existing incoming executives of the mining companies. There are 3-4 high expenditure category hotels in the town apart from other cheaper hotels.

Table 9-3: Hotels facility in the town.

Hotel facility in Barbil	No. of Hotels	No. of Rooms	No. of Beds
2011	18	306	518
2012	18	314	543

The right stay generated in the town can prove as a great boon for the town if the tourist places are well connected and initiative is taken by the local administration for the development of tourism sector. Listed below are the issues identified with respect to the tourism in the town of Barbil.

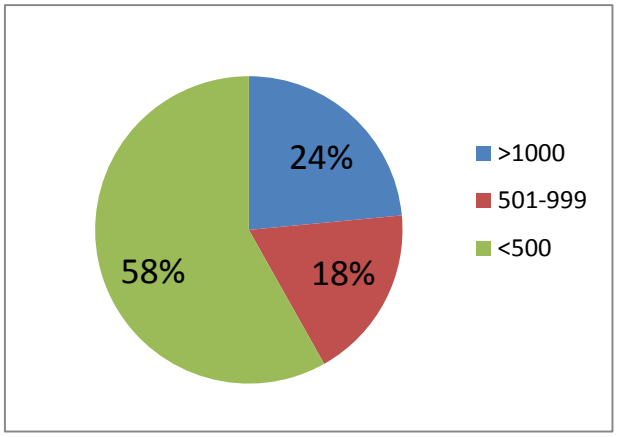


Figure 9.8: Hotel range by expenditure categories.

9.9 Identified Issues

9.9.1 Lack of Connectivity

There is a general lack of connectivity of Barbil with the rest of the district. Due to the mining activity, the transportation nodes are choked especially in the night, by goods vehicle traffic. The rail transport is time taking especially from commuters who are travelling from Bhubaneswar, because there is no direct route from the Joda Side. The lack of public transportation and efficient IPT modes also adds to the traffic connectivity woes. The Delay and congestion leaves few tourists interested to view the few important facilities in the town.

9.9.2 Lack of Tourist Attraction Point and their Development

There is no historic building or centre for attraction within the town. No historic building or monument is located within the town which can become a tourist attraction. The general lack of character of the town leaves a negative impression in the tourist travelling to the town. Though Murgamadeva temple is located nearby there is no connectivity to the site and no accommodation infrastructure has been developed in the town for the incoming tourists.

9.9.3 Poor Environment

The air quality in the town is very poor due to the neighbouring mining activities and the diesel vehicles plying through the town. The tourists coming to the area have to brave poor air quality, smoke, and dust which give lot of trouble and leave a bad taste in the minds of the visitors.

9.9.4 Lack of Initiative, Promotion and Branding

Tourist opportunities are in general overlooked and no such projects of significance in identified by the district administration or the local administration. The town is understood to be distant and aloof from the rest of the district and as such generally overlooked with respect to tourist activity.

9.10 Proposals for Tourism Development

9.10.1 Mining and Industrial Excursion Tour

The neighbouring mines and industries can be connected to form a tourist circuit for people interested in the mining and industrial history of the town. The above-mentioned mining and industrial units can be interconnected to formulate a tourist circuit which include the partnership of tour operators, government, mine owners and industrial units and hoteliers. The tour can be designed in such a manner that it gives a contemporary history to the town and the places visited. Neighbouring population around the mines and their condition can also be exhibited along with the scenery and the route.

9.10.2 Development of Tribal and Religious Unity Monument

The development of a monument in the centre of the town which gives the character to the urban area is required. The monument should be high enough so that it can be seen from all parts of the town and it should have space for public gatherings and seating facility, innovative use of lighting and recreational water works.

Figure 9.9: Example of such Monument which can give character to the town.

Source: Google Images

9.10.3 Multi-utility Event Centre Complex

Currently there is no developed space in the town to organize fates and gatherings, tribal festivals or sports meetings. Such space is required for the development of the community. Number of cultural events in the town can be organized over here. The facility shall include gathering space seating facility and provision of services and lighting it should me preferably made indoors.

9.10.4 Preservation and Development of Water Bodies

The only river running through the town is River Karo. There is no other waterbodies in the town. The river front needs to develop at its natural loop in between Karo Reserve Forest and Santabahal mouza. At present, Municipality has taken some steps of development of the spot. This spot can be further developed by construction of Check Dam, Children's Park, Parking area, Rest shed, Plantation and Convenient shops etc.

9.10.5 Serenda Forest Gateway Town

The town should be branded as the gateway to the Serenda forest region. The tour operators and trip organizers should be given incentive for the operating trips to the neighbouring district. The Hotel owners should be mobilized, so that they promote wildlife as tourism option in the neighbouring places to their incoming guests. Co-ordinated effort should be made with the authorities of the neighbouring district for the development of tourism in the region.

9.10.6 Development of Alternate Direct Route and Lodging Facility to Murgamahadeva Temple

Direct route to Murgamahadeva temple is necessary in order to attract the tourist in the town the alternate route beyond Thakurani mines should be explored and developed along with accommodation facility near the temple site and an all-weather motor able road is a must for this. The district administration should take initiative for the same as this place is falling beyond the existing planning area boundary.

9.10.7 Development of theme based IPT mode.

The IPT operators like rickshaw operators should be mobilized and funded to develop attractive designs on their autos depicting special character of the town. Presently, there is no facility for repair of IPT vehicles in the town and development of an effective IPT bases shared auto routs shout be focused on by the Municipality.

Figure 9.10: Theme Based Auto-Rickshaw and Large green space will give a special character to the town

Source: Google Images

9.10.8 Conservation of New and Old Green and Open Spaces

Large piece of land should be demarcated for creation of green lung for the city. As there is no large park or recreational area in the city. The Location of the park should be central and should be accessible to the surrounding population with good approach roads. Parking and other necessary facility should be created for the same. The Development can be taken up by pooling CSR based funds for the development of the area.

9.10.9 Tourism Branding and Promotion

Barbil tourism office needs to create tourism based website for the Barbil town which provide information to tourists regarding the places to visit and the months of the year which are best to travel along with hotel reservation and other facilities.

9.10.10 Improvement of Environment

Monitoring of the ambient air quality is necessary from time to time in order to know the existing situation and make efforts to regulate the same by taking various measures like regulation on the entry of vehicles and their pollution levels and mobilizing the Mine owners for the same. Automated data collection points for the

Figure 9.11: Air Quality to be measured displayed on a public LED Board.

collection of ambient air quality information from various parts of town and its continuous monitoring is necessary. The information should be shared with the public on a LED digital board outside municipality office so that they are made aware of the increasing pollution level and can prepare accordingly.

Source: Google Images

9.10.11 Safety of Tourists

Police control room for event monitoring and control should be established with the increase in the number of tourists in the town. The lighting facilities around the town in parks and public spaces should be improved in order to make the visitors feel safe.

9.10.12 Improvement in Infrastructure

Street markings, hoardings and boards should be put on various landmarks and streets and entry points in the town so that the people coming to the town are more informed. Such design intervention will also give an aesthetic appeal to the town.

Map 9-2 Signage on Roads and Streets

9.10.13 Construction of Check Dam

Two nos. of check dam, one near sahid Ratan Pradhan M.E School in mouza Sadding and another near Train line passing over the Sundara Nallah are required to be constructed provision of Flower Garden/Children's park, Boating facilities will develop the spot into an entertainment center on one hand and on the other hand it will facilitate as 'Dasatutha' for the nearby Hindu community and it will also fulfil the drinking water scarcity for the domestic animals.

9.11 Conclusion

With the design intervention and investment in the infrastructure, public mobilization and connectivity. The tourist footfall in the town can be increased significantly. Tourism activity will give a great boon to the economy of the town which is solely dependent on mining activity for its growth.

CHAPTER-10 ENVIRONMENT AND DISASTER PROFILE

10.1 Introduction

Environment plays a crucial role in establishing the paradigm of future development. Environmental concerns of both natural as well as built environment, which not only need to be conserved but also protected from various forms of natural hazards. Barbil town is endowed with various ecologically sensitive natural features such as river basins, tanks/ waterbodies, Uliberu Reserved Forest Area etc. Hence, it needs to be planned in a way to achieve an environmentally sustainable pattern of urban development through a rational land use pattern and conservation.

A disaster is a result from the combination of hazard, vulnerability and insufficient capacity or measures to reduce the potential chances of risk. Barbil town is vulnerable to natural disaster due to its geographical location, flood, earthquake, wind, fire are the major threats. Disaster Management includes the process starting from the pre-disaster preparedness to post disaster response.

10.2 Environment

10.2.1 Geology and hydrogeology of the study area

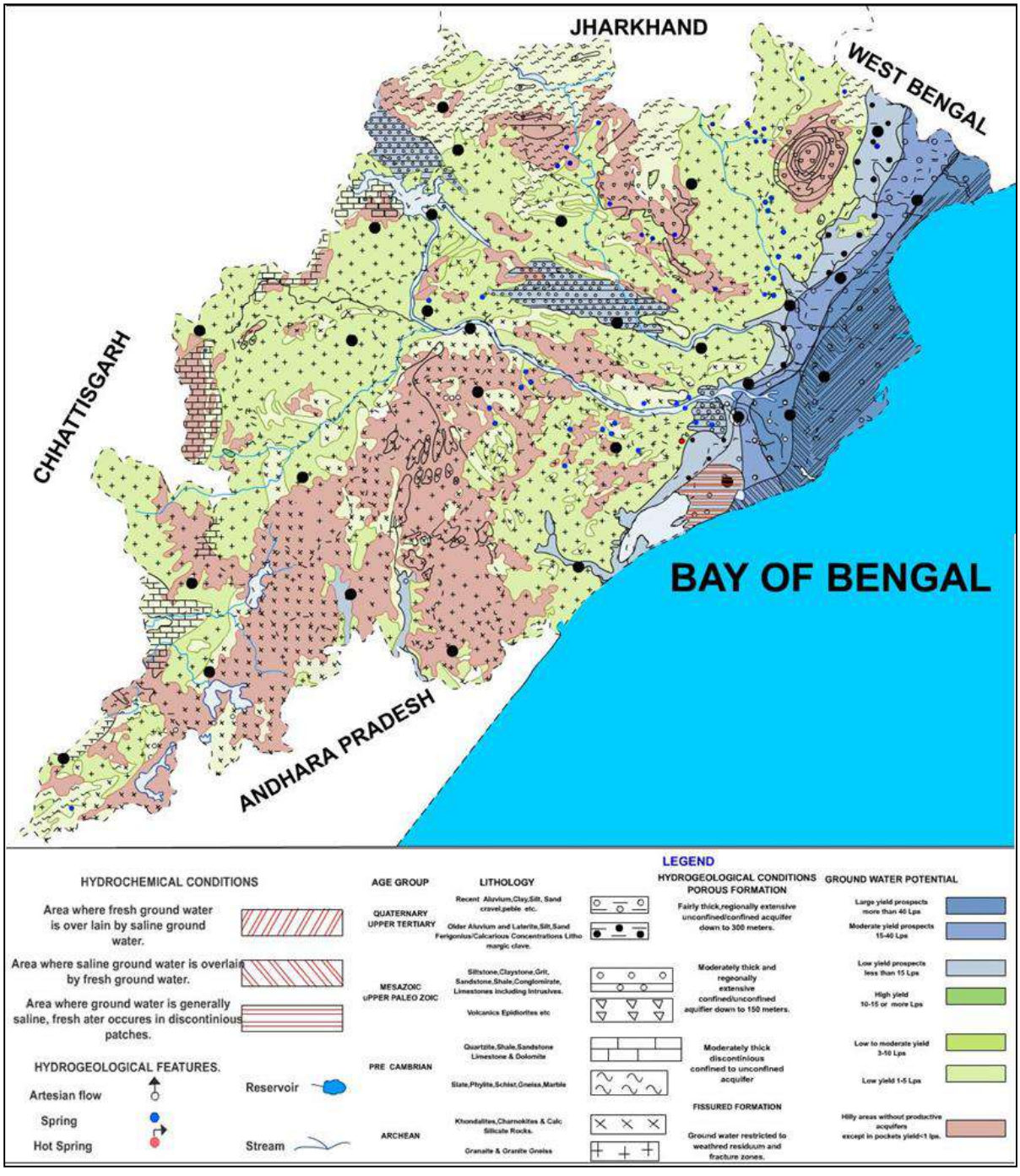
Orissa, situated on the eastern seaboard of India is one of the gifted parts of the World, where a gamut of mineral resources exists in bounty. The state is endowed with large reserves of bauxite, china clay, chromite, coal, dolomite, fireclay, graphite, gemstones, iron ore, limestone, manganese ore, mineral sand, nickel ore, prophylactic and quartz. Other minerals of the state include copper ore, lead ore, titanium bearing veneniferous magnetite, talc/ soap stone and high magnesia igneous rocks. Recent boom of the mineral industry has turned the state in to a hotspot, with entrepreneurs from all over the World crowding the state for their share of fortune.

The district of Keonjhar is rich in mineral resources. The table below shows the type of minerals and their distribution in the district of Keonjhar:

S.No.	NAME OF MINERAL	LOCATION AND DISTRIBUTION
1	BAUXITE	Dholkata pahar
2	CHINA CLAY	Ramchandrapur, Kathkaranjia, Nanua, Nijli, Mangalpur, Tikasil etc.
3	DIMENSION STONE	Industrial units of the district
4	IRON ORE	Roida-Bhadrasahi, Unchabali, Jajang, Jurudi, Belkundi, Bolani, Khandbandh, Katamati, Thakurani, Gandhamardan, Sakradihi, Joda-East, Haromoto, Guali, Kasia, Malangtoli etc
5	MANGANESE	Bonai-Keonjhar Belt
6	PYROPHYLLITE	Rebra-Palaspal belt. Deposits are Dhobakuchuda, Balabhadrapur, Amjore, Baliadihi, Madrangajodi, Nitigothe, Sidhamath, Uchkabeda, Rodvan, Rebna, Palaspal etc
7	QUARTZ & QUARTZITE	Quartz occurs in the form of veins and as a constituent of pegmatites. In Orissa, quartz and silica sand deposits are located in the Precambrian terrains occurring in the districts of Boudh, Bargarh, Kandhamal, Keonjhar, Jharsuguda, Kalahandi, Mayurbhanj, Nuapada, Sonepur, Nabarangpur, Rayagada & Koraput. Quartzite occurs as beds interstratified with other metasedimentaries. Quartzite deposits in Orissa are located in Bolangir, Kalahandi, Koraput, Mayurbhanj, Keonjhar, Sambalpur, Sundargarh, Kandhamal, Angul and Bargarh districts.

8	PLATINUM GROUP OF ELEMENTS	Balasore- Bhalukasuni, Jajpur- Sukinda valley, Keonjhar- Baula- Nuasahi complex,Dhenkanal- Bhuban, Asurbandha, Maulabhanj- Keonjhar-Amjori sill

The map below shows that the Barbil region has belt of moderate yielding acquifers with a range of yield between 1-5 Lps. Some parts of the town are hilly areas having no productive acquifers. Yield in these areas are less than 1 Lps.



The study area has Archaeans of Singhbhum and Keonjhar on the north and west. The remnants of Archaeans and parts of the Similipal Lava are found as denudational hills exposed here and there with long stretching pediplains towards the east. Since these beds containing marine fossils are found on the eastern fringe of the Precambrians of Keonjhar.

10.2.2 Soil

Mostly the planning area is having rocky terrain. The general soil condition of the area is stony and rocky. The topography in and around the town constitute mainly from hilly areas forming a part of the plateaus of Upper Keonjhar tracts. The surrounding areas are having rich deposits of iron and manganese ore.

10.2.3 Forests

The growth of the forest is dominated by gigantic growth of large number of tree species chief being Sal. Tree species such as Sal, Piasal, Asan, Neem, Kusum, Mahul, Dhow and Sisu are found all over the area too.

1.1.2 Climate

The climate of the Keonjhar district is characterised by an oppressively hot summer with high humidity. Summer generally commences in the month of March. Temperature begins to rise rapidly attaining the maximum in the month of May. During the summer maximum temperature is 38.20 C. The weather becomes more pleasant with the advent of the monsoon in June and remains as such up to the end of October. The temperature in the month of December is lowest i.e. 1.70 C. Sometimes it even drops down to 70 C. The average annual rainfall is 1487.7 mms. The nature of rainfall in the district is quite erratic and uneven. There may be heavy rainfall in a short span of time. This results in flash floods in the hilly terrain of the district. Sometimes this results in devastation in entire district. Flash floods in hilly area causes large scale house damages as mostly huts and small thatched houses are being constructed by the predominant tribal in these tracks. The rainfall may not be available for a long span of time. Due to this, there occurs a long period of dry spell even during the peak season of rainfall. This erratic nature of rainfall in the district is mostly responsible for occurrence of drought and it causes large scale failure in crop production. Besides, sometimes unseasonal rain occurs usually after retreat of monsoon and it causes damage to the crops before harvesting.

10.2.4 Rainfall

Storms and depression, which originates in the Bay of Bengal during monsoon, passes over the town during their westward movement and causes heavy rains in the catchments area of the River Karo. During this period the rivers are charged with huge quantities of water followed by a flash flood situation. In most of the years, the town has experienced temporary/ long dry spell or flood situation in some parts of the town due to heavy rainfall.

The Temperature and Humidity Report for Keonjhar is as below:

Table 10-1 Temperature and Humidity Report

WEATHER ANALYSIS REPORT				
Month	Mean daily max temp in °C	Mean daily min. temp in °C	Relative Humidity	
			08:30	17:30
			(in IST)	
January	25.4	11.7	62	51
February	28.3	14.4	59	43
March	33.2	18.6	51	36
April	36.9	22.7	53	41
May	38.2	24.6	56	42
June	34.2	24.7	70	65
July	29.7	23.1	82	80
August	29.6	23.6	83	81
September	29.8	22.5	82	81
October	29.2	20.2	77	70
November	27.0	14.8	64	55
December	25.1	11.7	63	54
Annual	30.5	19.4	67	58

Table 10-2 Climatically Rainfall Report

Sl. No.	Month	Average Rainfall (in m.m.)	Normal Rainfall (in m.m.)
1.	JANUARY	Nil	14.6
2	FEBRUARY	30.4	33.8
3	MARCH	19.9	33.1
4	APRIL	12.9	42.1
5	MAY	78.1	94.8
6	JUNE	130.2	241.4
7	JULY	427.8	318.0
8	AUGUST	367.6	343.6
9	SEPTE MBER	158.8	241.1
10	OCTOBER	108.8	101.3

Source: District Disaster Management and Response Plan, Keonjhar

10.2.5 Air Quality

i. Overview

Air consists of a mixture of mainly nitrogen and oxygen, with small amounts of carbon dioxide, organ, water vapour etc. In addition there are a number of other substances in the air which may be harmful to public life and properly. These impurities may generate from natural or manmade activities and may consist of substances which could adversely affect the life process and other bio geochemical cycles on earth.

ii. Status of Ambient Air Quality in Barbil Town

Rampant mining has severely polluted the area of Barbil, putting a tag of environmental degradation in the entire area. Air, water, and soil have been polluted.

Air Pollutants are added in the atmosphere from a variety of sources that changes the composition of atmosphere and effect the biotic environment. The concentration of air pollutants depends not only on the quantities that are emitted from air pollution sources but also on the ability of the atmosphere to either absorb or disperse these emissions. The sources of air pollutants are mainly vehicles and industries. Residential areas also generate pollution if wood or coal is used as fuel. Study of air quality around Dubuna, Keonjhar, India in the Eastern limb of Iron ore Horse shoe belt was conducted to obtain the ambient air quality of Barbil. Presence of mines and industries in the town has contributed to the air pollution of the town. However, increase in number of vehicles has inevitably caused major air pollution problems to city dwellers.

The air quality analysis from the study revealed significant changes. The SPM and RSPM level has reached above the CPCB standards of 200 micrograms/m^3. Similarly, the selected trace elements analysis of air deposited dust, also indicate higher level of concentrations in most of the locations.

Also according to a study 'Evaluation of Ambient Air Quality Status in Joda- Barbil Area, Odisha, India', it was revealed that the average concentration of SPM is above the prescribed ambient air quality standard (CPCB, New Delhi) in some of sites in the region of Barbli, whereas the average concentration of SO2 and NOX was observed below of the safety limits.

Another report on 'Roida-I Iron Ore Mine, Enhancement of Iron Ore Production at Village-Tonto, Tehsil-Barbil, Dist-Keonjhar, Odisha' reports the ambient air quality as below:

Ambient air quality monitoring carried out at 10 locations in the study area shows the maximum concentration for PM10 (68 µg/m3) was observed Inside Mine Lease area with the minimum concentration of (35 µg/m3) at TISCO Colony. The maximum concentration for PM2.5 of 44 µg/m3 was recorded at Inside Mining Lease area with the minimum concentration of (13 µg/m3) recorded at TISCO Colony. The maximum concentration for SO2 (7.1 µg/m3) recorded at Inside Mining Lease area with the minimum concentration of (BDL) recorded at all the locations except Tonto. The maximum concentration for NOx (13.5 µg/m3) was recorded at Inside Mining Lease area with the minimum concentration of BDL recorded at all the locations except Mining Lease Area & Tonto. The maximum concentration of CO (0.25 mg/m3) was recorded at Inside Mining Lease area with the minimum concentration of BDL recorded at all the locations. All observed values are within the permissible limit of National Ambient Air Quality Standard NAAQS, the standards of which are mentioned below.

iii. National Ambient Air Quality Standards (NAAQS), 2009

Air quality standards provide a legal framework for air pollution control. An air quality standard is a description of a level of air quality that is adopted by a regulatory authority as enforceable. The basis of development of standard should be to provide a rational for protecting public health from adverse effects of air pollutants, to eliminate or reduce exposure to hazardous air pollutants, and to guide national and local authorities in their air quality management decisions. To provide the legislative support for air quality protection, the Central Pollution Control Board (CPCB) reviewed the air quality criteria/standards and proposed air quality standards which are presented in Table.

Table 10-3: Table National Ambient Air Quality Standards (NAAQS), 2009

Sl No.	Pollutant	Average (Time)	Concentration in air sample	
			Industrial, Residential, Rural and other area	**Ecological sensitive area (according to Central govt.)**
1	Sulphur dioxide (SO_2) General Area, µg/m^3	Yearly	50	20
		Hourly	80	80
2	Nitrogen dioxide (NO_2) General Area, µg/m^3	Yearly	40	30
		Hourly	80	80

3	Particulate matter (PM_{10}), µg/m^3	Yearly	60	60
		Hourly	100	100
4	Particulate matter ($PM_{2.5}$), µg/m^3	Yearly	40	40
		Hourly	60	60
5	Ozone (O_3), µg/m^3	per 8 hr	100	100
		per 1 hr	180	180
6	Lead, µg/m^3	Yearly	0.5	0.5
		Hourly	1	1
7	Carbon Monoxide (CO), µg/m^3	per 8 hr	2	2
		per 1 hr	4	4
8	Ammonia (NH_3), µg/m^3	Yearly	100	100
		Hourly	400	400
9	Benzene (C_6H_6), µg/m^3	Yearly	5	5
10	Polyaromatic Hydrocarbons (BaP)	Yearly	1	1
11	Arsenic, ng/m^3	Yearly	6	6
12	Nickel, ng/m^3	Yearly	20	20

Source: CPCB

(1) Whenever measurement of vapour mercury cannot be done, standard for particulate mercury only is applicable

(2) For sensitive area, more stringent standards will be applicable for NO2 and SO2; standards for other parameters remain unchanged Notes:

Notes:

(a) Annual Arithmetic mean of minimum 104 measurements taken twice a week 24 hourly at a uniform interval should not exceed the annual standard.

(b) 1-hour/24-hourl/8-hourl values should be met 98% of the time in a year. However, 2% of the time, it may exceed but not on two consecutive days.

1.1.3 Water Quality

i. Overview

Water which is essential for survival is getting increasingly scarce and its quality is also deteriorating over time. The water resources of an area depend on the precipitation and the water flows through rivers and canals. The recharge potentials of groundwater reserves also influence the availability of annual utilizable groundwater resources. However, indiscriminate use of water for various urban uses, urbanization of green-field areas and soil erosion are causing depletion of surface and ground water resources. On the other hand, untreated sewage being let into water bodies, lack of

concern for treating industrial effluents and dumping of solid waste are the reasons deteriorating quality of water and land pollution.

ii. Status of Water Quality in Barbil Town

Since agriculture and animal husbandry are the main occupations of the populace here, water has become an important commodity. Though River Karo flows nearby, no proper surface irrigation system has been developed. For drinking, piped water supply has been provided only to a few places of the urban area. In rest of the places, people depend on dug wells and tube wells. Monsoon is said to be the chief source of water for irrigation.

The normal water requirements of the town is met by water lines from the river and underground bore-wells, but catering to the influx of 100,000 puts a major strain in providing water and drainage facilities. Some of the festival rituals entail bathing on the river banks by the devotees. Use of the town by such large numbers and the large number of offerings to the Gods in terms of flowers, sweets and clothing which are generally consecrated to the holy river waters create large amounts of solid waste dumping onto the river and the tanks/ponds.

Industries near the river in the town also pollute the water of the river making it unfit to be used for drinking purpose.

During major fairs/festivals, toilet facilities are provided by the public administration through temporary toilets, but those are woefully inadequate for such large numbers tourists/pilgrims. It is important to provide adequate toilet and drainage facility to avoid the environmental pollution of the town and the river. As per the existing situation in Barbil there is no present existing sewerage network in the town. The major sanitation facilities used in the town are septic tanks and wet pit toilets. Majority of the population especially in the slum areas defecate in the open. As per survey conducted by REPL the rate of open defecation in the town is found out to be about 55% in urban areas, while this figures goes upto 81% in Barbil rural areas. Use of the Septic tank is much less frequent with only about 36% of the household using the same. Most of the water bodies in the areas are used as places of open defecation in the town.

a. Ground Water Resources

Based on a study conducted on groundwater quality the following observations were seen.

Ground water was collected from 5 locations & analysed in environmental laboratory. pH values varied between 5.8 and 6.2 while Turbidity ranged from 1.3 to 2.1 NTU. Dissolved Solids varied between 72 mg/l & 102 mg/l and total hardness varied from 52 to 66 mg/l. Chloride values varied between 3.0 mg/l & 5.5 mg/l. Calcium values varied between 13.6 mg/l & 20.4 mg/l, Sulphate values varied from 4.5 to 6.3 mg/l and Nitrate values varied from 4.7 to 6.5 mg/l. Zinc values varied from 0.15 to 0.35 mg/l, Lead varied from 0.020 to 0.035 mg/l, Copper value varies from 0.005 to 0.009 mg/l.

From above discussion, it is evident that the ground & surface water quality of the study area confirms to IS: 10500 & IS: 2296 respectively.

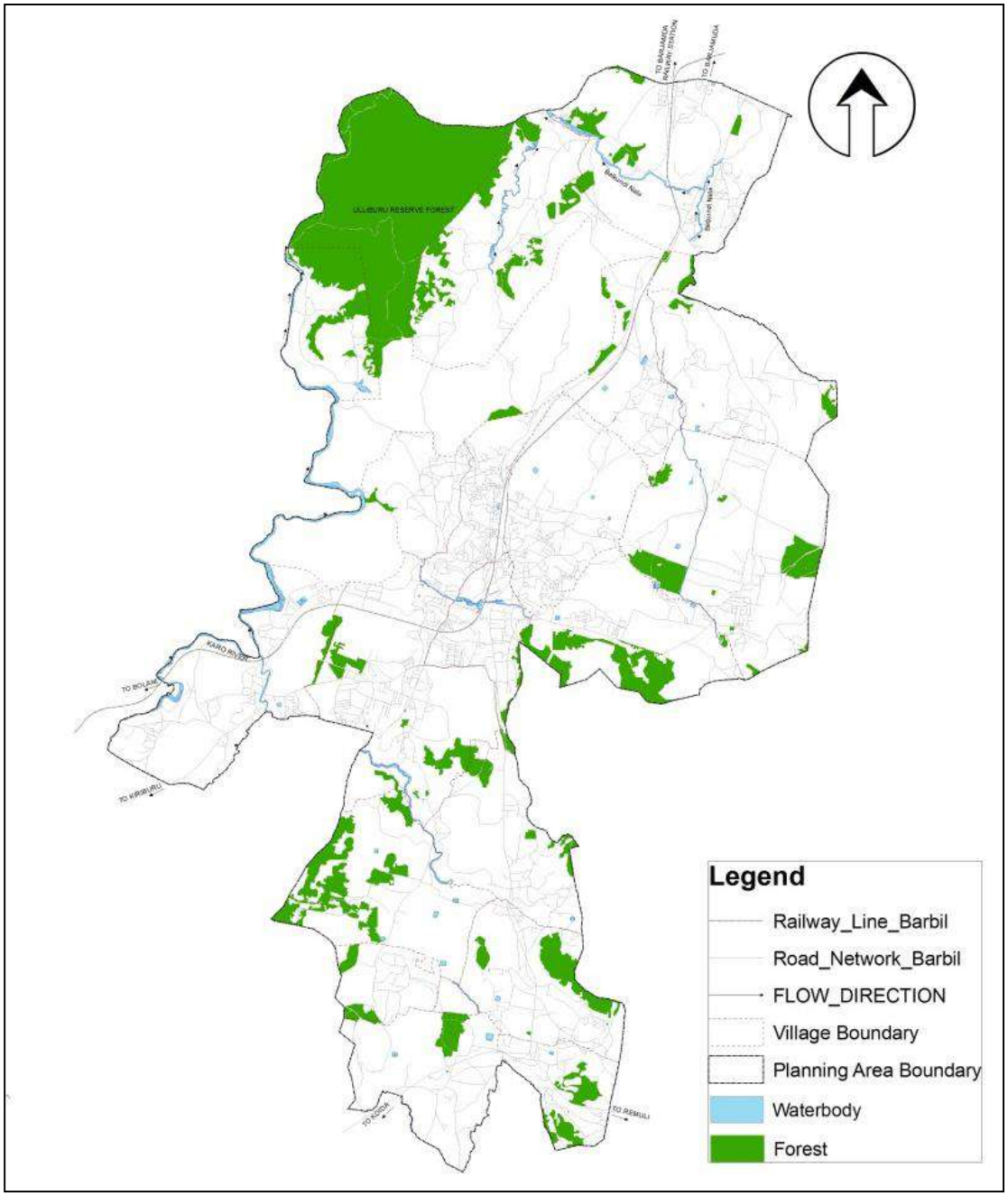
b. River System

The entire region of master plan has a good number of water resources of river, ponds and reservoirs. Originating from Bonai, Karo River is a major river of the district flows on the western boundary of the planning area and serves as a major source of water supply in the municipal area of Barbil.

It is also noticed that due to drawl of water by several industries and mine owners for their use, the flow of the river reduces in the downstream. Apart from River Karo, which flows on the north western boundary of the master plan area, there are a number of natural nallas such as Dholki Nalla, Sundara Nalla and Barapada Nalla, which form the natural drainage channel in the master plan area.

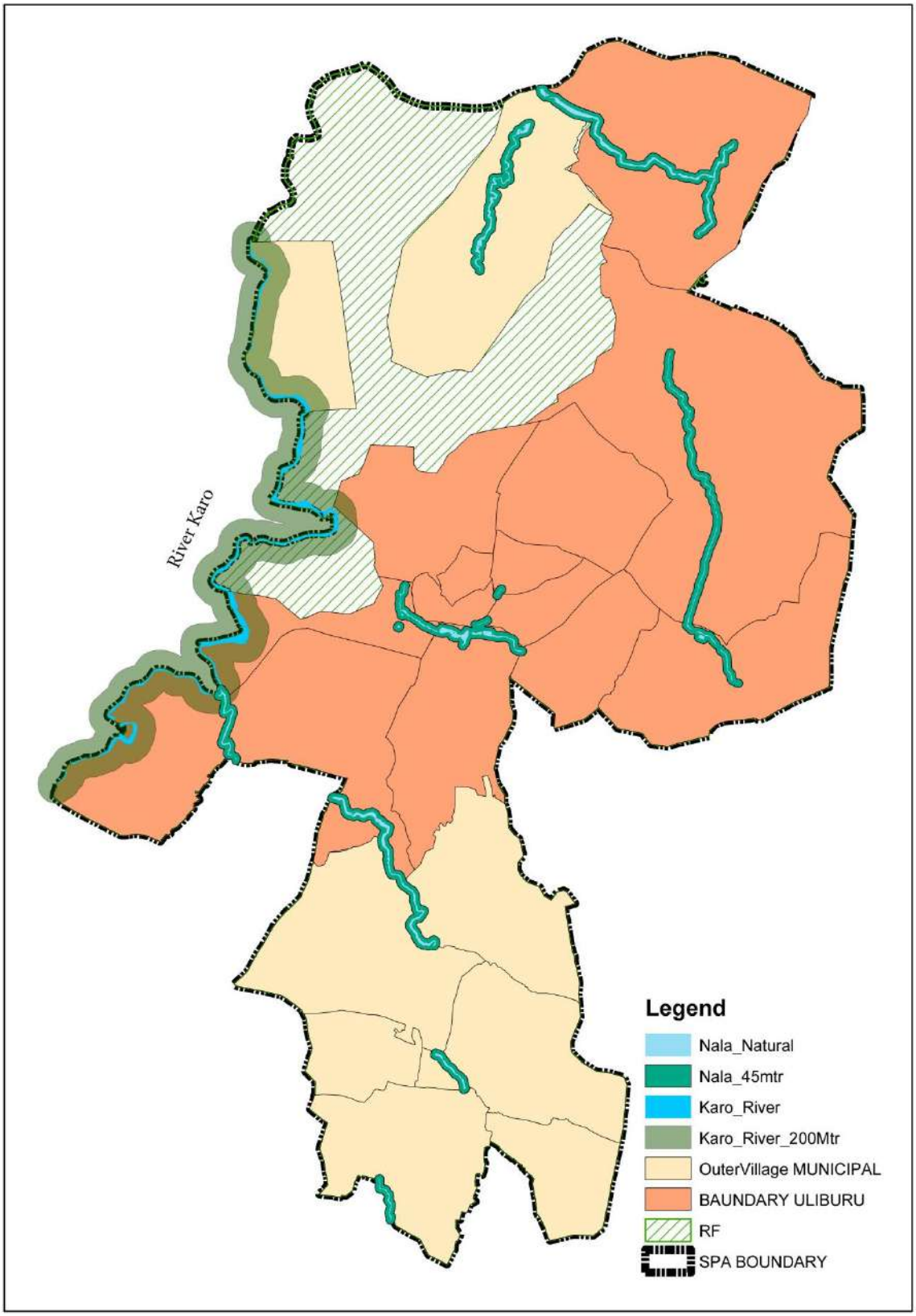
Apart from the river system in the planning area, there are a very few water bodies in the form of ponds which mainly used for household activities in the rural environ. Also it is seen that in summer season, the water level of the river as well the ground water depletes which results scarcity in drinking water supply. Therefore proper intervention needs to be taken up for augmentation of existing water supply scenario in the planning area. Already initiatives have been taken by PHEO for water supply augmentation scheme in Barbil urban.

Map 10-1: Water Resources- Barbil MP



Source: Basemap of Barbil, REPL

Map 10-2 Rivers flowing within MP Area, Barbil



Source: Landuse Map, Keonjhar

c. Ponds and reservoirs

The presence of ponds gives character to the town and adds to its aesthetic value. The large city level ponds are also being used for recreational purposes. However many are polluted and are being used to dispose of solid waste and waste water.

10.2.1. Noise

Noise pollution is considered as one of the major factors affecting the quality of life in urban areas. This noise problem is mainly due to growing busy traffic. The ambient noise standards being followed in India for different types of areas are given hereunder (CPCB, 2000).

Table 10-4: Ambient Noise Standards

Area	Day Time (6 AM- 10PM)	Night Time (10 PM- 6 AM)
	L eq in dB	L eq in dB
Industrial area	75	70
Commercial area	65	55
Residential area	55	45
Silence zone	50	40

Source: CPCB

- **Sources of Noise Pollution**

Various sources of noise are: industries, road, rail- and air-traffic, construction and public works, indoor sources (air conditioners, air coolers, fans, radio, television and other home and office appliances) etc. In our country, indiscriminate use of loudspeakers, generator sets and firecrackers has given a new dimension to the noise pollution problem.

- **Status and Assessment of Noise Environment**

The assimilative capacity of the acoustic environment is the maximum amount of noise load that can be discharged into the environment without causing private or public nuisance for the designated use of land units.

During day time, people are highly annoyed at L eq levels below 55 dB(A). Sound levels during the evening and night should be 5-10 dB, lower than during the day.

However, hearing impairment is not expected to occur at L eq8h levels of 75 dB(A) or below, even for prolonged occupational noise exposure.

As per a study conducted on the Barbil area, the noise levels were measured at 10 locations. Day time noise level varied from 48.7 to 68.2 dB(A) and night time noise level varied from 41.1 to 57.4 dB(A). Noise levels at all locations were within permissible norms.

Increasing population of Barbil town in different census clearly demonstrated a sure increase in vehicular growth of the town. The peak traffic observed during two specified times such as 7-10 a.m. and 7-10 p.m. at all the monitoring squares of the town show an increase in vehicular traffic.

Trucks and buses are contributing more noise to the environment, than compared to automobiles. It is evident that besides the total noise level, the number of heavy vehicles will be an important parameter in the annoyance function.

10.2. Disaster Vulnerability

Risk assessment and vulnerability assessment of Keonjhar has been conducted by District Disaster Management Authority. Following hazards have been identified at Barbil Town.

i. Flood
ii. Cyclone
iii. Sun Stroke/ Fire
iv. Drought
v. Hail Storm/ Whirl wind
vi. Tornado

10.2.6 Risk assessment and Vulnerability analysis

Table 10-5: Disaster History of Keonjhar District: (Since 1978)

Year of Occurrence	Type of Hazard	Area affected	Impact on life	Livelihood Property	Livestock	Remarks
2014	Flood/	Anandpur Sub-Division	Loss of lives	Loss of Livelihood	Loss of Livestock	
	Hudhud	Anandpur Sub-Division				
	Havey Rain	Entire district				
2013	Cyclone (PHAILIN)	Entire Dist.	Loss of lives	Loss of Livelihood	Loss of Livestock	
2011	Flood	Anandpur Sub-Division	Loss of lives	Loss of Livelihood	Loss of Livestock	
	Drought	Entire district				
	Heavy Rain	Entire district				
2010	Unseasonal rain	Anandpur Sub-Division	--	Loss of Livelihood	--	
2009	Flood/	Anandpur Sub-Division	--	Loss of Livelihood	Loss of Livestock	
	Havey Rain	Entire district				
2008	Flood/	Anandpur Sub-Division	--	Loss of Livelihood	Loss of Livestock	
	Havey Rain	Entire district				
2007	Flood	Anandpur Sub-Division	--	Loss of Livelihood	Loss of Livestock	
2006	--	--	--	--	--	
2003	Flood	Anandpur Sub-division		Loss of Livelihood	Loss of Livestock	
1999	Cyclone	Anandpur Sub-division	Loss of lives	Loss of Livelihood	Loss of Livestock	
2001	Drought	Entire Dist.		Loss of Livelihood	Loss of Livestock	
1998	Sunstroke	Entire Dist.	Loss of lives		Loss of Livestock	
1978	Tornado	Gadabandhagada of Ghasipura Block	Loss of lives	Loss of Livelihood	Loss of Livestock	

Source: DDMP, Keonjhar

Table 10-6: Seasonal Hazard Analysis

Type of Hazards	JAN-MAR				APR-JUNE				JULY-SEPT				OCT-DEC			
*	H	C	A	I	H	C	A	I	H	C	A	I	H	C	A	I
FLOOD								←	—	—	—	→				
CYCLONE							←	—	—	—	—	—	—	—	—	→
DROUGHT						←	—	—	—	—	—	—	—	—		
HEAT-STROKE					←	—	—	→								
EARTHQUAKE	←	—	—	—	—	—	—	—	—	—	—	—	—	—	—	→
FIRE		←	—	—	—	—	—	→								
EPIDEMIC								←	—	—	—	→				
ACCIDENT	←	—	—	—	—	—	—	—	—	—	—	—	—	—	—	→
LIGHTNING				←	—	—	—	—	—	—	—	—	—	—	—	→
TARNADO		←	—	—	—	—	—	—	—	—	—	—	—	—	—	→

*CHAI=Health Care Associated Infection

Source: DDMP, Keonjhar

Table 10-7: Disaster Probability

Sl.No	Block	Flood	Flash Flood	Cyclone	Tarnado	Heavy Rain	Drought	Sunstroke	Total Population
01	Keonjhar		✓	✓	✓	✓	✓	✓	116724

Source: DDMP, Keonjhar

10.2.7 Existing Institutions and Disaster Mitigation Plans

T. District Disaster Management Authority

Govt. have formed District Disaster Management Authority at District level in the year 2010 vide Notification No.46269/RDM dt.12.11.10.

The District Disaster Management committee is the apex planning body at the district level and will play a major role in preparedness and mitigation. A District Disaster Management Committee is formed in the district to assist the Collector in the following steps.

- Reviewing the threat of disasters.
- Vulnerability of the district to different disasters.
- Evacuation process to reduce risk and emergency response.

- Considering suggestions for improvement of the response document i.e. District Disaster
- Management Plan

A district disaster mitigation plan has been prepared which covers the Barbil town. All rescue and preparedness measure have been taken care of in detail in the plan which may be meticulously followed.

10.3 Proposed Environmental and Disaster Management Plan

10.3.1 Environment

1. The database for air quality, water quality (surface and ground water), noise pollution and land pollution is very poor and need to be created for the region. In order to create better database, more air quality monitoring stations are required. A Committee should be formed by the respective State Governments to recommend locations of the monitoring station of air and water quality, to regularly review the status and recommend remedial measures. Pollution Control Boards should monitor the above-cited parameters on a regular basis.
2. Data inputs to check the performance of various parts of the town in relation to these needs be made and regularly monitored.
3. Proposed Industrial parks/estates must be allowed with controlled environment and with Combined Effluent Treatment Plant (CETP) constructed considering the carrying capacity concept. For the hazardous waste producing industries in the region, land allocation should be done appropriately for Combined Treatment, Storage and Disposal Facility (TSDF).
4. Good agricultural land in the town should be protected and conserved. There is substantial surplus vacant land and waste land existing in the Master Plan area to accommodate various land uses. This may reduce the need for unnecessary conversion of good agriculture land to various urban uses.
5. Check needs to be put in areas where inefficient and excessive irrigation causes water logging and salination of the soil.
6. Action should be taken to stop the dumping of solid waste in rivers, drains, ponds and other water channels. A green buffer of 200m on both sides from the River Karo (main river in the town) and 45m buffer on both sides of the small tributaries is left for conserving them.

7. Forest conservation programs need to be initiated.
8. Public awareness programmes should be conducted at all levels to educate people regarding the health effects due to prolonged noise exposure. The Barbil Administration needs careful attention for abating road traffic noise through modification of traffic flow and also by sustainable traffic management.
9. Massive plantation of trees with dense foliage (rich canopy) should be encouraged as they were found to be highly effective in absorbing the acoustic noise and act as very good screens in bringing down the noise levels
10. While carrying out activities for the development of Barbil, provisions under Environmental Protection Act, 1986 and Rules thereof should be followed. Carrying Capacity of the town based on Minimum National Standards should be followed in order to provide a better quality of life to the people in the area.
11. The areas/zones mentioned below located in the Master Plan should be conserved/protected:
    - Reserved/protected forests
    - Forests other than reserved and protected forests
    - Monuments-National, State, Local
    - Heritage/cultural sites
    - Scenic areas
    - Parks/Playgrounds
    - Marshylands
    - Mining areas
    - Areas of tourist interest
    - Water bodies/Ponds/Tanks/Reservoirs
    - Springs/water recharge areas
    - Burial Ground/Crematorium
    - Other environmental resource areas
12. Management during fairs/festivals shall see the:

I. Upgradation of the supply of water from the river through additional pumps at the time of fairs/festivals

II. Allocation of additional spaces for toilet facility on higher ingress of pilgrims during festive times. The concept shall be to provide hygienic sanitary

facilities without despoiling the natural environment and allowing for natural neutrification of wastes without high technology inputs.

III. Provision of adequate garbage bins near mela grounds and deity procession routes.

13. Solid waste disposal scheme: It is imperative to adopt more environment conscious methods of waste disposal in the town. The segregation of non-degradable wastes like plastic and metal is imperative which can then be sent to the processing units. Vermiculture pits could be developed for the degradable waste in the open outskirts.
14. Mining Area Measures:
    a. Mining will be carried out on diverted forest land only. No mining will be done on the non-diverted land. Forestry Clearance will have to be taken for such areas.
    b. Compensatory afforestation is being / will be carried out as per stipulation of Forest Department.
    c. Topsoil to be stacked for utilization in plantation.
    d. Sewage Sludge to be used as manure for green belt development.

10.3.2 Disaster Mitigation and Preparedness

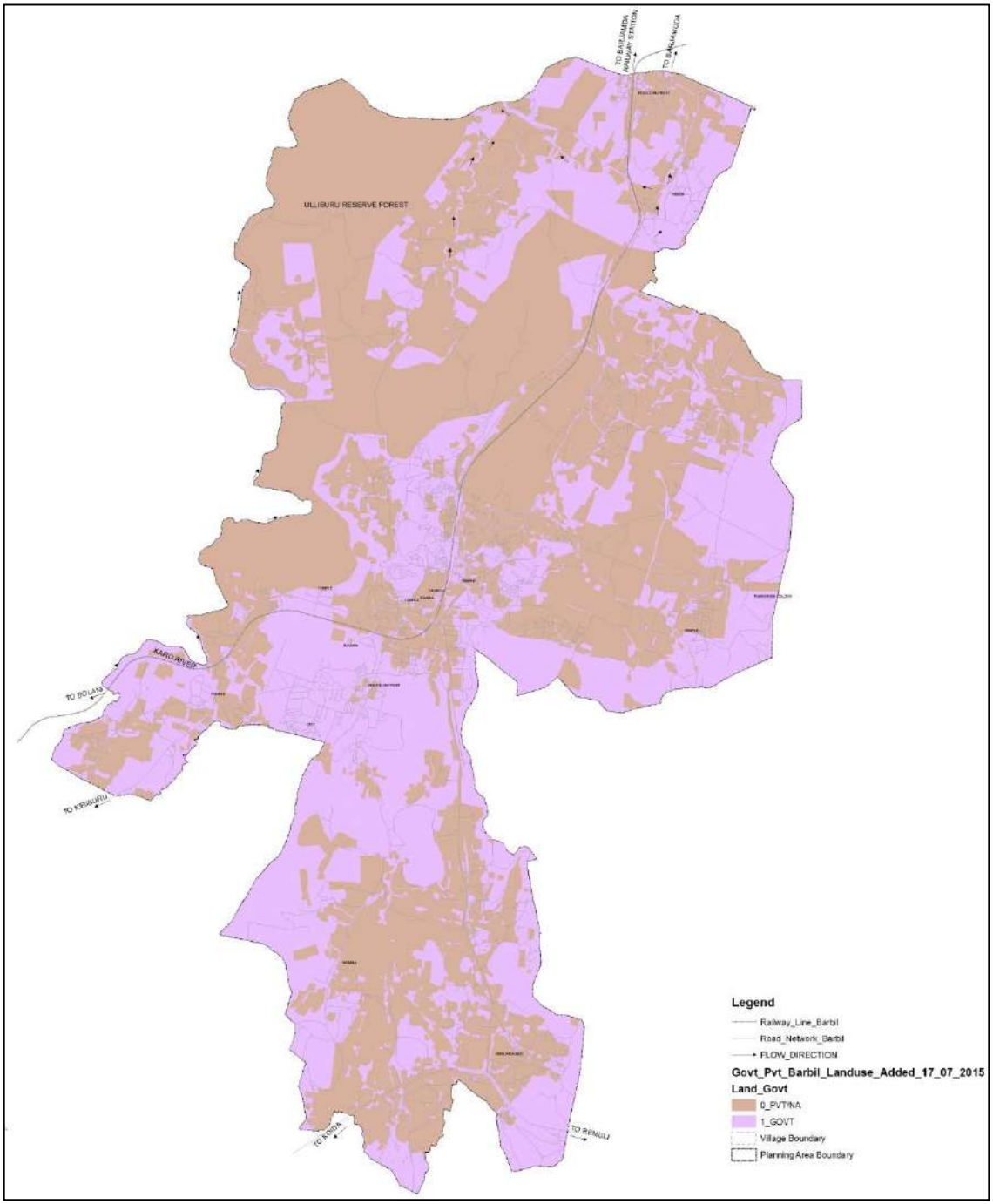
1. It should be made compulsory for all the new construction to be designed and constructed as seismic proof and withstand during severest quakes.
2. Building byelaws need to be updated to ensure earth quake resistant measures in the structural design of buildings and to minimize the risk of damage.
3. Flood zones need to be identified by the District Disaster Management Authority and accordingly No construction zone should be clearly specified. It should be regularly patrolled so as to prevent encroachment on these areas.
4. Flood forecasting and warning system is used for alerting the likely damage areas in advance of the actual arrival of floods, to enable the people to move to safer places.
5. Stakeholder participation should be encouraged.
6. All the structures should be well anchored so as to resist them from being uplift from the strong winds during cyclones.
7. Risk evaluation of the towns and cities should be done regarding the areas vulnerable to fires and database in terms of available equipments and personnel should be compiled and periodically updated.

8. At the time of disaster, distribution of relief materials should be organized in planned and disciplined manner so that there will be no irregularity overlooking or overlapping in distribution of relief materials.
9. Special training programmes on disaster preparedness, First Aid and Rescue techniques to be conducted for The NSS and NCC, Scout & Guide, Red Cross volunteers in the town. Their services may be entrusted as Volunteers during the response action by the public administration. They can be a part of different task forces to actively be involved in rescue, relief, rehabilitation action.
10. Local authorities should review the relief manuals and scarcity preparedness guidelines as detailed out in the District Disaster Mitigation and Response Plan, Keonjhar District to blend the vernacular climate and the local needs.
11. Plantation should be done as much as possible, plants will hold the soil, act as shield against wind etc.

CHAPTER-11 LAND OWNERSHIP

As per the land data available from Tehsildar, Barbil, government and semi government land consist of approximately 2491.30 ha (43.19%) land in Barbil Planning area. Rest of the area i.e. approximately 3276.47 ha (56.81%) is under private ownership.

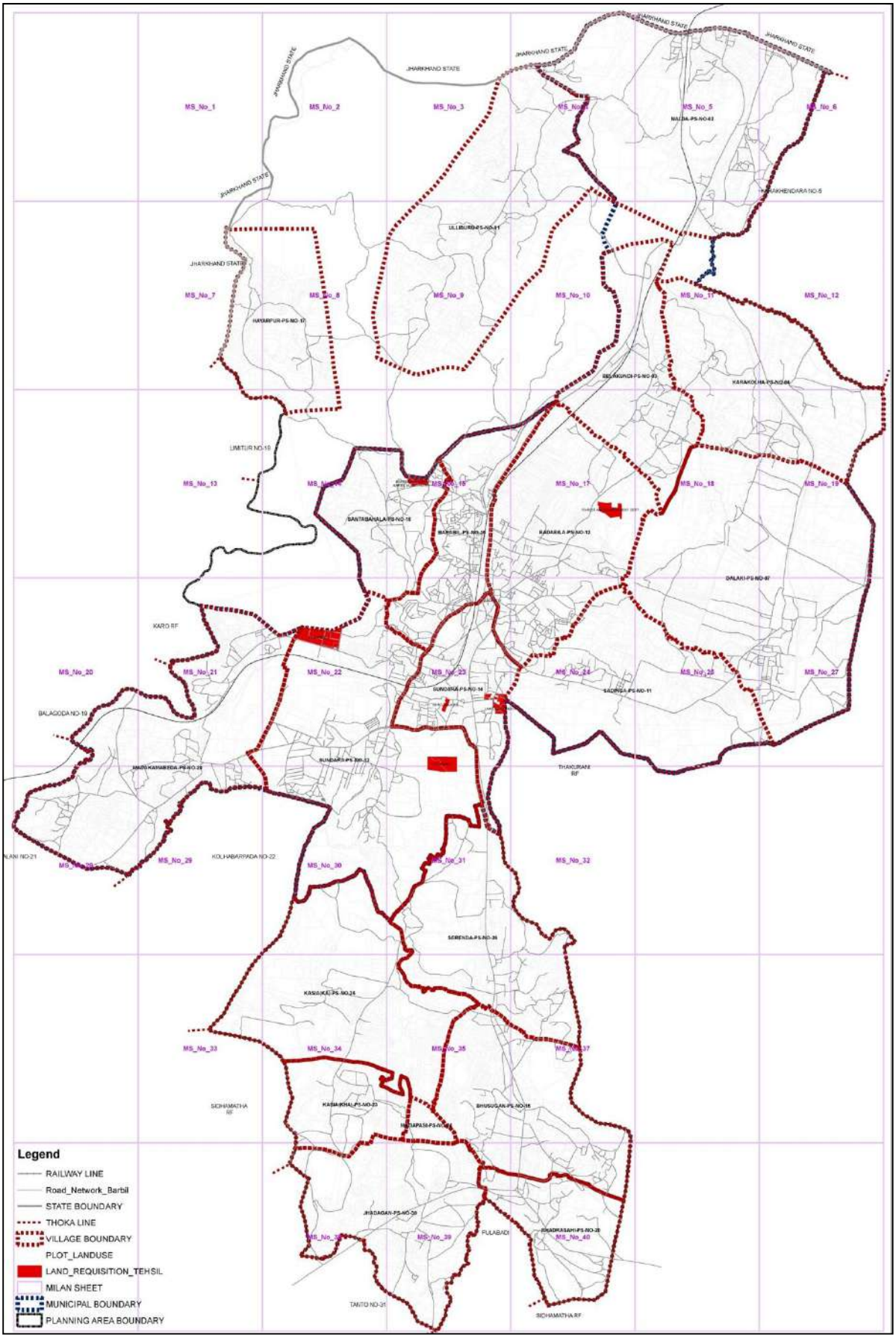
Map 11-1 Government/ Semi Government and Private Ownership of Land in Barbil Planning Area



Government/ Semi- government land will help in identifying the areas allocated for public, semi- public, utilities and other activities related to general uses for public. As the land belongs to government department, acquisition will not be a problem while implementing the projects hence result in completion of project in time bound manner.

Different departments has requested for land and acquired also for the purpose of setting up of their respective department. Detail of land is shown in map below:

Map 11-2 Land Requisition by Different Departments



CHAPTER-12 ZONING AND SUB DIVISION REGULATION

12.1 Introduction

Zoning regulations helps to promote healthy and liveable environment ensuring safety and general social welfare of the community. These regulations ensure that the area develops according to the vision for the town with optimum distribution of the amenities and the envisaged urban form.

In the preceding chapter under land use, the Master Plan envisages spatial distribution of the Urban Land into various functional use zones (Land Use Zones). Zoning is essentially a legal and administrative method of putting into effect certain functional features of a comprehensive plan i.e. Master Plan for a particular town, vis-à-vis the plan for circulation, conceived to solve the present deficiencies and to plan for future requirements of the Urban Community.

The development control regulations ensure that the development of the region takes place in accordance with the land use plan. Since various land uses have different characters, separate set of regulations establishing reasonable and minimal control over the land use have to be framed. This can prevent overcrowding in buildings and land thus ensuring adequate facilities and services. These regulations will promote public health, safety and general welfare of the community.

Land and buildings established prior to the zoning regulations are not prohibited. But, if there is any conflict with the newly proposed uses, they will be termed as non-conforming uses, which will be gradually eliminated keeping in mind the ease of the property owners.

The regulations are framed keeping in mind the character of each zone along with their relevant activity mix, for the desired development as proposed in the new regulations. The use based guidelines detail the permissible, restricted and non-permissible activities in each zone.

12.2 Objective of Zonal Guidelines

The zoning guidelines and development control regulations will attain the following objectives:

- To promote public health, safety and general welfare of the community

- Eliminate and phase out polluting and conflicting land uses
- To be pro-active and responsive to the envisioned needs of the region
- Realistic in nature and in close conformity to the market conditions and forces
- To recognize the dynamics of land values, densities and infrastructure
- To help match the development needs and demands of individuals and the city
- To permit mixed use and a dynamic urban form

The following principles, here-in-after called the 'Zoning Regulations' framed in keeping with the objectives of planned urban expansion, development of residential areas on neighbourhood principles, promotion of correct land use and convenience and general betterment of the inhabitants of the locality in view, will be applicable to the area covered by this Master Plan.

12.3 Zoning

Zoning has been done at following two levels.

- **Master plan zoning**: done for the purpose of delineating the boundaries of zones so that further zonal plans can be made (if required). Also, there may be difference in the zones as per the nature of activities permissible in the respective zone. Eight master plan zones have been delineated, namely Zone-A, B, C, D, E, F, G & Conservation Zone.
- **Land Use Zoning**: is done by categorising the whole Masterplan area into different zones based on the proposed landuse. Eight use zones have been delineated, namely Residential, Commercial, Mixed use, Public-Semi Public use, Industrial, Transportation, Recreational and Non-Builtup use.

12.4 Master Plan Zone Boundaries

The Master Plan Area has been divided into **eight zones** namely; **Zone-A, B, C, D, E, F, G and Conservation Zone**.

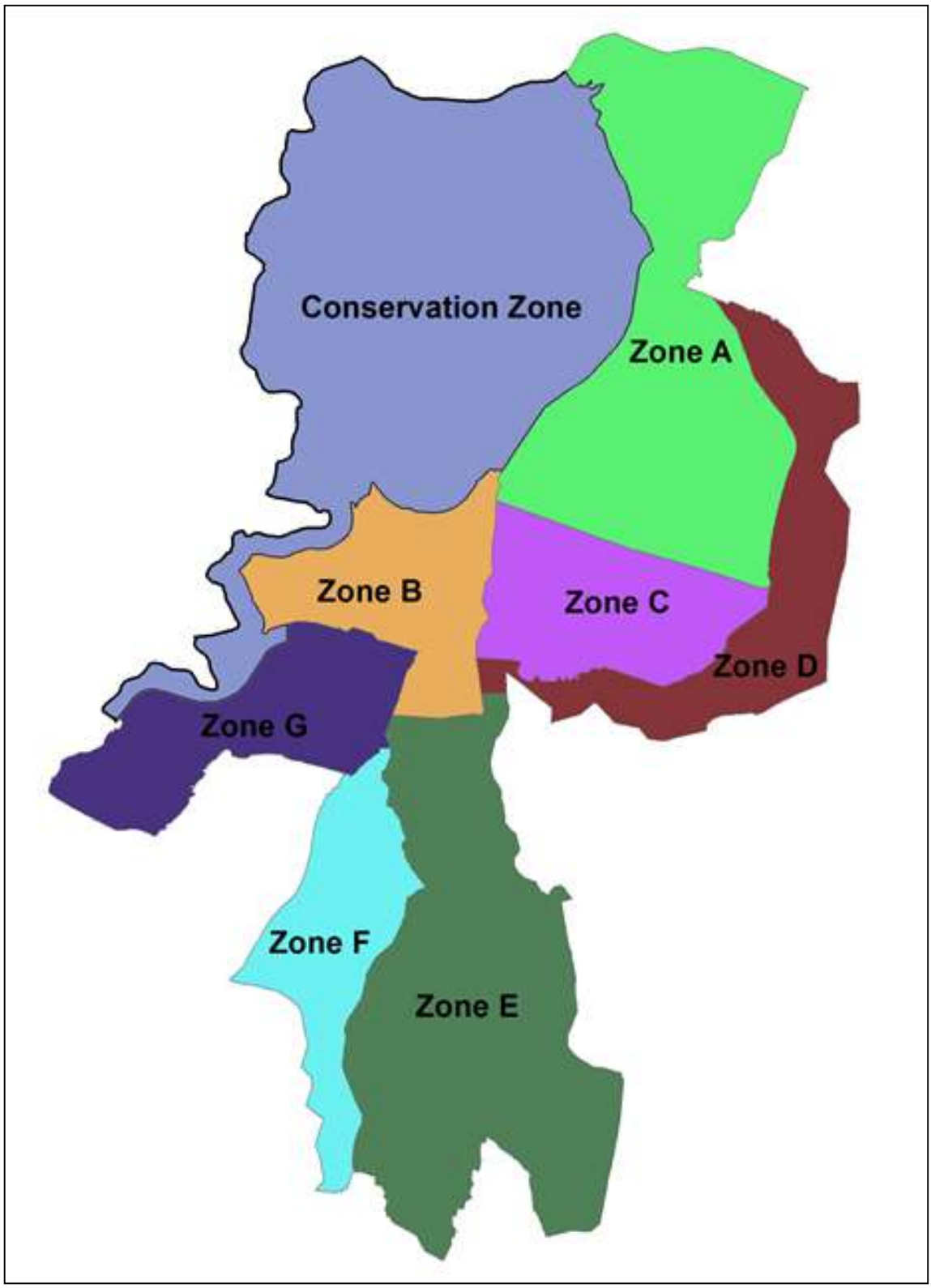
The zones are divided on the basis of:

1. Existing administrative boundaries like the ward boundaries
2. Existing physical features
3. Existing land-use and settlement pattern, its nature and character
4. Area fixed by each zone is manageable administratively

12.4.1 Master Plan Zones

The Zones formed under the master plan area can be seen below. The conservation zone majorly consists of the forest area and buffer zone for forest area.

Figure 12.1 Zones of Barbil masterplan Area



A. Conservation Zone

Conservation zone sprawls to a total 16.94 sq.km.(1694 hectares). It consists majorly of forest area and waste land, amounting to total 1200 hectares of the total area, i.e 76% of area.

Table 12-1 Existing Landuse Breakup of Conservation Zone

Typology	Area (in ha)	%age
Agriculture	92.52	5%
Commercial	1.12	0%
Industrial	25.96	2%
Other	102.41	6%
Other Urban	7.63	0%
Public/Semipublic	1.63	0%
Residential	35.04	2%
Residential Rural	10.88	1%
Transport	53.45	3%
Vacant Rural	23.58	1%
Vacant Urban	24.15	1%
Vegetation/Forest Land	500.28	30%
Waste Land	775.40	46%
Waterbody	39.37	2%
Total	**1693.58**	**100**

Figure 12.2 Conservation Zone-Existing Landuse

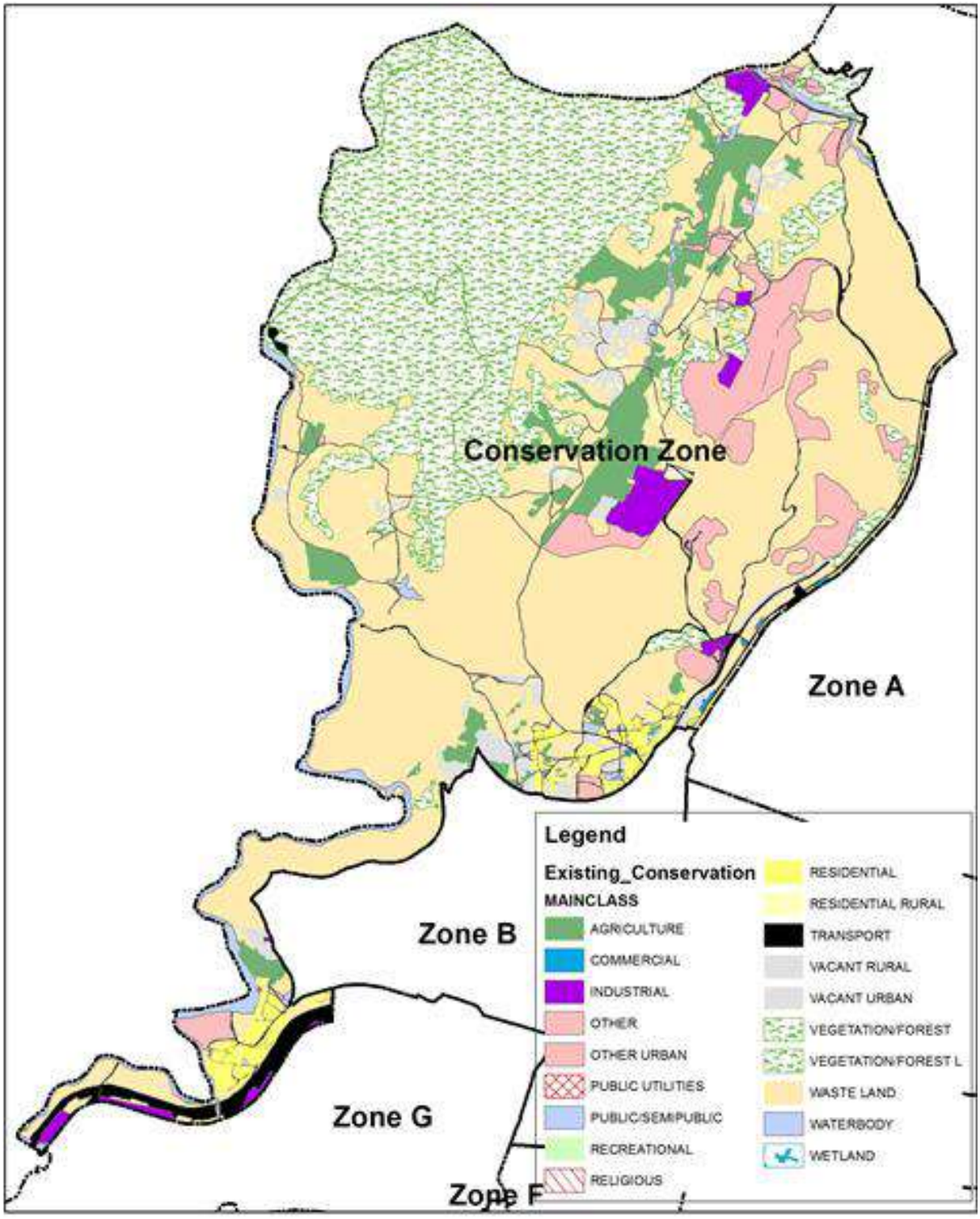
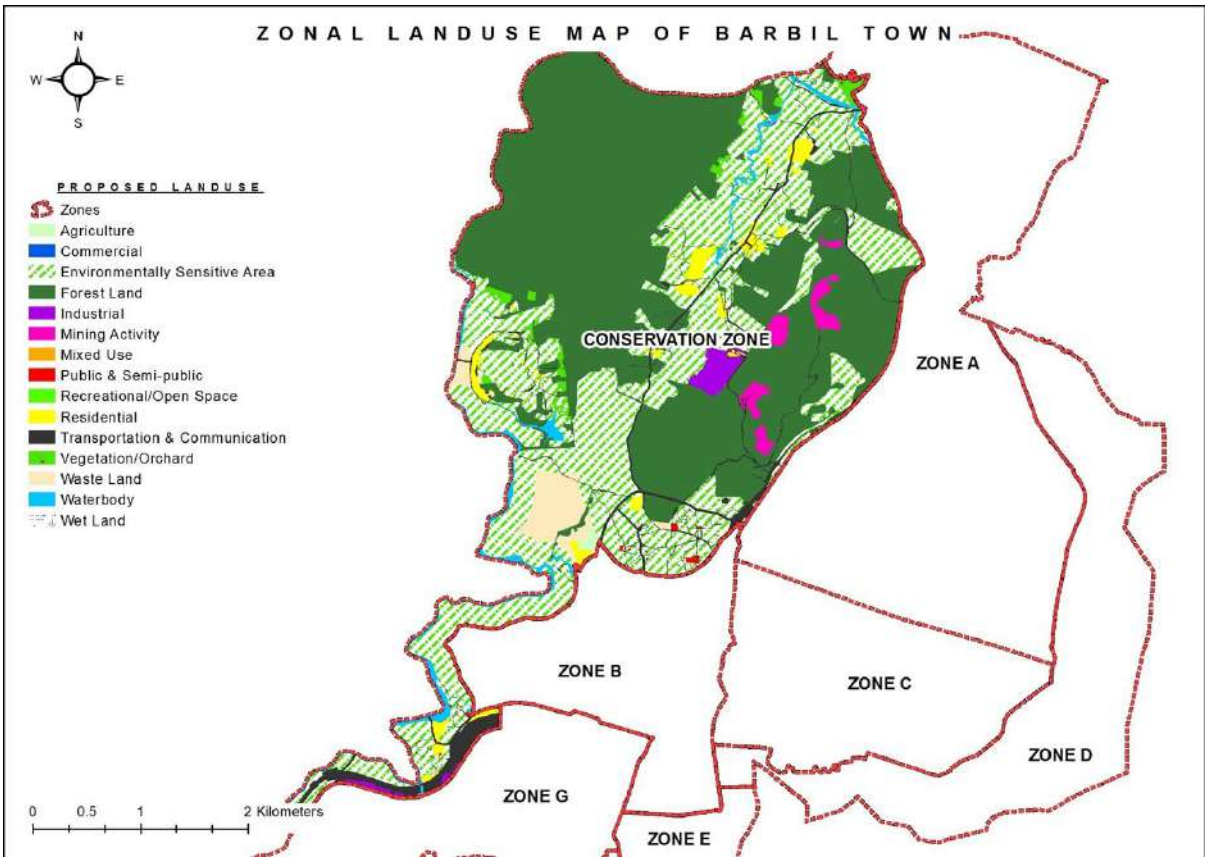


Figure 12.3 Conservation Zone-Proposed Landuse



The dominated use in this zone is Environmental sensitive having the major share followed by Vegetation/Forest land, other use, residential & water body. The Environmental Sensitive area consists of buffer area around Forest & River in the zone.

B. Zone A

Zone A sprawls to a total 10.25 sq.km(1025 hectares). It consists majorly of vacant land and waste land, amounting to total 7.50 sq.km (750 hectares) of the total area, i.e 76% of area.

Table 12-2 Existing Landuse Breakup of Zone A

Typology	Area	%age
Agriculture	45.33	4%
Industrial	6.60	1%
Other	27.47	3%
Other Urban	16.26	2%
Residential	48.21	5%
Transport	79.81	8%
Vacant Urban	257.18	25%

Vegetation/Forest	20.81	2%
Waste Land	508.38	50%
Waterbody	8.62	1%
Total	1025.67	100

Figure 12.4 Zone A-Existing Landuse

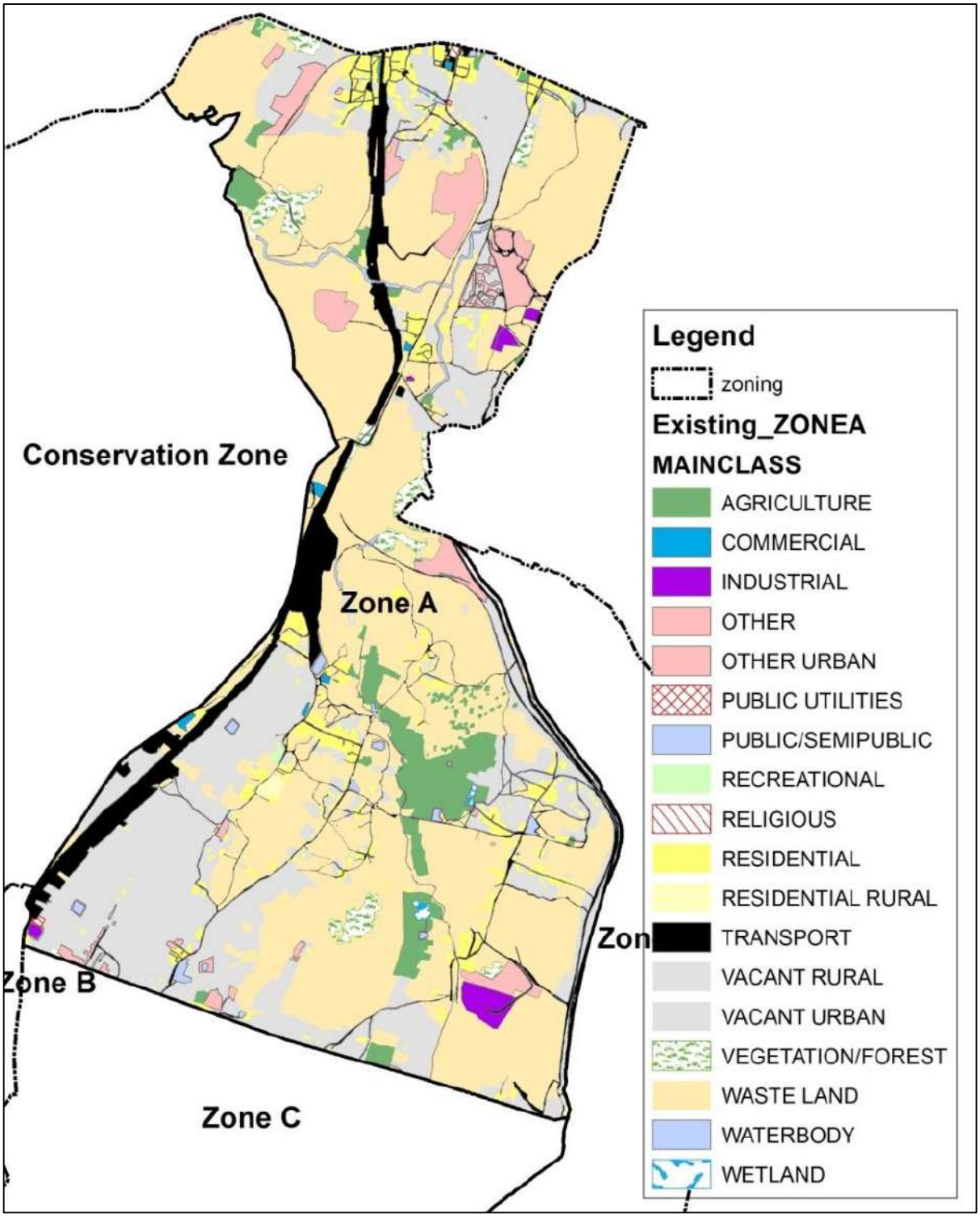
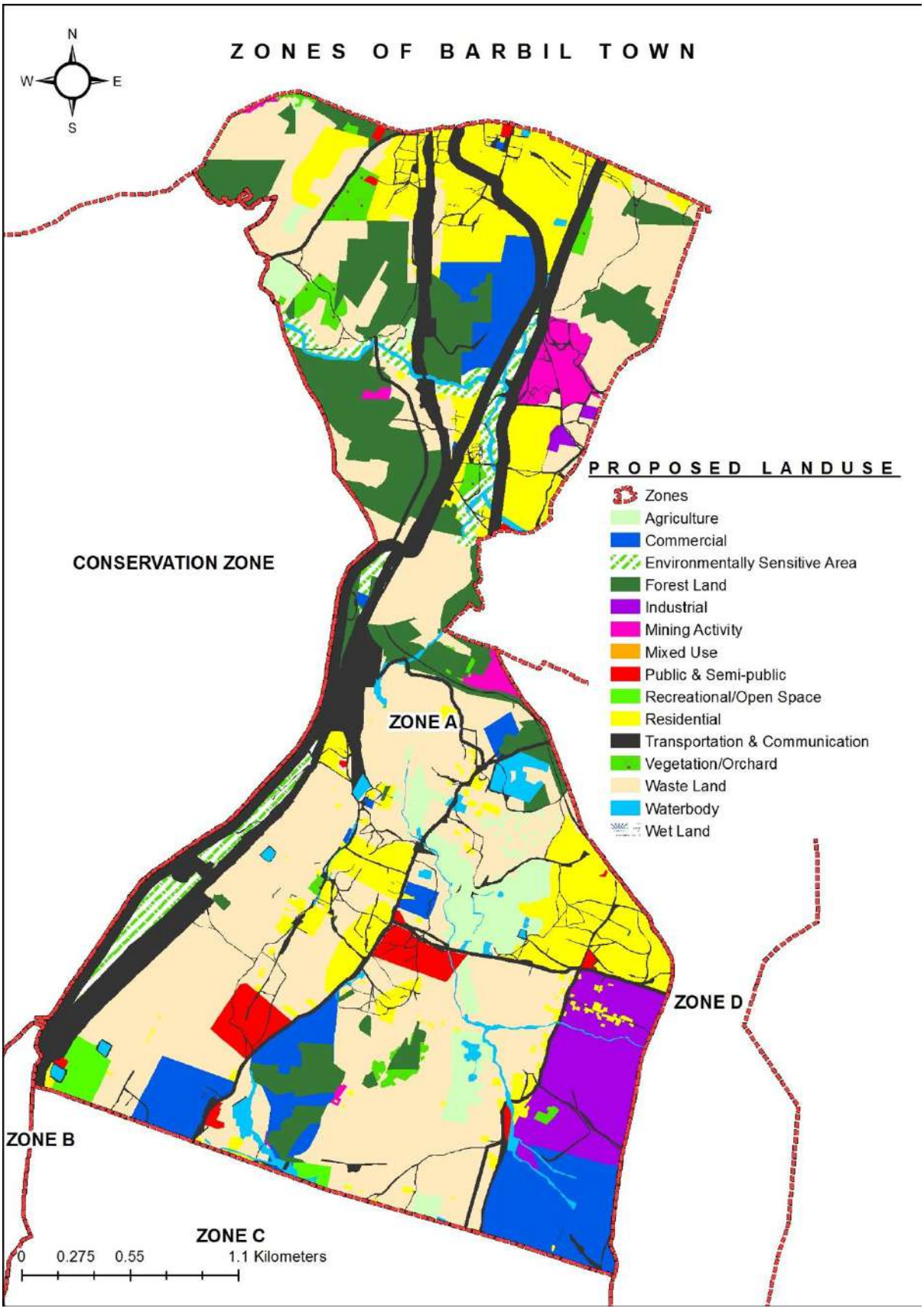


Figure 12.5 Zone A- Proposed Landuse



The Zone –A is adjacent to the Conservation zone. The Dominated landuse in the zone is "other use" followed by Residential, Industrial, Recreational, Public semi Public and Environmental sensitive.

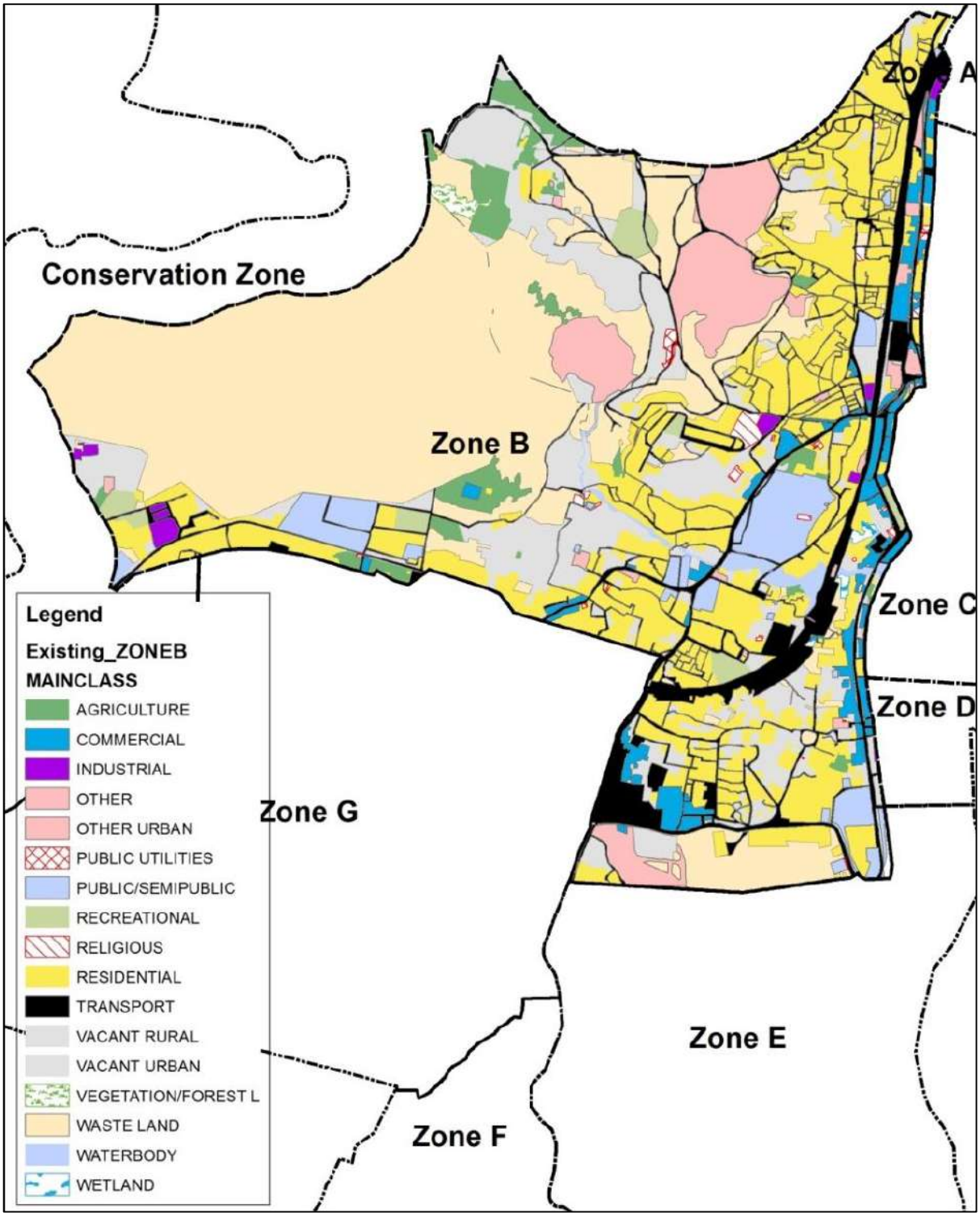
C. Zone B

Zone A sprawls to a total 3.77 sq.km (377 hectares). It consists majorly of residential and waste land, amounting to total 2.18 sq.km (218 hectares) of the total area, i.e 60% of area.

Table 12-3 Existing Landuse Breakup of Zone B

Typology	Area	%
Agriculture	10.42	3%
Commercial	10.52	3%
Industrial	1.83	0%
Other	12.66	3%
Other Urban	9.71	3%
Public/Semipublic	13.64	4%
Recreational	4.59	1%
Religious	1.22	0%
Residential	84.82	23%
Transport	36.37	10%
Vacant Rural	0.08	0%
Vacant Urban	51.67	14%
Waste Land	133.45	35%
Waterbody	3.21	1%
Wetland	0.54	0%
Total	376.30	100

Figure 12.6 Zone B-Existing Landuse



Zone B is surrounded by conservation zone, zone-A, Zone-C, Zone-E, Zone-F & Zone-G.

This zone has the residential use as the dominated use followed by 'Other' use, Administrative use, Recreational use, Commercial, Forest, Environmental sensitive, Industrial & Water body.

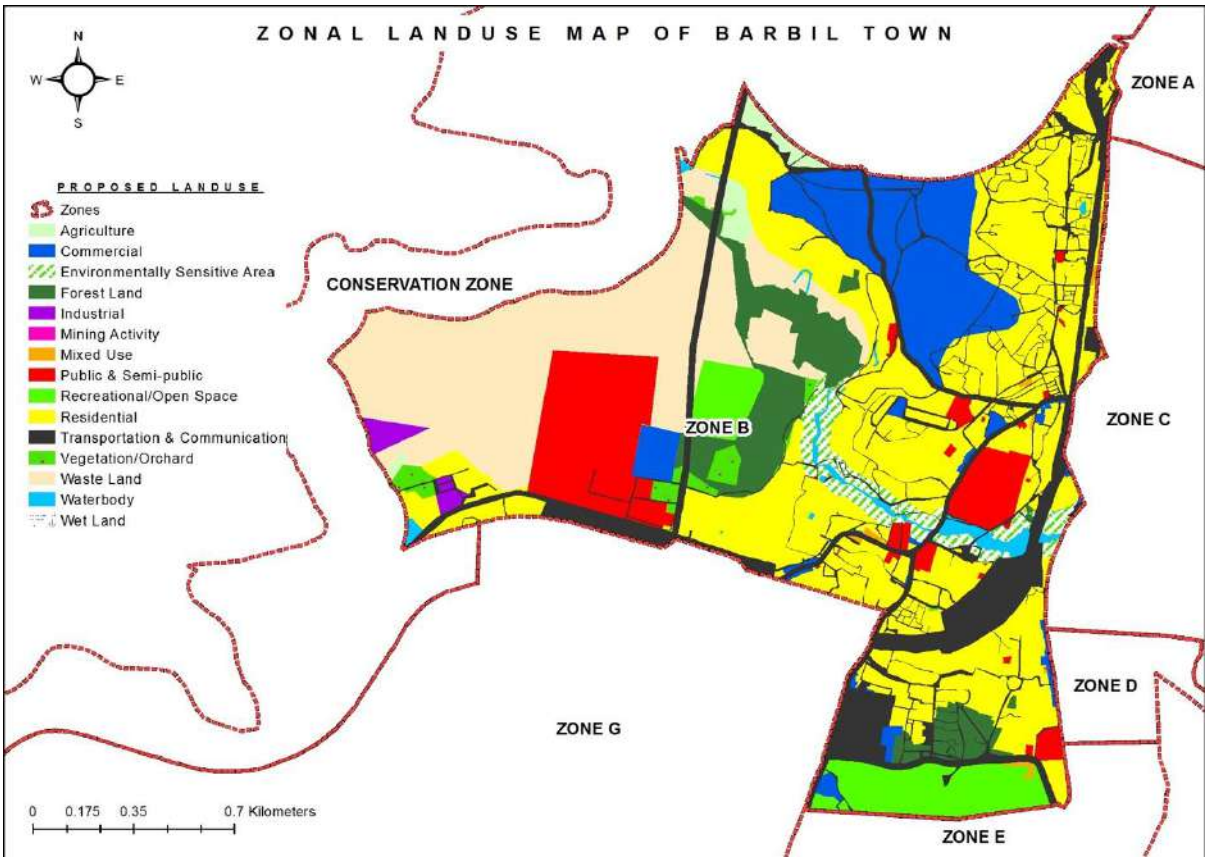


Figure 12.7: Proposed Land Use of Zone B

A. Zone C

Zone C sprawls to a total 3.91 sq km (391 hectares). It consists majorly of residential and vacant land, amounting to total 240 hectares of the total area, i.e 62% of area.

Table 12-4 Existing Land Use of Zone C

Typology	Area	
Agriculture	13.95	4%
Commercial	9.88	3%
Industrial	4.22	1%
Other Urban	8.85	2%
Public Utilities	6.15	2%
Public/Semipublic	9.31	2%
Recreational	4.12	1%
Religious	2.14	1%

Residential	90.85	23%
Transport	24.97	6%
Vacant Urban	150.45	38%
Vegetation/Forest Land	27.45	7%
Waste Land	36.34	9%
Water body	2.65	1%
Wetland	0.00	0%
Total	**391.32**	**100**

Figure 12.8 Zone C-Existing Landuse

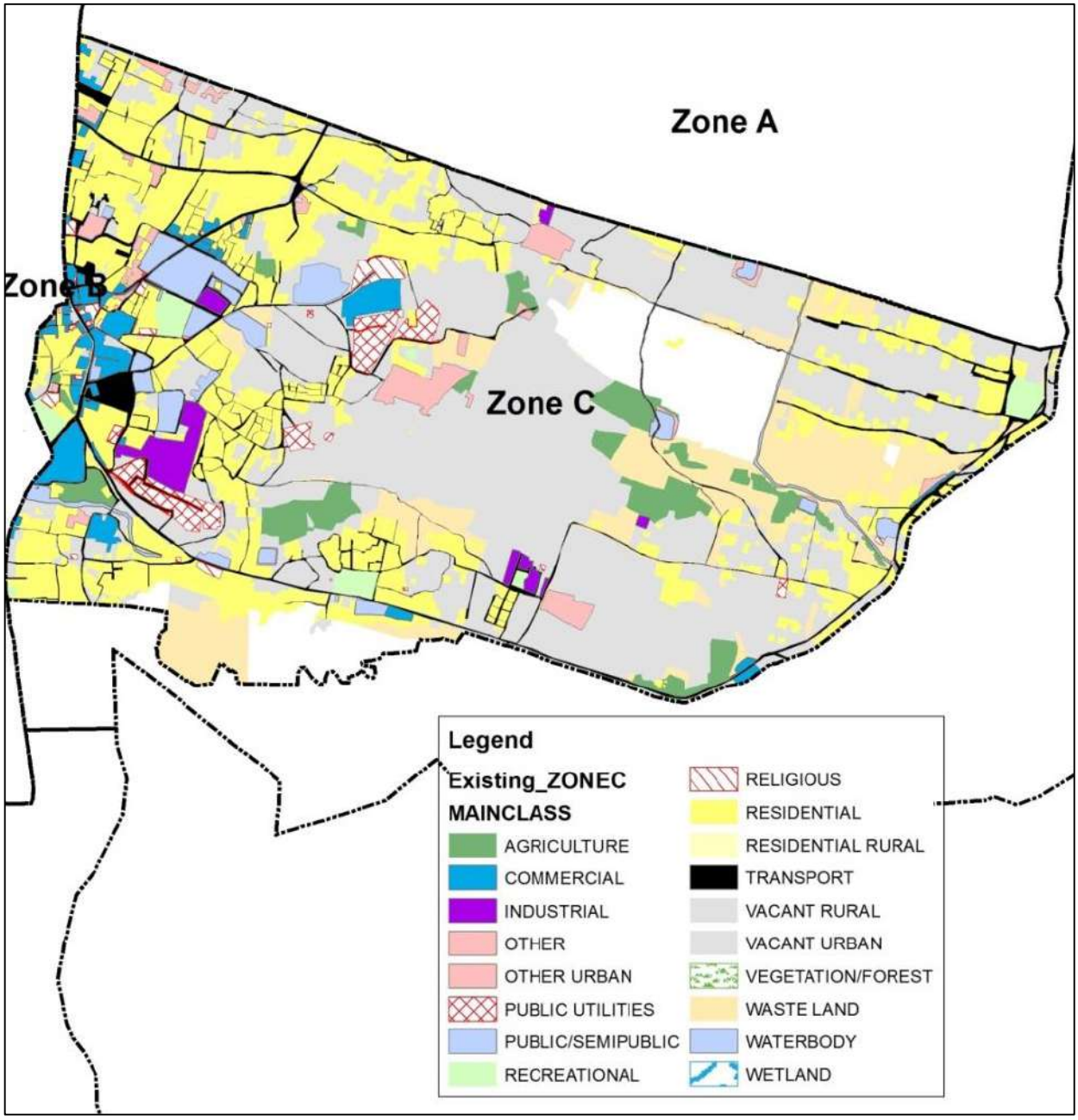
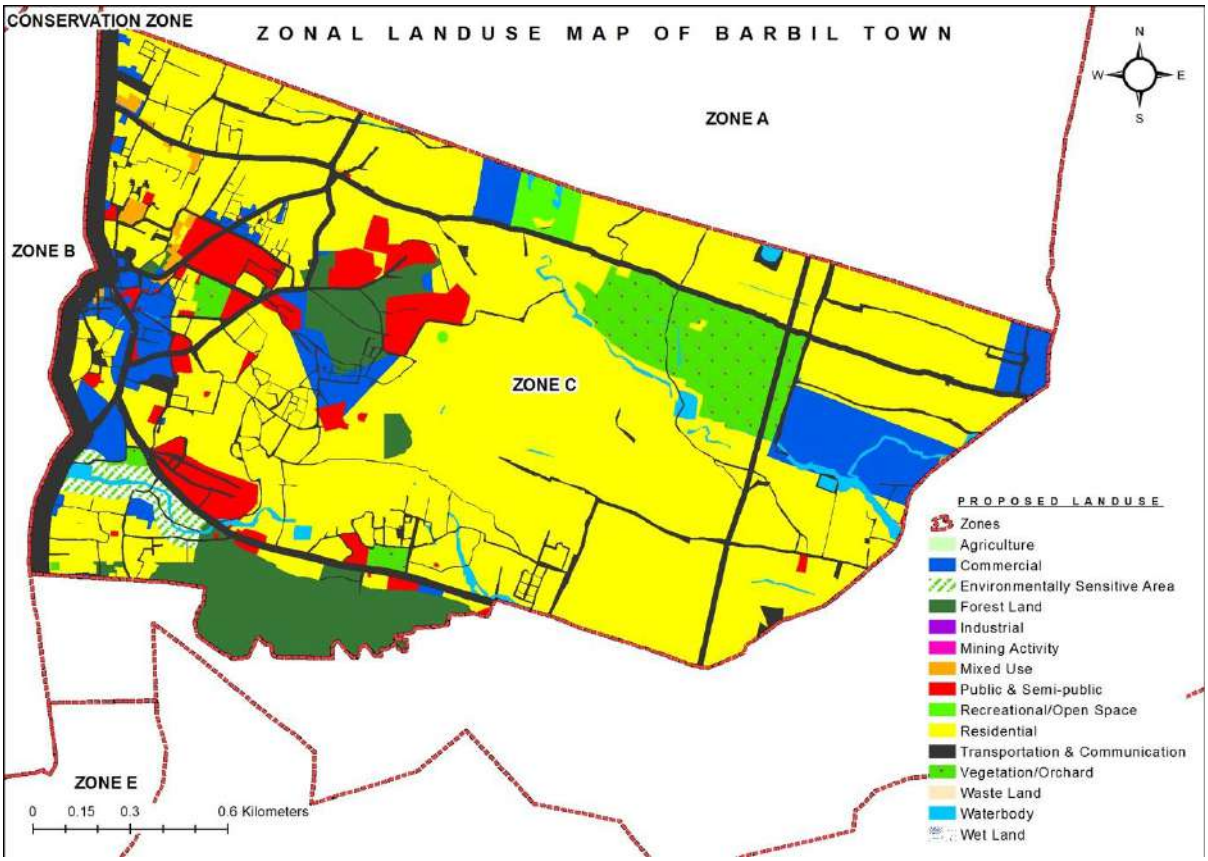


Figure 12.9 Zone C-Proposed Landuse



The Zone-C has residential use as dominating character and is between Zone-A, Zone-B & Zone-D. The other uses in the zone area Forest/Vegetation, Recreational, PSP and Environmental sensitive use.

B. Zone D

Zone D sprawls to a total 451 hectares. It consists majorly of wasteland, forest and vacant land, amounting to total 315 hectares of the total area, i.e. 70% of area.

Table 12-5 Existing Landuse Breakup of Zone D

Typology	Area	
Agriculture	18.29	4%
Commercial	3.12	1%
Industrial	26.15	6%
Other	40.04	9%
Public/Semipublic	3.41	1%
Recreational	1.19	0%
Residential	21.32	5%
Transport	20.24	4%
Vacant Urban	71.04	16%

Vegetation/Forest Land	64.26	14%
Waste Land	180.53	40%
Total	450.80	100

Figure 12.10 Zone D-Existing Landuse

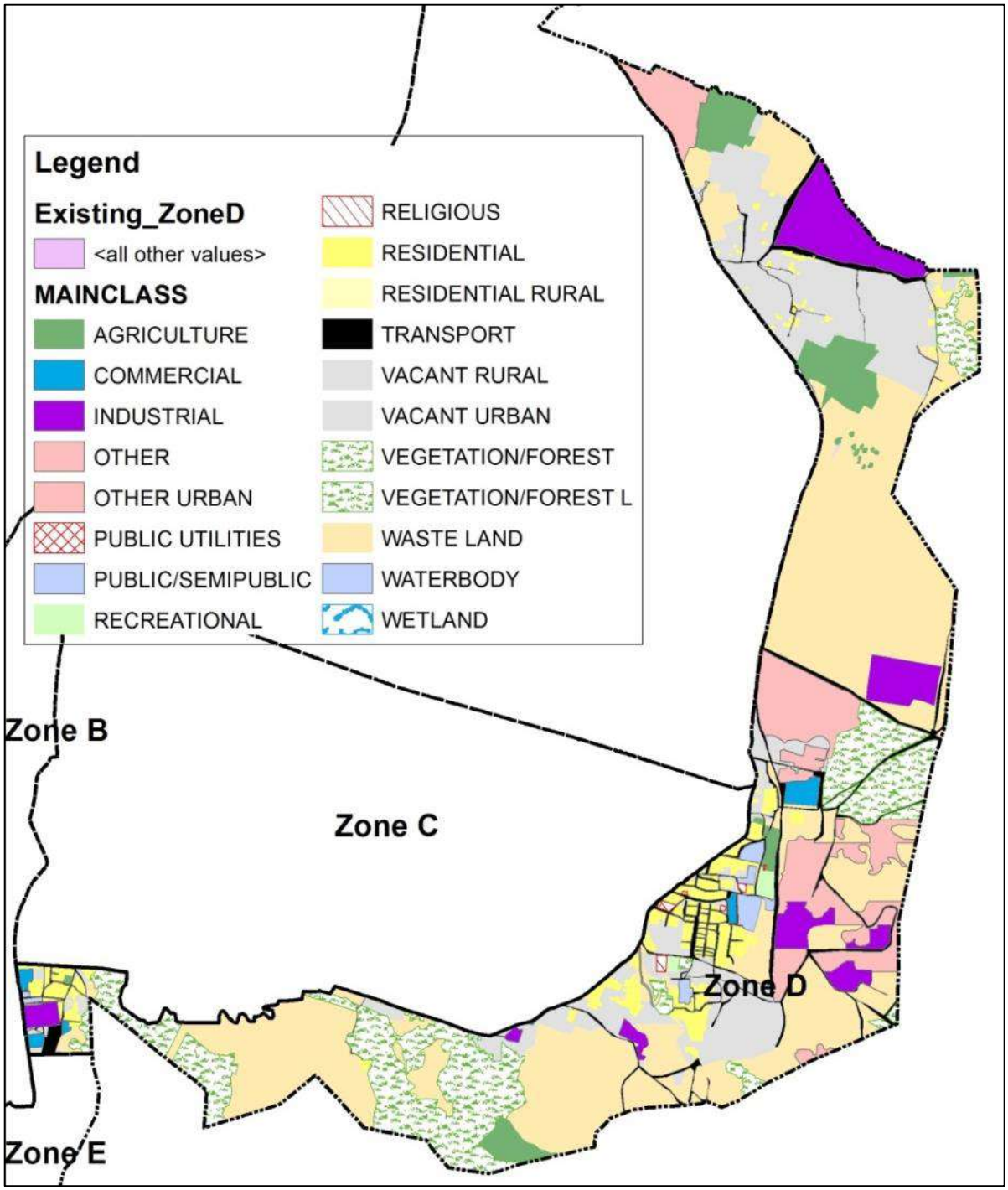
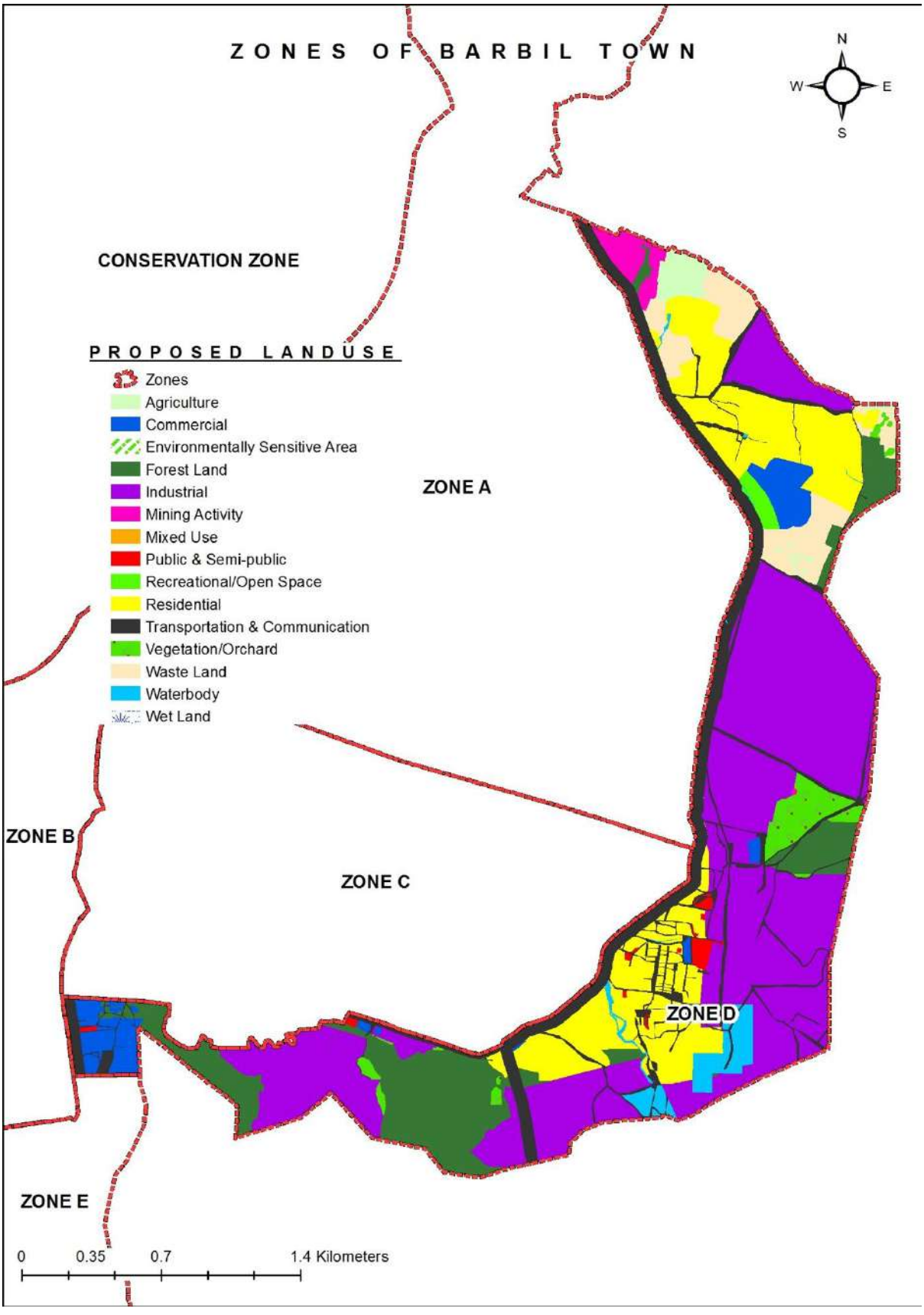


Figure 12.11 Zone D-Proposed Landuse



Zone D has Industrial Use as dominating Use followed by Residential Use, Other use, Forest/Vegetation and Commercial use.

C. Zone E

Zone E sprawls to a total 10.65 Sq.Km (1065 hectares). It consists majorly of wasteland, amounting to total 45.5 sqkm (455 hectares) of the total area, i.e 43% of area.

Figure 12.12 Zone E-Existing Landuse

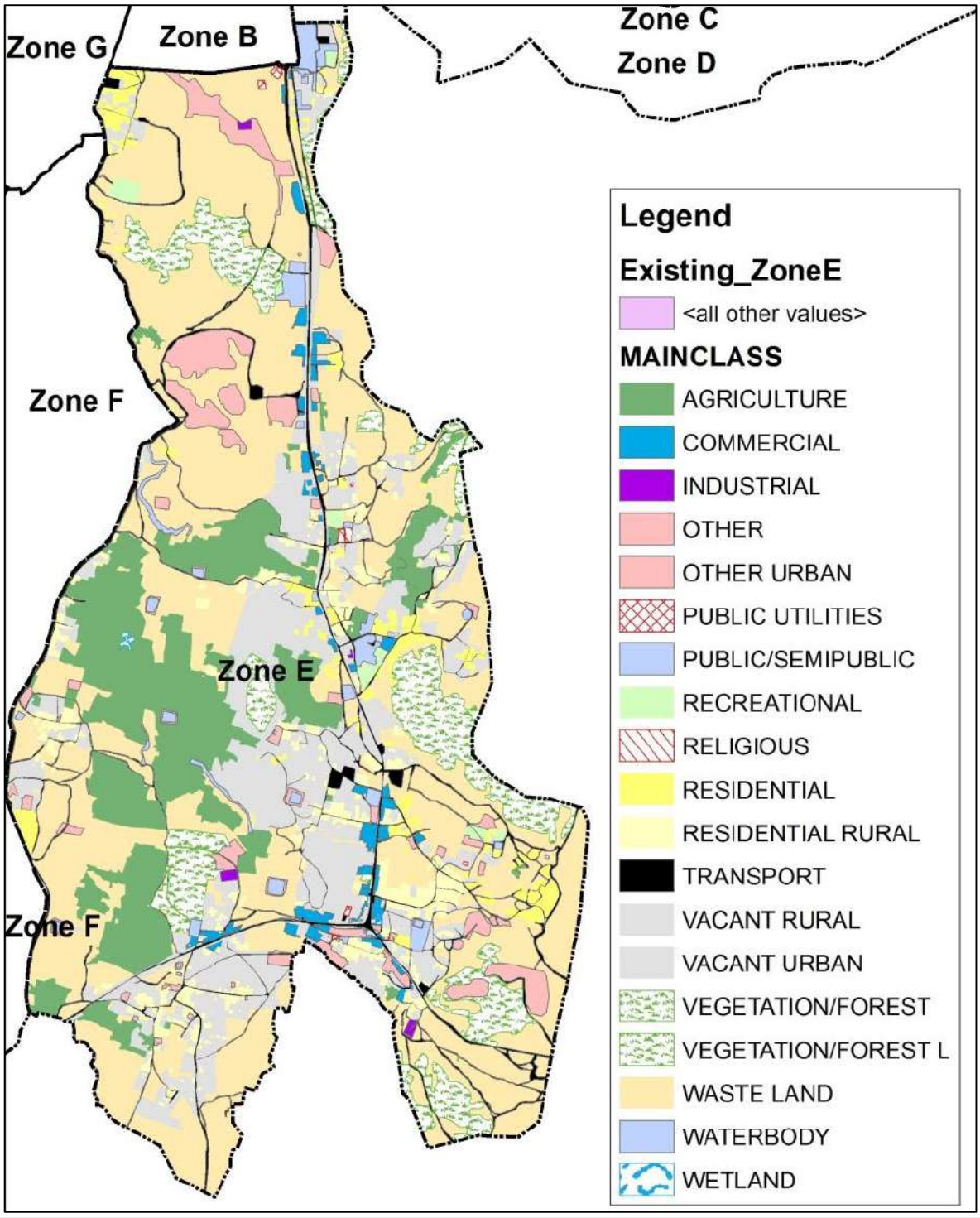
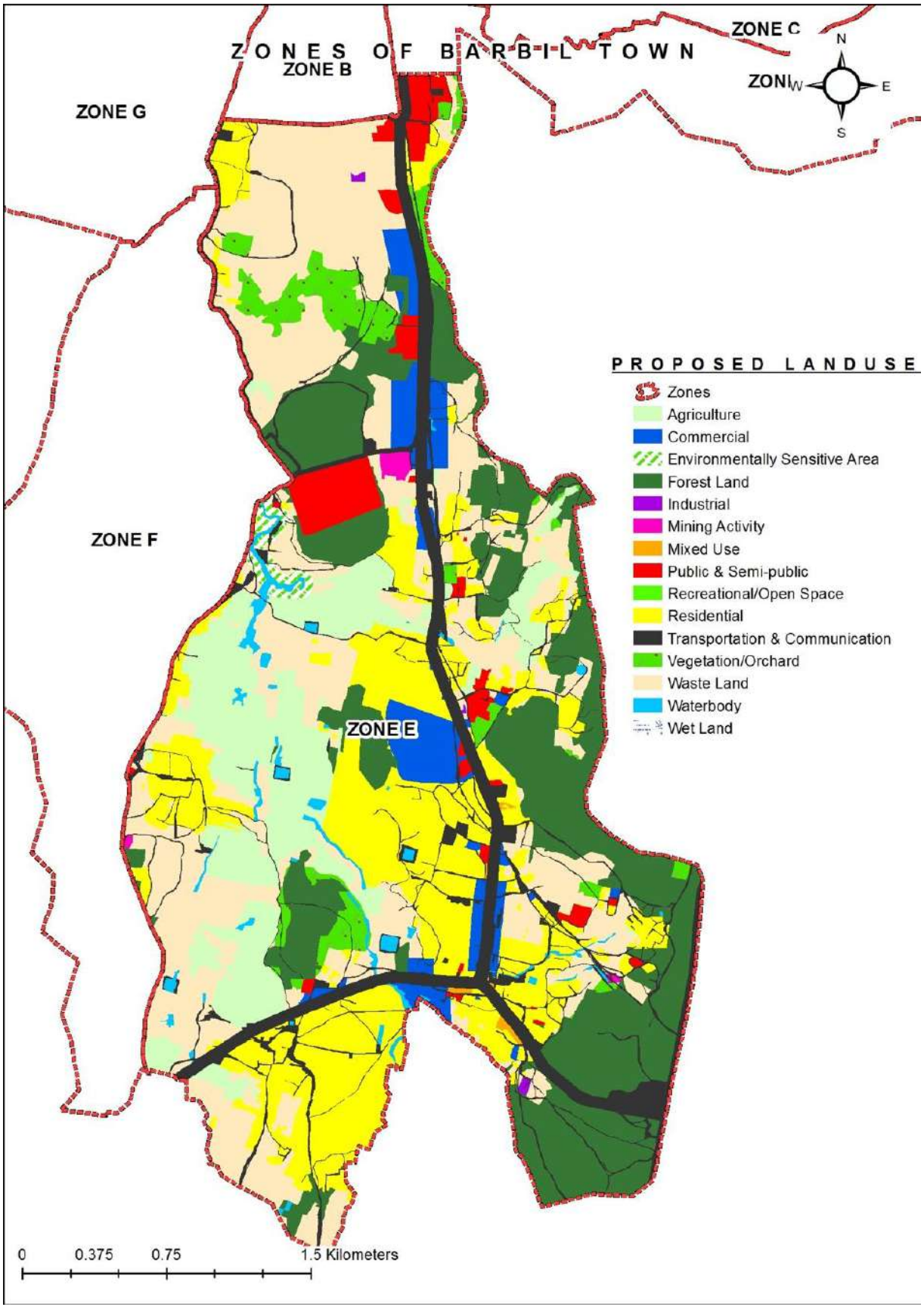


Table 12-6 Existing Landuse Breakup of Zone E

Typology	Area	%age
Agriculture	144.84	14%
Commercial	14.17	1%
Industrial	1.23	0%
Other	23.50	2%
Other Urban	22.08	2%
Public/Semipublic	12.51	1%
Recreational	5.32	1%
Residential	25.47	2%
Residential Rural	42.24	4%
Transport	47.26	4%
Vacant Rural	80.09	8%
Vacant Urban	92.44	9%
Vegetation/Forest L	90.46	8%
Waste Land	454.94	43%
Water body	6.01	1%
Total	**1064.22**	**100**

Figure 12.13 Zone E-Proposed Landuse



Zone E has the Potential For future development as it has the 'Other Use' as dominated use which may be use for future development. This zone also has Residential Use, Forest/vegetation, Recreational and Administrative & Institutional use.

D. Zone F

Zone F sprawls to a total 3.67 sq.km (367 hectares). It consists majorly of wasteland and forest area, amounting to total 2.31 sqkm (231 hectares) of the total area, i.e 63% of area.

Table 12-7 Existing Landuse Breakup of Zone F

Typology	Area	%Age
Agriculture	10.31	3%
Commercial	0.63	0%
Industrial	0.80	0%
Other	63.74	17%
Other Urban	1.14	0%
Public/Semipublic	0.64	0%
Residential	5.93	2%
Residential Rural	5.30	1%
Transport	8.56	2%
Vacant Rural	20.72	6%
Vacant Urban	13.01	4%
Vegetation/Forest Land	74.53	20%
Waste Land	157.27	43%
Water body	4.48	1%
Total	**367.06**	**100**

Figure 12.14 Zone F-Existing Landuse

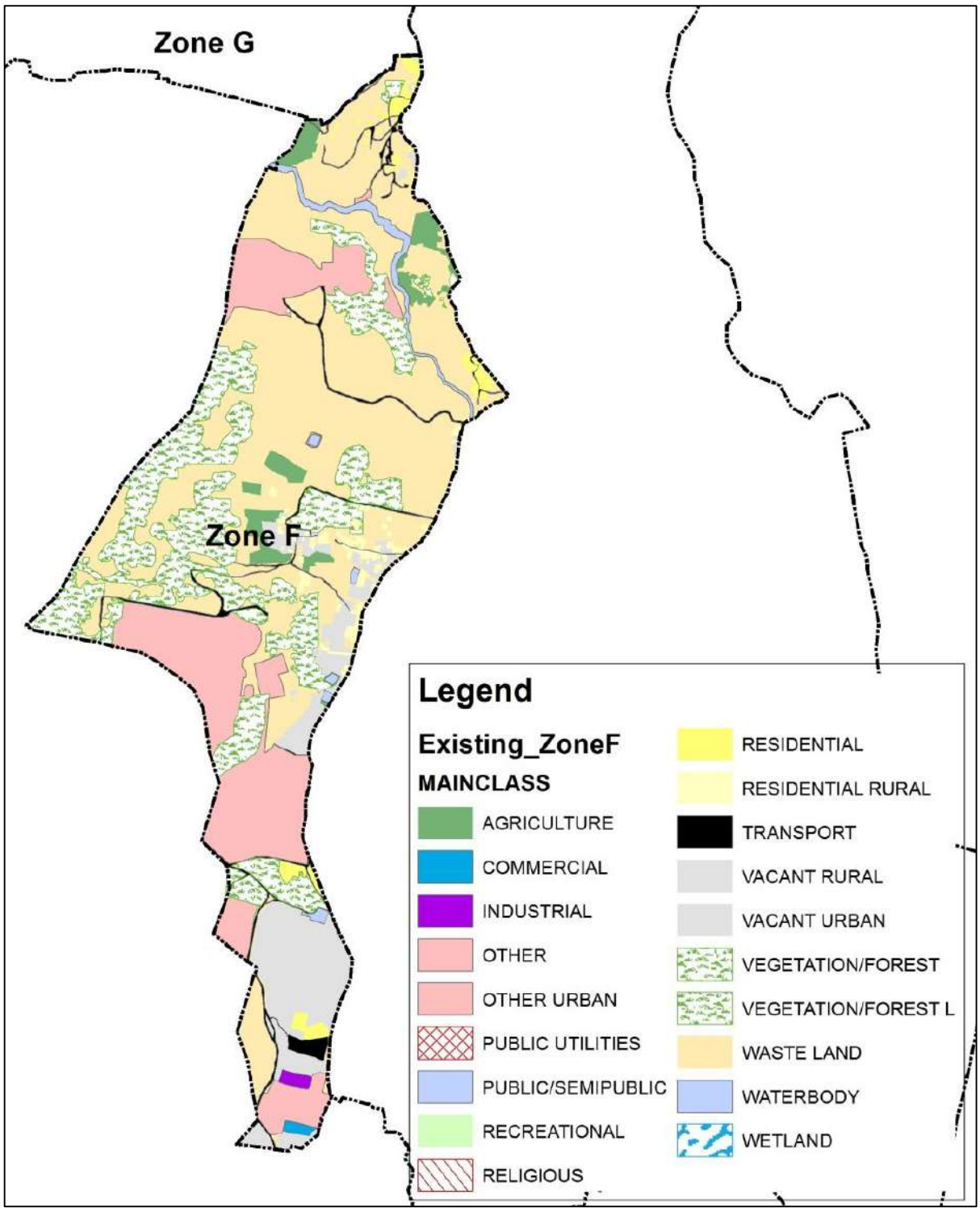
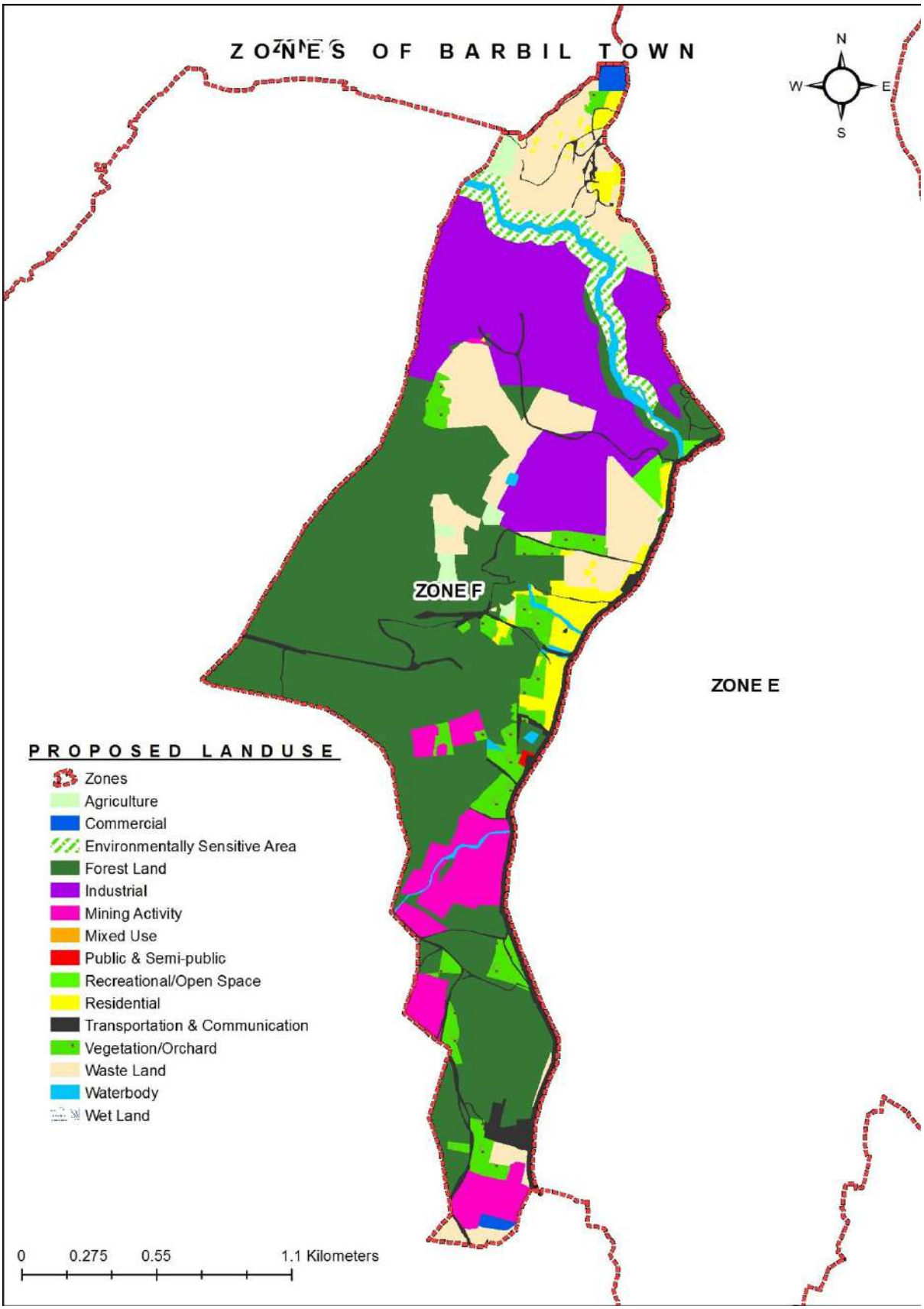


Figure 12.15 Zone F-Proposed Landuse



Zone F is having Forest/Vegetation as the dominating use followed by 'Other use', Industrial use, Environmental use & Commercial use.

E. Zone G

Zone F sprawls to a total 4.18 sq.km (418 hectares). It consists majorly of wasteland and industrial area, amounting to total 1.86 sq.km (186 hectares) of the total area i.e 44% of area.

Figure 12.16 Zone G-Existing Landuse

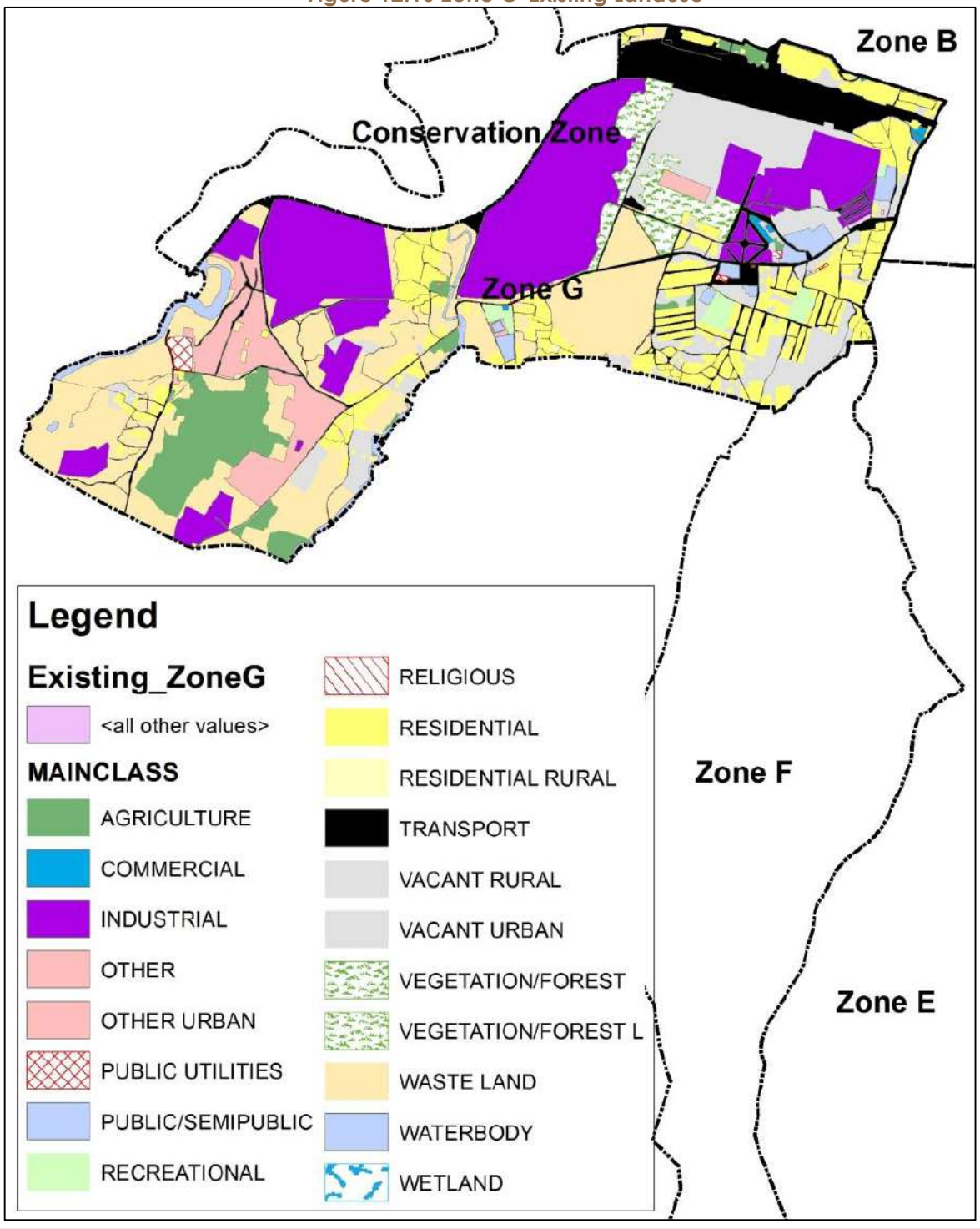
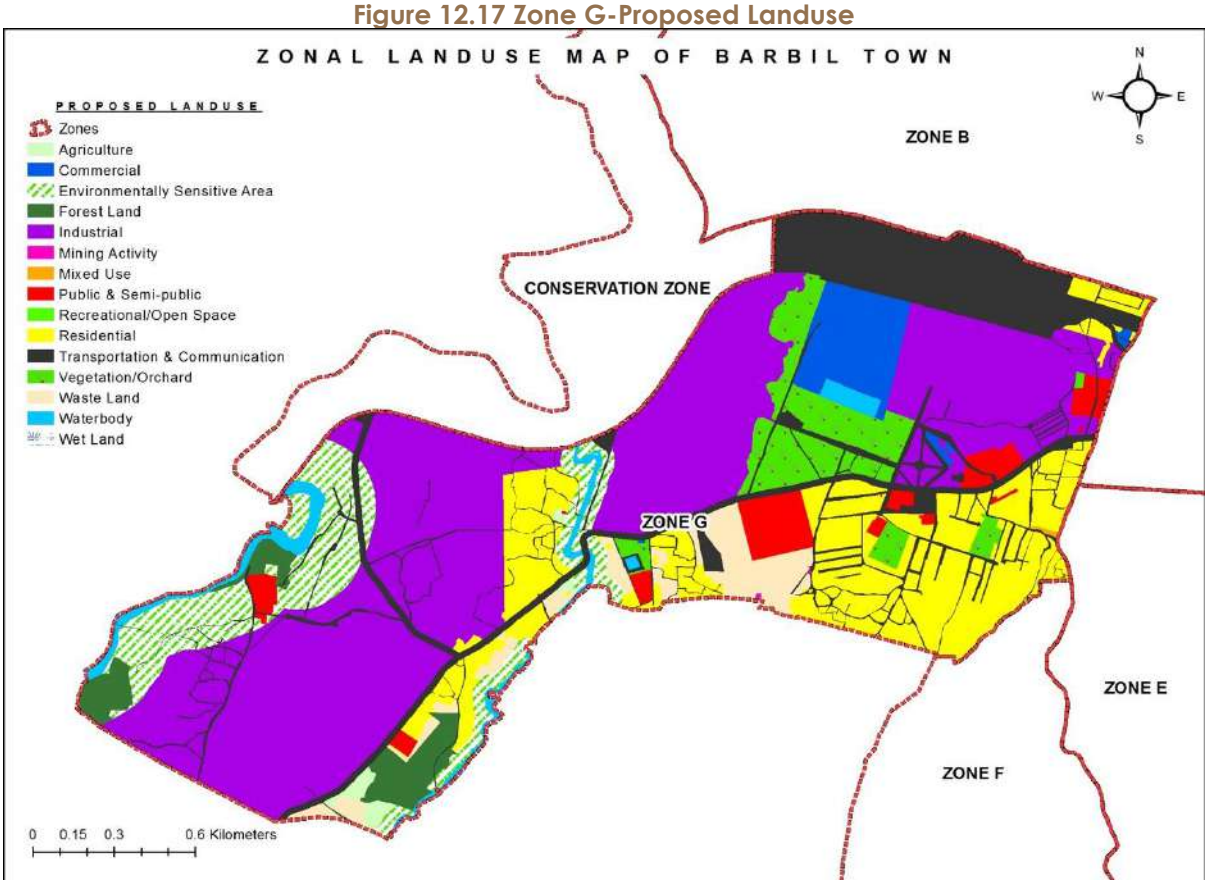


Table 12-8 Existing Landuse Breakup of Zone G

Typology	Area	Percentage
Water body	7.11	2%
Waste Land	93.43	22%
Vegetation/Forest Land	14.03	3%
Vacant Urban	48.95	12%
Transport	45.93	11%
Residential Rural	0.26	0%
Residential	55.43	13%
Religious	0.22	0%
Recreational	3.77	1%
Public/Semipublic	5.42	1%
Public Utilities	1.53	0%
Other Urban	1.91	0%
Other	21.26	5%
Industrial	92.88	22%
Agriculture	24.74	6%
Total	**417.78**	**100**

Figure 12.17 Zone G-Proposed Landuse



Zone-G has the Industrial use as dominating use in the zone, followed by Residential, Environmental sensitive use, 'Other use', Forest/vegetation, Administrative and commercial use.

12.4.2 Decisions on Zone boundaries:

1. The boundaries of each of the zones shall be, as indicated in the Master Plan. Unless, otherwise, shown in the Master Plan, the boundary lines of zones shall be plot line, the centre lines of the streets or such lines extended over the railway right of the way lines or corporate limit lines it existed at the time of enforcement of those regulations.
2. The zones designed may further be divided into sub-zones by the Planning Authority where it deems it expedient, the designation of such sub-zones being dependant on the special use to which each sub-zone is being utilized.
3. All the disputes and differences with respect to the exact location of the zonal boundaries shall be referred to the Director of Town Planning, Odisha, Bhubaneswar whose decision shall be final and binding.

12.4.3 General Regulation

1. Except as otherwise provided, no structure or land hereafter shall be used and no structure or part there of shall be erected, re-erected or materially altered and no contract dealing with land its sale, lease, subdivision shall be made unless in conformity with these regulations.
2. Any use of land or structure existing at the time of these enforcement of the regulations, but not in conformity with these regulations:

   Such uses of land or structure shall not be:

   a. Changed to another non-conforming use
   b. Re-established after discontinuance of use for six consecutive months
   c. Extended except in conformity with these regulations and
   d. Re-built or repaired after damage exceeding one half of its cubical contents immediately prior to such damage.
3. All existing places of worship, temples, churches, mosques etc. and burial and cremation grounds shall not be treated as non-conforming uses.

12.4.4 Period of Moratorium for Change from Non-conforming to Conforming use

1. All non-conforming uses of land and buildings shall be discontinued and made to conform to the Master Plan as specified below for different non-conforming uses, under section 32 of Odisha Town Planning and Improvement Trust Act, 1956.

12.4.5 Non-conforming Uses – General

1. Notwithstanding anything contained in the zoning regulations, the Planning Authority may, in exceptional and unavoidable cases, if it considers appropriate, recommend to the Government through the Director, Town Planning, Odisha, for the establishment of any non-conforming use in any zone. The final decision in this regard shall, however, lie with the State Government.
2. Notwithstanding anything contained in the zoning regulation, the Planning Authority may allow any addition or alteration in the existing non-conforming residential uses in the Industrial, Commercial, Administrative, Institutional and Utilities and Open Spaces zone with such restrictions as it may have considered desirable in the interest of the community.
3. In the plan for residential neighbourhood, requirement of open spaces, roads and neighbourhood commercial uses will be provided. In case where land is subdivided. It is essential that sub-divisional layout plan should have the prior approval of the Planning Authority. While approving, the Planning Authority will consider the provision of about 20-25 percent for roads, 5 percent for open spaces and 1 percent for neighbourhood shopping areas.

12.4.6 Industrial Non-Conforming Uses

1. Industrial use of structures or land which does not conform to the land use shown in the Master Plan, shall either have to be discontinued gradually, or shifted, in stages to the industrial areas earmarked in the Plan.
2. All noxious and nuisance industries which may be dangerous to life, or injurious to health or property, or causing offence to the sense of sights small or hearing or disturbance to rest and sleep must be the first to go from their present location. The time of their shifting ranging from period of 3 to 10 years shall be fixed by the Planning Authority, depending upon the nature and degree of such nuisance and the areas occupied.

3. Other industries will get more time for shifting i.e. from 5 years to a maximum period of 15 years on a sliding scale on the following criteria.
4. The capital value of land structure and machinery allowing for depreciation.
   a. The registered employment of industry (more time will be given to industries employing more workers).
   b. The registered employment of industry (more time will be given to industries employing more workers).
   c. The production floor space per workers.

12.4.7 Residential Non-Conforming Use

1. Existing residential use of building in industrial, commercial use zones in ground floors only, and such residential building in Administrative, Institutional and Utilities and open spaces zones as shown in the Master Plan, shall be discontinued within a period of twenty years.
2. Not-withstanding anything contained in the zoning regulations, the Planning Authority may in any exceptional and unavoidable cases, if it considers appropriate, recommend to the Government through the Director of Town Planning, Odisha for the establishment of any non-conforming use in any zone. The final decision in this regard shall however lie with the State Government.
3. Notwithstanding anything contained in the zoning regulations, the Planning Authority may allow any addition or alteration in the existing non-conforming residential uses in the industrial, commercial, administrative, institutional and utilities and open space zone with such restrictions as it may consider in the interest of the community.
4. In the plan for residential neighbourhood, requirement of open space, roads and neighbourhood commercial uses will be provided. In case, where land is sub-divided, it is essential that sub-divisional layout plan should have prior approval of the Planning Authority. While approving, the Planning Authority will consider the provision of about 20-25 percent for roads, 5 percent for open spaces and 1 percent for neighbourhood shopping areas.

12.4.8 Commercial non-conforming uses

1. Except otherwise provided in the Master Plan commercial use of buildings or lands of wholesale nature as existing at the time of enforcement of this regulation in industrial, residential, administrative, Institutional and Utilities and

Open Spaces zones as shown in the Master Plan will have to be discontinued within a period of ten years.

12.4.9 Off Street Parking Space for Motor Vehicles

1. Off street parking space shall be provided on any plot on which the uses specified in table are hereafter established. Such parking space as specified in table 9.2 shall be minimum and provided with adequate vehicular access to a street. In case of uses not included in table 9.2 the Planning Authority shall determine the requirements on the merit of each case commensurate with the intensity and adequacy of the requirements.
2. Each off-street parking space provided shall not be less than 250 square feet in area which includes the area of drives, isles and such other requirements.
3. If a vehicle parking space required by these regulations is provided in parking areas by groups of property owners for their mutual benefit, the Planning Authority may construe such use of this space as meeting the off-street parking requirements under these regulations.
4. If off-street vehicle parking space cannot be reasonably provided the Planning Authority may permit such space to be provided in the vicinity. Such vehicle parking space shall be required as open space associated with the permitted use and shall not be encroached in any manner.

12.4.10 Off Street Loading

1. All uses involving the loading and unloading of trucks and heavy vehicles shall be provided with sufficient space to permit the transfer of goods and products in areas other than a public street.

12.4.11 Application for Permission

a. Every owner of land who intends to erect a building or re-erect or alter materially or add to an existing building or intends to change the use of any land or structure shall submit application to the Special Planning Authority for approval of the site and for permission to execute the work in such form and manner and accompanied by such document as the Special Planning Authority may determine. All plans must be signed by an Architect or by a Graduate Engineer and thus be submitted to the Special Planning Authority, Barbil.

b. The Special Planning Authority, Barbil may fix a reasonable price for the form which it shall prescribe for submission of application seeking permission for construction. A subscription as scrutiny fee may be charged to every person, thus submitting their building plan completed in every respect and the charges are be paid at the time of submission of such plan and credited to Revenue Accounts of Special Planning Authority, Barbil.

c. In case of site of the building to be erected, re-erected or altered or added to, is held by the applicant on lease by any person or agency or department of Government, the application shall be accompanied by a certificate for the lessor to the effect that said lessor has no objection to such erection, re-erection, addition or alteration.

d. The Special Planning Authority, Barbil may require the applicant to furnish with it such information which has not already been furnished, or to satisfy it that there are no objections which may lawfully be taken to the grant of permission to execute the work.

e. If any information as required above or in the application form or plans and documents, is in the opinion of the Special Planning Authority, Barbil incomplete or defective it may require the applicant to furnish further information. If the required information is not furnished within one month the application shall be liable for rejection.

12.4.12 Duration of Permission

The permission once accorded shall remain valid for a period of 5 years for residential use and 3 years for the buildings other than residential use. If the construction is not completed within the specified period the owner shall get the permission revalidated by the Special Planning Authority, Barbil and such revalidation shall be subject to the regulations then in force.

12.4.13 Issue of Refusal of Permission

The Special Planning Authority, Barbil may either issue or refuse permission with such modification and directions or subject to such conditions as it may deem necessary. In case of refusal the Special Planning Authority, Barbil shall quote the reasons for such refusal.

12.4.14 Permission not to be given under Certain Cases

a. Save as otherwise provided in the zoning regulation, no permission shall be given for re-erection of or addition or alteration to a building, the use of which has been declared as non-conforming in the Master Plan unless the owner undertakes to change the use to conforming one, but subject to time limit prescribed under these regulations.

b. No permission shall be given for erection, re-erection of or alteration or addition to a building, if the use of site in the opinion of the Special Planning Authority, Barbil is likely to affect free flow of traffic in the area and is likely to cause congestion on the nearby.

12.5 Use Zones Designated

There shall be 8 land use categories subdivided into use Zones as given below:

Table 12-9: Land Use categories subdivided into Use Zones

S. No.	Land use	Name of Use Zone	Legend
1	Residential		R
		High density residential	
		Medium density residential	
		Low density residential	
2	Commercial		
		Retail Shopping, General Business and Commerce, District Centre, Community Centre, Non-Hierarchical Commercial Centre	C1
		Wholesale, Warehousing, Cold Storage and Oil Depot	C2
		Hotels	C3
3	Mixed use	Mix of two or more land uses	MU
4	Public- semi Public		
		Administrative Offices	PS1
		Institutional	PS2
		Public Utilities/ Services/ Communication	PS3
5	Industrial		

		Heavy Industries/ Industrial Estate	H.I.
		Light Industries/Cottage/ Manufacturing Units	L.I.
		Medium Industries/ Warehouse/ Godown	M.I.
6	Transportation	Roads/Bus Stand/Airport/Railway station	T
7	Recreational		
		Park/ Garden/ Zoo	P1
		Playground/ Stadium	P2
8	Non-Built-up Land		
		Agriculture	NB1
		Forest Land	NB2
		Water body	NB3
		Land reserved for future development	NB4
		Environmentally Sensitive Areas	NB5

There will be certain activities/utilities which shall be permitted, restricted and prohibited in different use zones. The table below highlights the permitted, restricted and prohibited acivities in detail.

LAND USE CLASSIFICATION AND PERMISSIBLE USES

Zoning: —

(1). In the Planning area or areas where various use zones viz, residential, commercial, industrial, administrative, public & semipublic, recreational uses, transport & communication, green belt, natural drainage channel and water bodies having their zonal boundaries have been indicated, they shall be regulated as per rule 22 of these rules. Except as otherwise provided no structure or land hereinafter shall be used and no structure shall be erected, re-erected or altered unless its use is in conformity with these rules.

(2). For all non-confirming land use, no expansion shall be permitted. At the time of redevelopment, stipulated zoning regulations shall be followed.

(3). The Planning Authority shall notify the hierarchy of road, road width and land area on which the Mixed Land Use to be applicable.

(A) Different use of land: —

(1). Permission for different uses shall be accorded outright for principal use earmarked in the different zones described in the Table (uses / activities permitted).

(2). Permission for different uses described in table under Restricted uses / activities shall be permitted on special consideration and approval of the Authority and reasons for such consideration shall be recorded in writing.

(3). The purposes specified in table under prohibited activities / uses shall not be permitted in the areas reserved for particular uses.

(4). Residential buildings and others buildings may be permitted in the Primary Activity Use Zone if the following conditions are satisfied along with other conditions of these rules: —

- The land is not a leasehold land;
- The coverage is not more than 20%;
- The height is not more than 7.0 (seven) meters; and at least 60% of land is used for plantation/ agriculture;

Table 12-10 Land Uses Permitted/Restricted/Prohibited in Different Use Zones

Sl. No.	Use Zone	Permitted Uses / Activities	Restricted Uses/Activities	Prohibited Uses / activities
1.	RESIDENTIAL (Primary Residential Zone, Unplanned/ Informal residential Zone).	1. Residence – plotted, (detached, semi - detached and row housing) group housing houses, residential flat, residential-cum-work, 2. hostels, boarding and lodging (accommodation for transit employees of Govt./ Local Bodies) houses, 3. marriage hall, community hall, 4. old age home, 5. police post, 6. guest houses, 7. crèches, 8. day care centre, 9. convenience shopping centres, local (retail shopping), 10. medical clinic, dispensaries, nursing home and health centres (20 bed), dispensary for pets and animals, 11. professional offices, educational buildings: (nursery, primary, high school, college), school for mentally/ physically challenged, 12. research institutes, 13. community centres, 14. religious premises, 15. library,	1. *Dharamshala*, foreign missions, night shelters, 2. petrol pumps, motor vehicle repairing 3. workshop/garages, household industry, bakeries and confectionaries, 4. storage of LPG gas cylinders, 5. burial-grounds, 6. restaurants and hotels, 7. printing press, 8. godowns/ warehousing, 9. bus depots without workshop, 10. cinema hall, auditoriums, markets for retail goods, 11. weekly markets (if not obstructing traffic circulation and open during non-working hours), 12. informal markets, 13. multipurpose or junior technical shops, 14. transient visitors camp, 15. municipal, State Central and Government offices.	1. Heavy, large and extensive industries: noxious, obnoxious and hazardous industries, 2. warehousing, storage go-downs of perishables, 3. hazardous, inflammable goods, 4. workshops for buses etc., 5. slaughter-housing 6. wholesale mandis, 7. hospitals treating contagious diseases, 8. sewage treatment plant/disposal work, 9. water treatment plant, 10. solid waste dumping yards, 11. outdoor games stadium, indoor games stadium, 12. shooting range, 13. zoological garden, 14. botanical garden, 15. bird sanctuary, 16. picnic hut, 17. international conference centre, 18. courts, 19. sports training centre, 20. reformatory, 21. district battalion office,

		16.gymnasium, 17.park/tot-lots, 18.plant nursery, 19.technical training centre, yoga centres/health clinics, 20.exhibition and art gallery, clubs, 21.banks/ ATM, police stations, 22.taxi stand/three-wheeler stands, bus stops, 23.electrical distribution depot, 24.water pumping station, 25.post offices, 26.hostels of non-commercial nature, 27.kindergartens, 28.public utilities 29.Buildings except service and storage yards.		22.forensic science laboratory.
2	COMMERCIAL USE (Retail Shopping Zone, General Business and Commercial District/ Centres, Wholesale, Go-downs, Warehousing/ Regulated markets, Service Sector, Regulated/ Informal/ Weekly markets	Shops, convenience /neighbourhood shopping centre, local shopping centres, professional offices, work places/offices, banks, stock exchange/financial institution, bakeries and confectionaries, cinema hall/theatre, malls, banquet halls, guest houses, restaurants, hotels,	1. Non-pollution, non-obnoxious light industries, 2. warehousing/storage go downs of perishable, 3. inflammable goods, coal, wood, timber yards, 4. bus and truck depots, 5. gas installation and gas works, 6. poly techniques and higher technical institutes, 7. junk yards, 8. water treatment plant 9. railway yards/stations, sports/stadium and	1. Dwellings except those of service apartment, 2. Essential operational, watch and ward personnel, 3. heavy, extensive, noxious, obnoxious, hazardous and extractive industrial units, 4. hospitals/research laboratories treating contagious diseases, 5. poultry farms/dairy farms, 6. slaughter-houses,

		weekly market, petrol pumps, go-downs and warehousing, general business, wholesale, residential plot-group housing, hostel/boarding housing, hostel, auditoriums, colleges, nursing homes/medical clinics, pet clinics, religious places, commercial centres, research/training institute, commercial service centres/garages/ work shop, night shelter, weekly/formal markets, library, parks/open space, museum, police stations/post, taxi stand/three wheeler parking site, stands, 30)post offices, government/ institutional offices, telephone exchange / centres, warehousing covered storage, research institutions.	public utility installation, 10. hotel and transient visitor's homes, 11. religious buildings, 12. hospitals and nursing homes.	7. sewage treatment/disposal sites, 8. agricultural uses, 9. storage of perishable and inflammable commodities, 10. quarrying of gravel, sand, clay and stone, 11. zoological garden, botanical garden, bird sanctuary, picnic hut, 12. international conference centre, 13. courts, 14. sports training centre, 15. reformatory, 16. district battalion office, 17. forensic science laboratory 18. all other activities which may cause nuisance and are noxious and obnoxious in nature.
3	INDUSTRIAL USE ZONE (Service and Light Industry, Extensive and Heavy	1. Residential building for essential staff and for watch and ward personnel,	1. Noxious, obnoxious and hazardous industries except storage of perishable	1. Residential dwellings than essential operational,

	Industry, Special Industrial Zone – (Hazardous, Noxious and Chemical)	2. all kind of industries, 3. public utilities, 4. parking, 5. loading, unloading spaces, 6. warehousing, storage and depot of non-perishable and non-inflammable commodities and incidental use, 7. cold storage and ice factory, 8. gas godowns, 9. cinema, 10. bus terminal, 11. bus depot and workshop, 12. wholesale business establishments, 13. petrol filling stations with garage and service stations, 14. parks and playgrounds, 15. medical centres, restaurants.	and inflammable goods, 2. junkyards, sports /stadium /playgrounds, 3. sewage disposal works, 4. electric power plants, 5. service stations, 6. cemeteries, government/semi government/ private business offices, 7. bank and financial institutions, 8. helipads, hospitals/ medical centres, 9. religious buildings, 10. taxi stands, 11. gas installations and gas works, 12. animal racing or riding stables, 13. workshops/garages, 14. dairy and farming, 15. quarrying of gravel, sand, clay or stone.	2. service watch and ward staff, 3. schools and colleges, 4. hotels, motels and caravan parks, 5. recreational sports or centres, 6. other non-industrial related activities, 7. religious buildings, 8. irrigated and sewage farms, 9. major oil depot and LPG refilling plants, 10. commercial office, 11. educational institutions, 12. social buildings.
4	PUBLIC AND SEMIPUBLIC USE ZONE (Govt./ Semi Govt. / Public Offices, Govt. land use, Police Headquarter/ Station, Police line, Educational & Research, Medical & Health, Socio Cultural & Religious (incl. Cremation and Burial Grounds.	1. Government Offices, Central, State, local and semi Government, public undertaking offices, 2. defence Court, universities and specialized educational institute, 3. polytechnic, 4. colleges, 5. schools, nursery and kindergarten (not to be located near hospital or health care facility), 6. research and	1. Residential flat and residential plot for group housing for staff employees, hostels, 2. water supply installations, 3. sewage disposal works, 4. service stations, 5. railway stations/yards, bus/truck terminals, 6. burial grounds, cremation grounds and cemeteries /graveyards, 7. warehouse /storage godowns,	1. Heavy, extensive and other obnoxious, hazardous industries 2. slaughter-houses, 3. junk yards, 4. wholesale mandis, 5. dairy and poultry farms, 6. farm-houses, 7. workshop for servicing and repairs, 8. processing and sale of farm product and uses not specifically

		development centres, 7. social and welfare centres, 8. libraries, social and cultural institutes, 9. religious buildings /centres, 10. conference community halls, halls, marriage halls 11. dharamshala, 12. guest house, 13.museum / art galleries, 14.exhibition centres, auditoriums, open air theatre, 15.recreational club, playground, 16.banks, police station/police posts, police lines, police headquarters, jails, 17.fire stations/fire posts, 18.post and telegraph, 19.public utilities and buildings, 20.solid waste dumping grounds/sites, 21.post offices, 22.local State and Central Government offices and use for defence purposes, 23.bus and railway passenger terminals, public utility and buildings, 24.local municipal facilities,	8. helipads, commercial uses / centres, 9. other uses/ activities.	permitted herein.

		25. uses incidental to Government Offices and for their use, 26. monuments, 27. radio transmitter and wireless stations, telecommunication centre, telephone exchange, 28. hospitals, health centres, nursing homes, dispensaries and clinic.		
5	MIXED USE ZONE (Mixed Industrial use, mixed Residential use, Mixed Commercial use)	1. In M1 Zone activities falling within non- polluting industry/ service industry (dominant land use) categories can coexist with maximum up to 30% of commercial, institutional, recreational and residential land use. 2. In M2 Zone all activities falling within permitted residential land use (dominant land use) shall be minimum 60% and to coexist with commercial, institutional, recreational. 3. In M3 Zone all activities falling within permitted commercial, institutional land use (dominant land use) shall be minimum 60% and to coexist with	1. Activities related to commercial, institutional and residential land use in M1 Zone and non-polluting industrial land use in M2 Zone can be increased to between 20-50% depending on the contextual and locational feasibility of the area.	1. All other activities especially industrial which are polluting in nature and which will have an adverse impact on the overall activities of this zone *Note: Mixed land use to be well defined by the Development control body by prescribing the limits on the use of activity based on the abutting road width, compatible uses, plots size, ground coverage, FAR/FSI, density, any other urban design guideline.*

		residential, recreational and non- polluting and household industry.		
6	RECREATIONAL USE ZONE (Playgrounds/ Stadium/ Sports Complex, Parks and Gardens – Public open spaces and Multi-open space	1. Regional parks, district parks, playgrounds, children traffic parks, 2. botanical / zoological garden, bird sanctuary, 3. clubs, 4. stadiums (indoor), outdoor stadiums with/ without health centre for players and staff, 5. picnic huts, holiday resorts, 6. shooting range, sports training centres, 7. specialized parks /maidans for multiuse, 8. swimming pool, 9. special recreation and special educational areas, , 10.library, 11.public utilities.	1. Building and structures ancillary to use permitted in open spaces and parks such as stand for vehicles on hire, taxis and scooters, bus and railway passenger terminals, 2. facilities such as police post, fire post, post and telegraph office, 3. commercial use of transit nature like cinema, circus and other shows, 4. public assembly halls, 5. restaurants and caravan parks, 6. sports stadium, 7. Open air cinemas.	1. Any building or structure which is not required for open air recreation, dwelling unit except for watch and ward personnel and uses not specifically permitted therein.
7	TRANSPORT AND COMMUNICATION USE ZONE (Roads/ BRTS, Railway/ MRTS, Airport, Seaports/ Dockyard, Bus depots/ truck terminals and freight complexes, Transmission and Communication)	1. Road transport terminals (bus terminals and depots), 2. goods terminals, 3. parking areas, circulations, airports building and infrastructure, 4. truck terminal, 5. motor garage, workshop, 6. repair and repair shop and	1. Any other use/activity incidental to transport and communication, residential dwelling units for essential staff and watch and ward personnel.	1. Use/activity not specifically permitted herein. In vicinity of airports: butcheries, tanneries and solid waste disposal sites shall be prohibited within 10 km from the Aerodrome Reference Point (ARP).

		7. facilities such as night shelter, boarding house, 8. banks, 9. restaurants, 10. booking offices, 11. transmission centre, wireless station, radio and television station, 12. observatory and weather office.		
8	PRIMARY ACTIVITY USE ZONE (Agriculture forest, Poultry and dairy farming, Rural settlements, Brick kiln and extractive areas, Others like fishing, pottery etc.)	1. Dwelling for the people engaged in the farm (rural settlement), 2. farm-houses and accessory buildings, 3. agriculture, 4. horticulture and forestry, 5. poultry, piggeries and dairy farm, 6. cottage industries, 7. storage, processing and sale of farm produce, 8. petrol and other fuel filling stations, 9. fishing, 10. public utility and facility buildings.	1. Farm houses, extensive industry, 2. brick kilns, 3. sewage disposal works, 4. electric power plant, 5. quarrying of gravel, sand, clay or stone, 6. service industries accessory to obnoxious and hazardous industries, 7. school and library, 8. temple, churches, mosques and other religious buildings, 9. milk chilling stations and pasteurization plants.	1. Residential use except those ancillary uses permitted in agricultural use zone, 2. heavy extensive, noxious, obnoxious and hazardous industries, 3. any activity which is creating nuisance and is obnoxious in nature.
9	ENVIRONMENTALLY SENSITIVE ZONE (Buffer of 500 meter on Forest area and 150 meter on each side of the river)	1. River side green areas, River front developments 2. Scenic value areas, Theme parks, yoga parks, sports centres and community recreational areas, International convention centre 3. Resorts, sculpture complex, lagoons and lagoon resort,	1. Hospitals and health institutions, 2. Educational technical, research institutes of higher order 3. Water Treatment Plant, Sewage Treatment Plant, Solid waste Treatment Plant, Solid waste dumping ground 4. Apartment buildings having 100% stilt.	1. Plotted Housing 2. Small industries or small institutions 3. Use/activity not specifically related to Environmentally sensitive Use Zone not permitted herein 4. No development of any kind is permitted between the River/Canal/

		water sports, Art academy, music pavilions 4. media centres, food courts, Parking areas, visitor facilities 5. Existing village settlements, Existing residential or other uses 6. Boating , Picnic huts, Camping sites Special Training camps 7. Tourist and pilgrim related commercial activities, hotels and lodges 8. Non-polluting, agro-based and processing industries, Storage or Godowns for food grains		Stream and the embankment
10	WASTELAND (Gullies and Ravines, Sodic land, Barren, Rocky/ Stony, Sandy and Water logged areas)	1. Cover cropping and strip planting 2. Industries requiring minimal water usage 3. Storage or Go-downs 4. Solid Waste Treatment Plant, Water Treatment Plant, Sewage Treatment Plant 5. Garbage Treatment Facility 6. Storage Yard or rail yard 7. Logistic Parks 8. Agro forestry 9. Play Ground or Exhibition Ground 10. Electricity Grid or Sub-stations	1. Affordable Housing 2. temple, churches, mosques and other religious buildings, 3. Educational technical, research institutes of higher order.	1. Plotted Housing 2. Heavy, extensive and other obnoxious, hazardous industries 3. slaughter-houses, 4. dairy and poultry farms, 5. farm-houses,

Source: The Odisha Special Planning Authority and Regional Improvement Trust Common Planning and Building Standard Rules, 2017

(B) Protected and Undevelopable use zone

The protective and undevelopable use zone shall be subdivided into

- Water bodies
- Special Recreation Zone / Protective Areas such as sanctuaries/ reserve forests and Eco sensitive zone
- Undevelopable use zone

Undevelopable use zone shall be identified as all earthquake/landslide prone, cliffs and environmentally hazardous area, areas adjacent to fault lines, areas with slope higher than 45 degree (NBC), flood plain and areas adjacent to major drainage lines191 for general guidance, other areas identified by State Disaster Management Authority and all the environmentally sensitive areas.

12.6 Development Control Regulations (DCR)

The Developmental activities shall be as per the Odisha Special Planning Authority and Regional Improvement Trust Common Planning and Building Standard Rules, 2017.

12.6.1 Special Regulations

All the measures mentioned within the regulation would be enforced while envisioning the plan; however, the development area has some unique features and opportunities to develop few of the areas differently with different sensibilities. Heritage precincts, areas in and around forest and other natural resources would have to be dealt with. Mentioned below are few of the selective measures that would have to be taken during Zonal Development Plan (ZDP) implementation.

A. Environmental Sensitive Zone

i. Around Mining Areas

Also for mining areas some special rules and regulations have to be observed, these are as follows:

- 100m buffer around the mining site has to be left vacant with no development within it.
- No forest area shall be used for mining purpose. Only diverted forest lands can be used for the purpose.

- Heavy plantation to be used near such sites within the buffer area. Sewage sludge will be used as manure for such buffer areas.

ii. Along Rivers and Water-bodies

A 200m buffer/ green belt along both sides along the River Karo and a 45m buffer/ green belt around both sides of other tributaries and water bodies are proposed in the Master Plan.

Within the demarcated buffer for the rivers and tributaries the following uses will be allowed:

- Sewerage Treatment Plants and Water treatment plants
- Roads, pathways, formation of drains, culverts, bridges, etc which will not obstruct the water course, run offs, channels.
- Activities associated with river and its buffer may be taken into account for reservation of park while sanctioning plans.

iii. Around Forest Areas

A 500m buffer zone is proposed along the two main forests in which no polluting or hazardous industries, mining or activities which will destroy the natural beauty or environment of the area; will be prohibited.

B. Around Heritage Areas

Each of the zones would be detailed out at the stage of Zonal Development Plan. Separate regulations for heritage areas within the town would be detailed out to preserve and conserve heritage significance of the development area. These areas and buildings will be decided by the ASI or the State as 'Heritage and Conservation Areas'.

The heritage regulations focus on the building development / redevelopment/ repairs, heritage listing, management of heritage precinct, maintaining the aesthetics and heritage character of the zone. Mentioned below are few of the areas where change would be proposed to maintain the character of the area:

- **Land use density**- low density development is to be suggested to control the pressure on the area.

- **Land use restrictions**- check on establishment of industries and other activities which might cause deterioration of the heritage building and precinct should be there.
- **Height restrictions** for new and existing development should be checked to maintain the visibility and dominance of the heritage assets of the area.
- **Facade details and regulations-** facades of the buildings should be in accordance with the existing architectural character. There can be regulations on colour schemes, materials used and other visible architectural elements.
- **FAR/ FSI regulation**- This should be regulated as per the guidelines for lesser density.

CHAPTER-13 INSTITUTIONAL SET UP

Planning function is a continuous process and the Planning Department's work continues from plan preparation to plan processing, plan enforcement, plan implementation, plan detailing, plan review and then plan formulation and so on. The plan formulation, implementation, monitoring and review exercises have to be statutorily prescribed in the State Acts and completed within the specified time-frame and schedule. In the context of these requirements institutional set-up has a vital role.

13.1 Institutional Set Up in Barbil

Directorate of Town Planning is responsible for planning in the state. However, the agency directly involved with the planning of cities depends on the size of the settlement as well as participation of local representatives. In Odisha, there are three types of agencies dealing in planning and development. These are –

- Special Planning Authority (for smaller towns / cities)
- Regional Improvement Trust (for medium sized cities)
- Development Authority (for larger cities)

Upgradation of any city from lower level to higher level of planning agency is accompanied by a Government notification.

Barbil has a Special Planning Authority responsible for preparation of Master Plan for the area and building plan approval.

13.2 Directorate of Town Planning, Government of Odisha

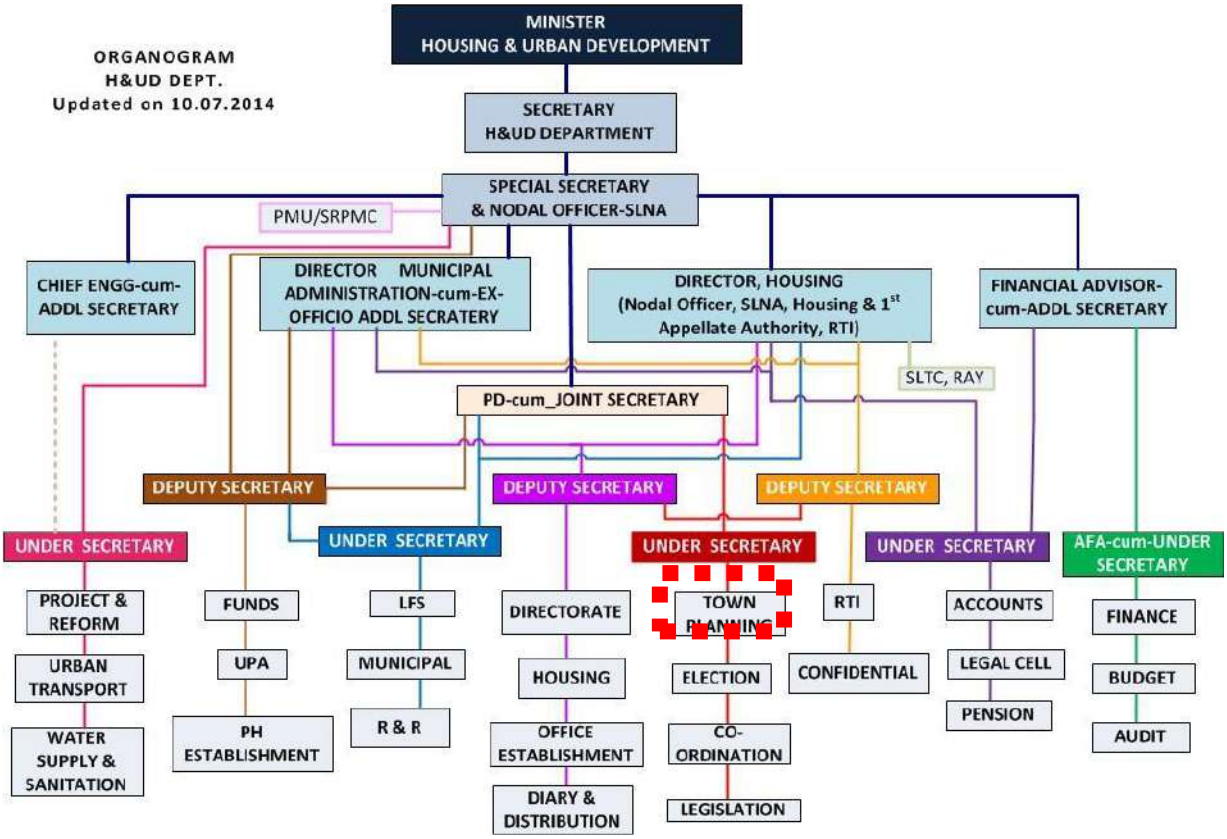
The first Town Planning Organization was created in Odisha for Planning of the Cuttack city with appointment of Town Planner in 1954. This Organization conducted various surveys and prepared various reports for Cuttack. The Town Planning Organization created for Cuttack drafted the legislation and Odisha Town Planning and Improvement Trust Act, 1956 was enacted.

Its major activities are:

- Preparation of Master Plans and approval of the same on behalf of Special Planning Authorities.
- Preparation of Project Reports for the IDSMT and monitoring of the schemes.

- Technical guidance to Government as well as Planning Authorities with respect to regulation of Plan proposals.

Directorate of Town Planning is under Ministry of Housing and Urban Development, Government of Odisha as shown in the figure below.



13.3 Special Planning Authority, Barbil

After enactment of Odisha Town Planning and Improvement Trust Act, 1956 the preparation of Master Plan was enforced through central assistance. The Planning Authority for Barbil town was constituted under Housing and Urban Development Department vide Notification No. 19371 /HUD Dt: - 20.6.78.

The aim of the Special Planning Authority, Barbil is to ensure provision for the planned development improvement and expansion of the town under its jurisdiction i.e. Barbil town so as ensure their present and future inhabitants. It is involved in preparation of Master Plan for the Urban centres with the perspective of 15 Years and preparation of various schemes for development of Housing, shopping, Trade & Commercial, Transport & Recreation etc. which will be economically viable & socially acceptable

13.4 Barbil Municipal Council

Barbil city is managed and governed by the Barbil Municipal Council (BMC). It is responsible for the following functions.

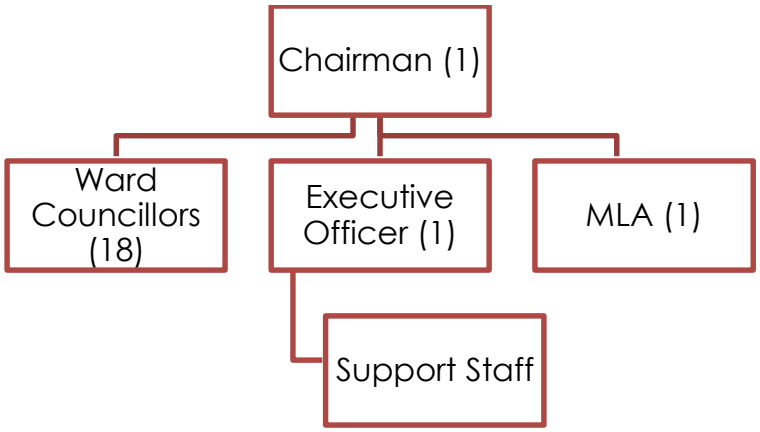
S. No.	Urban Infrastructure	Planning and Design	Construction	Operation and Maintenance
1	Water Supply	PHED (Urban)/ RWSSB (rural)	PHED (small works only)/ OWSSB/ RWSSB	PHED/ Municipality
2	Sewerage	OWSSB/ RWSSB	RWSSB/ OWSSB	OWSSB/ Municipality (Public Toilets)
3	Drainage	PHED/ Irrigation Dept.(rivers only)	PHED/ Irrigation dept/ Municipality	PHED/ Municipality
4	Solid Waste Management	Municipality	Municipality	Municipality
5	Municipal Roads	Municipality/ R&B	Municipality/ R&B	Municipality
6	Street Lighting	General Electrical Department.	NESCO	Municipality
7	Public Transport	Road & Buildings	R&B	Municipality/ R&B

The Orissa Municipal Act, 1950, governs the functioning of BMC. BMC performs the obligatory and discretionary functions as in the above Act. The governance of Urban Local Bodies (ULB) assumes importance in the wake of the 74th Constitution Amendment Act which delegates mandatory elections and greater devolution of powers and functions to the city corporations.

13.4.1 Organizational Structure

The Municipal Council is headed by a Chairman who is elected. Each ward is represented by a Ward Councillor in the Municipality. An officer on deputation is nominated as the Executive Officer in the municipality. All the members of Legislative

Assembly are also part of the Municipal Council. The organizational structure of Municipal Council, Barbil is shown below.



13.4.2 Departments

BMC consist of 10 departments as shown in the figure below:

Health department in the BMC works closely with the PHED, Government of Odisha which supplies the water to the city for provision of water supply and sanitation. Works department works closely with the R & B (PWD), Irrigation department. Street Lighting department is associated with NESCO which supplies power to the town.

CHAPTER-14 IMPLEMENTATION STRATEGIES, MANAGEMENT STRUCTURE AND RESOURCE MOBILIZATION

14.1 Introduction

Planning in a comprehensive, holistic and decentralized manner is essential to ensure ownership, commitment and relevance to the needs of the stakeholders. Planning involves the study of the existing problems, opportunities, challenges and their conceptualization in a framework. It is an effort to move in a desirable direction. Planning seeks to be efficient i.e. doing things rightly (make optimal use of resources, information, structures, funding etc), effective i.e. doing the right things (create desired and meaningful impacts and outcomes in a time bound manner which are measurable through monitoring). It also seeks to enhance equity and inclusion (of opportunity, rights and power, especially with regard to gender and deprived sections).

The three main resources for planning and development are money, manpower and land. Among all the three resources, land availability is limited and hence it must be utilised judiciously so that it helps in achieving a high level of economic efficiency.

Land and money, both the resources are limited with Government, hence private sector resources should be duly recognized and appropriately mobilized for investment in development depending upon the potential of the city. Proper mix of public and private sector resources is an impending need for the spatial and efficient implementation of public infrastructure programme.

For the development and rapid implementation of proposed projects, such policies will be framed which will help in meeting the envisioned target in minimum required time. Development proposals which will be self-sufficient, of public interest and resource generating will be encouraged.

To achieve the above envisaged proposal, points to be considered are as follows:

i. Phasing and prioritization of development activities.
ii. For major proposals according to phasing, land acquirement shall be done in six months.
iii. Upcoming schemes/ proposals in private sector shall be marked and private resources shall be invited.

iv. For solving the problem of land acquisition, town planning scheme and transferrable development right shall be adopted.

v. To overcome the problem of encroachment, strict action should be taken.

14.2 Preparation of Master Plan

Master Plan is a legal document prepared under the purview of the Orissa Town Planning and Improvement Trust Act, 1956. The Plan is prepared after conducting the detailed social economic survey, land use survey, traffic and transportation problems within the Master Plan Area with a view to diagnose the problem, potential of the town to view the perspective till 2030 taking into consideration the various objectives envisaged U/s 30 of the Orissa Town Planning & Improvement Trust Act. Barbil Master Plan 2030 is being prepared to fulfil the vision envisaged for the area.

14.3 Process of Master Plan Preparation

i. **Work order Issued to the Consultant for preparation of GIS Based Master Plan**- REPL has received the Work order for the preparation of Plan for the perspective year 2030

ii. **Preparation of Inception Report**- Report contains the detailed understanding of the project, area and methodology to prepare a Master Plan.

iii. **Preparation of Concept report**- Report contains the study of existing condition of urban and rural areas, analysis of several aspects and conceptualization of Master Plan.

iv. **Land use Validation**- 100% validation of available data from the concerned Authority/ Department and updating of changes in the existing land use map.

v. **Survey Status Report**- 15% Socio- Economic Survey, Traffic and Transportation Survey and Land use Survey findings should be incorporated in the report.

vi. **Stakeholder Consultation**- Meeting with various Stakeholders will be done on the survey status report so that their inputs can be incorporated in the report and suggestions have been considered while preparing Draft report.

vii. **Preparation of Draft Master Plan**- Report contains the vision, aspect wise existing situation and proposals.

viii. **Publication of Draft Master Plan**- After the consultation with the SPA, Draft Master Plan will be published for the suggestion and comments of Public within 60 days U/s 31 (1) of the Act. After the suggestion and comments of public it is duly considered by the Planning Authority and forwarded to the Director/ State Government.

Until the Plan gets approval from the State Government, no building, layout plan or any land related plan will get into contract within the Master Plan Area unless having applied and obtained permission from the Planning Authority.

ix. **Approval and Final Publication**- after considering the views of the Planning Authority on suggestion and comments, the Director Town Planning/ State Government is to accord approval of the Plan and there upon, the same shall be finely published U/s 32 of the Odisha Town Planning & Improvement Trust Act. Since the Master Plan has to be dynamic Plan, being flexible enough to accommodate the fast pace of change taking place in an Urban Area over time, the Act also stipulates for the variation of Master Plan under section 32 (A) and periodic vision.

x. **Implementation of Master Plan**- Implementation of proposals of Master Plan require co-ordination between various agencies involved in Master Plan Area at Central, State and Local level. Any other proposals/ projects not mentioned in the Notified Master Plan but fall within the Master Plan Area should be in conformity with the proposed land use map and according to the zoning regulations.

14.4 Resource Mobilization and Implementation Framework

The Barbil Master Plan embodies number of development having long and short term implications. The process of materializing the planning proposals is called "Implementation of plan". The S.P.A Barbil constituted by the Government of Housing and Urban Development Department, Odisha, is the Implementing agency for implementation of development proposals in accordance with the provisions of the Odisha Town Planning & Improvement Trust Act, 1956 and Master Plan.

The basic aspects of implementation of Master Plan are:

(A) Plan Enforcement and Regulation

Enforcement of plan refers to relates to regulatory aspects over constructional activities principally in informal sector. Hence, it is essential to enforce the Odisha Town Planning & Improvement Trust Act, 1956 in co-ordination with the Odisha Municipal Act/Rules to check Non-confirming Land uses, unplanned vertical/horizontal expansion of the urban area, creation of sums, squatters and other unhygienic conditions.

The Special Planning Authority, Barbil has to control unauthorized constructions/ developments after publication of the Draft Master Plan under 31(1) of the Odisha Town Planning & Improvement Trust Act, 1956. The publication of the Master Plan under section 32, it has taken care of the new developments in desired directions within the Master Plan Area as per the provisions mentioned in section 33(1) of the above said act.

(B) Execution of Plan

Execution of Plan refers to the type and frequency of various developments taken-up for implementation by different Developing Agencies both in formal and informal sectors as per the provisions laid down in the Master Plan. In the urban set up, 90% of the development responsibility in the field of Housing, Trade and Commerce and Industries and rest comes from the private sector. The role of the public sector is more significant in the field of utility, facility and services.

The Special Planning Authority, Barbil has empowered to acquire vacant land within and in the peripheral areas of the Town, those are expected to be developed in next few years. After development, the same can be undertaken for different urban development schemes by the Special Planning Authority, Barbil raising funds from the Government as well as other financial institutions either in shape of Departments like: Director of Town Planning, Public Health & Engineering Department, Urban Local Body, Roads and Building etc. and actively association with the general public as far as possible.

For implementing various envisaged proposals, coordination among different responsible agencies and availability of fund with them is necessary. For increasing the resource availability with the local bodies, charges will be applied as per the

usage of infrastructure facilities availed by the individual. This will help in achieving and completion of large infrastructure projects such as development of roads, construction of sewage treatment plant etc.

Funds for development activities shall be available with local bodies through following sources:

i. Municipality Debentures
ii. Increase in users charges as per investment
iii. Regular and effective collection of user charges
iv. External development tax and betterment tax
v. Land use change charge
vi. Transferrable and purchasable development right
vii. Loans form the State and Central Government and other Corporations like LIC, HUDCO etc.
viii. Income from its own properties and services.

Expenditure for development activities of Planning Authorities are as follows:

i. Land acquisition and its development
ii. Housing Programme
iii. Social and utility services
iv. Action Programmes
v. Maintenance of its properties
vi. Surveys and inspections.

Implementation of plan can be effective only when it is monitored and reviewed time to time. While executing or implementing the project, it needs to be monitored regularly for seeing its effects. Monitoring will help in responding to the emerging socio-economic forces and check the unorganized development, alter the policies and proposals as per the actual demand of the time, effect of other neighbouring ongoing projects and completion of projects as scheduled.

For effective and efficient monitoring of plan, separate and Dedicated Monitoring Unit shall be formed, which will be responsible for overall monitoring and implementation of the plan.

14.5 Phasing and Prioritization of Development

The phasing of the development schemes is done to address the most important issues on priority. The phasing will also help in avoiding the exhaustive use of the resources and help in judicious and efficient resource utilization. Prioritization of development is very important concern for proper implementation of various proposals. City faces problems related to congestion, transportation, lack of infrastructure services like water supply, sewerage treatment, solid waste management which further impacts and degrades the environmental condition.

Management of solid waste is a serious threat to the city. To overcome the problem of solid waste, it is proposed to develop the solid waste management project for Barbil on priority basis. The sewer line needs to be laid in the developed areas which would help in minimizing the further degradation of water resources. (Water bodies/ Drains/ Rivers). Unplanned development and encroachment is also visible at various locations (in proposed Parks and Playground, industrial, institutional and commercial areas). It is recommended that such encroachments should be removed and proper fencing should be done after delineation of such spaces.

Seeing the present scenario of the area, slight increase in residential, commercial, industrial and public- semi-public uses were happened since the year 2008- 2014. Hence new residential areas shall be developed according to the demand and infrastructure facilities shall be laid in priority according to their requirement.

14.6 Strategy

i. For the capacity building of the Master Plan Area, it is important that the present staffing pattern should be strengthened with persons with greater technical capabilities such as GIS, Auto cad, web designing, data mining, analytics etc. In addition, provision for short term contract, outsourcing of young staff with special skills from the open market should be permitted.

ii. Master Plan Area should be developed through intelligent use of energy and resources with promotion of walk to work office area, digital communication networks and OFC connectivity.

iii. It is observed that villages are largely excluded from the development radar. So, a separate funding window should be available for integrating them into the rural development strategy.

iv. Convergence and dovetailing of resources to be done in an innovative manner to maximize the impact of interventions in the area. Restructuring and reforms in institutional, fiscal and economic systems is necessary to achieve the efficacy and effectiveness in management of long term programme of investments based on private finance by utilizing the public funds.

v. Project wise Funds should be available for the development of infrastructure in the area.

As far as possible, agricultural land needs to be conserved. Urban land is a very precious resource and its use should be rationalised so that squatting on land for speculative purposes, artificial rationing and urban sprawl for sub-urbanisation and gentrification can be avoided.

CHAPTER-15 INVESTMENT PLAN

The different sectoral plans that have been drawn up for achievement over the period up to 2030 have given a rough estimate of investment to be undertaken. Notwithstanding the fact that this is just an indicative investment plan, it would be imperative to find out sources of enhanced capital finances to be able to carry out the required investment. Again, it has been a common experience that many of the capital expenditure has not been sustained properly leading the delivery of services to suffer. Therefore, sustenance of capital expenditure in terms of operation and maintenance of assets created becomes all the more important and this calls for looking at the recurrent revenue options.

15.1 Sector wise investment Plan

A summary of sector wise investment plan for all sector covering traffic and transportation, housing, water supply, sewage and storm water drainage. The following tentative standard rates are considered as per our calculation.

15.1.1 Traffic and Transportation

There are mainly three category of new roads proposed i.e. 60m ROW, 24m ROW and 18m ROW respectively within the Master Plan Area. The proposed road with 60M ROW requires a tentative estimation of 8.00 Cr per kilometre, so the total cost proposed 31km of 60M ROW require an investment of 248Cr. Similarly, 24M ROW road of length 16 km requires a tentative investment of 80Cr at 5Cr/ Km and 18M ROW road of length 30km require a total tentative investment of 105Cr at 3.5Cr/KM. The total of cost of investment estimated for the improvement of road network is 433 Cr.

Table 15-1: Tentative Investment Plan of Traffic and Transportation

Item	Cost per Unit (In Cr. Rs.)	Length (in km)	Total Cost (In Cr. Rs.)
60 M ROW Roads	8.00 Cr/km	31	248
24 M ROW Roads	5.00 Cr/km	16	80
18 M ROW Roads	3.50 Cr/km	30	105
Grand Total			**433 Cr.**

** These costs are tentative in nature and do not include land acquisition cost*

15.1.2 Affordable Housing

Considering the household size of 4 in the master plan area for the estimated population for 2030. The total number of affordable housing units proposed to accommodate the future population in 17,232. Considering the size of a single

affordable housing unit in a municipal council area as 60 sq.m. the cost of constructing a single unit has been estimated as Rs.7000 per sq.m. In order to develop the proposed number of housing units a total tentative investment of 650.4 Cr is required.

Table 15-2: Tentative Cost of Development of Affordable Housing

Item	Dwelling Unit Required	Housing Area (45 sq.m. per unit)	Cost per Unit (Rs./sq.m.)	Total Cost for Development (In Cr.)
Total Capital	17232	775440 sq.m.	7000	542
Add the cost towards the price escalation of materials@10%				54.2
Add the cost towards the price escalation of labour charges@10%				54.2
Grand Total				**650.4 Cr.**

15.1.3 Water Supply Distribution

As per the estimation of water supply demand for the forecasted population of 2030, an additional water supply of 16.05 MLD is required. The total cost of development of a water supply network to distribute 1 MLD of water is estimated to be 1.5 Cr. In order to distribute a total amount of 16.05 MLD water a tentative investment of 24.07 Cr is required to construct the water supply network.

Table 15-3: Tentative Cost Estimate of Proposed Water Supply Distribution Systems in 2030

Item	Cost per Unit (In Cr. Rs.)	Proposed Quantity (In MLD)	Total Cost for Development (In Cr.)
Total Capital	1.5 Cr/MLD	16.05	24.07
Add the cost towards the price escalation of materials@10%			2.4
Add the cost towards the price escalation of labour charges@10%			2.4
Grand Total			**28.87 Cr.**
Annual O&M Cost @5%			1.4 Cr.

*Excluding cost of land

15.1.4 Sewerage Network

Considering that 80% of water supplied shall be released as sewage from the households. It is estimated that around 16.84 MLD of sewage shall be generated in 2030. In order to construct a sewerage network to cater around 17 MLD of sewerage, a total tentative estimation of 46.3 Cr is required.

Table 15-4: The Expected Cost Estimate of the Proposed Sewerage System for 2030

Item	Cost per Unit (In Cr. Rs.)	Proposed Quantity (In MLD)	Total Initial Investment Cost (In Cr.)
Total Capital	2.5 Cr./MLD	16.84	42.1
Annual O&M costs for a STP unit @10%			4.2
Grand Total			**46.3 Cr.**

*Excluding cost of Land

15.1.5 Solid Waste Management

Generation of solid waste in Keonjhar is projected to be 47.6 MT per day by 2030. In order to manage the household waste a comprehensive solid waste management system has been proposed which requires a capital investment of 0.2Cr per MT of waste. The management of total estimated 47.6 MT of solid waste would require a total investment of 11.37 Cr in 2030 which includes annual O&M costs of 0.05 Cr per year.

Table 15-5: Tentative Cost Estimate (In Crores) of Proposed SWM and Treatment Systems in 2030

Item	Cost per Unit (In Cr. Rs.)	Proposed Quantity (In MT)	Total Initial Investment Cost (In Cr.)
Total Capital	0.2Cr./MT	47.6	9.52
Add the cost towards the price escalation of materials@10%			0.9
Add the cost towards the price escalation of labour charges@10%			0.9
Annual O&M costs for a SWM unit @5%			0.05
Grand Total			**11.37 Cr**