Draft Master Plan Report for Itanagar Capital Region

GIS Based Master Plan under AMRUT Scheme

REMOTE SENSING INSTRUMENTS

Contents

List of Maps

List of Graphs

List of Tables

List of Pictures

Abbreviations & Units

AMRUT	Atal Mission for Rejuvenation and Urban Transformation
APSTS	Arunachal Pradesh State Transport Services
APUCP	Arunachal Pradesh Urban and Country Planning
AUWSP	Accelerated Urban Water Supply Programme
CDP	City Development Plan
CSO	Central Survey Office
DPR	Detailed Project Report
GIS	Geographic Information System
ICR	Itanagar Capital Region
IFC	Integrated Freight Complex
IRC	Indian Roads Congress
IUCN	International Union for Conservation of Nature
JnNURM	Jawaharlal Nehru National Urban Renewal Mission
LED	Light-emitting diode
LPCD	Liters per Capita per Day
MLD	Millions of Liters Per Day
MSL	Median sea level
NEFA	north-east frontier agency
NLCPR	Non-Lapsable Central Pool of Resources
NRSC	National Remote sensing Center
ODR	Other district roads
PCA	Primary Census Abstract
PGCIL	Power Grid Corporation of India
PHED	Public Health Engineering Department
PTS	Public Transport System
PWD	Public works department
SOI	Survey of India

STP	sewage treatment plant
SWOT	Strengths, Weaknesses, Opportunities and Threats
UNWTO	United Nations-World Tourism Organization
URDPFI	Urban and Regional Development Plans Formulation & Implementation

UNITS

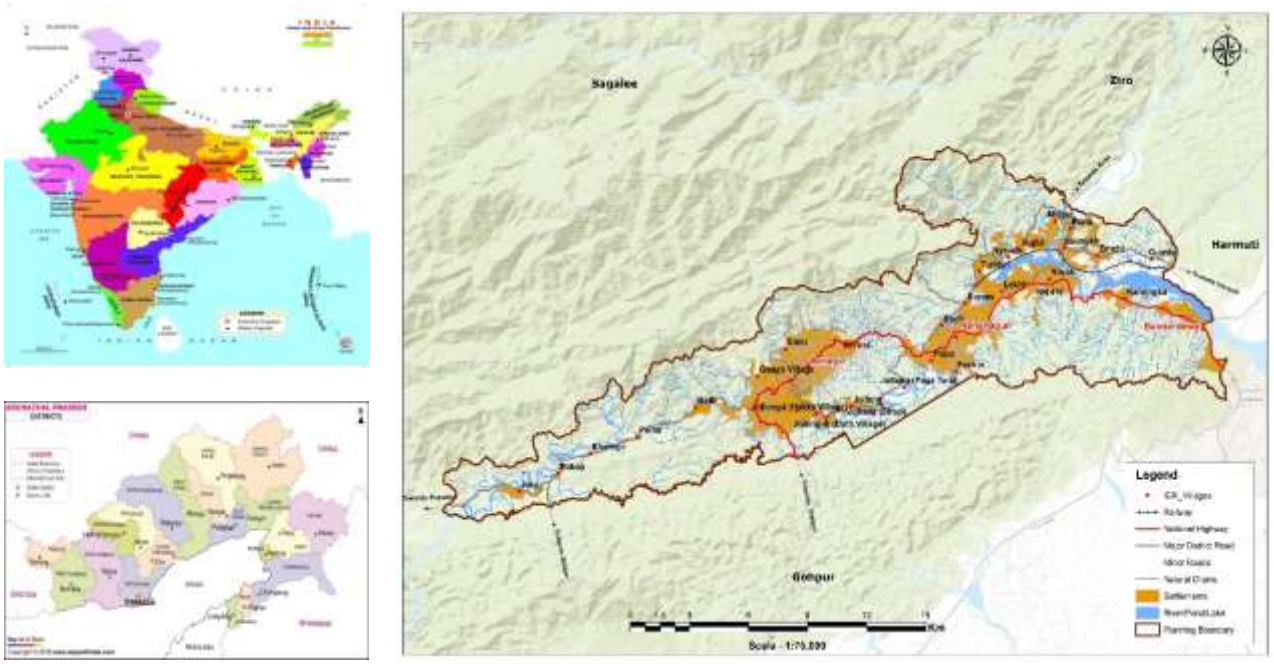
sq.km.	Square Kilometer
km/h	Kilometer per hour
M	Meter
°C	Degree Celsius
Km	Kilometer
NH	National Highway
km2	Square Kilometer
PCU	Passenger Car unit
MT	Metric tons
Kg	Kilogram
KW	Kilowatt
MW	Megawatt
Ha	Hectare
Sq. m	Square Meter
mm	Millimeter
BCM	Billion Cubic Meter

CHAPTER-1: INTRODUCTION

1.1 Overview

Itanagar is the capital city of India's North-Easternmost state of Arunachal Pradesh. It is also the administrative headquarters of Papum Pare district. Itanagar is called the 'Land of Dawn-lit Mountains' as it is situated in the lap of the majestic Himalayas, and soaked in stupendous natural grandeur with blissful weather all through the year. Itanagar is located at an altitude of 530 meters above mean sea level between 27^0 North latitude and 93^0 East longitudes.

The state of Arunachal Pradesh attains strategic importance in India's spatial planning, since it shares international borders with Bhutan in the west, Myanmar in the east and the disputed McMahon Line separates it from China in the north.



Map 1: Map Showing the Itanagar Capital Region in India

Itanagar town has evolved as one of the major towns of this region, necessitating the formulation of comprehensive development proposals. Opening up of the Trans-Arunachal Highway will further add impetus to the growth of the town. Itanagar Capital Region—as identified for purposes of this Master Plan comprises Banderdewa, Karsingsa, Nirjuli, Emchi, Gumto, Doimukh, Rono, Tigdo, Yupia, Niroch, Tarajuli, Buram, Naharlagun, Jollang, Itanagar, Chimpu, Ganga, Bath, Poma, Khemyir, Rakap and Jote areas. The region is a sophisticated mix of history, cultural miscellany and natural diversity. The extent of Planning Area is approximately 271 sq.km.

The studies involved in the preparation of Master Plan for Itanagar Capital Region (2011-2040) concern the areas crucial to planning and development of the region. The Geographic Information System (GIS) based Master Plan for Itanagar Capital Region is a broad policy framework in the form of coherent set of proposals aimed at the development of the capital region.

1.2 Atal Mission for Rejuvenation and Urban Transformation (AMRUT)

The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) was launched on June 25, 2015 by the Government of India, with a purpose to provide basic infrastructural services in 500 Mission cities, which satisfy at least one of the following criteria:

I. All Cities and Towns with a population of over one lakh with notified Municipalities, including Cantonment Boards (Civilian areas)
II. All Capital Cities/Towns of States/ UTs
III. All Cities/ Towns classified as Heritage Cities by MoUD under the HRIDAY Scheme
IV. Thirteen Cities and Towns on the stem of the main rivers with a population above 75,000 and less than 1 lakh, and
V. Ten Cities from hill states, islands and tourist destinations (not more than one from each State)

The major components of AMRUT mission are as follows:

- Ensure that every household has access to a tap with assured supply of water and a sewerage connection.
- Increase the amenity value of cities by developing greenery and well-maintained open spaces.
- Reduce pollution by switching to public transport or constructing facilities for non-motorized transport.

One of the sub schemes of the AMRUT Mission is the Formulation of GIS based Master Plans, which will help in different types of urban planning exercises, e.g. preparation of Sectoral Plans, Development Plan, Zonal Plan, Utility Plan, Infrastructure Plan, etc. Priority is given to cities which do not have master plans and those cities whose Master Plans are about to expire by 2021.

The objective of GIS-Based master plans for AMRUT cities is to develop common digital geo-referenced base maps and land use maps using GIS. Formation of GIS-based Master Plans support decision making, efficient land use management and utilization, spatial growth management, enable project planning and urban management.

The urban sprawl has been towards the suburbs and rural vicinity, establishing an immediate need to regulate and integrate future growth and existing development with statutory planning framework for the comprehensive, holistic, integrated and sustainable development of natural and built environment, socio-economy and to provide good quality of life to its people.

Being located in the hilly areas, it is required to incorporate advanced technology of Remote Sensing and GIS for preparation of the Development/Master Plan. In order to address this requirement, Itanagar, the AMRUT city of Arunachal Pradesh has taken up the centrally funded reform of the GIS-based Master Plan Formulation scheme to be implemented by the State Government, State Mission Directorate with the Department of Town Planning and Urban Local Bodies acting as the State Nodal Agency (SNA) for implementing the scheme.

1.3 GIS - Based Master Plan formulation for Itanagar Capital Region

Conventional methods of information collection and management are not worthwhile to use in the planning process of hilly areas. Geographic Information System (GIS) plays a key role in decision-making, planning and management of such urban areas. GIS offers the capability for dynamic query by analyzing reliable, seamless and reasonably accurate data, which displays information in efficient and analytical manner. Satellite imagery and Geographical Information System (GIS) are the tools that facilitate to develop datasets for preparation of rapid, comprehensive, rational and implementable plans. GIS software is a technological tool for comprehending geography and making intelligent decisions. By introducing GIS, one can determine areas with inadequate public services, infrastructure, and provide basic solutions. GIS in urban planning, as an analytical and modelling tool, can be applied to a wide array of problems. This comprises addressing problems related to database structures, simple and complex analytical models alike. GIS is also useful in monitoring of an area or conducting a feasibility study of a location for a specific purpose.

Formulation of Master Plan of Itanagar Capital Region as per Provisions of Arunachal Pradesh Urban and Country Planning Act, 2007, includes demand assessment, identification of issues, projected requirements, development strategy and draft proposals on the GIS base map, and data analysis. The deliverables are in the form of base map, thematic maps specified, data analysis reports and Master plan document.

1.4 Objectives of the Assignment

The following are the objectives of the assignment:

- To formulate Master Plan of Itanagar to ensure systematic growth of Itanagar Capital Region.
- It aims at utilizing existing Landuse and infrastructure to propel the growth direction and the growth pattern of Itanagar Capital Region to satisfy the present conditions without compromising existing resources for the future developmental needs of the city.
- It arranges the pattern of a city to satisfy both the present and future requirements
- It helps in restricting the haphazard and unplanned growth.
- To develop a common geo referenced base maps and land use maps at 1:4000 scale for ICR which shall be used by several line departments for policy decisions.

1.5 Scope of Work

Itanagar Capital Region Master Plan 2040 covers the following important aspects:

I. Location, physiography, linkages, climate, regional setting
II. Historical background
III. Brief description of city, review of existing Master/ Development Plan, issues related to implementation of existing master plan
IV. Spatial growth of the town & direction, incorporation of new areas
V. Demographic data including population (urban/ rural, ward-wise, male &female), literacy rate, growth of population, workers and non-workers, occupational structure, etc., shall be collected – as per current & past Census data.
VI. Employment generating activities – existing and potential
VII. Industries - existing and potential, their nature, employment etc.
VIII. Commercial activities including retail and wholesale business, warehousing and godowns, mandis, rural markets, etc.
IX. Government and semi government offices and government reserved areas.
X. Educational facilities (Govt. /Private) including universities, colleges (engineering, medical, arts, science, commerce, law, etc.), schools (higher secondary, secondary, middle, primary, nursery, etc.) vocational training centres, etc.
XI. Medical facilities (Govt. /Private) including hospitals, dispensaries, primary health centers, veterinary, Ayurvedic, Homeopathic, etc.
XII. Social, cultural and other religious activities.
XIII. Other community facilities including cremation and burial grounds
XIV. Physical infrastructure – electricity, water supply, sewerage, solid waste management, telephone, etc.

XV. Recreational facilities including parks, open spaces, mela grounds and playgrounds, semi-public recreation, etc.

XVI. Agricultural use including dairies, orchards, nurseries, reserved forests, etc.

XVII. Circulation facilities including airport/railway stations and yards, road transport terminals, stands for buses and trucks, parking, etc.

XVIII. Proposals/ commitments by Central/ State Government concerned Local Body, development authority, etc.)

XIX. All vacant lands under government ownership (non-built)

XX. All forest lands

XXI. Places of tourist and heritage importance both natural and manmade including natural areas, fairs and festivals, etc.

XXII. Legislative and Institutional Framework, institutional structure – municipal bodies, development authority, urban improvement trust, etc.

XXIII. Action Plan, identification of projects and phasing, resource mobilization.

1.6 Arunachal Pradesh Urban and Country Planning Act (APUCP Act), 2007

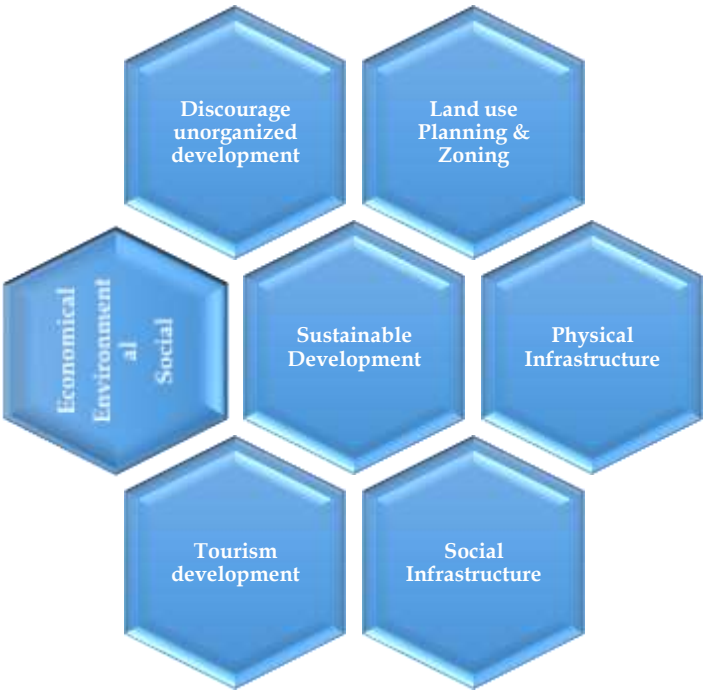
The Master Plan for any planning area in the State of Arunachal Pradesh is prepared under the provisions of the Arunachal Pradesh Urban and Country Planning Act (APUCP Act, 2007). The Master Plan currently in force is 'The Development Plan of Itanagar 2021'. The Master Plan is to be revised once every ten years as per the provisions of Section VI 26. Arunachal Pradesh Municipal Corporation is the Local Planning Authority exercising the powers, functions and performs duties under the provisions of the APUCP Act, as the Local Planning Authority for the Itanagar Capital Region.

1.7 Salient features of ICR Master Plan

The following aspects have been kept in mind while drafting this Master Plan:

- To discourage the unplanned and unorganized growth of the city
- To regulate the urban development in a systematic and scientific manner through proper land allocation and zoning
- To plan and account for existing migration of rural population to the urban area
- To achieve 100% coverage and quality of basic amenities such as water supply, sewerage, sanitation, solid waste management, etc.

- To address the evolving challenges in various fields such as Housing, Infrastructure, means of transport, open space development and insufficiency in public amenities, recreational facilities, etc.,
- To conserve environmentally sensitive land parcels through green practices and sustainable development.
- To promote Tourism in the ICR region and generate revenue for the ULB.



The subsequent chapters will present a detailed analysis of various aspects of development considered in the Preparation of GIS Based Master Plan for Itanagar Capital Region.

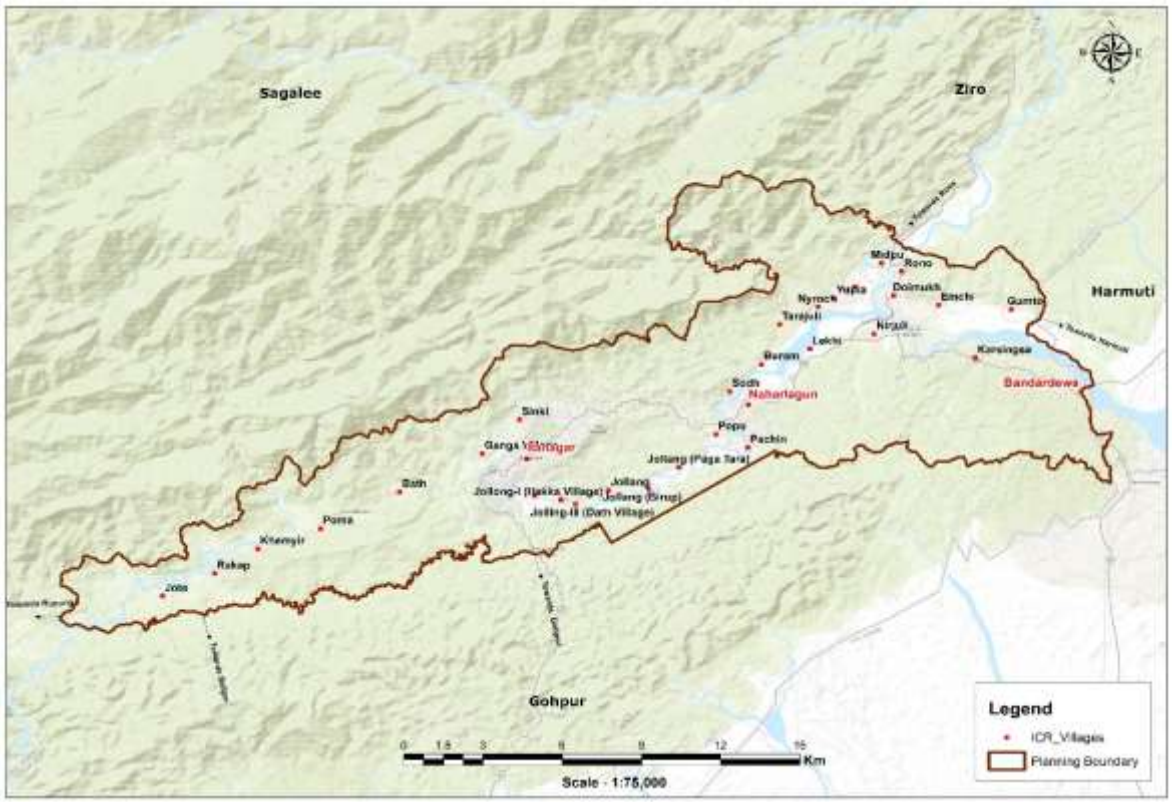
Picture 1: Itanagar Arch

CHAPTER-2: PROFILE OF PLANNING AREA

2.1 Planning area of Itanagar Capital Region

ICR comprises of three major towns - Itanagar, Naharlagun, Banderdewa and 19 villages (Karsingsa, Nirjuli, Emchi, Gumto, Doimukh, Rono, Tigdo, Yupia, Tarajuli, Buram, Jollang, Chimpu, Ganga, Bath, Poma, Khemyir, Rakap, Niroch, Jote, Pappu Nalla) in the periphery of ICR. The planning boundary of the capital region has been demarcated considering the future requirements of urban expansion, topography and by understanding special needs of the area. The towns are experiencing an unpredictable population growth and increasing immigration. The growth is facing challenges of urbanization, urban management, infrastructure carrying capacity and urban Landuse management.

The capital region of Itanagar is the largest urban agglomeration in Arunachal Pradesh accounting for nearly 30% of states urban population, with a planning area of 271.00 Sq.km. Settlements covered in the region are inclusive of Banderdewa, Karsingsa, Nirjuli, Emchi, Gumto, Doimukh, Rono, Tigdo, Yupia, Niroch, Tarajuli, Buram, Naharlagun, Jollang, Itanagar, Chimpu, Ganga, Bath, Poma, Khemyir, Rakap and Jote areas.



Map 2: Itanagar Capital Region

2.2 Cultural and Historical Background

There are practically no records relating to the earlier history of this area except some oral literature and the number of historical ruins found mainly in the foothills dating approximately from the early Christian era.

In 1826, the British exercised their control in Assam after the treaty of Yandaboo concluded on 24th February 1826. Before 1962, the Arunachal was popularly called North Eastern Frontier Agency and was constitutionally a part of Assam. The Ministry of External Affairs administered it until 1965 and subsequently by the Ministry of Home Affairs through the Governor of Assam. In 1972, North Eastern Frontier Agency was constituted as a Union Territory and renamed as Arunachal Pradesh. On 20th February 1987, it became the 24th state of Indian Union.

People of tribal origin inhabited Arunachal Pradesh. These groups had distinct culture. In the 16th century, the Ahom Kings influenced the region. The population were of Tibeto-Burmese linguistic origin. The tribe consisted of the Daflas, Bangnis, Monpas and they were influenced by Buddhist ideals. The Miri along with the Daflas and Tagin lived in the hills. The Apatanis were believed to be more advanced. They were agriculturists. Besides this, the Abor who called themselves as Adi lived in the valley of Arunachal Pradesh. Besides them the Membas, Ramos and Boris formed minor groups. The Mishmis exist as Idus, Taraons, and Kamans. They excelled in handicrafts. Today tourism forms an important source of revenue for the state economy.

Itanagar was home to many indigenous ethnic groups. Earlier several tribes were prominent in Itanagar such as Adis, Apatanis, Galos and Miris. The region still has a very small amount of population of the decedents of ethnic groups still living in their ancestor's ways. During the 17th century, the Ahoms ruled in this region. The ITA fort, built by the Ahoms, is the best example for the powerful Ahom rule in the region; other examples are Tawang Monastery, Malinithan Temple, Likabali, Dirang Dzong, Dimachung-Betali and Bhismaknagar Fort etc. The Monpa and Monyul combined to flourish Monyul Dynasty. Tibet and Bhutan tribes ruled few sections on the northern frontier of the region and the Ahoms ruled remaining parts of the Itanagar.

The region continued to be under Ahoms rule until the British annexed the region in the year 1858. Post-independence after the British rule, the government of China and India had a conflict in the

region. India declared the McMahon lone as the official boundary but China refused to accept the line, further deteriorated the matter. In the year 1954, the Northeast frontier agency (NEFA) was formed and the matter died down temporarily. After a decade, the China again aroused the matter and as result, the Sino Indian war of 1962 took place. This helped Chinese government to capture most parts of Arunachal Pradesh.

In the year 1972, Arunachal Pradesh became a Union Territory separated from Assam with Shillong being the capital where all the administrative work was carried out. In the year 1987, Arunachal Pradesh was carved out as a separate state of independent India, because of the rapid development and administrative inconvenience, and Itanagar was chosen as the capital of the state.

Culture

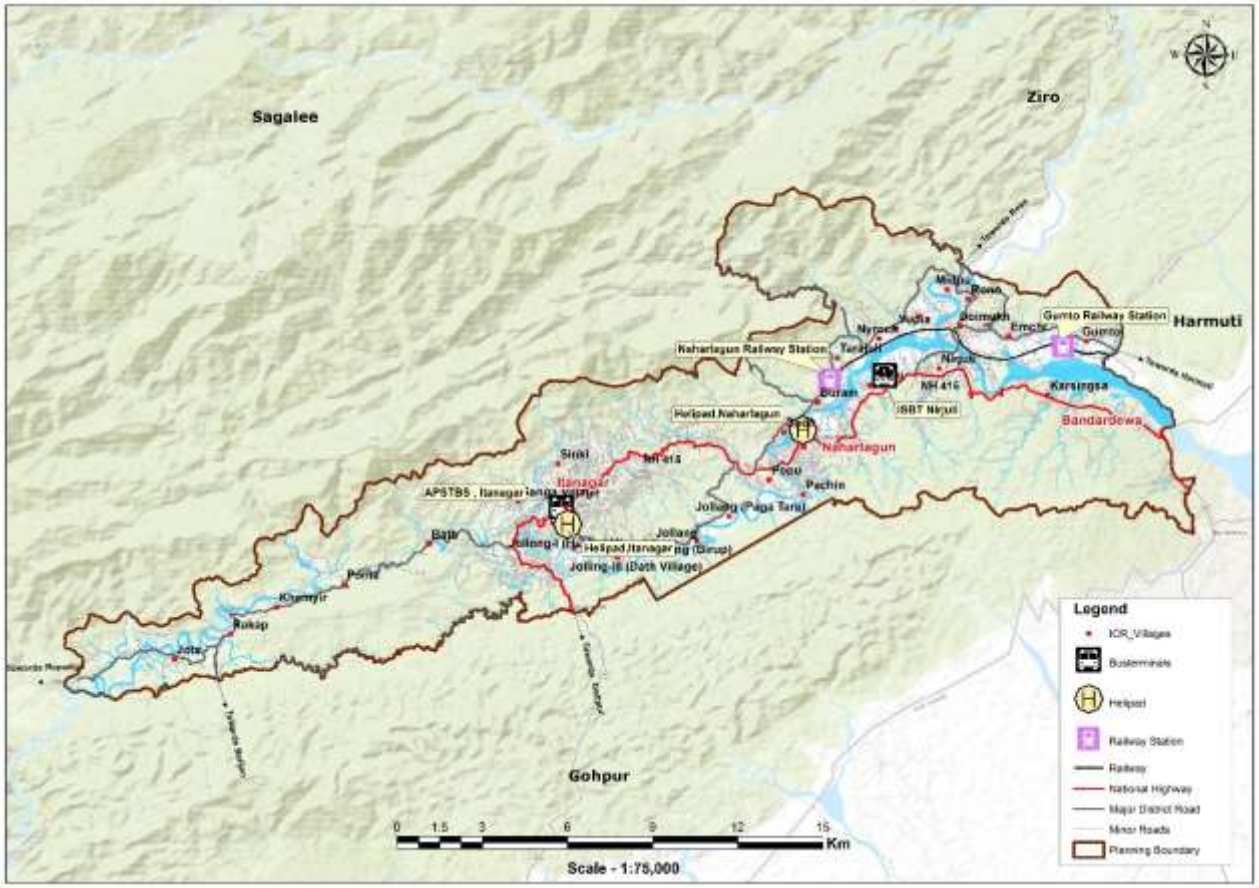
It has the thinnest population density in the country of 13 persons per Sq. Kms. The total population is 13.84 lakh (2011 Census). The indigenous people of Arunachal Pradesh are tribes with rich and glorious heritage of arts and crafts. The state has 26 major tribes and a number of sub-tribes having their own ethos, dialects and cultural identities. Each tribe has its own enchanting folk songs and colorful traditional dances, which present a unique scenario of unity in diversity. Their colorful festivals are manifestation to their faiths and beliefs. Though the people speak their own dialect, Hindi and Assamese are also widely spoken and used in communication with non-Arunachalees. The literacy rate is 54.74% and English is the official language.

Arunachal Pradesh finds mention in the Kalika Purana and in the epics of Mahabharata and Ramayana. It is believed that sage Vyas meditated here. Itanagar was called Mayapur during the reign of the Jiti Dynasty that ruled the region in the 11th century. Even during the reign of the Jiti kings, Mayapur was the capital city. The magnificent Ita Fort (Ita = brick), dating back to the 14th-15th century, is believed to have been built by King Ramachandra.

The capital of Arunachal Pradesh, Itanagar is also known as 'the Land of the Dawn lit Mountains'. It is located to the east of Tawang and has been identified as Mayapur, a city dating back to the 14th-15th century AD. The major attractions of Itanagar include the Itafort, Buddhist monastery, Jawaharlal Nehru Memorial Museum, and the Ganga lake (Geykar Sinyik) and the Zoo. It is also ideal for boating, canoeing and angling on the river Dikrong.

2.3 Regional Linkage & Connectivity

Itanagar, the town of bricks is named after 'Ita Fort' (Fort of Bricks) (14th – 15th century), located 30 kms from Banderdewa, the commercial capital of Assam. As per Census 2011, Itanagar is a notified Town City. Regular Helicopter service to Guwahati form Naharlagun is available and the nearest functioning airport is Lila Bari at a distance of 72 km. A Greenfield Airport, few miles from the city is under construction in Hollongi. Itanagar is connected by NH-52A/NH-415, branching off the highway of NH-52 at Banderdewa. Itanagar`s nearest rail connectivity is Naharlagun station since 2016.



Map 3: Transportation network map

2.4 Physiography

Papum Pare district is characterized by low to high relief hills and corrugated landform. The general trend of ridges is from North East to South West and the Siwalik hills from hogback topography. General altitude in major part of the district ranges from 1000 to 2000 m above MSL. Various geographic features in the district can broadly be grouped as given below:

(i) ***Structural Hills***: These structural hills are found further east in Sagalee – Doimukh section where Lower Gondwana rocks are exposed. Gondwana rocks also observed along Kimin– Ziro road section to give raise their characteristics geomorphic signature.

(ii) ***Low relief Structural Hills***: These hills show deep valleys and gullies with gently sloping land developed due to stream or river erosion with average height restricted to 1200 m.

(iii) ***Dissected and highly dissected hills***: This unit occurs in the central and southeastern part of the district. The hill ranges very between 300 m and locality to 1000 m.

(iv) ***Intermountain Valley:*** The broad valley between Naharlagun and Nirjuli represents this unit filled with quaternary sediments.

(v) ***Piedmont***: It occurs as nearly flat to gently sloping surface sloping southwards, covering a large area towards the foothills. Area around Harmuti, Banderdewa and Hollongi represents this unit and mostly occupied by quaternary sediments.

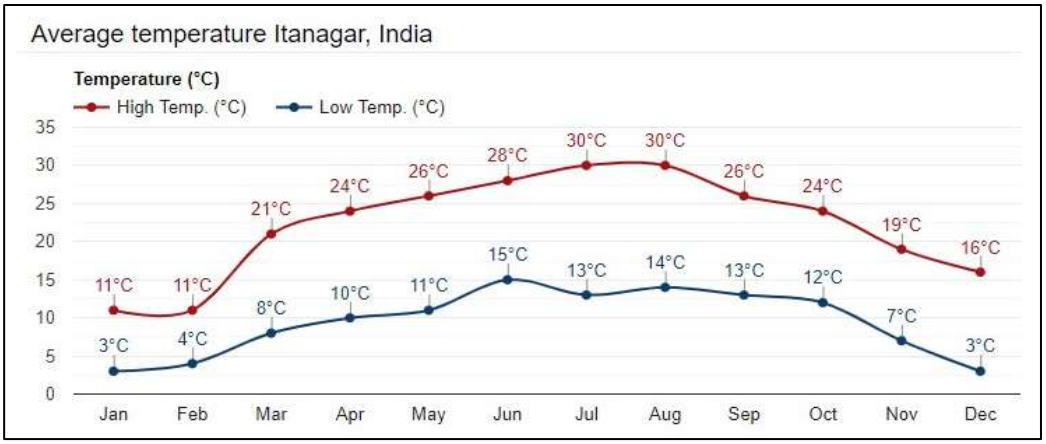
(vi) ***Alluvial Plain***: It occurs along the wide flood plain areas of Pachin and Dikrong rivers. It represents various sub-features, viz. Paleo channel, Swampy/marshy Land, river terraces, flood plains, point bar, channel bar and river channel.

2.5 Climate

The Himalayan Mountains and large variations in altitude influence the climate of the state greatly across the state. Itanagar is under the Papum Pare district that falls under mid tropical hill zone. Climate is wet and humid in the southern part of the district. Itanagar, Naharlagun and Doimukh experience severe hot weather during summer. During winter, the climate is cold with the temperature falling below freezing point at many places. In the foothill areas, winter is not as cold as in the other areas of the districts. Winter months have average temperatures in the range 15°C to 21° C, and the monsoon month temperatures are in the range of 22° C – 33° C, and the summer months temperatures sometimes are higher, well over 37°C. The foothills experience maximum temperatures around 40° C during summer.

2.6 Temperature

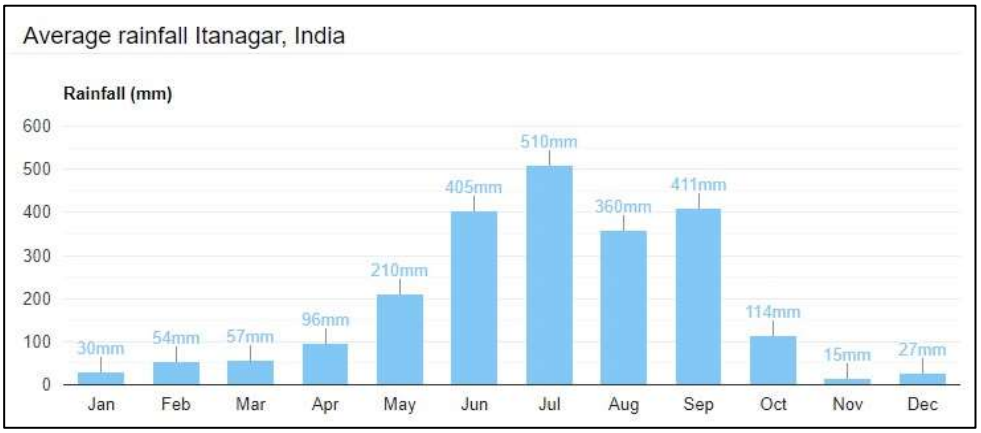
The highest temperature ever recorded was 33°C and the lowest ever recorded was 9°C. Winter temperatures rarely drop below 4°C. Winter months have average temperatures in the range 15°C to 21°C, and the monsoon month temperatures are in the range of 22°C – 33°C, and the summer months temperatures sometimes are higher well over 37°C. The foothills experience maximum temperatures around 40°C during summer.



Graph 1: Temperature trend

2.7 Rainfall

Rainy season or monsoon season starts from May and continues up to September/ October. The average annual rainfall is 232.25 mm



Graph 2: Rainfall trend

2.8 Urbanization in the ICR

In the past two decades, the Capital Region has witnessed many changes from a predominantly rural area to a bustling urban character. The traditional Jhum cultivation of existing tribes has been

replaced by settled cultivation, which progressively lead to the growth of urban settlements. The shift to other temporary locations often merges settlements into nearby urban areas and forms urban sprawl. The growth of urban centers has brought in many issues like improper civic infrastructure and poor quality of road network etc. Rapid growth of Itanagar has brought forth many challenges with respect to the urban sector.

The share of urban population in the Capital Region is comparatively high. In Papum Pare District 50.8% of the total district population (1,21,732) is in the urban areas, which is 27.8% of State urban population. In the circles of Itanagar and Naharlagun, the urban population is 89% and 68% of total circle population respectively. In case of Doimukh circle, the urban population as per Census is nil, although 90% of its population is engaged in non-farm activities. The total (urban and rural) population of Itanagar is approximately 71,565 (2018). The literacy rate is 78.1% in the total area, 80.8% in urban area and 54.5% in rural area. It is 84.5% for men and around 70.5% for women. The sex ratio is 901.

After Itanagar was selected as the Capital of the State, the requirements of a modern town with requisite amenities was felt. Government departments and supporting residential development were then planned and implemented. This resulted in the expansion of the town, owing to the influx of large number of migrants from the surrounding areas. The Master Plan (1992) earmarked an area of 136 sq. km. for the proposed developments. The MATURE Project (2005) identified an area of 152 sq. km.

Naharlagun, a census town since 1981, was the old capital city of the State. It is situated 12 kms from Itanagar along NH 52A/NH 415. Itanagar and Naharlagun along with settlements such as Nirjuli, Banderdewa, Yupia and Doimukh in addition to still smaller settlements such as Ganga, Pappu Nallah, Model Village, Tarajuli, Karsingsa and Chimpu form the various developed pockets of the Capital Region. All these settlements are located along the National Highway No. 52A, within a distance of 46 kms. Some of these settlements such as Itanagar and Ganga, Naharlagun and Nirjuli have merged. All settlements thus form part of an urban fabric with strong physical, socio-economic, infrastructure and environmental linkages.

Integrated planning and development of these settlements is therefore, necessary keeping in view future growth. The pattern of development in the Capital Region is linear, with poles/ nodes of commercial and related activities situated along the NH 52A. The general growth has been such

that the corridors and poles of development are identified based on physical delineation. These urban stretches are:

- The Chimpu-Ganga-Itanagar Corridor

- The Naharlagun-Nirjuli Corridor

- The Doimukh-Yupia Corridor

- Other settlements that lie between these corridors are physically discernible.

The Capital Region is a valley that runs west to east, and has a ridge that runs through the center of this valley. The historic Ita-fort was constructed on the topmost area of this ridge. Itanagar has developed on the northern part of the central valley. The general topography of the land in the Chimpu-Ganga-Itanagar Corridor is contoured, while that in the Naharlagun-Nirjuli Corridor and Doimukh-Yupia Corridor is relatively flat. The Capital Region has pockets of developed and un-developed areas. Some settlements are distinctly rural like Chimpu, while others exhibit varying degrees of urbanization.

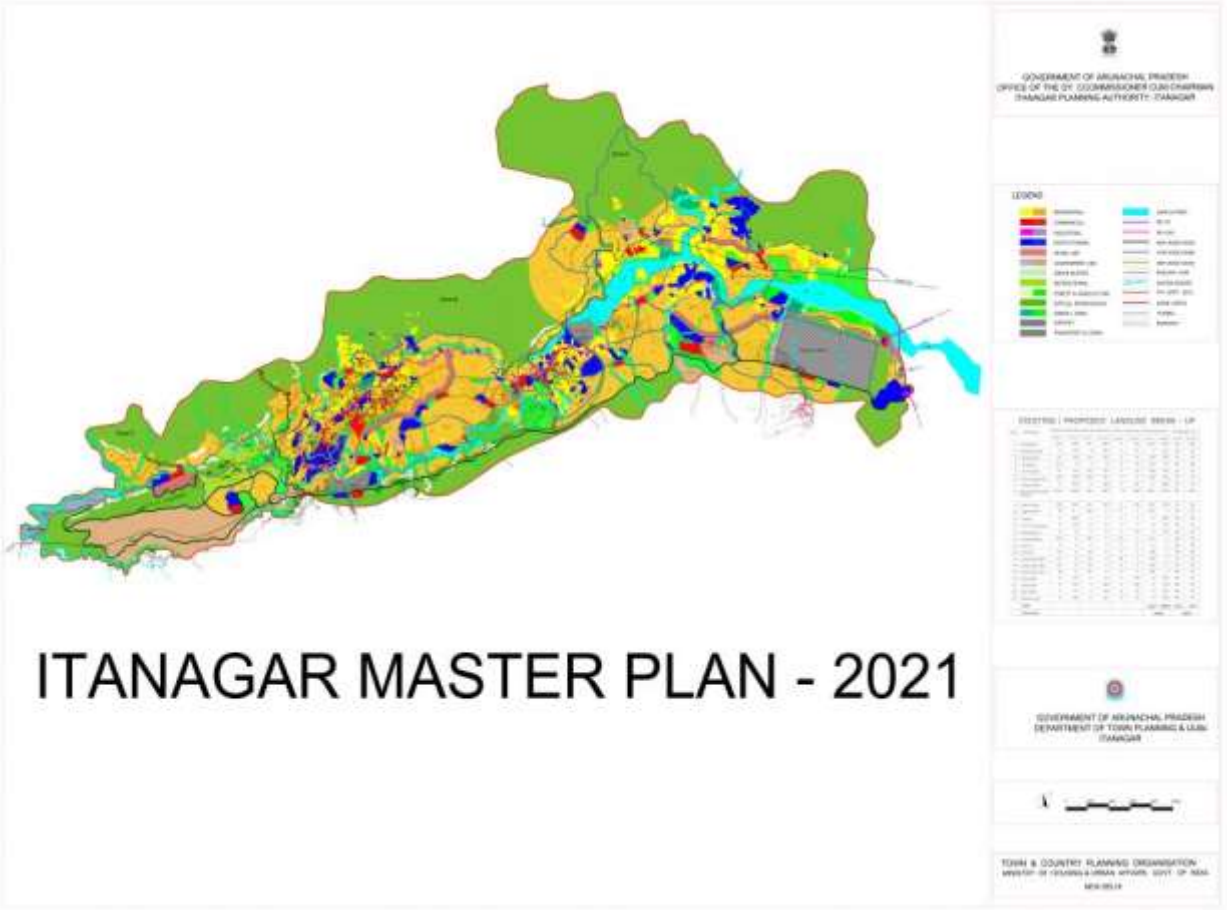
Pressures of urban expansion and resultant land necessities have caused a spillover of urban activities on ecologically fragile hill slopes. Some of these areas are part of the Wild Life Sanctuary or Reserved Forest.

The housing conditions in each pocket largely are a reflection of the level of urbanization. Settlements near Itanagar and Naharlagun and those near the Assam border show higher levels of urban functions.

Currently, since most private developments are on forestland, the urban regulatory authorities have little control on their growth. Such haphazard and unplanned growth invariably results in problems in service provisioning. Most private developments in the city have come up without prior permission (i.e. without land allotment procedure or building permission) from relevant Government departments. These developments are classified as:

- Unauthorized but later regularized developments;
- Unauthorized and presently not regularized (they may be regularized as they do not pose a significant threat to future growth);

- Unauthorized, unregulated development, which by their location, type and nature pose significant hurdles to future city growth.



Map 4: Itanagar Master Plan

Source: https://itanagar.nic.in/

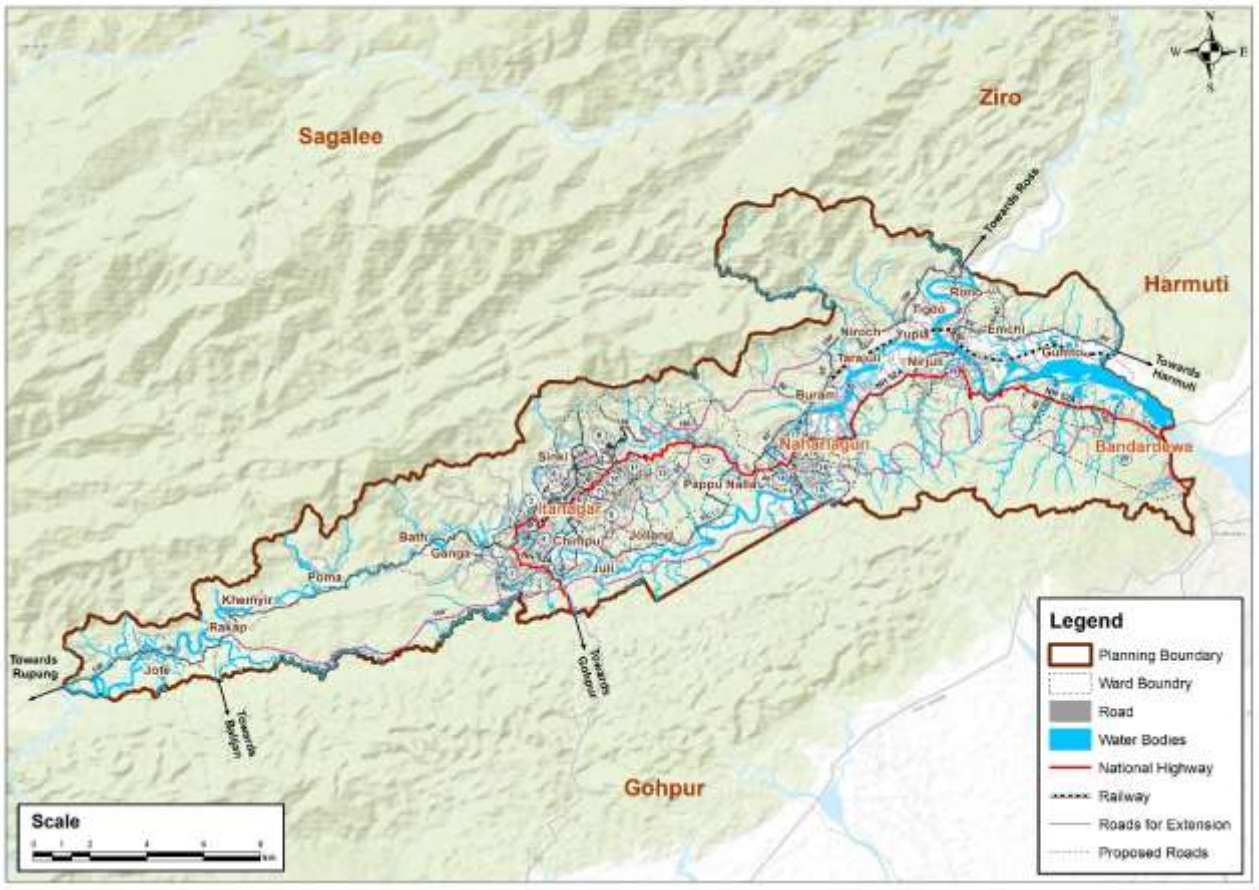
2.9 Economy of ICR in the regional context

The GSDP increased at a compound annual growth rate (CAGR) of 11.93% between 2011-12 and 2017-18. The state has considerable mineral reserves that offer huge potential. Due to its topography, the state has varied agro-climatic conditions suitable for horticulture of flowers and aromatic and medicinal plants.

2.10 Regional transportation network

Road Network

The total length of road network in the Capital Region is 280 km. Different roads form the road network may be classified into three broad categories i.e.



Map 5: Road network

Sl. No	Road Type	Length (km)	RoW (m)	C/W (m)
1	National Highway 52 A	34.5	30m	7
2	Other Important Roads	42.7	24m	3.0 to 5.5
3	Feeder Road/ Internal Road Network within city clusters	203.1	10m for local street	3 to 7
	Total	**280.3**	**-**	**-**

Of the total road length of 280 km, over 220 km roads are bituminous including 34.5 km of National Highway from Banderdewa to Chimpu. The quality of almost the entire road system is extremely poor marked with excessive pavement failure, distressed pavement, potholes and poor maintenance. As part of the Master Plan, the road stretches that require complete re-laying, or extensive strengthening have been identified through primary surveys.

National Highway

The National Highway 52A, besides providing vital access, acts as a major artery to the city system marked with the presence of large number of markets and commercial areas generating parking

demand and high volume of mixed traffic including pedestrians. Poor enforcement has caused severe problems of encroachment. There are over 460 cases of encroachments along the National Highway that fall within the 30 m Right of Way. Over 225 such encroachments are in Itanagar, nearly 200 in Naharlagun, while the remaining are in Banderdewa.

The National Highway has a number of defects like poor riding quality, poor geometrics, severe bends and s-curves aggravating safety concerns. There are many accident-prone locations like Km 20. At Km 21, there is a very steep hillock on one side forcing the road to take a harsh curve. The road stretch between Km 6.80 to Km 7.45 near Karsingsa passes through sinking area formed due to under cutting by river Dikrong and tectonic movements. Though studies indicate that chances of occurrence of landslides are remote, during heavy monsoons, occurrence of landslides along NH 52A are common. Presently, this issue is critical because any occurrence of landslide virtually cuts off Itanagar. Besides, proper street lighting facilities at urban stretches, signages, markings and other street furniture either are absent or not properly maintained on important roads.

Other Major Roads

Other major roads are Jully by-pass, approach road to Yupia, approach road to Doimukh and Yupia -Doimukh – Harmutti Road. Jully bypass starts from the heart of Itanagar town, runs along river Pachin in south and meets NH 52 A just before Naharlagun town at Pappu Nallah. Yupia Road begins from NH 52 A, from a point quite close to the terminating point of Jully bypass, and leads to the District Headquarter Yupia. There is another important district road in Doimukh, which runs along river Dikrong in the east leading to Assam.

Jully Bypass is currently in a dilapidated condition due to poor maintenance. This road has the potential to be developed as an alternative route and serve the new city development in the South. Yupia is the district headquarters of Papum Pare district. Yupia road needs upgradation and needs construction of one major bridge. Doimukh -Harmutti link is important as it provides a shorter route to the nearest railhead from Doimukh and Yupia. Jully bypass along with Pappu Nala – Yupia -Doimukh – Harmutti roads have the potential to offer an alternative route to the NH 52A.

Of the total 203 km roads in different areas, Itanagar accounts for nearly 95 km while Naharlagun accounts for 56km. Remaining 52 km is spread in other constituent areas of the Capital Region.

Share of single lane roads is substantial. Places like Karsingsa and Tarajuli have predominantly single lane roads and share of single lane roads is over 60% in Itanagar, Doimukh, Banderdewa and Nirjuli. Presence of two-lane roads is marginal with the exception of Naharlagun.

Public Transport System

Public Transport System (PTS) in the Itanagar Capital Region is a road-based system facilitated by bus transport. APSTS buses ply together with private buses on selected routes catering to the trip demand. The salient features of public transport as follows:

Currently, APSTS provides services to Government staff and people at large along with dedicated services to school/ college going students on selected local routes besides operating a wide range of services on various intercity routes.

Picture 2: Funded Buses under JNNURM

Salient Features of Bus Transport:

Indicators	Values	
No of Local Routes	10	
No of Routes operational	6	
Fleet size 37 to 60 seater 27 seater Semi Deluxe	21 Vehicles (03 Vehicles 02 Vehicles respectively) The fleet size is stagnant for the last few years.	
Frequency (No of Trips per day)	As the services are for school/ college students or Government staff the number of services on each route are restricted to 4 trips per day which includes two trips in the morning and two trips in the evening.	
No of Workshops	1, space for workshop is inadequate.	
No of persons passengers travelling per day (Local Routes) 2002-2003, 2003-2004 and 2004-2005	Students 7329, 6290 and 7573	Staff 4752, 5144 and 7178

It is observed that the patronage of buses has remained stable over the years despite population growth. The reason for this, may be, that inspite of deteriorating service, proliferation of various para transit modes providing convenient accessibility has occurred. Besides the above local routes, there are 19 intercity long distance bus services being provided by APRTS, which also cater to some city-based trip demand enroute.

The bus terminal at Itanagar has severe space constraints and is unable to handle local buses, intercity buses, and interstate buses from one location. There are no proper facilities for internal circulation and there is no separate access for entry and exit, parking, eating, waiting, display of route information, schedule of operations, and public conveniences available for passengers causing tremendous problems. Even the bus stops are not planned properly and most of the bus stops in the area do not have a proper bus shelter or bus route information displayed.

Para Transit

Para-transit consists of rickshaw (3-seater) Tempo (7-seater) and Trekker/ Sumo (10-seater) which have grown in the recent years to meet the trip demand in the city on specified routes. While a proper integration of para-transit can actually complement the bus system, this has not happened due to the much-unorganized nature of the sector with too many independent owners of auto-rickshaws. The high degree of maneuverability of the auto rickshaws and frequent stopping on the carriageway to serve passengers has resulted in severe problems to the free flow of road traffic.

Tempo services have been operational in Itanagar for quite some time on two routes namely Naharlagun to Nirjuli and Mithun Gate to Ganga. There are 65 operators in Naharlagun - Nirjuli while there are 42 operators in Mithun Gate - Ganga route. Each operator is able to make nearly 7 to 8 trips per day and carry 10 passengers per trip. The flat fare charged for each trip is Rs 5 irrespective of length of journey.

Private operators from Ganga to Naharlagun operate trekker services. These services started in 2004. The Tempo service is not environment friendly and difficult to operate due to hilly terrain.

There are a total 40 Trekkers and 50 Tata Sumos operational. Each Trekker is able to make 12 trips per day and carries 10 passengers per trip charging flat fare of Rs 10 per trip from each passenger.

Parking for these Para transit modes is a major problem in the city. Besides causing inconvenience to the operators and the users, it is a major cause of traffic congestion on NH 52 A. The estimated parking requirements of these modes are presented in the table given below -

Parking Demand for various Para transit modes (no of spaces)

AREA	TEMPO	TREKKER	AUTO RICKSHAW	CYCLE RICKSHAW
Ganga	35	35	25	-
Mithun Gate	25	-	20	-
Naharlagun	25	35	6 Nos of 15 each	30
Nirjuli	35	-	20	20
Civil Secretariat	-	-	30	-
Akashdeep	-	-	20	-
Waghe Tinali	-	-	10	-

In some of these areas, land is already available. Only proper layouts are required to be developed and formal parking lots need to be marked and duly paved with proper circulation.

Freight Operations and Distribution

Freight operations are the most neglected in the city. There is no Truck Terminal in the city and all the trucking operations right from loading and un-loading, parking etc. takes place on streets. Truck operators do not have any booking office. They mainly carry stone, building materials, bamboo, cement, iron rods etc. and parking for at least 40 trucks, along with other integrated allied facilities like loading and unloading facilities, booking office, warehouses etc. are required at Itanagar. Besides Itanagar, truck parking facilities are also required at Nirjuli (20 trucks), Naharlagun (20 trucks) and Doimukh Nirjuli (15 trucks). In addition to heavy trucks, LCV pickups popularly called "Tata Mobile" are available for local distribution of goods. These vehicles are used to carry small payloads of miscellaneous goods, building materials, vegetables and fruits, newspapers etc. The parking for these vehicles is inadequate at all locations in the city. There is requirement of at least 20 parking lots for these vehicles at Ganga, Naharlagun, Nirjuli and Doimukh.

2.11 Administrative Setup

Total geographical area of Itanagar Capital Region is 271 km². The Local administrative body of town is known as Itanagar Municipal Council. The Municipal Council is responsible for establishment & operation & maintenance of all basic amenities like water supply, sanitation, sewerage & solid waste disposal. Nagar Panchayat is also responsible for holding public meeting, function, fairs & public awareness programs & implementation of all govt. schemes. The Itanagar town is distributed in 30 wards based on population, area & Landuse. Streets, river & main roads distinguish Ward boundaries.

2.12 Key Issues and Challenges

I. Strengthening and development of system of roads in the Capital Region.

II. Development of alternate road links and corridors for meeting emergency situations and maintenance works of NH 52 A.

III. Development of Parking Facilities for private cars and two wheelers.

IV. Improvement of junctions.

V. Developing Pedestrian crossings, Foot over bridges and pucca footpaths.

VI. Construction of a new bus terminal at Itanagar (Relocation) and designating this area for the expansion of workshop.

VII. Expansion of Bus Terminal at Naharlagun.

VIII. Construction of Parking lots for Tempo stand, Trekker stand, Auto Rickshaw & cycle stand.

Picture 3: Temporary Link across River

IX. Development of Truck Terminal at Itanagar and truck parking facilities at Naharlagun and other towns.

X. MCV stands at various locations.

XI. Street Lighting at urban stretches on NH 52 A and other internal areas.

XII. Straightening of various bends on NH 52 A especially at 20 Km. and 21km.

XIII. Improvement of sinking zone (6.8 km. to 7.2 km.) of NH 52 A that requires training of Dikrong River.

XIV. Removal of encroachments from NH 52A.

XV. Better Traffic Management and Traffic safety measures.

2.13 Past Efforts at Master Plan Preparation

In 2006, City Development Plan for Itanagar, a requirement for accessing funds under both sub missions of JnNURM highlighted problems of urban renewal in terms of absence of development control and monitoring, lack of urban management, the need for initiating a renewal process, infrastructure deficit, non-conforming uses, and unauthorized encroachment on public land, narrow streets and lack of pedestrian facilities. The report identified various road works, cross drainage work, storm water drains, erosion and flood control measures, street lighting, paving, water supply, sewerage and solid waste management projects to be taken up for funding along with implementation of the urban reform agenda.

In respect of the Basic Services for Urban Poor component, slum areas were identified based on primary surveys at Itanagar, Naharlagun, Nirjuli, Doimukh, Karsingsa and Banderdewa, along with projects and interventions required at various levels. The vision statement of the then CDP sought to develop Itanagar as a nodal city of the North-east that thrives on economic, infrastructure, cultural and environmental strengths and provides a socially fair and environmentally sustainable environment through participatory planning, transparent institutional framework for its residents, visitors and investors alike.

These aspects were kept in mind while preparing the GIS based Master Plan for Itanagar Capital Region.

CHAPTER-3: DEMOGRAPHY

3.1 Introduction

Itanagar

The sub district is home to about 65 thousand people, among them about 33 thousand (51%) are male and about 32 thousand (49%) are female. 41% of the whole population are from general caste and 59% are schedule tribes. Child (aged under 6 years) population of Itanagar circle is 13%, among them 52% are boys and 48% are girls. There are about 14 thousand households in the sub district and an average 5 persons live in every family.

The majority of the population, nearly 91% (about 59 thousand) live in Itanagar Sub District urban part and 9% (5811) population live in the Itanagar Sub District rural part.

Naharlagun

The sub district is home to about 49 thousand people, among them about 25 thousand (50%) are male and about 25 thousand (50%) are female. 41% of the whole population are from general caste and 59% are schedule tribes. Child (aged under 6 years) population of Naharlagun circle is 14%, among them 50% are boys and 50% are girls. There are about 10 thousand households in the sub district and an average 5 persons live in every family.

The majority of the population, nearly 74% (about 36 thousand) live in Naharlagun Sub District urban part and 26% (about 13 thousand) population live in the Naharlagun Sub District rural part.

Banderdewa

The sub district is home to 8523 people, among them 4372 (51%) are male and 4151 (49%) are female. 23% of the whole population are from general caste and 77% are schedule tribes. Child (aged under 6 years) population of Banderdewa circle is 17%, among them 51% are boys and 49% are girls. There are 1625 households in the sub district and an average 5 persons live in every family.

3.2 Census data

The recording of census population of Arunachal Pradesh began from 1981. Since the first census, Itanagar and Naharlagun were considered as the most populated urban areas in the state. In the year 1991, seven urban centres - Basar, Changlang, Daporijo, Deomali, Jairampur, Seppa and Tawang, were recognized as census towns. Subsequently, nine more settlements were notified by

the State Govt. as urban - Dirang, Sagalee, Yingkiong, Boleng, Koloriang, Anini, Hawai, Longding and Miao.

Year	Arunachal Pradesh		No. of Towns	Growth Rate	Indian Urban Growth Rate
	Total population	Urban Population			
1961	NA	NA	NA	NA	18.24
1971	NA	17,288	4	3.7	20.21
1981	6,31,839	41,428	6	6.5	23.7
1991	8,64,558	110,628	10	12.8	25.72
2001	10,91,117	2,22,688	17	20.41	27.78
2011	13,83,727	3,38,348	19		

Table 1: Population of Arunachal Pradesh state

Source: Census of India 2011.

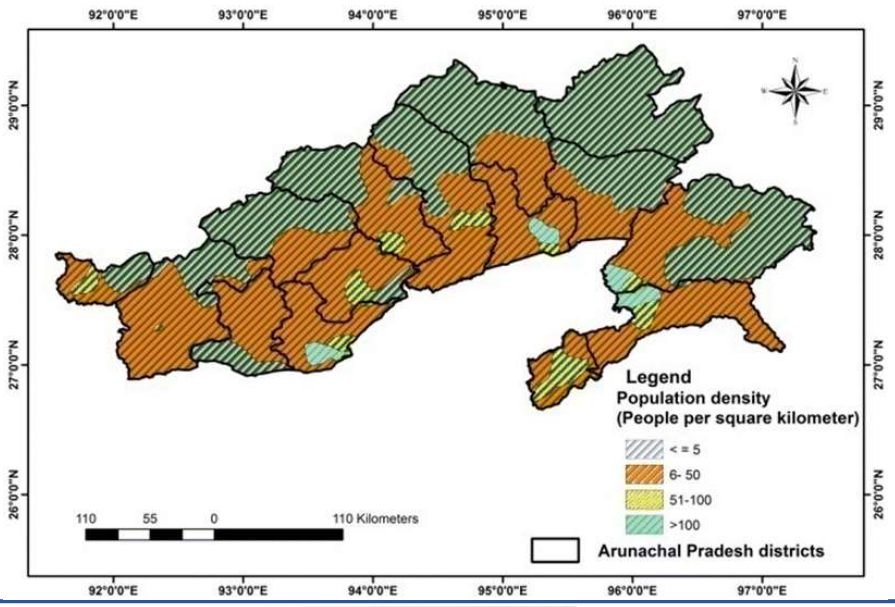
Papum Pare District has one of the highest populations among 22 districts in Arunachal Pradesh. Papum Pare district is the most urbanized district with 50.83% urban population.

Year	Total	Decadal growth rate	Urban	% of Urban Population
1981	39,736	NA	14,116	35.52
1991	72,811	83%	30,914	42.83
2001	1,21,750	67%	61,882	50.83
2011	2,92,610	73%	1,15,660	58.68

Table 2: Population of Papum pare district

Source: Urban Development Strategy for Arunachal Pradesh, Dept. of Urban Development,

Naharlagun was initial called as Itanagar and the present Itanagar was known as new Itanagar. Itanagar became Naharlagun and new Itanagar as Itanagar as the twin settlements.



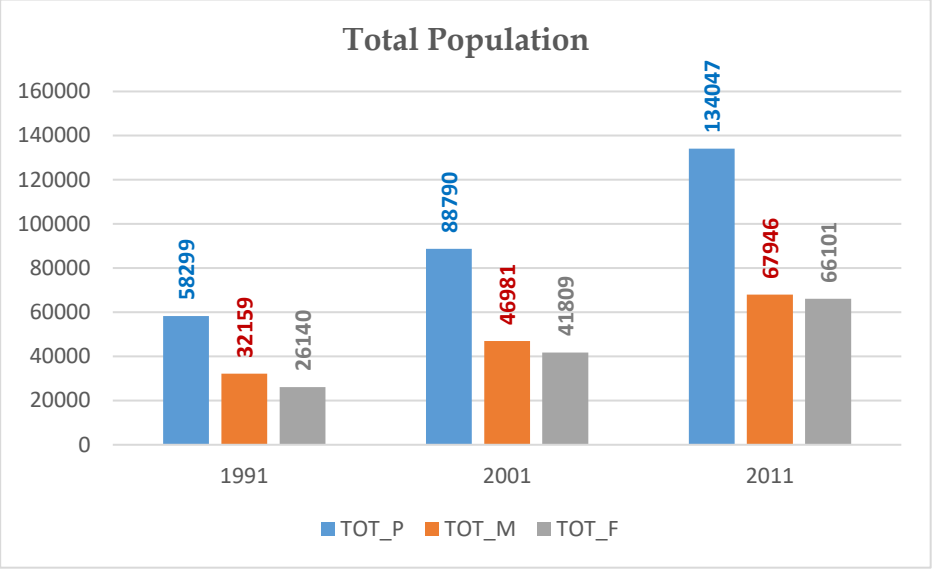
ICR village wise population

Town name	Households	Population	Male Population	Female Population	Population (0-6 yrs.)	SC Population	ST Population	Literates	Literacy rate	Work force	Avg household size	Sex ratio
Bander dewa	534	2700	1454	1246	386	0	1903	2023	74.93	806	5.06	857
Nirjuli	1182	5453	2811	2642	606	0	2688	4178	76.62	2036	4.61	940
Gumto	142	770	361	409	98	0	526	510	66.23	320	5.42	1133
Doimukh	465	2222	1039	1183	263	0	1185	1708	76.87	585	4.78	1139
Rono	71	420	175	245	55	0	350	305	72.62	93	5.92	1400
Tigdo	76	423	212	211	84	0	313	203	47.99	200	5.57	995
Tarajuli	42	218	106	212	46	0	173	164	75.23	85	5.19	2000
Jollang	12	84	40	44	11	0	72	39	46.43	42	7.00	1100
Chimpu	236	1469	745	724	257	0	1015	876	59.63	574	6.22	972
Ganga	86	508	238	270	61	0	426	345	67.91	138	5.91	1134
Poma	26	225	105	230	39	0	196	120	53.33	88	8.65	2190
Rakap	36	264	133	131	32	0	259	151	57.20	98	7.33	985
Jote	74	363	143	220	52	0	343	196	53.99	69	4.91	1538

Table 3: Population of ICR region villages

Population growth

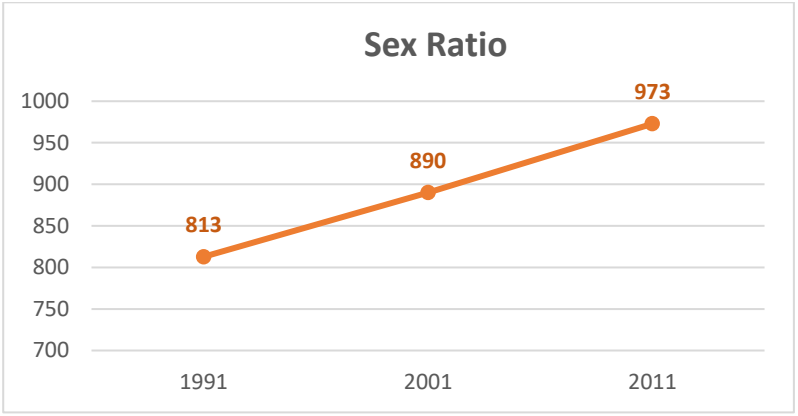
The population of ICR has rapidly grown after constituting the state. ICR experienced consistent high population growth rates, when compared to the cities with the same population. Due to the influence of ICR, the surrounding areas have also experienced similar growth rate creating increased influx into the region.



Graph 3: Population growth rate

Sex composition

Number of females per 1000 males denotes sex ratio; it is a social indicator of any place. Sex ratio of Itanagar is 950, Naharlagun is 998, with the state average of 973, and the countries sex ratio is 971. However, during the last decade the sex ratio has substantially increased.

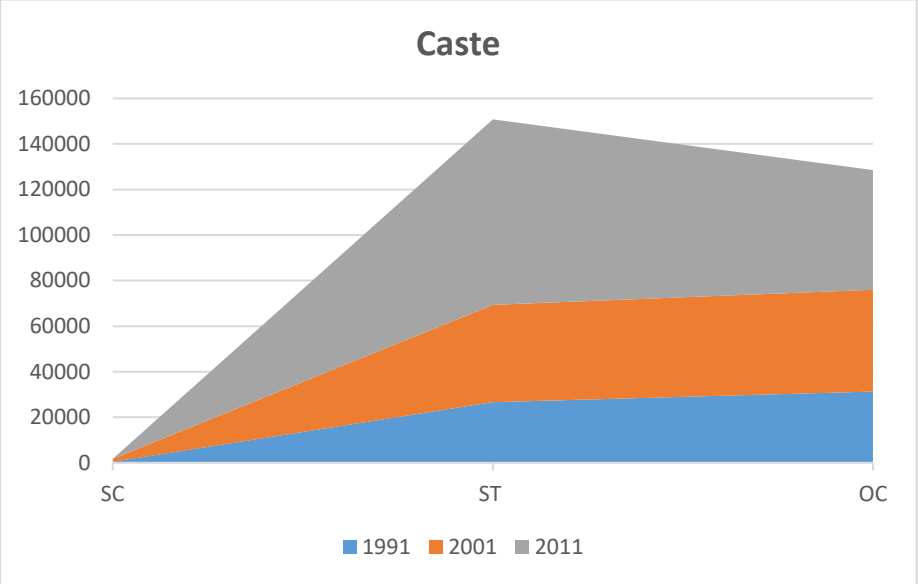


Graph 4: Sex Ratio

Caste

In Itanagar, most of the population is from Schedule Tribe (ST) constitutes 57.20 % of total population in Itanagar. There is no population of Schedule Caste (SC) in Itanagar of Papum pare.

In Naharlagun, most of the population is from Schedule Tribe (ST). Schedule Tribe (ST) constitutes 57.43 % of total population in Naharlagun. There is no population of Schedule Caste (SC) in Naharlagun of Papum pare.



Graph 5: Caste details of ICR region

3.3 Household Characteristics and Household Sizes

ITANAGAR:

As per 2011 census, Itanagar Notified Town has total 13,465 houses and the Mean Household Size of Itanagar is 4.4.

NAHARALAGUN:

As per 2011 census, Naharlagun Notified Town has 7,735 houses. Mean Household Size of Naharlagun is 4.7.

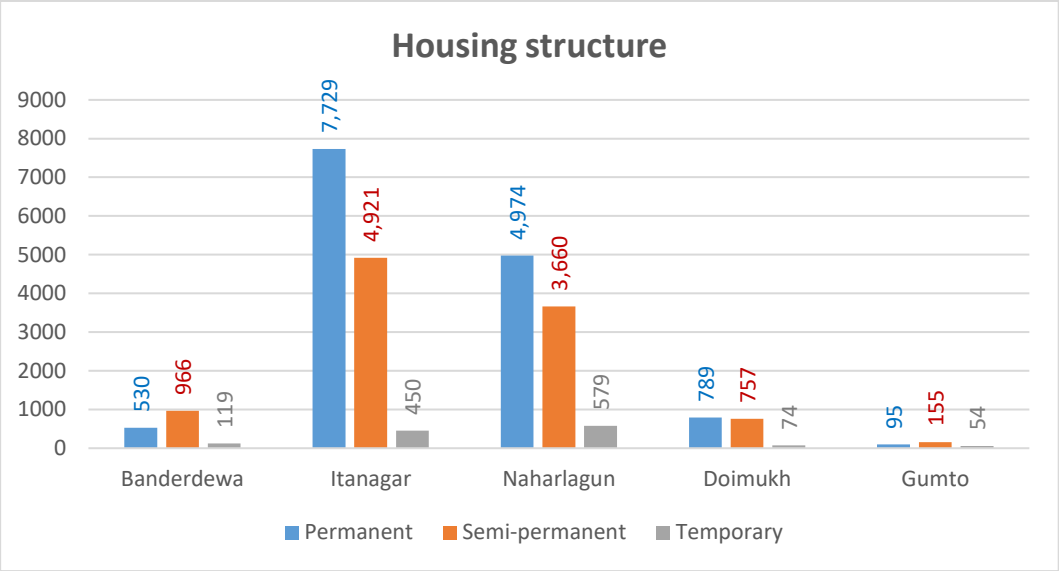
BANDERDEWA:

As per 2011 census, Banderdewa has total 1625 houses and the Mean Household Size of Banderdewa is 5.2.

Town	No. Of Households	Total No. Of Persons	Household Size
Itanagar	13645	59490	4.3
Naharlagun	7735	36158	4.6
Banderdewa	1625	8523	5.2
Doimukh	1845	9479	5.1
Gumto	295	1638	5.6

Table 4: Household number and Household size

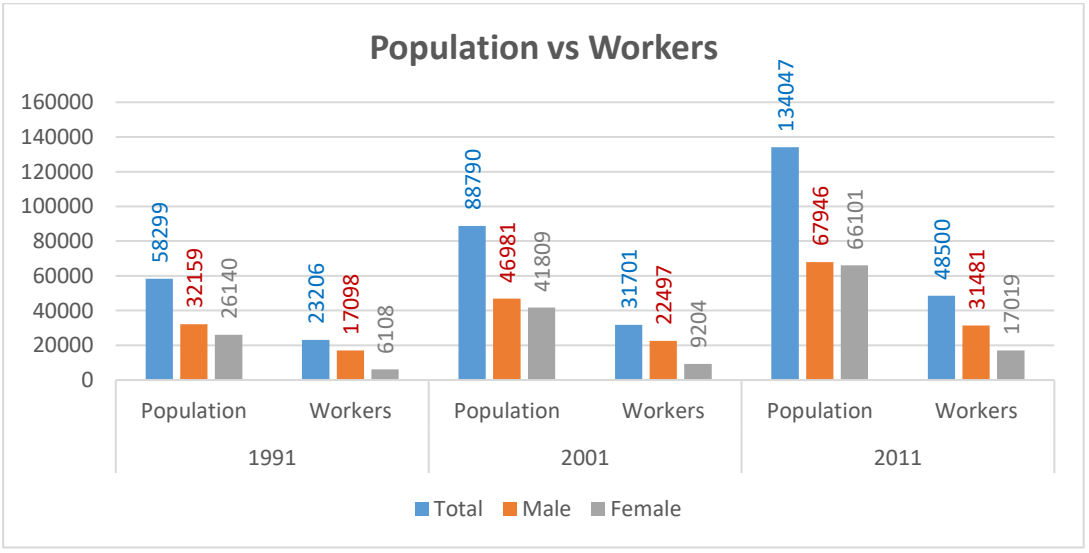
As per the census, the total number of households in Itanagar Capital region is 28,598 dwelling units. The type of housing structure is classified into three categories i.e. permanent, semi-permanent and temporary houses.



Graph 6: Types of Housing structure

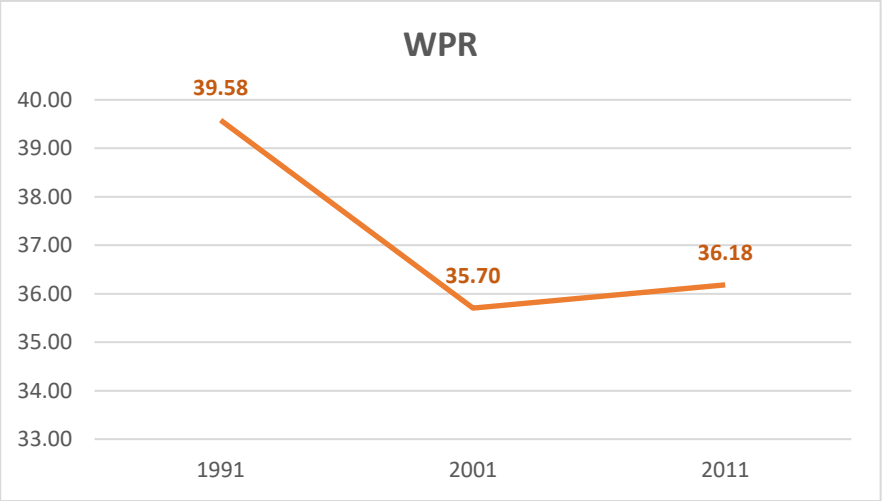
3.4 Work profile

Occupational status defines the number of people that are occupied and employed in various professions generating revenue and contributing to the economy to the total number of people residing in the town. Economic activities in the urban area has direct implications on the town`s socio-economic profile and structure like employment opportunities, densities, level of interaction between employment nodes, employment pattern etc.



Graph 7: Work force vs Population

The number of women opting for occupation has nearly tripled over the past two decades from 6108 in 1991 to 17,019 in 2011.



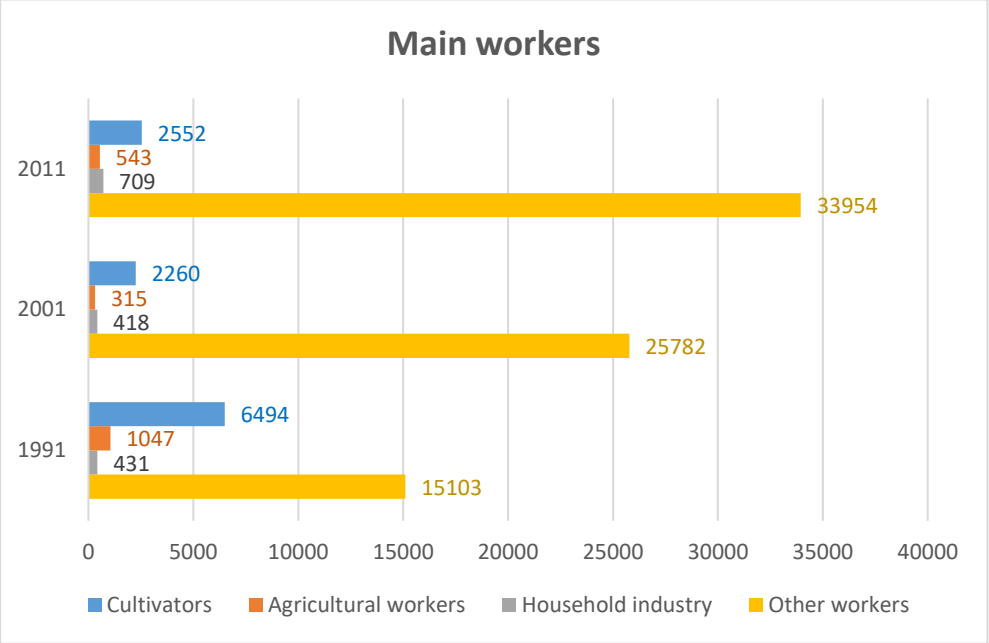
Graph 8: Worker Participation Rate

Due to the influx of people from surrounding villages into the ICR, the employment opportunities for the people has been oscillating highly, leading to variability in the Workforce Participation Rate (WPR) of the area from 1991 to 2011. This ledto establishment of seasonal and temporary work profiles in the region with no perennial sustenance. One such sector is Transport and Tourism, in and out of the region of the ICR.

The Census classifies Workers into two groups namely, Main workers and Marginal workers. Main Workers are those workers who had worked for the major part of the reference period i.e. 6 months or more. Marginal Workers are those workers who had not worked for the major part of the reference period i.e. less than 6 months.

The Main workers are classified based on Industrial category of workers into the following four categories:

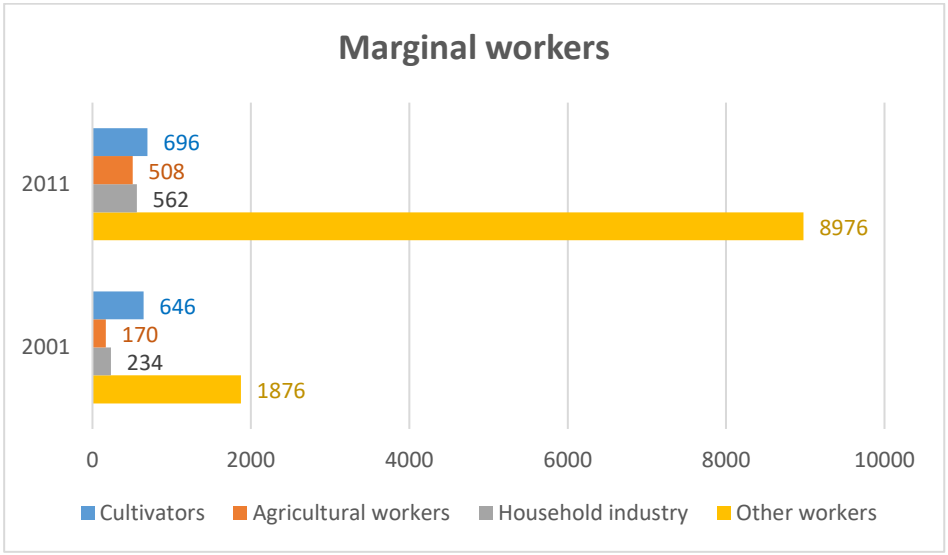
1. Cultivators
2. Agricultural Laborers
3. Household Industry Workers
4. Other Workers



Graph 9: Classification of Main workers

The percentage of main workers being employed in various professions in the ICR region has increased gradually from 23,075 in 1991 to 37,758 in 2011 pertaining to an average increase of 63.6%.

The number of main workers following cultivation has reduced in half from 6,494 in 1991 to 2,552 in 2011. The number of main workers working as agriculture workers has also reduced in half from 1,047 in 1991 to 543 in 2011. However, the number of main workers in household industry sector has increased. The average decadal increase in the main workers population is 27.9%.



Graph 10: Classification of Marginal workers

The percentage of marginal workers being occupied in various professions in the ICR region has increased exponentially by 81 times from 131 in 1991 to 10,742 in 2011.

The number of marginal workers following cultivation has almost the same from 646 in 2001 to 696 in 2011. The number of marginal workers working as agriculture workers has more than tripled from 170 in 2001 to 508 in 2011. The number of marginal workers in household industry sector have more than doubled from 234 in 2001 to 562 in 2011. While the people dependent on other occupations for their livelihoods has increased by 378.5% marking an important factor influencing the economy of the ICR region. The average decadal increase in the marginal workers population is 267.2%.

3.5 Future Population projections

Population projections are important to predict the amount of influx of the people into the city and also the increasing population of the region with an aim to cater for the all the people till the horizon year of the Master plan period. The population of Itanagar Capital Region, which was formerly not present and referred to as independent towns/cities has grown over the past three decades as follows:

Year	Population	Decadal Population Growth %	Annual Population Growth Rate %
1991	58299	-	-
2001	88790	52.30%	5.23%
2011	134047	50.97%	5.1%

Table 5: Decadal change in population

The decadal population growth rate in the region is approximately 90.77% and the annual growth rate is 9%. The population projection was done using three methods:

Arithmetic Progression

In this method the average increase in population per decade is calculated from the past census reports. This increase is added to the present population to find out the population of the next decade. Thus, it is assumed that the population is increasing at constant rate.

Hence, dP/dt = C

i.e., rate of change of population with respect to time is constant.

Therefore, Population after nth decade will be **Pn= P + n.C**

Where, Pn is the population after 'n' decades and 'P' is present population.

Census Year	Census Population	Decadal increase in population	Average increase in population
1991	58299	-	37874
2001	88790	30491	
2011	134047	45257	

Table 6: Arithmetic progression method

Projected population for the year 2021 is = 134047 + (37874*1)

= 1,71,921.

Projected population for the year 2031 is = 134047 + (37874*2)

= 2,09,795.

Projected population for the year 2041 is = 134047 + (37874*3)

= 2,47,669.

Geometric Progressions

In this method the percentage increase in population from decade to decade is assumed to remain constant. Geometric mean increase is used to find out the future increment in population. The population at the end of nth decade 'Pn' can be estimated as -

$Pn = P (1+ IG/100)^n$

Where, IG = geometric mean (%)

P = Present population

N = no. of decades.

Census year	Census Population	Decadal change in population	Rate of growth
1991	58299	-	-
2001	88790	30491	0.52
2011	134047	45257	0.51

Table 7: Geometric progression method

Geometric mean, IG = √(0.52*0.51 = √0.266583 = 0.516317 i.e. 51.6%.

Projected population for the year 2021 is = 134047 + (1+0.516317)^1

=2,03,258.

Projected population for the year 2031 is = 134047 + (1+0.516317)^2

= 3,08,203.

Projected population for the year 2041 is = 134047 + (1+0.516317)^3

= 4,67,333.

Incremental Increase method

The incremental increase is determined for each decade from the past population and the average value is added to the present population along with the average rate of increase. Hence, population after nth decade is Pn = P+ n.X + {n (n+1)/2}.Y

Where, Pn = Population after nth decade

X = Average increase

Y = Incremental increase

Year	Population	Decadal growth in population	Incremental increase in population
1991	58299	-	-
2001	88790	30491	-
2011	134047	45257	14766

Table 8: Incremental increase method

Average increase in population is, X = (30491+45257)/2

= 37874.

Incremental increase in population is, Y = 14766.

Projected population for the year 2021 is = 134047 + (37874 x 1) + {(1 (1+1))/2} x 14766

= 1,86,687.

Projected population for the year 2031 is = 134047 + (37874 x 2) + {(2 (2+1))/2} x 14766

= 2,54,093.

Projected population for the year 2041 is = 134047 + (37874 x 3) + {(3 (3+1))/2} x 14766

= 3,36,265.

Census year	Arithmetic method	Geometric method	Incremental increase method
1991	58299	58299	58299
2001	88790	88790	88790
2011	134047	134047	134047
2021	171921	203258	186687
2031	209795	308203	254093
2041	247669	467333	336265
Average	**467333**		

Table 9: Population projection of ICR region

The projected population for the ICR in the horizon year 2041 was projected as the average value from all the three methods and determined to be **4,67,333** .

CHAPTER-4: ECONOMIC PROFILE

This section deals with the characteristics of economic activities of the people in the town. The basic indicators that were considered for the current exercise are the occupational structure, population involved in primary, secondary and tertiary sectors. The town has fair economy with the mix of rural and urban economy.

The economy of Arunachal Pradesh is predominantly based on agriculture and allied agro-activities, which is the driving source of income to the people because the fertile soil and abundant source of water. Undulating topography and diverse agro - climatic conditions offer great potential for horticulture and growing a variety of fruits, vegetables, spices, aromatic, medicinal plants, flowers and mushroom. Swidden cultivation, the slash-and-burn method that is known in North-East India as Jhum. The land is shaped into multiple terraces, which prevents soil erosion and runoff water. Only a small minority of tribes (the Apatanis, the Singphos and the Khamptis), who are settled in river valleys and plateaus practiced among the tribal groups produce rice, maize, millet, wheat, pulses, sugarcane, ginger and oilseeds.

Arunachal Pradesh is covered with dense and rich forest. The state has close to 61,000 square kilometers of forests. The forest product and industries based on forest products are the lifeline in the state and provides income and employment to large scale of people, next most significant sector of the economy after agriculture and cultivation. The industries are based on forest products such as Timber, Veneer, Plywood and tea.

4.1 Workers Profile

ITANAGAR TOWN:

Itanagar town has 23,013 working population, which includes 17,420 main working population and 5,593 marginal working population. 39% of the total population of Itanagar Town is engaged in either main or marginal works. Almost 65% of the working population is male and the remaining 35% of the working population is female. Almost 66% of the working female population is engaged in main working category.

Itanagar town has 17,420 main workers of whom 12,178 are male and 5,242 are females. Itanagar Town has 174 cultivators, 115 agricultural laborers, 257 Household industry workers, and 16,874 other workers. 5593 Marginal workers including 2854 male and 2739 females. The population of marginal workers in Cultivators is 165, Agricultural laborers is 178, Household industry workers

is 286, other workers is 4964. There are 36,477 non-workers in the town.

	Workers	Main workers	Marginal workers	Non workers
Total	39(% of total population)	29.3(% of total population)	9.7(% of total population)	61(% of total population)
Male	49.3 (% of male population)	40 (% of male population)	9.4 (% of male population)	50.7 (% of male population)
Female	27.5 (% of female population)	6 (% of female population)	21.5 (% of female population)	72.5 (% of female population)

Source: Census of India, 2011

Among these main workers, the female contribution is very low. There are people engaged in cultivation or other agricultural activities as well as household industries, but the major form of employment for the people is the service sector or manufacturing sector. 9.7% of the population are marginal workers, in which the maximum number of people are engaged in household industries sector and other workers category. It is evident from this, that for employment throughout the year, people have to depend on the secondary and tertiary sector.

The people of Itanagar, especially the ones with higher education, are not able to find a job that suits their educational profile, within the city area. There is large flow of young working-class population towards the major industrial and commercial centers near Itanagar. Agartala, Aizawl, Kohima, Guwahati, Imphal, and Shillong are the major towns that the people of Itanagar are mostly dependent on in terms of finished goods, employment, education and advanced healthcare facilities.

Female contribution in workforce is very much low in almost all sectors except for household industrial sector. However, it is to be noted that only 5.1% of the total marginal workers are engaged in household industrial activities.

4.2 Major Economic Activities

The state's economy is largely agrarian, based on the terraced farming of rice and the cultivation of crops such as maize, millet, wheat, pulses, sugarcane, ginger, oilseeds, cereals, potato & pineapple.

- In 2017-18, total horticulture production reached 210.15 thousand metric tons.

- In 2016-17, total production of horticulture crops in the state was recorded at 422.98 thousand metric tons, while the total production of fruits & production of vegetables in the state stood at around 311.53 thousand metric tons & 33.34 thousand metric tons, respectively.
- The state also produces various food grains including paddy (rice), cereals, etc. Major cereal crops of the state are rice, wheat, maize & millet.
- Under State Budget 2018-19, Rs 743.96 crore (US$ 114.92 million) was allocated to the sector.
- Under Rashtriya Krishi Vikas Yojana, Rs 40.51 crore (US$ 6.29 million) was allocated to the state during 2017-18.
- In April 2017, the Arunachal Pradesh government launched the 'State Organic Mission' to make the state an organic farming hub.

Picture 4: Market area in Itanagar

4.3 Workforce Projection

The workforce projections for four types of industrial workers has been made for Itanagar town based on category wise employment data available from census 2011 to estimate category wise employment for the year 2040. It has been assumed that the employment pattern of the city will be same as observed in 2011. The category wise employment data for 2011 and employment forecast for Itanagar town up to the year 2030 and 2040 is given in Table below:

Table 10: Workforce projection

Type of worker	Workers in 2011	Existing (%)	Assumed (%)	2018	2028	2038
Cultivators	339	1.5	3	342	398	454
Agricultural Workers	293	1.3	9	1025	1193	1363
Household Industrial Workers	543	2.4	4	456	530	606
Secondary & Tertiary	21838	94.9	84	9569	11134	12722
Total	23013	100	**100**	**11392**	**13255**	**15145**

Being a town under transition from rural settlement to urban agglomeration, substantial increase has been noticed in the secondary and tertiary sector i.e. industrial sector and other services. Town's economy is driven by secondary, tertiary and service sectors. While at village level, still primary sector is the dominating economy.

Existing working population of Itanagar Town (2011) is 23,013 (38.7%). Projected work force will be same as existing but to be regularized according to the table as stated above.

CHAPTER-5: SURVEYS AND STUDIES

5.1 Data Collection

Master Plan preparation requires relevant and reliable data, regarding the area's physical and socio-economic conditions such as existing Landuse, Transportation, Demography, Housing, Economy, Industry, Employment, Physical Infrastructure such as Water Supply, Electricity Supply, Solid Waste Management, Sewerage and Drains, Social Infrastructure like Educational, Health and Recreational facilities, for understanding and analyzing the existing situation to make projections for the future requirements and developments. The data was accumulated from various sources through both primary and secondary surveys.

Table 11: Survey Status Report

S. NO	City /Town		Base/infrastructure	Landuse	Socio - Economic Survey	Traffic Volume Count	Origin Destination	Speed Delay	Road Inventory	Pedestrian survey	parking survey
1	Itanagar	status	completed	completed	completed	Completed	completed		completed	completed	completed
		volume			600						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	2/1/2018 to 4/1/2018	9/1/2018 to 11/1/2018	22/12/2017 to 30/12/2017	2/1/2018 to 4/1/2018	6/1/2018 to 7/1/2018	10/1/2018 to 12/1/2018
2	Naharlagun	status	completed	completed	completed	Completed	completed		completed	completed	completed
		volume			1000						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	5/1/2018 to 6/1/2018	9/1/2018 to 11/1/2018	22/12/2017 to 30/12/2017	5/1/2018 to 6/1/2018	6/1/2018 to 7/1/2018	10/1/2018 to 12/1/2018
3	Banderdewa	status	completed	completed	completed	Completed	completed		completed	completed	completed
		volume			100						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	7/1/2018 to 8/1/2018	9/1/2018 to 11/1/2018	22/12/2017 to 30/12/2017	7/1/2018 to 8/1/2018	6/1/2018 to 7/1/2018	10/1/2018 to 12/1/2018
4	Chimpu	status	completed	completed	completed		completed		completed	completed	completed
		volume			20						

		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	9/1/2018		22/12/2017 to 30/12/2017		8/1/2018	14/1/2018 to 16/1/2018
5	Ganga	status	completed	completed	completed	Completed	-	-	completed	completed	completed
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	10/1/2018		22/12/2017 to 30/12/2017		9/1/2018	14/1/2018 to 16/1/2018
6	Tarajuli	status	completed	completed	completed	Completed	-	-	completed	completed	
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	11/1/2018		22/12/2017 to 30/12/2017		10/1/2018	14/1/2018 to 16/1/2018
7	Yupia	status	completed	completed	completed	Completed	-	-	completed	completed	
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	12/1/2018		22/12/2017 to 30/12/2017		11/1/2018	14/1/2018 to 16/1/2018
8	Doimukh	status	completed	completed	completed	Completed	-	-	Completed	completed	
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	13/1/2018		22/12/2017 to 30/12/2017		12/1/2018	14/1/2018 to 16/1/2018
9	Nirjuli	status	completed	completed	completed	Completed	-	-	completed	completed	completed
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018			22/12/2017 to 30/12/2017		13/1/2018	14/1/2018 to 16/1/2018
10	Karsingsa	status	completed	completed	completed	Completed	-	-	completed	completed	completed
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	14/1/2018				14/1/2018	14/1/2018 to 16/1/2018

11	Emchi	status	completed	completed	completed	Completed	-	-	completed	completed	
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	15/1/2018		22/12/2017 to 30/12/2017		15/1/2018	14/1/2018 to 16/1/2018
12	Gumto	status	completed	completed	completed	Completed	-	-			
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	26/12/2017		22/12/2017 to 30/12/2017		15/1/2018	14/1/2018 to 16/1/2018
13	Rono	status	completed	completed	completed	Completed	-	-	completed	completed	
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	27/12/2017					14/1/2018 to 16/1/2018
14	Tigdo	status	completed	completed	completed	Completed	-	-	completed	completed	
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	28/12/2017		22/12/2017 to 30/12/2017		16/1/2018	14/1/2018 to 16/1/2018
15	Nirochi	status	completed	completed	-	-	-	-	completed	-	-
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018			22/12/2017 to 30/12/2017			14/1/2018 to 16/1/2018
16	Jollang	status	completed	completed	completed	Completed	completed	-	completed	completed	completed
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	29/12/2017		22/12/2017 to 30/12/2017		11/1/2018	14/1/2018 to 16/1/2018
17	Bath	status	completed	completed	completed	Completed	Completed	Completed	Completed	Completed	Completed
		volume			10						

		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	30/12/2017		22/12/2017 to 30/12/2017		11/1/2018	14/1/2018 to 16/1/2018
18	Poma	status	completed	completed	completed	Completed	-	-	completed	-	-
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	31/12/2017		22/12/2017 to 30/12/2017		6/1/2018	14/1/2018 to 16/1/2018
19	Jote	status	completed	completed	completed	completed	-	-	completed	Completed	Completed
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	11/1/2018		22/12/2017 to 30/12/2017		7/1/2018	14/1/2018 to 16/1/2018
20	Juli	status	-		Completed	Completed			Completed	Completed	Completed
		volume			10						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	12/1/2018		22/12/2017 to 30/12/2017		10/1/2018	14/1/2018 to 16/1/2018
21	Pappu Nalla	status	completed	completed	completed	Completed	Completed	-	completed	completed	
		volume			20						
		Date	22/12/2017 to 30/12/2017	22/12/2017 to 30/12/2017	5/1/2018 to 15/1/2018	13/1/2018		22/12/2017 to 30/12/2017		10/1/2018	14/1/2018 to 16/1/2018

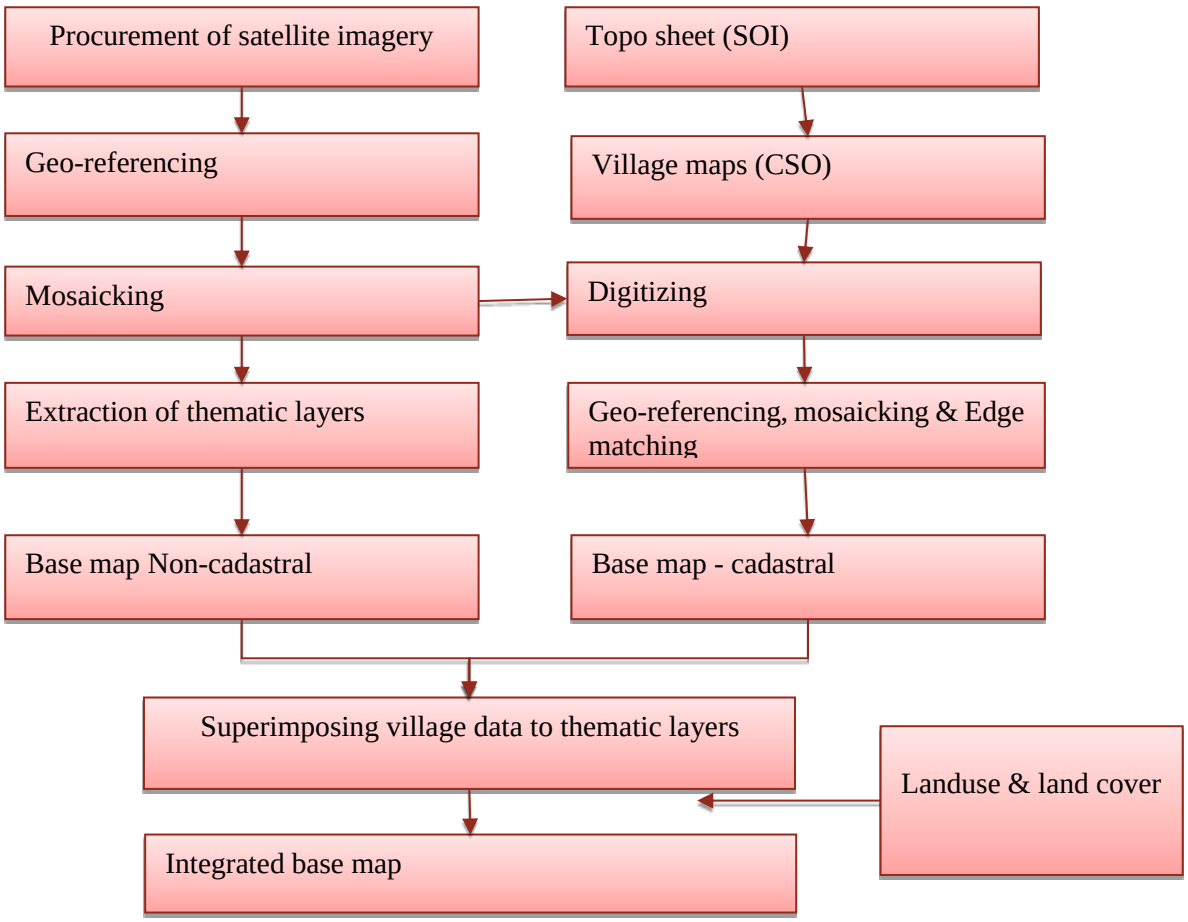
5.2 Surveys for preparation of the base map

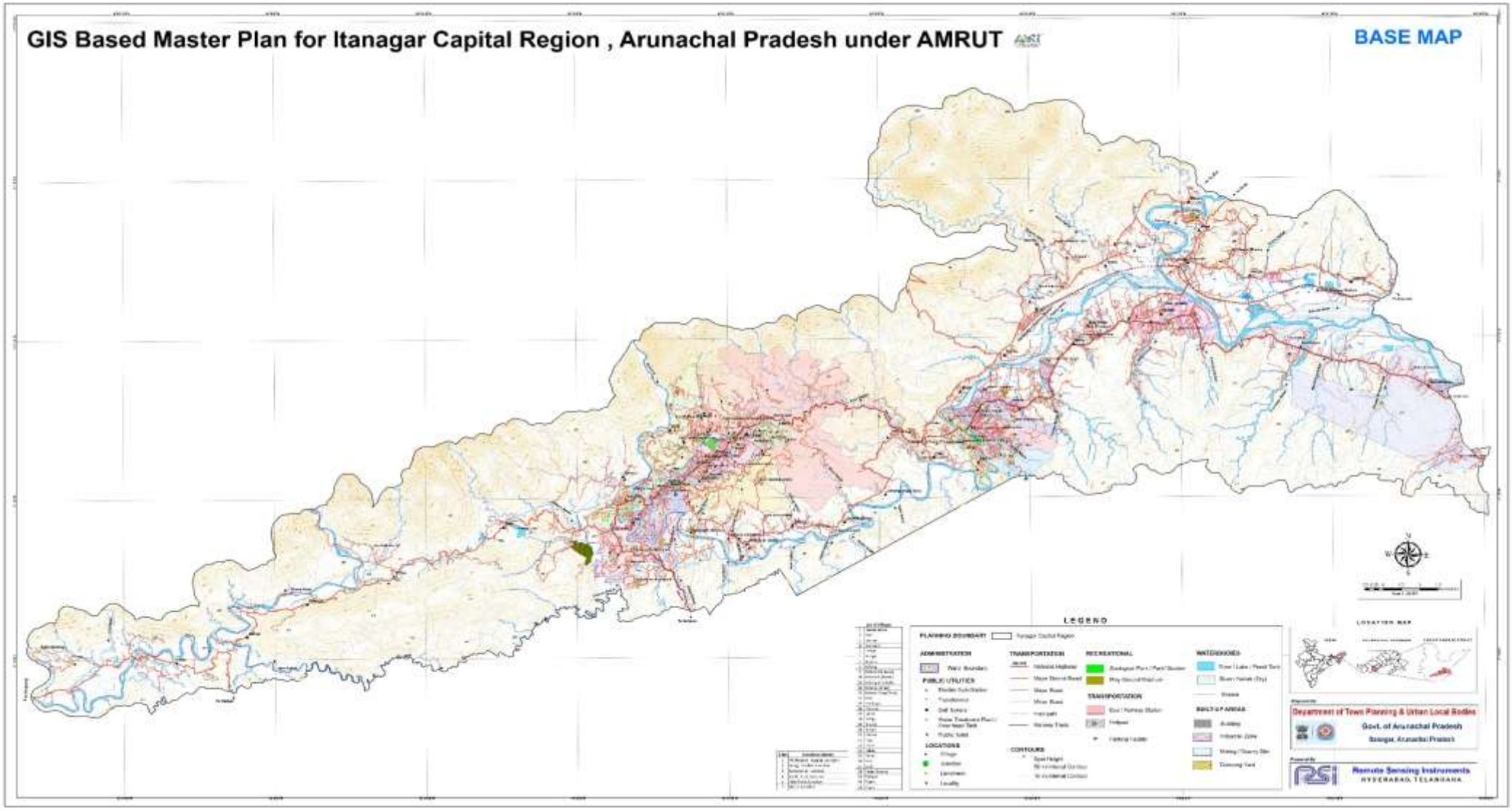
The base map provides vital information for the preparation of a master plan. It provides spatial data, which generates existing Landuse map, network maps, density map, other thematic maps, natural features and proposed Landuse map. It creates a common base for physical features, topography, drainage pattern, water bodies, power lines, road network, rail, forest area, settlement areas etc. The Base Map is prepared using High-Resolution Satellite Imagery and superimposed with Cadastral information supported by extensive field surveys for the entire Itanagar capital region for an area of 271 Sq. km.

Appropriate techniques were deployed to improve the accuracy of the information and the geo-referencing. Seventy geo-referencing points were taken across ICR and integrated with revenue

maps from Central Survey Office (CSO), GOI. The GIS-based base map is prepared using high-resolution satellite imagery from Quickbird and LiSS imagery from National Remote sensing Center (NRSC) with a resolution of 0.3m. Extract information like buildings, roads, natural features (lakes & streams/ drains), contours, railway line, power substation, High Tension Power lines, Sewage Treatment Plants etc. Secondary spatial data of other departments have also been integrated with the base map to form the overall geospatial database.

METHODOLOGY FOR PREPARATION OF BASE MAP





Map 6: Basemap of Itanagar Capital Region

5.3 Existing Landuse survey

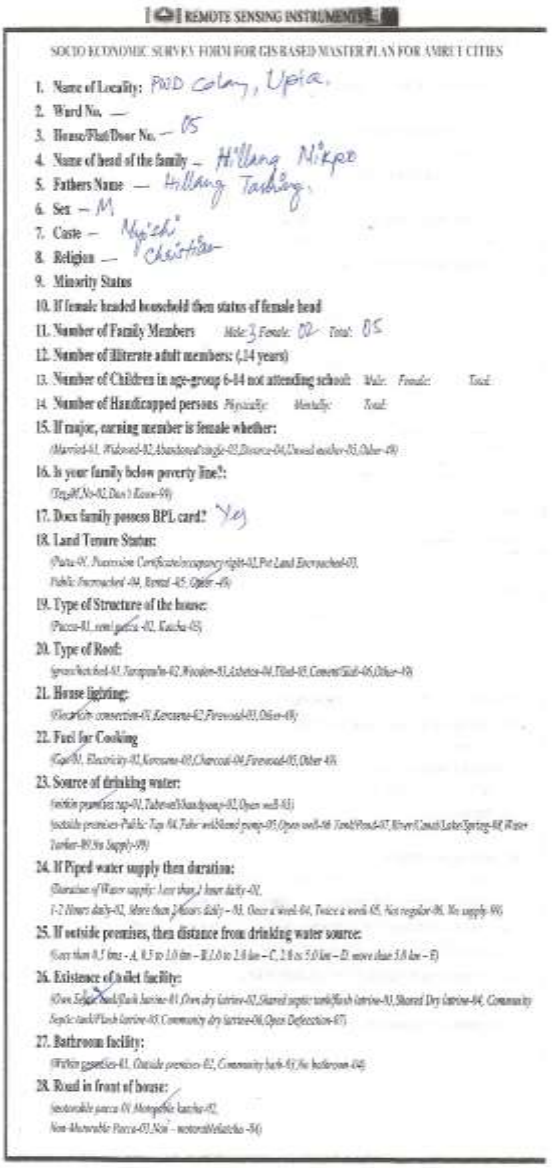
Extensive field surveys were carried out to map the existing land use and cross verification of the features extracted from satellite imagery using the base map. Existing landuse map is prepared with the base map as the foundation. The existing Landuse shows the current Landuse and land cover of the area, providing information of area; residential, commercial, industrial, public & semipublic uses, recreational (parks & playgrounds), open spaces, vacant land, agriculture land, forest cover, water bodies, utilities & services facilities, circulation system, conservation areas, special areas etc. it is vital for formation of master plan by understating the existing situation and prepare alternatives scenarios and proposals for the Itanagar Capital area.

Map 7: Arunachal Pradesh District map

Infrastructure & Existing Landuse data collected from field on Satellite Image (A3 Size map)

5.4 Comprehensive socio-economic survey

The socio-economic survey is conducted to understand the people's socio-economic condition from demographic details, household characteristic, education status, land holding, infrastructure availability etc. by using stratified random sampling techniques, for Itanagar, Naharlagun, Banderdewa and 20 villages within ICR. The socio-economic survey covered 2000 households, of which, 90% is for the urban area and 10% of the rural areas within ICR. The nature of the survey was a door-to-door questionnaire type of survey with face-to-face interviews.



REMOTE SENSING INSTRUMENTS

SOCIO ECONOMIC SURVEY FORM FOR GIS BASED MASTER PLAN FOR AMRUT CITIES

1. Name of Locality: PWD Colony, Upper.
2. Ward No. —
3. House/Flat/Door No. — 05
4. Name of head of the family — H'llang Nikpo
5. Fathers Name — Hillang Tasheng.
6. Sex — M
7. Caste — Mi'zeh
8. Religion — Christian
9. Minority Status
10. If female headed household then status of female head
11. Number of Family Members Male: 3 Female: 02 Total: 05
12. Number of illiterate adult members: (>14 years)
13. Number of Children in age-group 6-14 not attending school: Male: Female: Total:
14. Number of Handicapped persons Physically: Mentally: Total:
15. If major, earning member is female whether:
(Married-01, Widowed-02, Abandoned/single-03, Divorce-04, Deserted mother-05, Other-09)
16. Is your family below poverty line?:
(Yes-01, No-02, Don't Know-99)
17. Does family possess BPL card? Yes
18. Land Tenure Status:
(Patta-01, Possession Certificate/occupancy right-02, Pvt Land Encroached-03, Public Encroached-04, Rented-05, Other-06)
19. Type of Structure of the house:
(Pucca-01, semi pucca-02, Kaccha-03)
20. Type of Roof:
(grass/thatched-01, Tarpaulin-02, Wooden-03, Asbestos-04, Tiled-05, Cement/Slab-06, Other-09)
21. House lighting:
(Electricity connection-01, Kerosene-02, Firewood-03, Other-04)
22. Fuel for Cooking
(Gas-01, Electricity-02, Kerosene-03, Charcoal-04, Firewood-05, Other-06)
23. Source of drinking water:
(within premises: tap-01, Tube well/Handpump-02, Open well-03)
(outside premises-Public: Tap-04, Tube well/Hand pump-05, Open well-06, Tank/Pond-07, River/Canal, Lake/Spring-08, Water Tanker-09, No Supply-99)
24. If Piped water supply then duration:
(Duration of Water supply: Less than 1 hour daily-01, 1-2 Hours daily-02, More than 2 hours daily - 03, Once a Week-04, Twice a week-05, Not regular-06, No supply-99)
25. If outside premises, then distance from drinking water source:
(Less than 0.5 kms - A, 0.5 to 1.0 km - B, 1.0 to 2.0 km - C, 2.0 to 5.0 km - D, more than 5.0 km - E)
26. Existence of toilet facility:
(Own Septic Tank/Flush latrine-01, Own dry latrine-02, Shared septic tank/flush latrine-03, Shared Dry latrine-04, Community Septic tank/Flush latrine-05, Community dry latrine-06, Open Defecation-07)
27. Bathroom facility:
(Within premises-01, Outside premises-02, Community bath-03, No bathroom-04)
28. Road in front of house:
(motorable pucca-01, Motorable kaccha-02, Non-Motorable Pucca-03, Non - motorable kaccha-04)

REMOTE SENSING INSTRUMENTS

29. Type of Pre-school available:
(Municipal-01, Government-02, Private-03)
30. Type of Primary School available:
(Municipal-01, Government-02, Private-03)
31. Type of High School available:
(Municipal-01, Government-02, Private-03)
32. Type of health facility access:
(PHC-01, Govt Hospital-02, Maternity Centre-03, Pvt Clinic-04, RMP-05, Ayurvedic Doctor-06)
33. Access to welfare benefits by any family member:
(old age pension-01, widow pension-02, Disabled Pension-03, Health Insurance-04, General Insurance-05, Other-09)
34. Consumer Durables (Yes-01, No-2)

Fan	✓	Telephone	–	Furniture	✓
Fridge	–	Mobile phone	✓	Bicycle	–
Cooler	–	T.V	✓	Rickshaw	–
Residential	✓	Sewing Machine	–	Push Cart	–

Bullock Cart	–
Two Wheeler	–
Three Wheeler	–
Taxi	–
Car	✓

35. Live Stock (Yes-01, No-02) No If yes, specify
36. Number of years of stay in this Town, City:
(0 to 1 year - A, 1 to 3 Years - B, 3 to 5 Years - C, More than 5 Years - D)
37. Whether migrated from:
(Rural to Urban Area: 01, Urban area to area: 02)
38. Migration Type
(Seasonal - 01, Permanent - 02)
39. Reasons for Migration
(Unemployment - 01, Low wage - 02, Debt - 03, Drought - 04, Conflict - 05, Education - 06, Marriage - 07, others - 09)
40. Number of earning adult members Male: 01 Female: Total: 01
41. Number of earning non-adult members Male: Female: Total:
42. Average Monthly Income of household (in Rs.) 5800/-
43. Average monthly expenditure of household (in Rs.)
44. Debt outstanding as on date of Survey (in Rs.)
45. Signature of the household:

10/01/19

Picture 5: Socio, Economic Surveys being conducted in ICR

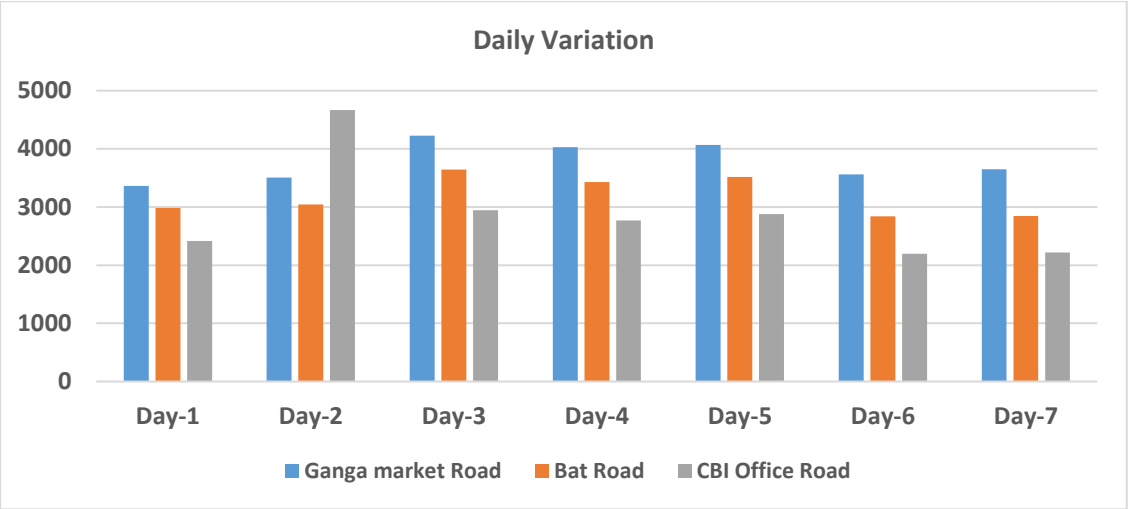
5.5 Traffic and transportation survey

Traffic and transportation surveys are conducted to assess traffic and travel characteristics, assess passenger & goods movements and travel pattern along with the problems and constraints will help in the development, calibrating and calculation of travel demand forecasting models and transport model. The focus of the surveys has been on obtaining traffic volume data on as many roads and Origin-Destination Matrices syntheses from earlier studies. As part of the Master Plan exercise, various surveys were conducted.

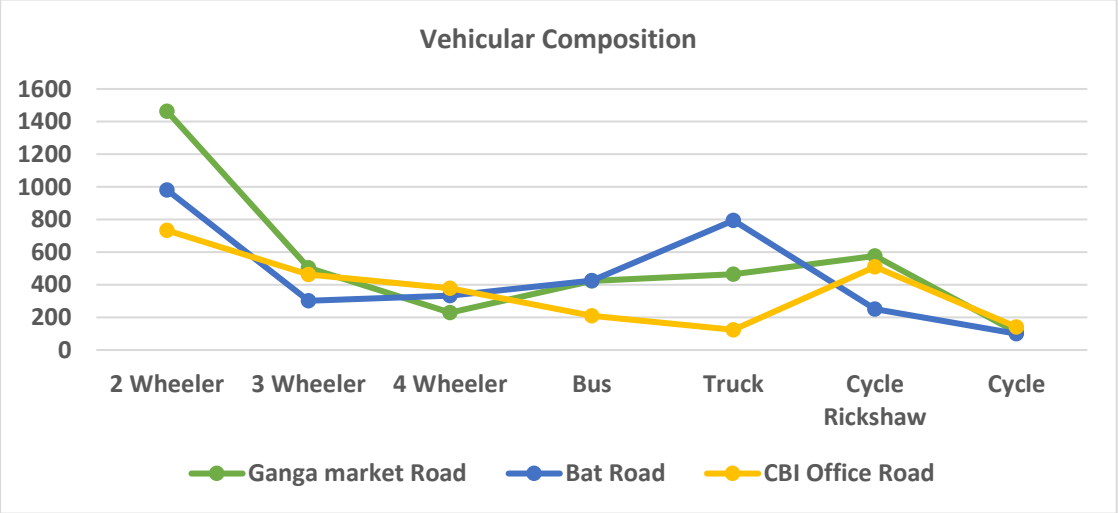
Classified Traffic Volume Count Survey

Traffic volume studies are conducted to determine the number, movements, and classifications of roadway vehicles at a given location. These data can help identify critical flow time-periods, determine the influence of large vehicles or pedestrians on vehicular traffic flow, or document traffic volume trends. The length of the sampling period depends on the type of count being taken and the intended use of the data recorded. TVC survey has been conducted in the following six junction areas. They are –

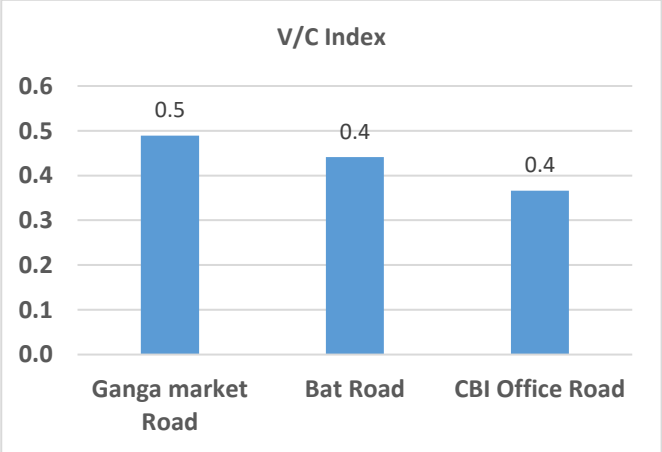
1. RK Mission hospital junction



Graph 11: Daily variation of vehicles in RK Mission hospital junction

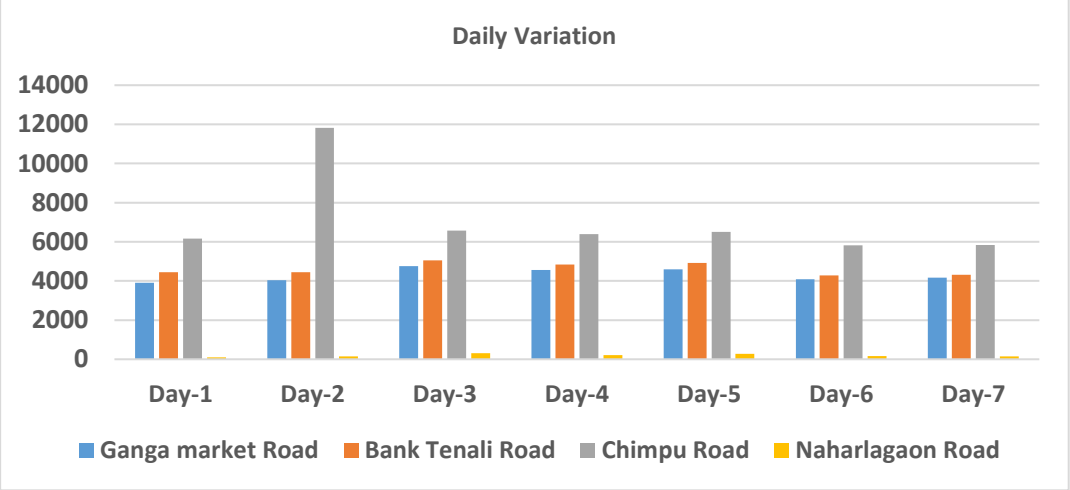


Graph 12: Vehicular composition of the arms in RK mission hospital junction

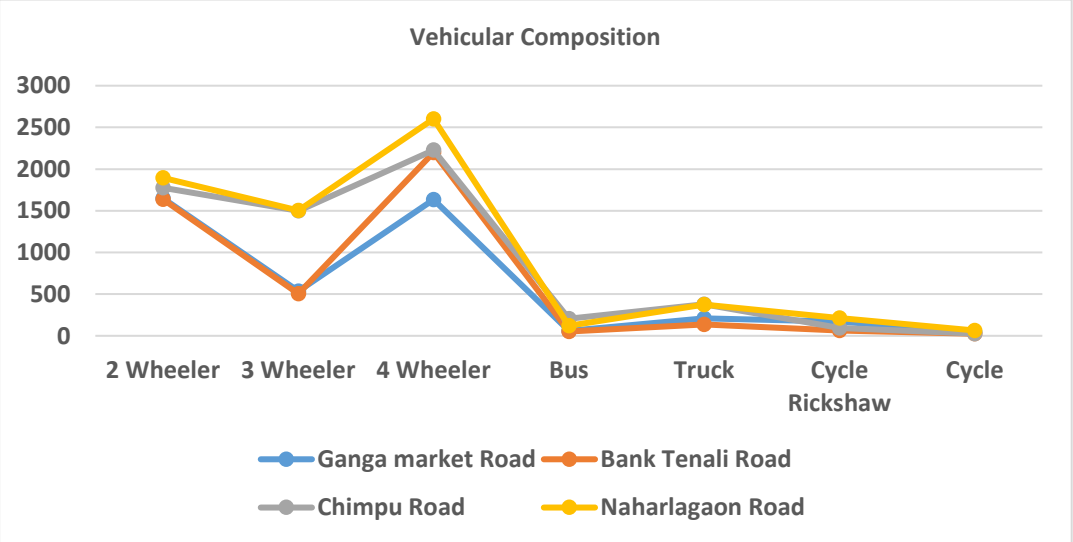


Graph 13: V/C values for RK Mission hospital junction arms

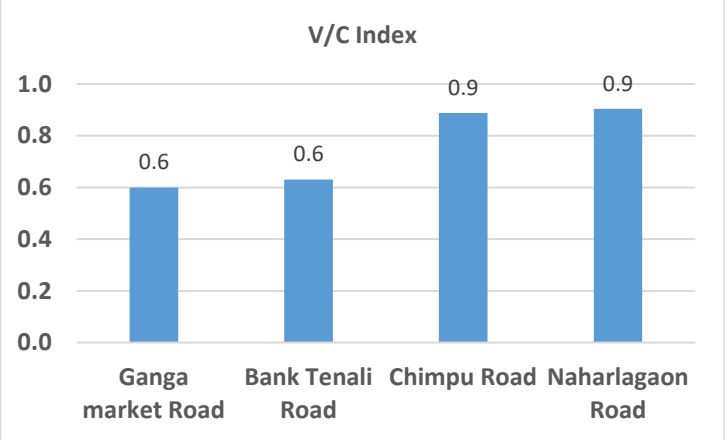
2. Ganga Market junction



Graph 14: Daily variation of vehicles in Ganga Market junction

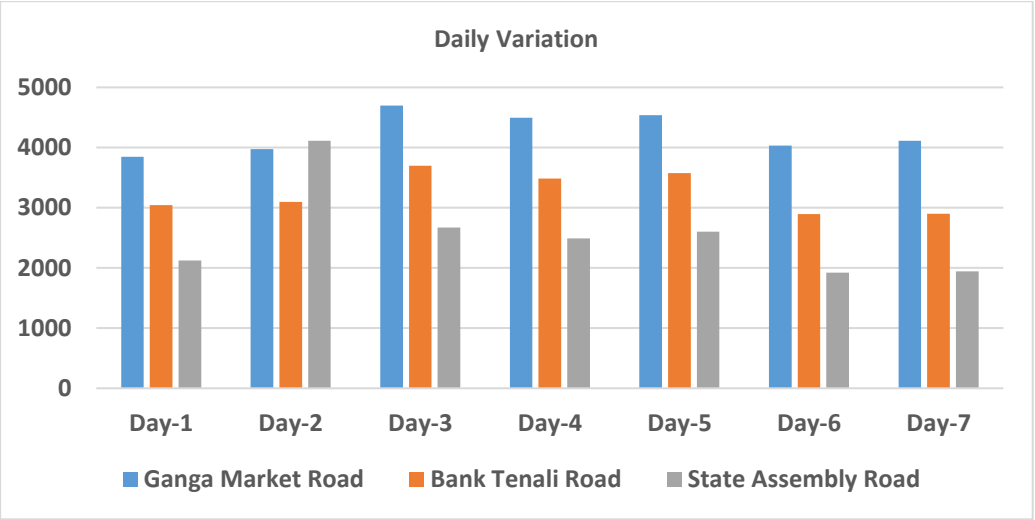


Graph 15: Vehicular composition of the arms in Ganga Market junction

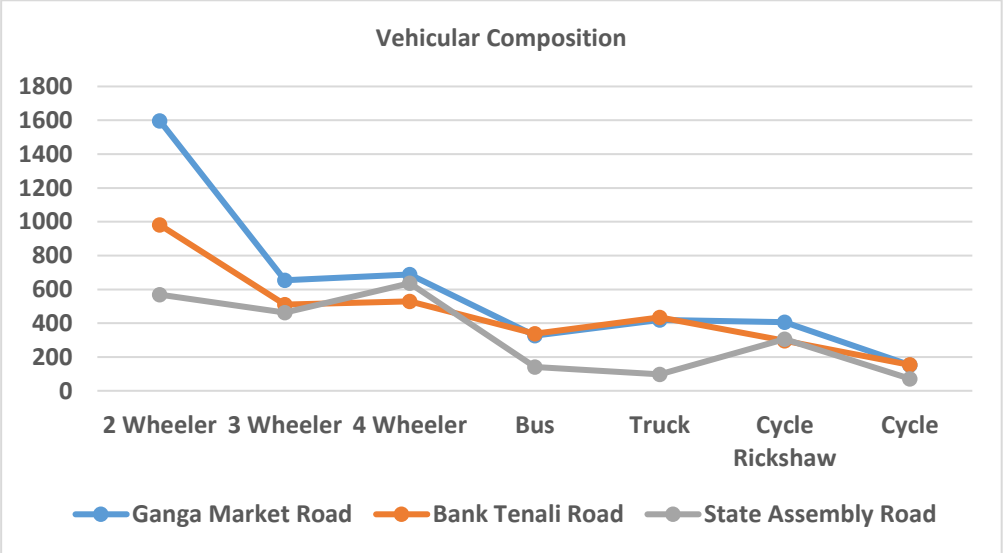


Graph 16: V/C values for Ganga Market junction arms

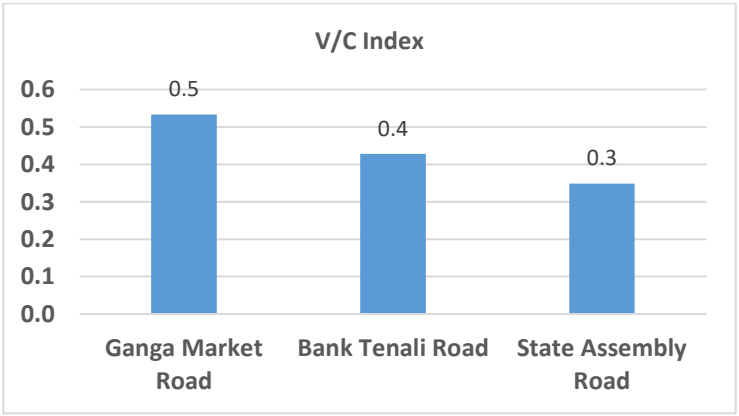
3. Secretariat junction



Graph 17: Daily variation of vehicles in Secretariat junction

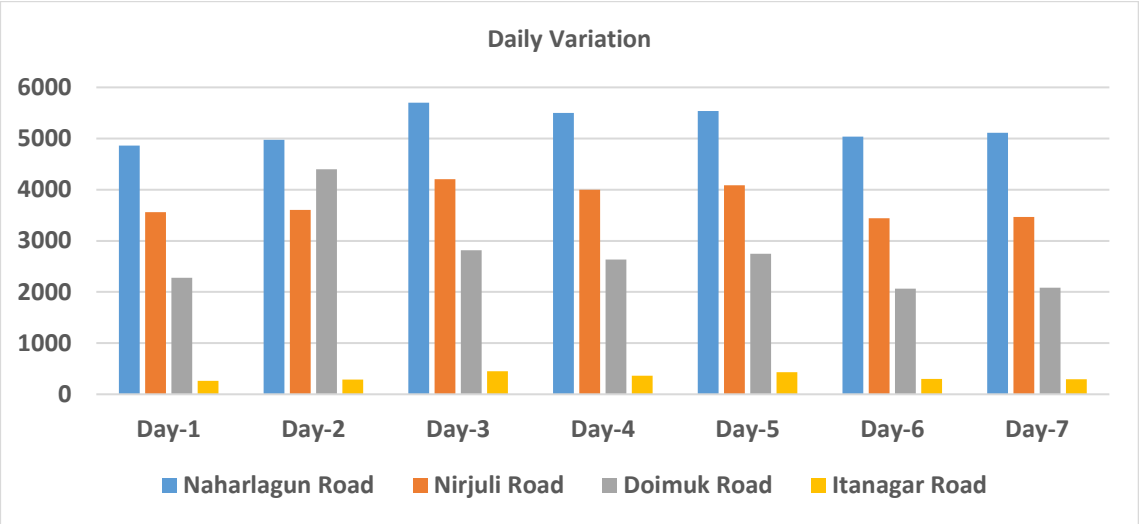


Graph 18: Vehicular composition of the arms in Secretariat junction

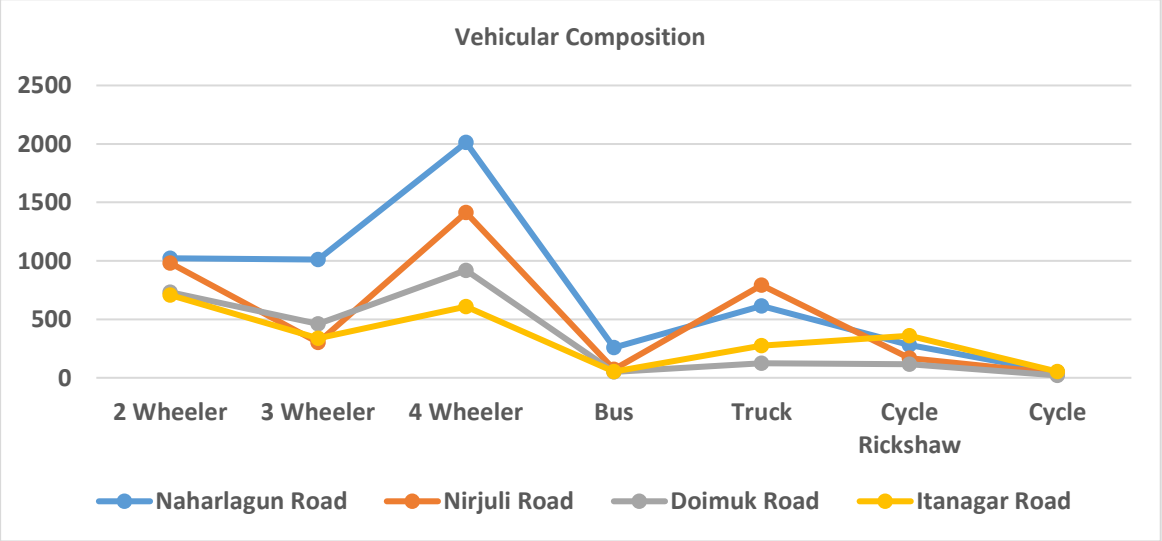


Graph 19: V/C values for Secretariat junction arms

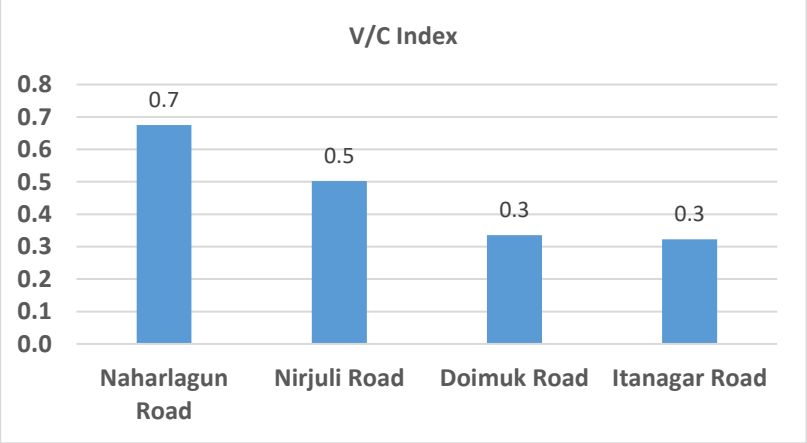
4. Bank Tinali junction



Graph 20: Daily variation of vehicles in Bank Tinali junction

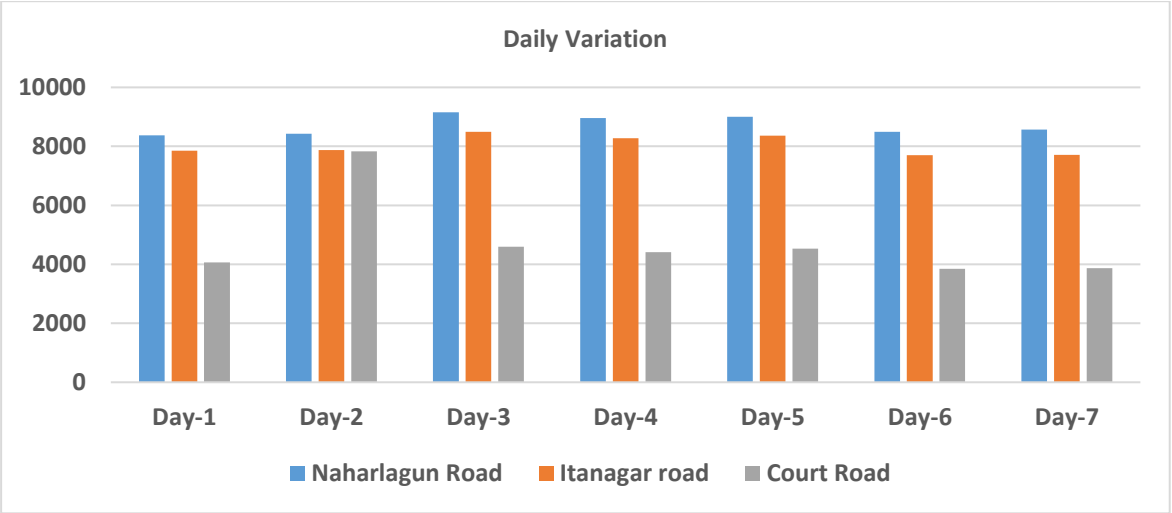


Graph 21: Vehicular composition of the arms in Bank Tinali junction

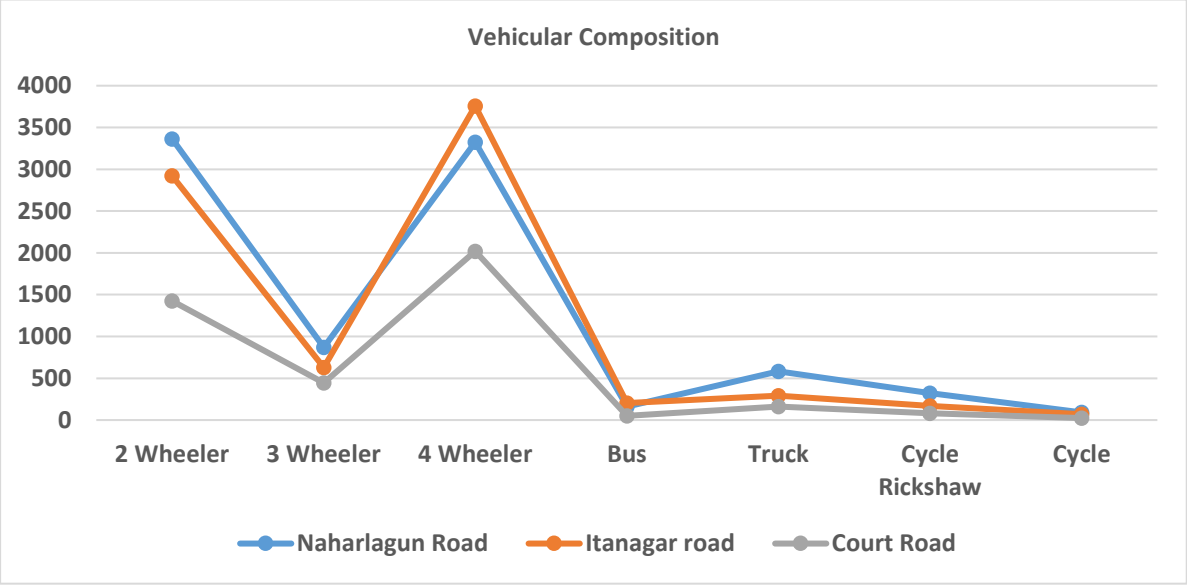


Graph 22: V/C values for Bank Tinali junction arms

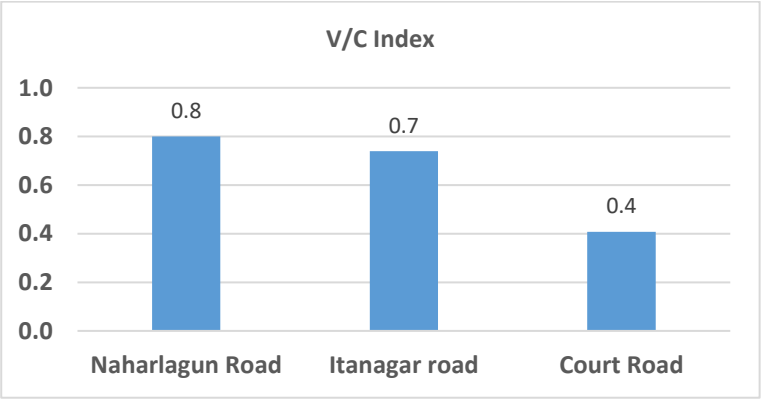
5. Hathi Matha junction



Graph 23: Daily variation of vehicles in Hathi Matha junction

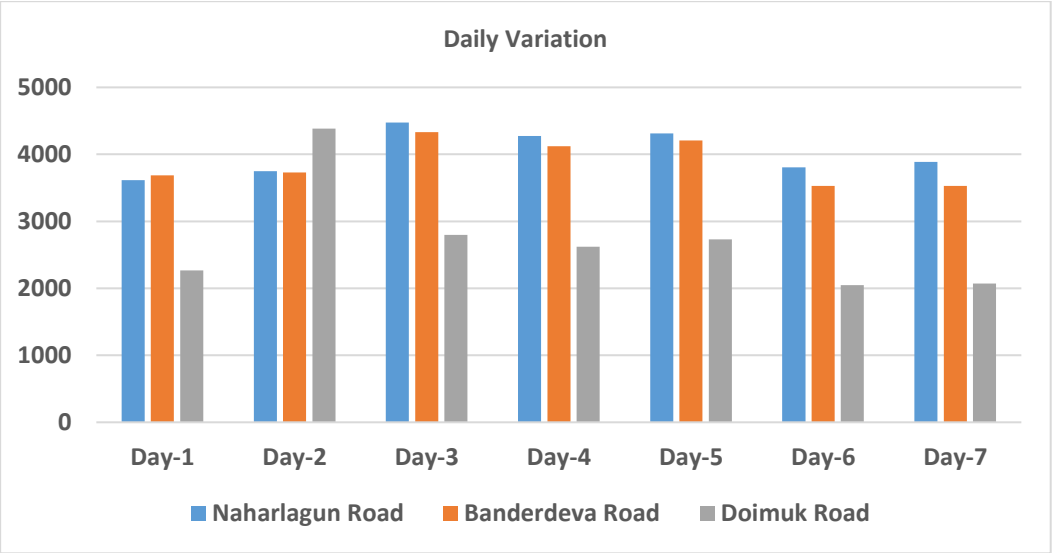


Graph 24: Vehicular composition of the arms in Hathi Matha junction

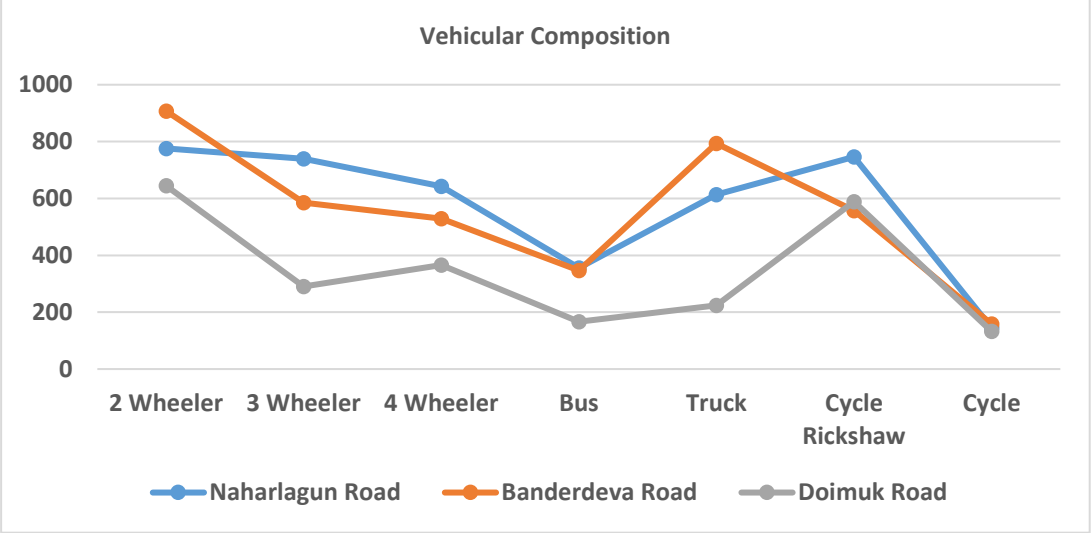


Graph 25: V/C values for Hathi Matha junction arms

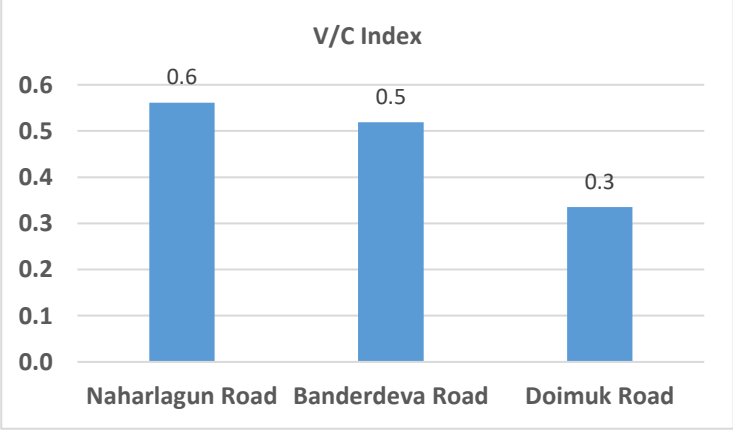
6. Nirjuli junction



Graph 26: Daily variation of vehicles in Nirjuli junction



Graph 27: Vehicular composition of the arms in Nirjuli junction



Graph 28: V/C values for Nirjuli junction arms

Pedestrian Volume Count –

Pedestrian Volume Count Survey was conducted at the selected intersections as given below and the results are tabulated in a chronological way.

1.Ganga Market Junction

Ganga Market Junction			
Location	**Week Days**		**Total**
Time	**IN**	**OUT**	
7 AM - 8 AM	310	293	603
8 AM - 9 AM	323	376	699
9 AM - 10 AM	493	528	1021
10 AM - 11 AM	576	614	1190
4 PM - 5 PM	540	471	1011
5 PM - 6 PM	555	537	1092
6 PM - 7 PM	712	689	1401
7 PM - 8 PM	760	724	1484
Total	4269	4232	8501
Average per Hour	534	529	1063

The morning peak hour is from 10 AM to 11 AM with a bidirectional pedestrian volume of 1190. The evening peak hour is from 7 PM to 8 PM with a bidirectional pedestrian volume of 1484. It is observed that such a high pedestrian volume is due to the surrounding commercial land use and facilities such as taxi stand, auto stand, bus counter, hotels and other tourist facilitation services.

The existing road width at this junction is 54 m. The pedestrian footpath has a width of 1.5 m. The Recommended Road Width according to IRC - 86 (1983) is 2 m. Hence, it is sufficient at present. Considering the horizon year of 2041, the pedestrian footpath maybe expanded to 3 m.

2. Bank Tinali Junction

Bank Tinali Junction			
Location	Week Days		Total
Time	IN	OUT	
7 AM - 8 AM	147	110	257
8 AM - 9 AM	156	124	280
9 AM - 10 AM	350	289	639
10 AM - 11 AM	413	459	872
4 PM - 5 PM	213	183	396
5 PM - 6 PM	295	312	607
6 PM - 7 PM	301	316	617
7 PM - 8 PM	314	257	571

Total	2189	2050	4239
Average per Hour	274	256	530

The morning peak hour is from 10 AM to 11 AM with a bidirectional pedestrian volume of 872. The evening peak hour is from 6 PM to 7 PM with a bidirectional pedestrian volume of 617. It is observed that such a high pedestrian volume is due to the surrounding commercial land use and facilities such as India Post office, Ita fort Observatory tower banks, treasury office, etc.

The existing road width at this junction is 18 m. There is no pedestrian footpath as of now. The Recommended Road Width according to IRC - 86 (1983) is 1.5 m. Hence, it is sufficient at present. Considering the horizon year of 2041, the pedestrian footpath maybe expanded to 2.5 m.

3. Yupia Junction

Yupia Junction			
Location	Week Days		Total
Time	IN	OUT	
7 AM - 8 AM	76	84	160
8 AM - 9 AM	110	124	234
9 AM - 10 AM	165	132	297
10 AM - 11 AM	137	106	243
4 PM - 5 PM	89	64	153
5 PM - 6 PM	78	122	200
6 PM - 7 PM	163	146	309
7 PM - 8 PM	132	157	289
Total	950	935	1885
Average per Hour	119	117	236

Yupia junction is at the junction of NH 52A and Yupia Road. The existing road width is approximately 30 m. There is no designated pedestrian pathway.

From the pedestrian volume count survey, it was observed that the morning peak hour flow in both the directions was 297 from 9 AM to 10 AM. Evening peak hour was from 6 PM to 7PM and the maximum bidirectional pedestrian traffic flow was observed as 309. As per IRC recommendations, a pedestrian footpath of 1.5 m may be provided.

4. Hathi matha Junction

Hathi matha Junction			
Location	Week Days		Total
Time	IN	OUT	
7 AM - 8 AM	46	84	130
8 AM - 9 AM	110	114	224

9 AM - 10 AM	129	102	231
10 AM - 11 AM	121	89	210
4 PM - 5 PM	88	69	157
5 PM - 6 PM	140	103	243
6 PM - 7 PM	106	139	245
7 PM - 8 PM	141	112	253
Total	881	812	1693
Average per Hour	110	102	212

The morning peak hour is from 9 AM to 10 AM with a bidirectional pedestrian volume of 231. The evening peak hour is from 7 PM to 8 PM with a bidirectional pedestrian volume of 253. It is observed that such a high pedestrian volume is due to the surrounding commercial land use and facilities such as Bank of India, M-mart, hotels, stationery shops, other commercial buildings, etc.

The existing road width at this junction is 18 m. There is no designated pedestrian footpath as of now. The Recommended Road Width according to IRC - 86 (1983) is 1.5 m. considering the horizon year of 2041, the pedestrian footpath maybe expanded to 2-2.5 m.

5. Banderdewa Junction

Banderdewa Junction			
Location	Week Days		Total
Time	IN	OUT	
7 AM - 8 AM	37	45	82
8 AM - 9 AM	74	38	112
9 AM - 10 AM	144	79	223
10 AM - 11 AM	120	111	231
4 PM - 5 PM	78	49	127
5 PM - 6 PM	74	80	154
6 PM - 7 PM	89	85	174
7 PM - 8 PM	56	77	133
Total	672	564	1236
Average per Hour	84	71	155

The morning peak hour is from 10 AM to 11 AM with a bidirectional pedestrian volume of 231. The evening peak hour is from 6 PM to 7 PM with a bidirectional pedestrian volume of 174. It is observed that such a high pedestrian volume is due to the surrounding commercial land use and facilities such as Hanuman Mandir, Electronics and mobile repairing shops, stationery shops, other small-scale commercial buildings, etc.

The existing road width at this junction is 10 m. There is no designated pedestrian footpath as of now. The Recommended Road Width according to IRC - 86 (1983) is 1.5 m. Hence, considering the horizon year of 2041, the pedestrian footpath maybe expanded to 2-2.5 m.

Intersection Counts –

•G-Extension	•Secretariat
•Elephant Centre*	•Akashdeep Complex
•Bada Pani	•R K Mission
•PCCF office	•Vivek Vihar
•Bank Tinali	

Parking Demand Estimation– from 07:00 hrs to 11:00 Hrs & 15:00 Hrs to 19:00 Hrs.

•Naharlagun Market	•Secretariat
•G Extension	•Akashdeep
•Gandhi Market	•Ganga Complex
•TT Marg	

Traffic at Itanagar is maximum throughout the day followed closely by traffic at Naharlagun. Traffic at Chimpu is marginal and it would increase when Itanagar – Gohpur section becomes operational. There are distinct peaks observed at Itanagar and Naharlagun at the same time, which lends credence to the fact that NH 52A functions as an urban road.

5.6 Registered Vehicles and Composition

As per the Regional Transport Authority, the total number of vehicles registered in Papum Pare District, were 27,000 in the year 2006. Of these about 14,700 (53.0%) were 2-wheelers, 9,000 cars (33.0%), 18,000 Trucks (7%) and 750 (3%) buses. Commensurate with population growth, the number of vehicles has also grown at a rapid pace. Private transport has become the preferred mode of transport in Itanagar. However, because of hilly terrain, the share of two wheelers is comparatively low, while share of cars, particularly that of Jeeps is high. The deficiency in frequency of APSTS buses is one of the reasons for the growth of private vehicles. However, intermediate public transport modes are available, which meet trip demand.

Overall, there is an attitudinal shift of people to use private vehicles rather than public transport. All these vehicles are plying on a near static road length of 280 km in the Capital Region resulting

in enormous strain on the road network and leading to a situation of endless jams during the peak hours.

Analysis of vehicles reveals that Two-Wheeler is the most predominant mode on NH 52 A at over 27% followed by Two Axle Trucks at nearly 23.7% and cars at over 20%. Freight vehicles account for 19% to 20% at Km 19.5 and Km 36.5 respectively.

Table 12: Details of Vehicular Composition at different count locations (in %)

Name of Intersection	Morning Peak			Evening Peak		
	Peak Hour Volume (PCU)	**Peak Flow Share (%)**	**Peak Hour (Hrs.)**	**Peak Hour Volume (PCU)**	**Peak Flow Share (%)**	**Peak Hour (Hrs.)**
G-Extension	1033	12.1	10:00-11:00	992	11.6	18:00-19:00
Elephant Centre	1874	17.1	10:00-11:00	1658	15.1	18:00-19:00
Bara Pani	864	15.5	10:00-11:00	831	14.9	18:00-19:00
PCCF Office	1307	17.3	10:00-11:00	1014	13.4	18:00-19:00
Bank Tinali	1172	14.7	10:00-11:00	960	12.1	18:00-19:00
Civil Secretariat	2073	19.5	10:00-11:00	1647	15.5	18:00-19:00
Akashdeep Complex	1492	14.6	10:00-11:00	1459	14.3	18:00-19:00

5.7 Other traffic surveys

A. Origin-Destination (OD) Survey is carried out to understand the traffic characteristics, traffic flow, and the groups making the trip and their desired patterns. OD survey determines the amount of passing traffic, trip generation and distribution models, to determine the extent to which the present roadways are adequate and to plan for new facilities. Roadside interviews method is used on the vital junction in ICR.

B. Road inventory- of the major roads is the review exercise to do a complete listing of existing transport infrastructure facilities provided like flyovers, underpasses, a major intersection, parking zone, crossway, street lighting, etc. The physical characteristics of the road network in terms of the right of way, carriageway, footpath etc. to understand the existing transport situation on the ground. The survey was conducted using manual methods on the major junctions of ICR.

C. Speed delay studies are done to get the journey and running speed along the road network, for qualitative delays and factors causing delays and identify bottlenecks on the roads. Moving observer method was used to understand the running speed, travel time and delay factors.

D. Pedestrian survey- conducted along and across the junctions and roads. To comprehend pedestrian characteristics in terms of size, composition and variation. It is important to understand the safety (street lighting and pavements), comfort (plant shade and access ramps) and convenience in pathfinding signage, street furniture etc. the survey was conducted manually and for 12 junctions across ICR.

E. Parking survey is to determine the availability of existing parking and parking space inventory and unauthorized parking both on street and off street.

Picture 6: Conducting of Parking Survey

CHAPTER-6: PHYSICAL INFRASTRUCTURE

Physical infrastructure facilities include water supply, solid waste management, sewerage and drainage system. Distribution of optimal level of services and facilities in relation to a settlement's population size is an important determinant in balanced regional development. Thus, an important objective of spatial planning is to identify and correct imbalances in the availability of infrastructure services, if any, in the city. In this chapter, discussion regarding the available physical infrastructure facilities is done. All physical infrastructure facilities like water supply, solid waste management sewerage, drainage system are studied and their status is analyzed.

6.1 Water Supply

Background

The PHED is responsible for the construction, operation and maintenance of water supply system in Itanagar. Chlorination is being done at all the major reservoirs for maintaining the residual chlorine of 0.20 ppm at all the tail end points.

As per PHED, only 55.5 % of the population residing in Itanagar is covered with piped water supply whereas there is no piped water supply in the areas in the adjoining settlements namely Chimpu, Gohpur, Banderdewa and Doimukh. Besides, the distribution is not commensurate with the frequency of water supply which ranges from 2 hours per day in Government quarters to 3 hours in private houses. The Government houses account for nearly 60% of total number of households in Itanagar. The supply was for 24 hours to major hospitals in the Capital area but the supply has been stopped during night due to excessive wastage.

The main transmission pipeline carries water from the source at Senki River to the water treatment plant at Senki View further leading to the Master Balance Reservoirs. The Master Balance Reservoirs subsequently feed water to the trunk distribution mains.

Water Sources

As per Census 2011, the Itanagar town is supplied with treated tap water from source. Naharlagun is provided with tap water from an untreated source of water supply.

The only source of water supply for the city is underground water. There are 5 bore wells in the city that provide the city with 1.3 MLD of water. The ground water table level is 80 feet during pre-monsoon months and 40-60 feet during the post monsoon months. The water is of potable

quality and no treatment is done. The industries use water from the bore wells that they have dug out on their own.

Water connections

Ground survey was carried out in the year end 2017 to assess the quantum of present population of the townships which are as follows:

Itanagar = 148120 persons

Naharlagun & Nirjuli = 120980 persons

Banderdewa = 8640 persons

Total = 277740 persons

Present water requirement = 135 x 277740

= 37494900 litres/day

= 37.49 MLD

Add 15% UFW= 5.63 MLD

= 43.12 MLD

Say 43.5 MLD …...A

Projected population for 15 years i.e., 2033 = 277740 (1+0.0662)1.5

= 305772 persons

Water demand as of 2033 Q= 135 X 305772

= 41279220 litres

Considering UFW of 15% = 6191883 litres

= 47471103 litres

= 71206654 litres

Add peak factor 1.5 times = 71.21 MLD

Existing water supply system

1.Lift water supply from Senki River, Itanagar Township Ph-I = 7 MLD

2.Gravity water supply) from Poma river, Itanagar Township Ph-II = 11 MLD

3.Water supply from Doria Nallah, Itanagar = 1 MLD

4.Water supply from Pappu Nallah, Itanagar = 1 MLD

5.Gravity water supply from Niorch River, Naharlagun Township Ph-I = 7 MLD

6.Water supply for Banderdewa areas = 0.5 MLD

Total = 27.5 MLD…..B

In order to meet up the present water supply gap the following project proposal has been made to augment the supply.

Project proposal

I.Providing Lift Water Supply to New ltanagar Township=7.0 MLD

2.Augmentation of water supply at Damste area, Naharlagun=1.0 MLD

3.Providing water supply) to Urban Housing Complex at Lekhi=1.0 MLD

4.Augmentation of water supply) at Banderdewa =0.5 MLD

Total =9.5 MLD

Projected total water deficit of design year up to 2033 AD (71.21 – 27.5) =44 MLD

The project deficit after commissioning of the project (44 – 9.5)=34.5 MLD

Another mega project of 35.5 MLD water supply is required for next 15 years.

Present water deficit A-B (43.5 – 27.5)=16 MLD

Therefore, the proposal has been made to meet up the present water supply gap @ 9.5 MLD capacity,

Another 7 MLD capacity project is urgently required to meet up the present gap.

Providing lift water supply to New Itanagar Township comprises of

1.Construction of sedimentation tank

2Providing and laying of DI main pipe line and GI distribution line, anchor block, saddle block, trestle support and service reservoir.

3.Water treatment plants consist of construction of

i.Cascade aerator
ii.Flash mixer
iii.Chemical house including pump house with lime tank and mixing basin
iv.Clariflocculator
v.Filter house along with all accessories and filler media
vi.Backwash tank over filler cum chemical house
vii.Disinfection equipment
viii.Clear water reservoir

4Laying of sludge lines for disposal of sludge

5.Electrical equipment and accessories

6.Providing, fixing and installation of D.G. Set, alternate and all accessories etc., complete

7.Construction of service reservoir tank.

Augmentation of water supply at Dam site, Naharlagun comprises of

1.Construction of drop inlet headwork

2.Construction of pre-settling tank

3Providing and laying of GI Main pipe line, anchor block, saddle block, trestle support, etc

4.Water treatment plants consist of construction of

i.Cascade aerator
ii.Approach channel with Parshall flume
iii.Chemical house with coagulant tank
iv.Sedimentation Tank
v.Gravity slow sand filter
vi.Clear water reservoir

Providing water supply to Urban Housing Complex at Lekhi comprises of

1.Construction of drop inlet headwork
2.Construction of Pre-sedimentation tank
3.Providing and laying of GI Main pipe line, anchor block, saddle block, trestle support, etc
4.Water treatment plants consist of construction of

i.Sedimentation tank

ii.Slow sand filtration tank

iii.Clear water reservoir

iv.Zonal tank/service reservoir

Augmentation of water supply at Banderdewa comprises of

I.Deep tube well boring
2.Electrification of power system
3.Installation of solar plate for alternate source
4.Construction of aerator
5.Installation of Iron plant
6.Construction of clear water reservoir
7.Construction of security fencing
8.Laying of distribution network

Design population for 15 years = 9512 persons
Design water demand@ 135 lpcd = 1284120 litre/day

UFW 15% = 192618 litre/day

Sub-total = 1476738 litre/day

Peak demand 1.5 times = 2215107 litre/day

Total water requirement at the end of 2033 = 2.22 MLD

Total Water Deficit

The overall present deficit of township as on 2017 = 16 MLD

A. Itanagar = 3 MLD

B. Naharlagun- Nirjuli = 12 MLD

C. Banderdewa = 0.85 MLD

Total projected water deficit by the end of 2033 = 34.22 MLD

A. Itanagar = 11 MLD

B. Naharlagun- Nirjuli = 22 MLD

C. Banderdewa = 1.22 MLD

Proposal for augmentation under AMRUT

1. Providing Lift Water Supply to New Itanagar Township 7 MLD capacity

2. Augmentation of water supply at Damsite area, Naharlagun 1 MLD capacity

3. Providing water supply to Urban Housing Complex at Lekhi 1 MLD capacity

4. Augmentation of water supply at Banderdewa by Deep Bore Well 0.5 MLD capacity

Population to be benefitted under AMRUT

SUB HEAD	ESTIMATED COST (Rs. In lakhs)	Present population to be covered as per household survey 2017	Household to be connected with water supply as per household survey 2017	Anticipated Household to be connected within 5 years after completion
Providing Lift W/S to New Itanagar Township 7 MLD	1800.00	45088	2761	3681
Augmentation of water supply at Damsite area, Naharlagun 1 MLD	642.00	6441	921	
Providing water supply to Urban Housing Complex at Lekh 1 MLD	570.00	6342	906 (New colony)	
Augmentation of water supply at Banderdewa by 4 Nos. of Deep Bore Well 0.5 MLD	300.00	2282	326	
	3312.00	60153	4914	3681

Water Tax

There is no metered system for domestic and commercial connections in Itanagar Capital Region. During 2006, PHED has revised its water tariff. New water connection charges have been increased from Rs 1000 to Rs 2000. Monthly Tariff for private consumers in urban areas is now Rs 100 per month compared to Rs 50 per month in semi urban areas/ district towns. The charges from Govt quarters range from Rs 50 per month for Type -1 quarters to Rs 175 per month for Type VI quarters.

Nearly 25% of water is lost due to physical losses in the system. There are no studies conducted so far to ascertain the exact proportion of non-revenue water.

Norms for Water Supply

Per capita water supply for designing of various schemes as suggested in "Manual on Water Supply and Treatment" of the Central Public Health Engineering Organization, Government of India is as follows:

- 70 LPCD for Towns provided with piped water supply but without sewerage system.
- 135 LPCD for Cities provided with piped water supply where sewerage system is existing/contemplated.
- 150 LPCD for Metropolitan and Mega Cities provided with piped water supply where sewerage system is existing/contemplated.

Status of water supply

Table 13: Status of water supply

Sl.No.	Water supply indicators	Benchmarks	Itanagar
1	Coverage of water supply	100%	46%
2	Per capita supply of water	135 lpcd	80 lpcd
3	Extent of metering of water Connection	100%	0%
4	Extent of non-revenue water	20%	20%
5	Continuity of Water Supply	24 hours	4 hours
6	Efficiency in Redressal of Customer Complaints.	80 %	40%
7	Cost Recovery in Water Supply Services	100 %	100 %
8	Efficiency in collection of Water related Charges	90 %	70 %

Source: IMC, Itanagar

Picture 7: Water Supply in ICR

Status of Household Coverage

Tap Connection

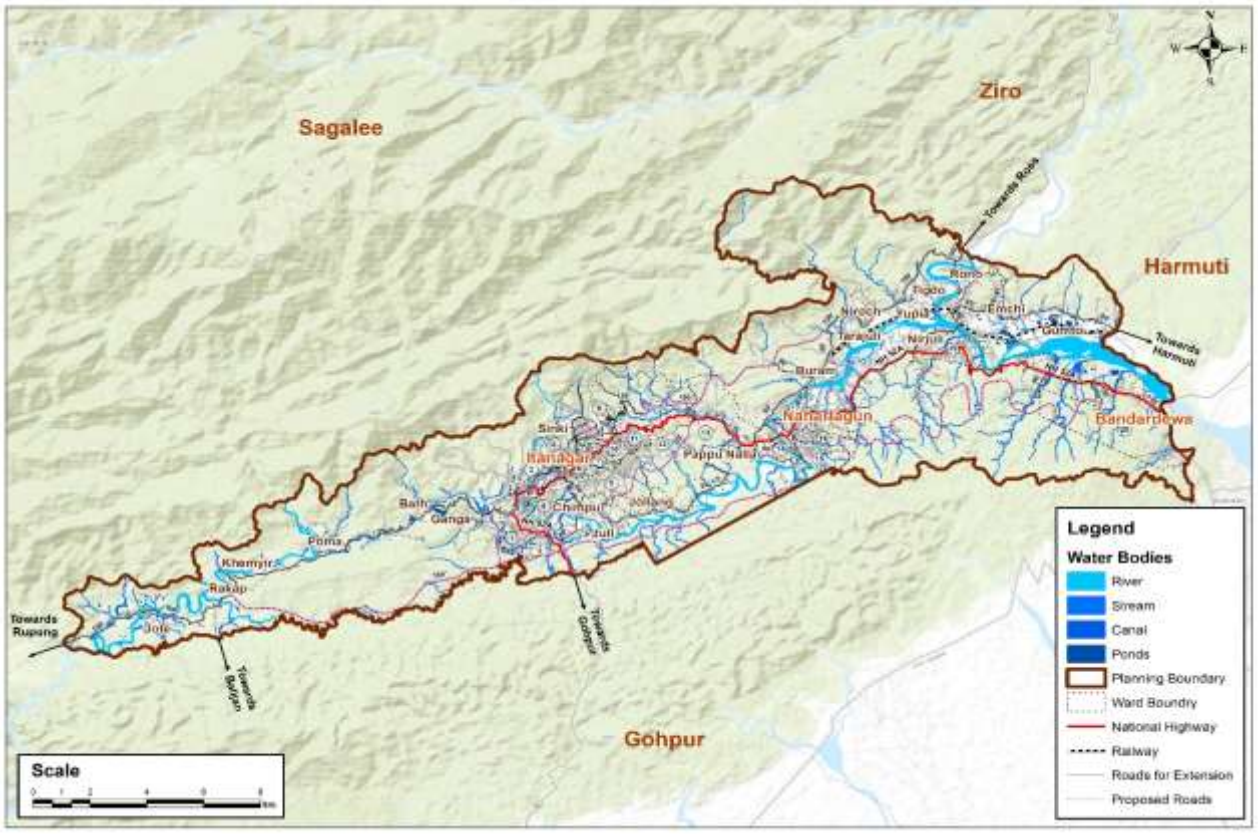
Total Nos. of HH	Total no. of tap connection at start of Mission	Gap	Target for taps by end of Mission Period			Progress on taps			Gap remaining
			Through AMRUT	Other program	Total	Through AMRUT	Other program	Total	
1	2	3	4	5	(4+5) =6	7	8	(7+8)=9	10
26759	15159	11600	4914		4914				6686

Projected Water Demand

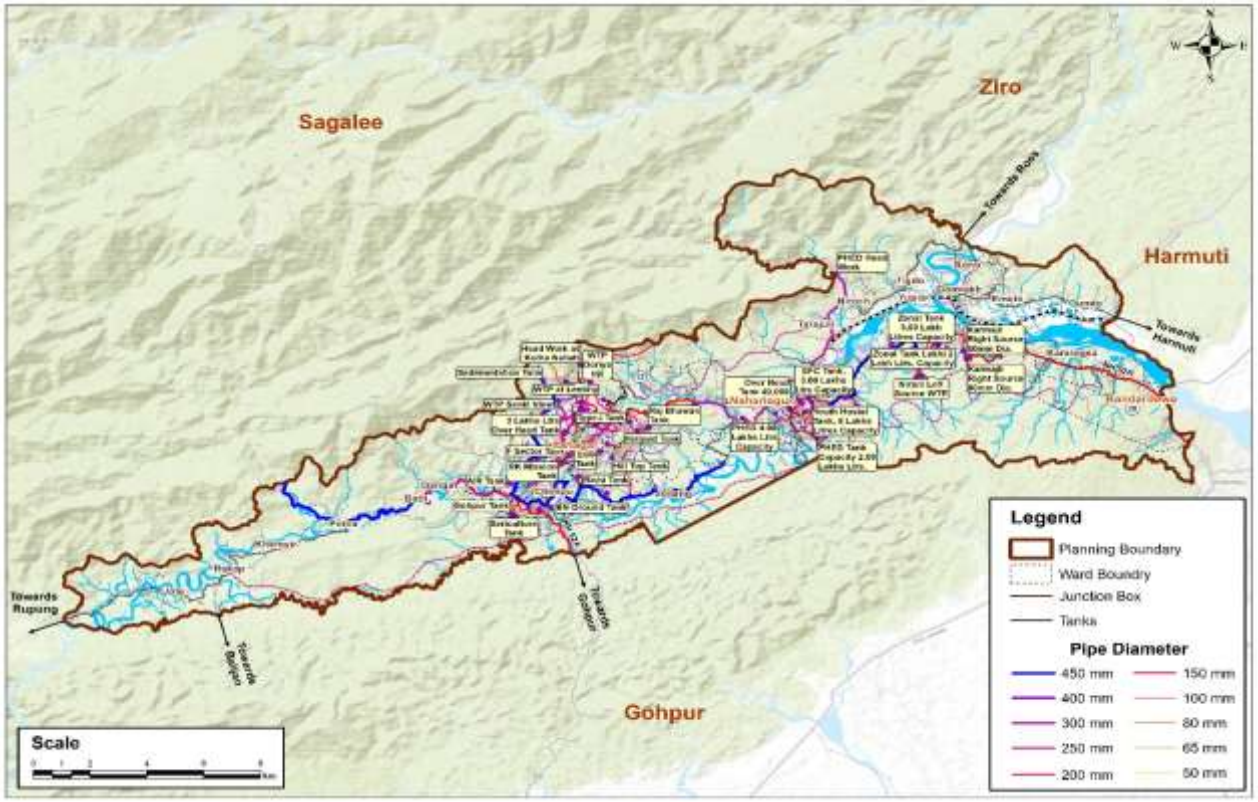
The city faces the problem of inadequate supply of water. According to URDPFI Guidelines, 135 LPCD of water is to be supplied for the entire population. The total present deficit of the township as on 2017 is 16 MLD. This is broken down in to the deficit for Itanagar as 3 MLD, Naharlagun and Nirjuli as 12 MLD and Banderdewa as 0.85 MLD. The projected water deficit for the year 2033 is estimated as 34.22 MLD, including 11 MLD for Itanagar, 22 MLD for Naharlagun-Nirjuli and 1.22 MLD for Banderdewa respectively.

Availability of water in slums

Ground water (hand pumps) is the major source of water supply in slums. At some places, public stand posts are installed to supply the surface water. No individual connections are there for the households in slums.



Map 8: Water bodies map in ICR region



Map 9: Water supply network and utilities map

6.2 Sewerage

Sewerage is the core element of physical infrastructure that determines the environmental status of any settlement. Development of appropriate sewage carriage system with efficient treatment is the key element, which acts as a pre-requisite for facilitating balanced and harmonized growth. There is open drainage system in Itanagar town, and both open and closed sewerage system in Naharlagun town. There are 22 latrine pits and 13,141 latrine flush/pour flush in Itanagar town as recorded in the Census 2011. There are 317 latrines in Itanagar Town. There are 757 latrine pits and 11,562 latrine flush/pour flush in Itanagar town as recorded in the Census 2011. There are 9 latrines in Naharlagun town as per Census 2011.

Projected Quantity of Waste Water

Assuming that 80% of the total water supplied is going to come out as sewage, the total quantity of sewage with a rate of supply of 135 LPCD will be 4.8 MLD by the year 2040.

There are projects under Swachh Bharat Mission and works going on in Itanagar for the betterment of the existing condition of the sewerage system.

Key Issues

- Absence of a sewerage network, resulting in the sewerage being drained to open or vacant land as well as into ponds.
- Most of the surface water and sewerage gets mixed up resulting in storm water drains being used as sewers.
- The natural water bodies such as ponds and streams are getting polluted by the sewerage.
- The existing drains are chocked with solid waste or plastic waste, resulting in localized water logging (mixed with waste water).
- Industrial effluents, which is hazardous for ground water and environment, is untreated and is discharged into artificial ponds.
- The Nagar Panchayats of the surrounding settlements does not have any identified specific land for the construction of a Sewage Treatment Plant.



Picture 8: Sewerage Lines in ICR

6.3 Storm Water Drainage

Drainage is an important element of physical infrastructure and constitutes removal and disposal of surplus rain/ irrigation water from the land. It has two aspects namely flood- protection and removal of storm water.

In Itanagar, the storm water drainage system consists of natural drainage system (Nallah) and major drains in the town. There are roadside open drains, either pucca or kutcha. Open drains are available along almost all roads of the town, which end up mostly into the Nallah and in some cases, into local ponds or open fields.

Storm Water Drainage in Itanagar

The drainage system is mainly through natural drainage courses on account of topography. The discharge is calculated on the basis of additional drains as well as upgradation of existing drains.

Many of the slums lack in proper storm water drainage system. Only roadside open drains are available in some of the slum pockets which are carrying both waste water and storm water. Mostly these drains find their way to open lands and ponds. As of now, no scheme or work for storm water drains is under execution.

Key Issues

1. The storm water is getting mixed up with the sewage and results in pollution of natural water bodies.
2. There is no proper storm water network for the overall town area.
3. Drains gets chocked with the solid wastes, creating water logging.
4. Regular cleaning of drains is not taking place and hence heavy silting happens in drains, resulting in water logging in rainy season.



Picture 9: Storm water Drain Condition in ICR

6.4 Solid Waste Management

Solid Waste Management (SWM) is one of the most expensive municipal services that a local body has to provide as its obligatory municipal function and absorbs about 1% of GNP in the urban areas. It is, therefore, imperative to optimize this huge civic expenditure and evolve an indigenous low-cost technology, which is technically sound, financially viable, aesthetically beautiful and socially acceptable to public. Waste management consists of different components viz. generation, collection, transportation and disposal that were handled by the Municipal Council.

Generation

The production of solid waste in settlements is a function of the socio-economic profile of the population and activities in an area. Insufficient conservancy services in most of the urban centers tend to leave the garbage spread on the road sides or open spaces leading to unhygienic living conditions. The garbage is removed by the municipal bodies and dumped at the dump yard or in some cases it is converted to compost especially in small towns. The generation of waste varies from about over a quarter of kilogram in small towns to about half a kilogram per capita in large cities.

Knowledge of the quantum of waste generation and composition of Municipal Solid Waste is essential for determining collection, transportation, processing and disposal option that could be adopted for the Nagar Panchayat.

The city generates about 80 MT of solid waste per a day and 60 MT is the total waste collected per day. The major sources of solid wastes are residential units, markets, slaughter houses, industries and institutions. Over 100 'Clean Arunachal' IEC Campaigns for Swachh Survekshan have been

undertaken. As per the Smart City Project Report, Source segregation with 100% Door-to-door collections is effective in all the Households.

Physical Composition

The physical composition of waste generated in Itanagar is given in the table below.

Table 14: Physical composition of solid waste

Sl. No:	Type	Percentage
1	Wooden pieces	3.6
2	Paper	6.2
3	Textile	2.4
4	Thermocol	2.2
5	Leaves	22.2
6	Concrete/stone	1.8
7	Soil	14
8	Metal	0.4
9	Brick	1.8
10	Glass	1.8
11	Rubber/leather	3.2
12	Kitchen waste	16.4
13	Ceramic	0.8
14	PVC/Pipes	0.6
15	Plastics	6.8
16	Polythene	1.2
17	Vegetables	9
18	Dry matter/straw	5.6

Per Capita Household Waste Generation

The average household waste generation per capita per day is 0.156 kg. The projected waste generation for the year 2040 is 7.2 MT of solid wastes and 1.2 MT of sweeping silt.

Household Income (in Rupees per month)	Less than 5000	Between 5000 and 15000	Above 15000
Per capita waste generation (kg)	0.118	0.166	0.184

Collection and Transportation of Solid Waste

There are 824 workers, including 667 NGO's and 157 Municipal workers engaged in waste

collection and transportation in the city. Total number of 43 vehicles is used for this purpose. 30 collection points of 660 liters capacity are present in the city.

Dumping

There are 2 landfills – 1 each at Karsingsa and Chimpu. As of now, the solid waste collected is dumped at site, which does not meet the standards of a site to be used for dumping solid waste.

Picture 10: Municipal Solid Waste (MSW) Plant Chimpu, Itanagar

Picture 11: Dumping ground Karsingsa, Naharlagun

Status of Solid Waste Management

The table given below shows the level of service achieved in Itanagar with comparison to the standards that have to be achieved.

Sl.No.	Water supply indicators	Benchmarks	Itanagar NP
1	Household level coverage of solid waste management services	100%	100%
2	Efficiency in collection of Municipal Solid Waste	100%	60%
3	Extent of source segregation of municipal waste	100%	0%
4	Extent of Municipal Solid Waste reused, recycled & recovered	80%	0%
5	Extent of scientific disposal of Municipal Solid Waste	100%	0%
6	Efficiency in Redressal of Customer Complaints	80 %	0%
7	Extent of Cost Recovery in SWM services	100 %	0 %
8	Efficiency in Collection of SWM Charges	90 %	0 %

Requirements - Solid waste generation

Year	Population in NP area	Population in planning area villages	Floating population @10%	Total population in planning area	Norms as per URDPFI	Solid waste generation (in tons per day)
2011	16306	9136	2544	27986	300 Gr Per	8.4
2018	17774	9798	2757	30329		9.1
2023	19342	10459	2980	32781		9.9
2028	21026	11148	3217	35391		10.6
2033	22840	11836	3468	38144		11.5
2038	24802	12484	3729	41015		12.3

Key Issues

1. There is acute shortage of manpower for solid waste collection, transportation and disposal.
2. Different wastes are getting mixed together and no efforts are taken to segregate the waste at any stage of the process.
3. Manual handling of waste is practiced which can have adverse impact on the health of sanitary workers.
4. Transportation of solid waste is done with open vehicles.
5. Open dumping of solid waste is a major issue, which cause unhygienic living conditions near dumping site and also result in soil pollution.

A DPR have been made for the city for solid waste management. The proposal includes 100% coverage with door to door collection of wastes, within the Nagar Panchayat Area. It also proposes more vehicles and manpower as per the standards required. A command control and response mechanism is also proposed which will have a customer handling cell to register complaints. The landfill site proposed in this DPR is near the airport which is not in operation now. But, in future, if the airport is put into operation, the site cannot be used for disposal of solid waste. Thus, the location of site needs to be reconsidered.

6.5 Power Supply

There are 16850 electricity connections as per Census 2011, and 32174 households connected to GRID as per Smart City Proposal report of Itanagar. Augmentation & Strengthening of DTs & LT lines has been proposed under PGCIL, APEC & IPDS. Online billing & Collection system under R-APDRP, Electric energy metering and billing with AMR and pre-paid meters in Capital Complex are already underway.

The city and its region have number of hydro-electric dams. Ranganadi Hydro Electric project is the biggest power plant of 405 MW installed capacity in North Eastern Region situated near Itanagar. The city has also commissioned Solar PV power plant of 5 KW and 40 KW. 100 KW, 200 KW and 1 MW GRID connected Solar PV plant at Secretariat, Assembly Building and at Energy Park respectively.

Solar City Master Plan is already prepared with target of 15% energy from solar. On an average, electricity is supplied 22 hours a day.

Picture 12: Power lines Condition in ICR

Future Demand

According to URDPFI Guidelines and based on the estimated requirements of power supply as per the URDPFI Guidelines, the average consumption works out to 2 KW per household at the town level and includes domestic, commercial, industrial and other requirements. One electric substation of 11 KV switching station is recommended for a population of 15,000. For Itanagar, it is expected to electrify all households in near future and hence, future requirement for power are estimated in the table given below:

Table: Future Requirement of Power for Planning Area

Year	Population	Power Requirement-MWs
2011	1,34,047	55
2021	2,03,258	80
2031	3,08,203	120
2041	4,67,333	180

Source: Calculated values

The table shows that, for the year 2041, the power requirement for the city of Itanagar will be 180 MW as per URDPFI Guidelines.

6.6 Traffic & Transportation

Introduction

Traffic and transportation play an important role in the overall functioning of the city. It is an integral part of urban planning and is responsible for the smooth functioning of the city. It is also responsible, besides other factors, for the spatial growth of the city by increasing the accessibility of sites on the periphery of the city. This chapter deals with the traffic and transportation aspect of the town.

Given its topography, geo-climatic conditions and remoteness, both construction and maintenance of roads in ICR are not difficult but costly. Steep and unstable slopes of young Himalayan hills, subjected to by frequent earth quakes, deforestation and heavy precipitations, are prone to wasting of land masses further leading to the problem of landslides, avalanches, rock falls, subsidence etc. The resulting damages to roads costly repairs and also call for heavy protection works. Removal of landslides, cleaning of clogged drains and culverts, jungle clearance trimming, operations at least twice a year - all add to the cost of maintenance both during and after construction.

City Network

The length of internal roads in ICR is 31.6 km and is maintained by the IMC. The existing road condition of the roads maintained by IMC is poor. According to census 2011, the city is having 15km of pucca road and 10 km of kutcha road. The reason for this is two. The first is that there is no funding dedicated for the construction and maintenance of the roads. The second reason is the poor utilization of the available fund. The roads of Itanagar require immediate attention as conveyance is one of the basic parameters that can help in the rise of economy and living standards.

Road Type	Road Width (inm)	Road Length (in km)
National Highway (52A)- Banderdewa - Gohpur	30	51.87
Arterial Roads	5-10	10.951
Sub-Arterial Roads	3-8	11.330

The designated ROW of the NH-52-A, which functions as the spine of the Capital region, is 30m. A system of 60 m ROW bypasses is proposed for all the major settlements along the NH 52-A. These are in turn are supported by 45 m. ROW new collectors and 30 m. ROW new distributors, opening up new pockets for development. A 30 m. wide green buffer is proposed on both sides of new 30 m., ROW, 45 m. ROW and 60 m. ROW roads and along existing roads wherever feasible to cater to future road widening, provision of BRTS, MRTS etc. This green buffer will be a value addition to the ecology and environment, improve microclimatic conditions and also urban aesthetics of Itanagar as a whole and project a new image for the city.

An area of 75 Hect. is delineated for Integrated Freight Complex (IFC). IFC will contain truck terminal, Inter State bus stand, whole sale markets for food grain, vegetables etc. and ancillaries' facilities. In order to provide connectivity from the new railway line to areas in the north and south of River Dikrong, a railway station complex is proposed in Zone A. Similarly, the area near the existing heliport at Naharlagun has provision for Institutional and Transport and communication use. A tunnel connecting Circuit House area to proposed mixed Landuse of 600 m. long is also proposed in Zone A. In order to cater to tourist demand two rope ways are proposed connecting Moktu to Secretariat (length 1000 m.); Ganga lake to zoological park (length 2500 m.)

The city is bifurcated by the National Highway NH 52. The arterial roads of Itanagar are not much crowded and there is no or little traffic on the internal roads of the city. So, there is no requirement for road widening but encroachments and on-street parking are issues that are to be taken care of.

Many of the roads end abruptly too. There is no well-defined road network. The ribbon development along the major roads has caused the arterial roads to be made just as a feeder for the major ones. There is no planned development of roads. Thus there are many dead ends and these dead ends are to be removed by making proper connections within the internal road network.

Located on the northernmost corners of India, Itanagar does not have an airport of its own. However, one can easily access the city via other neighbouring airports. The nearest airport located in Itanagar is the Lilabari airport located in the north Lakhimpur in Assam. The Lilabari airport is located about 67 km from the capital city and about 53 kms from Naharlagun. There are regular flights to Guwahati from the Lilabari airport. Another nearest airport is the Tezpur airport. Apart from these, domestic helicopter services are also provided by Pawan Hans, three days in a week, between Itanagar and Guwahati. The helicopter also connects cities like Dibrugarh (Mohanbari) , Guwahati, and Itanagar to Ziro, Tawang, Daporijo, Roing, Along, Pasighat, Tezu, Khonsa and Anini.

There is a proposal to develop a greenfield airport at Hollongi, which will have a better topography and a larger runway. The proposed 2,200-metre runway at the airport can handle jet aircraft that can provide direct flights to metro cities. The construction works are proposed to begin by December 2018. There are heliports at Itanagar, Daparjio, Ziro Along, Tezu and Pasighat among other places.

Public Transportation

The major mode of public transportation for intercity commutation is the railways. Arunachal Pradesh State Transport Department is running daily bus services including deluxe night services from Itanagar to most district headquarters including Tezpur, Guwahati (Assam) and Shillong. Besides private bus services to different routes/places are also available. Taxies are also ply at various places.

Itanagar has an excellent network of roads. Itanagar is connected to all the major cities and other neighboring states of Manipur, Assam, Tripura Meghalaya and Mizoram. The roads link Itanagar to Bomdila (350kms), to Guwahati (429kms) Shillong (495kms, Siliguri (942kms), North Lakhimpur (64kms) and Kolkata (1611kms). Overnight buses are available from Itanagar to Shillong, Guwahati and Imphal. Arunachal State Transport bus service is also available in Itanagar.

Itanagar provides lots of options for local transport within the city and some of these includes auto rickshaws, cycle rickshaws and taxi. Walking is also a good option to get around the city.

Itanagar does not have a railway station of its own. The closest rail head is located in Harmuti in Assam. The railway station is about 33km away from Itanagar. There is also another railway station located about 60 km from Itanagar in North Lakhimpur in Assam. The railway station is directly connected to Kamakhya Railway Station in Guwahati, which leads to Kolkata, Silchar and Siliguri.

Naharlagun railway station lies in the Northeast Frontier railway zone of India, headquartered at Guwahati. There are many trains that passes through Harmuti Junction in Assam, which is 19 km from Naharlagun station by rail route. Naharlagun railway station is a railway station located in Papum Pare district of Arunachal Pradesh. It is about 15 kilometers to the state capital Itanagar. Naharlagun Railway station is connected to Harmuti Junction, by a single diesel line of 19 km track length. Gumto station is an intermediate station on this route.

There are 3 direct trains that run from Harmuti to Naharlagun, viz., Donyi Polo Express (daily basis), Guwahati- Naharlagun Shathabdi Express (thrice a week) and Arunachal Express (twice a week). Since most of the people in Itanagar Capital Region are dependent on the nearby cities for employment, they rely on the rail network the most because the trains are punctual, reliable and cheap.

The existing bus stand is about 3.5 km away from the railway station and there are insufficient bus connections to the railway station. Considering the future growth and development of the town and for the improvement of connectivity to the region, it is necessary to have a bus stand near the railway station. An improved bus network will increase the chance for people of Naharlagun stay in the town itself rather than migrating to the nearby Harmuti in Assam.

Major Issues

- The conditions of the roads in the city is very bad and require immediate maintenance.
- The road network is not planned and is inefficient
- Lack of connectivity to other cities by means of public transportation.
- Encroachment are present along the major roads.
- Footpaths are not present, thus making it difficult for pedestrians and can be a potential cause for accidents.

CHAPTER- 7: SOCIAL INFRASTUCTURE

7.1 Introduction

Social infrastructure refers to the facilities and the process involved to ensure education, health facilities and community development in any town. The social infrastructure includes the education system, health care, social and cultural facilities, parks and open spaces, etc. The different components of social infrastructure will help to know how well a town is equipped with facilities. The provision of education, health, etc. defines the quality of life. As the town expands and population increases, the gap between demand and supply of these essential services widens, which deteriorates the quality of life especially in the urban areas.

Development of physical infrastructure cannot lead in overall development at the desired level if the social infrastructure is not simultaneously developed. The education, health, public entertainment etc. have to be developed to ensure proper social infrastructure in the planning area.

7.2 Health Care Facilities

To support its huge rural population, Arunachal Pradesh has a three-tier public healthcare infrastructure comprising sub-centres, primary health centres and community health centres. In addition, there are district hospitals in most districts. The state government is taking steps to start a medical college at Naharlagun for which Rs. 45 crores (US$ 6.98 million) were allocated in state budget 2017-18. The college is expected to start from academic year 2018-19.

Table 15: URDPFI Standards for Healthcare Facilities

Facility Requirement	Area Requirement	
Hospital Allopathic/Referral Hospital	1 per 100,000	1 Ha (0.6 for Hospital, 0.4 for residential accommodation)
Dispensary/Health Centre	1 per 15,000	0.08 – 0.12 Ha
Family Welfare Centre	1 per 50,000	500 – 800 sq. m
Maternity Home	1 per 45,000	0.2 – 0.3 Ha
Nursing Home	1 per 45,000	0.2 – 0.3 Ha
Veterinary Hospital	1 per 500,000	2000 sq. m
Non-Government Charitable Hospital or Nursing Home	1 per 45,000	0.2 – 0.3 Ha

Source: URDPFI Guidelines

Itanagar does not have a government allopathic hospital. There is an allopathic hospital in Naharlagun, which is 12 kms from the town. It has 162 beds, 72 doctors, 86 para medical staff. There is one hospital for alternative medicine in Itanagar with 2 doctors and one hospital for alternative medicine with 6 doctors in Naharlagun town.

There are one dispensary each in both Itanagar and Naharlagun towns. Itanagar dispensary has a strength of 4 doctors and 26 para medical staff, whereas there is 1 doctor and 5 para medical staff in Naharlagun dispensary.

There is a family welfare center in Naharlagun with 2 doctors. There is a Maternity and Child Welfare Centre in Naharlagun with 8 beds and 3 doctors. Apart from this, there in 1 TB hospital in Naharlagun.

Future Demand

Table 16: Existing Scenario and Projected Requirement of Healthcare Facilities

Facility	Population Served per unit	Existing	Current Requirement	Current Gap	Future requirement (for 2038)
Hospital Allopathic/Referral Hospital	1 lakh	1	1	0	2
Dispensary/Health Centre	15,000	2	7	5	13
Family Centre Welfare	50,000	1	2	1	6
Maternity Home	45,000	0	3	3	8
Nursing Home	45,000	0	3	3	8
Veterinary Hospital	5 lakh	2	1	-1	3
Non-Government Charitable Hospital or Nursing Home	45,000	1	3	2	7

Source: PCA 2011 and Calculated values

7.3 Education Facilities

As per 2011 census, Arunachal Pradesh has a literacy rate of 65.38%; the male literacy rate stood at 72.60% and female literacy rate at 57.70%. Arunachal Pradesh has become the first state in the country to launch a web-based educational program for all schools in collaboration with Google Inc. The system aims to bring the power of the web into the classroom & improve productivity by simplifying the teaching process. In March 2017, the state government decided to introduce the concept of smart classes to 264 government run higher secondary & secondary schools. The classes will be for students of 9th & 10th classes and will use ICT to impart education.

Basic Educational and Literacy Indicators

As per 2011 census, total 44,172 people out of the total population in Itanagar town are literate, among them 23,997 are male and 20,175 are female. Literacy rate of Itanagar town is 74.25%. Male literacy is around 90.51 % while female literacy rate is at 79.58 %.

There are 17 primary schools, 12 middle schools, 1 secondary school and 3 senior secondary schools in Itanagar. There are 2 Government Arts degree colleges and there are 2 Government Science degree colleges in Itanagar town. There are 6 middle schools, 2 secondary schools and 2 senior secondary schools in Naharlagun. There are no Government Arts degree colleges and there exists 2 Government Science degree colleges in Naharlagun town.

Education System in Arunachal Pradesh State

In the field of education, the primary objective of the State Government has been the universalization of elementary education and Qualitative improvement of Higher Education.

Elementary Education 1. Primary 2. Upper Primary	Age 6-14 years	Classes I-VIII
Secondary Education	Age14-16 years	Classes IX-X
Higher Secondary	Age 17-18 years	Classes XI-XII
Higher Education 1. University 2. Institutes of National Importance 3. Degree Colleges		
Technical and Vocational Education Vocational Institutes		

Table 17: System of Education in the state

As per URDPFI, the following are the requirements of educational facilities for a city.

Table 18: URDPFI Standards for Educational Institutions

FacilityRequirementArea Requirement		
Pre-Primary / Nursery / Anganwari	1 per 2500	0.08 Ha
Primary School	1 per 5000	0.4 Ha (0.2 Ha for school building area and 0.2 Ha for playfield area)
Middle school	1 per 7500	1.8 Ha (0.6 Ha for building area and 1 Ha for playfield area and 0.2 Ha for parking area)
Secondary School	1 per 7500	1.8 Ha (0.6 Ha for building area and 1 Ha for playfield area and 0.2 Ha for parking area)
Senior Secondary School	1 per 7500	1.8 Ha (0.6 Ha for building area and 1 Ha for playfield area and 0.2 Ha for parking area)
General College	1 per 50,000	5 Ha (1.8 Ha for building, 2.5 Ha for playfield, 0.3 Ha for hostel and 0.3 Ha for parking)

Source: URDPFI Guidelines

As per URDPFI standards, the city of Itanagar lacks in some basic educational facilities and have to be provided with more facilities as that of in table given below:

Table 19: Existing Scenario and Projected Requirement of Educational Institutions

Facility	Population served per unit	Existing	Current Requirement	Future requirement (for 2038)
Pre-Primary / Nursery / Anganwadi	2500	28	39	48
Primary School	5000	17	19	24
Middle School	7500	18	13	23
Secondary School	7500	3	13	27
Senior Secondary School	7500	5	13	29
School for physically Challenged	45,000	0	2	2
Technical & Vocational Education Center	1,25000	1	1	4
General College	1,25000	3	1	5

Source: PCA 2011 and Calculated values

There is very large gap in number of pre-primary schools in the city. The city also needs more number of senior secondary schools. There is also requirement for a school for physically challenged, a technical and vocational education center.

Major higher educational institutes in Arunachal Pradesh

- North Eastern Regional Institute of Science and Technology1, Nirjuli
- National Institute of Technology, Yupia
- Jawaharlal Nehru College, Pasighat
- Industrial Training Institute (Roing, Daporijo and West Kameng district)
- College of Horticulture and Forestry

Picture 13: Education facilities in ICR

CHAPTER - 8: REVIEW OF EXISTING DOCUMENTS/POLICIES

During the site visits information regarding the available schemes, the team members collected plans & policies. Following documents are available for the town & were reviewed.

8.1 National Building Code

The National Building Code defines hilly areas as "Any area above 600 m in height from mean sea level, or any area with average slope of 30°, considering the sensitive and fragile eco-system of hills and mountains." However, the State Governments may identify and notify areas to be covered under 'Hilly Area', which need to be dealt with special consideration, when developmental activities are taking up. Hilly areas have fragile ecosystems, which need to be conserved. Therefore, planning and development strategies for hilly areas shall have to be designed with added sensitivity and sound land use planning and settlement planning.

8.2 URDPFI Guidelines

Hilly areas have various factors, which necessitate a thrust on adoption of an integrated planning approach for conservation, preservation and planned development

Strategy: Land Conservation and Optimization

1) Environment Inventory/ Impact Assessment: For planning of the new settlements or working out the strategies for the growth of the existing settlements, it is necessary to conduct detailed environmental inventory/ impact assessment. The inventory would involve geological investigations, slope analysis, soil, flora and fauna analysis, climatic inventories, vulnerability to natural disasters (such as earthquakes, landslides, floods etc.), etc. In addition to this the aesthetic factors, cultural, architectural and historical heritage, scenic/ landscape value shall also be taken into consideration.

2) Identification of Developable Area: Identification of developed area is calculated by deducting the natural ecological area from the entire township jurisdiction. Jurisdiction may be large to control the surrounding areas. The classification of land uses should be given only for developed area, while the rest of the ecological area shall be for conservation or restoration.

3) Land use optimization: Keeping in view the scarcity of good buildable land and also the high cost of the construction, it is necessary to optimize the use of land by calculation of carrying

capacity and land suitability analysis. Green building approach should be adopted such as use of cost effective and appropriate building materials and technologies.

8.3 Arunachal Pradesh Urban and Country Planning Act, 2007

After preparation of the development plan, the Director of Town Planning/ Chief Town Planner of Town Planning shall submit the development plan to the State Government/ State Urban and Country Planning Board and the State Government/ State Urban and Country Planning Board shall follow the procedure and exercise the powers of the Local Planning Authority under sections-22, 23, 24 and 25.

Control of Development and Use of Land

- After the coming into operation of any Development Plan in any area, no person shall use or permit to be used any land or carry out any development in that area otherwise than in conformity with such Development Plan.
- The State Government/ State Urban and Country Planning Board on receipt of the proposals for development together with the objections of the Local Planning Authority, shall in consultation with the Director of Town Planning/ Chief Town Planner, either approve the proposals with or without modifications or direct the concerned Department or Local Authority as the case may be, to make such modifications in the proposals as they consider necessary in the circumstances.

8.4 Arunachal Pradesh Building bye laws

Layout Plan

The layout plan shall be formulated as per the norms of Master Plan and shall be approved as per the procedure followed by the Authority, under the provisions of the relevant Act.

Requirement of Site Plan

(i) In hilly terrain, the site plan should include location of landslide prone areas, if any, on or near the site, detected during reconnaissance. The Authority in such case shall cause to ensure that the site is away from such landslide prone areas.

(ii) The site plan on a sloping site may also include proposals for diversion of the natural flow of water coming from uphill side of the building away from the foundation.

Services Plan and Water Supply Provisions

(i) Plans, elevations and sections of private water supply, sewage disposal system and details of building services, where required by the Authority, shall be made available to a scale not less than 1: 100.

(ii) For residential plots more than 2000 sq.m. and non-residential plots more than 1 hectare in size, the following provisions shall be made:

(a) separate conveying system to be provided for sewerage and sullage to facilitate reuse of sullage water for gardening and washing purposes. This may require suitable storage facilities that shall to be indicated on the building plans.

(b) for recharging ground water, rainwater-harvesting provisions are to be provided within the plot, which are to be indicated on the building plans.

Low Income Housing

The norms of ISS–8888:1993 formulated by the (Bureau of Indian Standards) Bureau of Indian Standard shall be applicable for Low Income Housing, which provide a maximum net density upto 250 DUs./Ha in plain areas. However, in hilly areas, the net density may be restricted up to 150 DUs./Ha.

Group Housing

The number of dwelling units are calculated on the basis of the density pattern given in the unit.

Minimum size of the plot	2250 sq m.
In hill towns	5000 sq m.
Maximum ground coverage	35%
Maximum FAR	125
Maximum Height	12 m.

Industrial Plot

Minimum plot size	2000 sq m.
Maximum ground coverage	33.33%
Maximum floor area ratio in hills	100
Maximum height	12 m.

Bus Terminal

Maximum coverage on different floors:	
Floor area ratio in hills	100

Ground floor in hills	5% (for passenger's facilities).
First floor in hills	5% (for passenger's facilities and terminal offices).
Maximum floor area permissible	500 sq. m.
Maximum Height	12 m.

CHAPTER-9: ENVIRONMENT AND NATURAL HAZARDS

9.1 Introduction

The urban areas of the country are facing problems of deterioration of environmental and socio-economic conditions. The major concerns are unplanned and haphazard development, poor sanitary and living conditions, urbanization and associated problems including slums, poor/inadequate infrastructure and pollution problems. While there are several causes for urban degradation such as population migration, environmental considerations not adequately being incorporated into plans (Master Plans), uncoordinated and haphazard development, weak implementation of plans and laws and inadequate institutional competences, one of the major concerns is resource crunch.

9.2 Natural Reserves

The total geographical area of the district is 2875 Sq. km, which form about 3 % of the whole state. Geologically, Papum Pare district is underline mostly by Siwalik group of rocks in the central. The Southern and Southwestern parts being separated from narrow and elongated tract of Gondwana in the north by main boundary thrust (MBT) fault that follows the trend of Gondwana sedimentary. The Siwalik range trends NE–SW except in the Banderdewa area, where it is ESE–WNW. The western and northern parts of the district are occupied by metamorphic like gneiss, schist, plyllite, quartzite etc. Quaternary alluvium and terrace deposit boulders, gravel, pebble, sand, silt and clay characterize the valleys. They are locally folded jointed and fractured. The foothills are composed of older Alluvium (piedmont deposits) underline by Sandstone, shales and boulders/pebbles of Siwalik formation. The foothill piedmont zone occurring on the south of Siwalik hills have contact with the Brahmaputra flood plain. The entire older metamorphic formation of Paleozoic is over thrusted over the younger tertiary Siwalik and demarcated the lower boundary of the Gondwana group.

The district has a potential of natural resources provided it should be explored but the majority of the area of district is still geographically unexplored and as a result most of the mineral deposits are lying unattended in the valleys where the scope of Economic development is more if the minerals are mined and traded.

Vegetation & Forest

The district is covered by thick forest which has sub–tropical, deciduous and humid type of vegetation. The variation of altitude ranging from 170 meters to 800 meters and varied climatic conditions has bestowed the area with three different type of forest:

1. Tropical evergreen forest

2. Tropical mixed evergreen forest

3. Secondary Forest

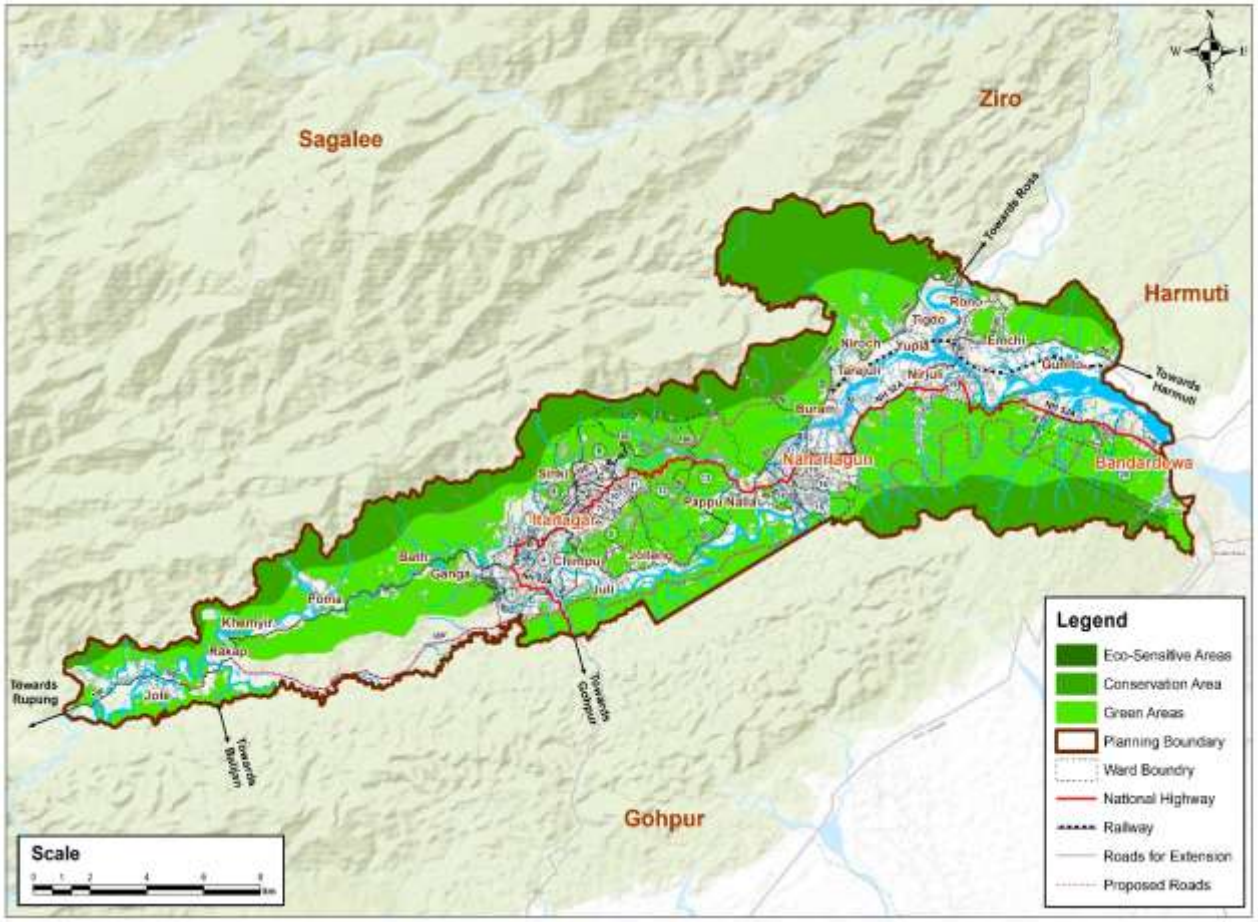
There are four forest divisions in the district, viz.

(1) Banderdewa forest division,

(2) Silviculture division, Itanagar

(3) West Land division, Itanagar and

(4) Wild life sanctuary division, Sagalee.



Map 10: Conservation Areas in ICR region

Maximum forest area comes under Banderdewa Forest Division. Following table shows the area under Banderdewa Forest Division as on 2011.

Sl. No.	Type of forest	Area (in Sq. km) (approx)
1	Reserved forest	810.50
2	Proposed Reserved forest	300.44
3	Unclassified state forest	595.00
4	Forest area proposed	1705.94

The area under reserve forest in Papum Pare district during the year 2011 is as follows.

Sl. No.	Type of forest	Area (in Sq. km) (approx.)
1	Reserved forest	1007.75
2	Unclassified state forest	1368.25
3	Forest under wild life sanctuary	140.30

Source: - District statistical report – 2011.

Area under plantation and afforestation in Papum Pare district as on 2011 is as follows:

Sl. No.	Type	Unit	Particulars
1	Actual Economic Plants	In hects.	NA
2	Afforestation	In hects.	NA
3	MNP	In hects.	250
4	ANR	In hects.	80
5	Apnaban	In hects.	NA
6	Nurseries	In Nos.	280500 seedlings.

Source: - District statistical report – 2011.

Flora & Fauna

The important plants of this area include Dendrocalamus bamiltonii intermixed with Musa sp forming secondary forests and it extends up to 500 meters. Besides, Buddleia Asiatica, Ptris enciformis cyathea spinulosa, osbekia nutans, Scoparia dulcis, Urena lobata etc. are common

component of this forest.

Various wild animals found in the district are elephants (elephas maximus linnacus), Samber (cervus unicolor kerr), Barking deer (munficus muntjak Zimmerman) and wild boars (sus scrofa linnacus). The common primates found in the southern region are the Macaque (macaca assamenis moclalland) and capped langur (presbytis pileatus blyth). The insectivorous and rodents are very common. The common varieties are the long tailed tree mouse (vandeluria oleracia benneth), house rat, various types of squirrels viz. Palla's Squirrel (calloscirus pallas), Giant flying Squirrel (petaurista petaurist pallas) and the Himalayan giant Squirrel are also found. Among the birds, Jungle fowl, hornbill, dove, Parakeet, Snipes, Swifts, Cuckoo, Owls, Kingfisher, Trogon, Barbets, Woodpeckers, Mynas, Jungle Crow, tree pie etc. are found in the district. Forest Divisions/Ranger/Beats in Papum Pare district as on 2011 is given below.

No. of Forest Division	No. of Rangers	No. of Accounts Beats	No. of Non – account Beats.
4	**31**	**5**	**10**

In 1978, Papum Pare district became home to the Itanagar Wildlife Sanctuary, which has an area of 140 km² (54.1 sq. mi).

9.3 Pollution

Water Pollution

The spring water of Papum Pare District is slightly alkaline with low dissolved solid content; soft and generally concentration of all the chemical parameters in the spring water are within permissible limit. However, slightly higher concentration of Cl and SO4 in the water from two springs of Naharlagun area, viz., Barapani and D-colony are indicative of some degree of pollution. Abnormal concentration of Cl may result due to pollution by sewage wastes, salting for certain types of trees like coconuts and leaching of saline residues in the soil.

PHED, AP is supplying water in Papum Pare district by tapping surface water sources. The poor ground water development in this district is mainly due to lack of agricultural practices using modern techniques and also due to excessive dependence on surface water for drinking water supply or locally by tapping springs. Moreover, construction of ground water structure like tube wells in this hilly terrain is difficult and in most of the places of the district it is impossible due to approachability problem till date. There is immense scope for the same in the valley and foothill

areas, which will boost agriculture and ultimately the state economy. In this district agricultural practice is mainly depend on monsoon rainfall. Most peoples who are engaged with agriculture are unaware of doing agriculture or horticulture in the lean period by using ground water. In the valley or foothill areas where construction of ground water structures like large diameter dug wells or tube wells are feasible, farmers should be encouraged to adopt the practice of cultivation by using ground water structures at least in which months there is scarcity of rain or surface water. Moreover, in the hilly part of the district, perennial springs are only utilized for drinking or other household purposes only.

For this, only a part of the spring water is utilized and rest part is allowed to pass away. This excess water may be tapped fully by constructing collector chamber and then allowed to pass through horticultural field, which not only reduce the soil erosion but also recharge the ground water as well as meet the water requirement of the horticultural field in the lean period also.

The major rivers of Arunachal Pradesh are free from pollution and the ground water is of excellent quality with all the parameters within permissible limits, according to an investigation carried out by the Central Ground Water Board and Central Water Commission in the year 2016. This situation, however, may change in the near future with rapid urbanization and increase in population. There is no major water quality issue in the state except localized occurrence of iron.

However, rivers like Pachin flowing through densely populated areas had become a waste disposal site and needed to be tackled.

Itanagar has 170 rainy days per year and average precipitation is 2289 mm. With only 3.7% storm drains along main roads, drainage was marked as a key area of focus. City sewerage is discharged into open drains. The hilly terrain means limited scope for u/g sewer network indicating requirement for alternative solutions.

The quality of water bodies is getting deteriorated because of the sewage discharge and solid waste dumping such as plastic waste. There is no sewage treatment plant present in the city and collection efficiency of solid wastes is just 60%.

Open dumping is also practiced in the city. There are several industries including agro-based, textile industry, metal fabrication, paper and paper products, repairing and servicing industries. These industries let a part of their untreated effluents to drain into the manmade ponds, which end up in polluting the water.

Rain Water Harvesting

The aquifer beneath the planning area is getting overexploited because of the borewells and hence, the ground water resources are being depleted. Effort should be made to prevent the contamination of the ground water in the first instance. Rain water harvesting, should be mandatory for all new buildings to harvest surface runoff and ground water recharge.

Air pollution

The industrial growth in the city is causing air pollution and little measure has been taken to control the air pollution. There are soap factories and rice mills present in the city, along with few other industrial units too. There is very little pollution from automobile exhausts, as there is little need for transportation for intra city commutation. The intercity commutation is also done by modes such as buses and trains, hence reducing the impact on air quality.

Noise Pollution

Except for the areas that are adjoining to the major industries, the city is generally having a low level of noise pollution. The problem of noise pollution might arise when the city will grow in future and necessary precautions can be taken in advance to avoid this issue.

9.4 Natural Hazards

The Government of India is viewing the prevention of loss to life and property due to natural calamities very seriously. In the past, the main role played by the Government in the case of various disasters was confined mainly to post-disaster activities that included providing relief and organizing rehabilitation The need was felt for a proactive approach rather than waiting for a disaster to occur. As a part of this strategy, the Government decided to institute task forces for hazard zoning, geotechnical investigations, and land use zoning and regulation.

Hailstorm and Thunderstorm

Hailstorm rarely involve physical injury their economic impact can be severe. The damage appears to be a function of the severity, intensity and duration of storms and the size of hailstones, which they produce. Some damages are also caused by high winds. Heavy rainfall affects the transportation of Itanagar because storm water drainage is weak in the city.

Floods

The land protection wall of several nallahs and rivulets in the state capital were badly damaged following the floods in 2017. The National Highway 415 connecting Itanagar and Naharlagun was

closed during the flash floods in 2017-18 and all vehicles were diverted to Pappu-Nallah and Itanagar via Jollang Road. On the other hand, the Jullang road, which is currently the only lifeline connecting Itanagar and Naharlagun, was also in a bad condition with mudslides causing considerable damage at several points. This requires immediate attention to prevent future risk.

Earthquakes

Itanagar lies in Earthquake Zone V, and there are 5 fault lines in the city which discourages vertical development along the National Highway 52A and along the Dikrong river valley passing through the southern border of the entire Itanagar Capital Region.

CHAPTER-10: SPATIAL GROWTH

In the beginning, Itanagar stood for Naharlagun, whereas the present town of Itanagar was known as New Itanagar. Finally, New Itanagar became Itanagar and Naharlagun, which emerges as Satellite Township, resulted in the twin capital town of Itanagar and Naharlagun.

In the past two decades, the Capital Region has witnessed many changes from a predominantly rural area to a bustling urban character. The traditional Jhum cultivation of existing tribals has been replaced by settled cultivation, which progressively leads to the growth of urban settlements. The shift to other temporary locations often merges settlements into nearby urban areas and forms urban sprawl. The growth of urban centres has brought in many issues like improper civic infrastructure and poor quality of road network etc. Rapid growth of Itanagar has brought forth many challenges with respect to the urban sector.

The share of urban population in the Capital Region is comparatively high. In Papum Pare District 50.8% of the total district population (1,21,732) is in the urban areas, which is 27.8% of State urban population. In the circles of Itanagar and Naharlagun the urban population is 89% and 68% of total circle population respectively.

After Itanagar was selected as the Capital of the State, the requirements of a modern town with requisite amenities was felt. Government departments and supporting residential development were then planned and implemented. This resulted in the expansion of the town, owing to the influx of large number of migrants from the surrounding areas. The Master Plan (1992) earmarked an area of 136 sq. km. for the proposed developments. The MATURE Project (2005) identified an area of 152 sq. km.

Naharlagun, a census town since 1981, was the old capital city of the State. It is situated 12 kms. from Itanagar along NH-52A. Itanagar and Naharlagun along with settlements such as Nirjuli, Banderdewa, Yupia and Doimukh in addition to still smaller settlements such as Ganga, Pappu Nallah, Model Village, Tarajuli, Karsingsa and Chimpu form the various developed pockets of the Capital Region. All these settlements are located along the National Highway No. 52A, within a distance of 46 kms. Some of these settlements such as Itanagar and Ganga, Naharlagun and Nirjuli have merged. All settlements thus form part of an urban fabric with strong physical, socio-economic, infrastructure and environmental linkages.

Integrated planning and development of these settlements is therefore, necessary keeping in view future growth. The pattern of development in the Capital Region is linear, with poles/ nodes of

commercial and related activities along the NH 52A. The general growth has been such that the corridors and poles of development may be identified on the basis of physical delineation. These urban stretches are:

- The Chimpu-Ganga-Itanagar Corridor
- The Naharlagun-Nirjuli Corridor
- The Doimukh-Yupia Corridor
- Other settlements that lie between these corridors and are physically discernible.

Pressures of urban expansion and resultant land necessities have caused a spillover of urban activities on ecologically fragile hill slopes. Some of these areas are part of the Wild Life Sanctuary or Reserved Forest.

The Capital Region is a valley that runs west to east, and has a ridge that runs through the center of this valley. The historic Ita-fort was constructed on the topmost area of this ridge. Itanagar has developed on the northern part of the central valley. The general topography of the land in the Chimpu-Ganga-Itanagar Corridor is contoured while that in the Naharlagun-Nirjuli Corridor and Doimukh-Yupia Corridor is relatively flat. The Capital Region has pockets of developed and un-developed areas. Some settlements are distinctly rural like Chimpu, while others exhibit varying degrees of urbanization.

The housing conditions in each pocket are, to a large extent, a reflection of the level of urbanization. Settlements near Itanagar and Naharlagun and those near the Assam border show higher levels of urban functions.

Presently since most private developments are on forest land, the urban regulatory authorities have little control on their growth. Such haphazard and unplanned growth invariably results in problems in service provisioning.

Most private developments in the city have come up without prior permission (i.e. without land allotment procedure or building permission) from relevant Government departments. These developments may be classified as:

- Unauthorized but later regularized developments.
- Unauthorized and presently not regularized (they may be regularized, as they do not pose a significant threat to future growth).
- Unauthorized, unregulated development, which by their location, type and nature pose significant hurdles to future city growth.

The Capital Region has two major urban clusters viz. Itanagar and Naharlagun. Both the clusters have urban and rural settlements. Itanagar Cluster: Population was 39,173 in 2001, Itanagar urban: 34,970 and Itanagar rural 4,203 Rural Itanagar comprises Chimpu (1656), Dat (811), Bat (140), Ganga (514), Jollang (231), Chimri (164), Poppu to E/ Gate (635). Naharlagun Cluster: Population was 39,727 in 2001, Naharlagun urban: 26,912 and Naharlagun rural: 12,815. Naharlagun rural: Poppu-1(113), Sood (117), Model village (1366), Lekhi village (338), Nirupjuli Village (183), Tarajuli (404), Nirupjuli (5354), Banderdewa (3006), Borum (240), Hostalam (74), Karsingsa (1106), and Papu-II (406).

As per 2001 census, Doimukh had a rural population of 9890 persons and there was no urban population. This is contrary to ground reality. The total population of Capital Region was 88,790 in 2001 inclusive of both urban and rural population. The urban population of the Capital Region is nearly 70% of the total population. Given that the urban population of the Capital Region is approximately 28% of total State urban population, the total population of Capital Region may have crossed 1.25 lakh by 2009. As per population projections based on past trends, the projected population of Itanagar Capital Region would be 3.42 lakh by 2021.

Table 20: Total Population of Capital Region along with Rural Urban distribution 2001.

CLUSTER	URBAN	RURAL	TOTAL
Itanagar	34970*	4151	39121
Naharlagun	26912*	12707	39619
Doimukh	0	9890	9890
Total	**61882**	**26748**	**88630**
Ratio	**70**	**30**	**100**

** According to 2002-03 Statistical Hand Book of Papum Pare District, the population of Itanagar and Naharlagun is 35,022 and 27,020 respectively but in all other publications including Census publications, figures shown above have been indicated.*

10.1 Development Challenges & Potential:

Unlike other urban centers, ICR is having more area coming under Agricultural and Forestland. The city is still under a transitional stage from a village settlement to an urban agglomeration. The city is expected to grow outward along the major roads and in the direction of the adjacent villages. The proposals are made considering that; the city is to be expanded outwards, increasing the scope for future growth and relieving burden on the city center. The proposals are also aimed at making the newly added villages to be well connected to the present city center and to promote the growth of these areas.

The Region is concentrated into a small area where all major activities take place. In the past 10 years, it is observed that there has been very little growth in the outward direction. However, there is increase in density within the core region of the ICR. The city is not growing outward because of the lack of connectivity and poor coverage of basic infrastructure. If provided with adequate supply of water, electricity etc. and also by making the outer areas easily accessible by developing new roads, we can expect the city to grow outward. This will relieve the pressure from the core area and provide with opportunity for the development of the barren land in the outer areas of the ICR.

The Region economy is needed to be boosted by creating more employment opportunities and increasing production from the ICR. This can be done by industrialization, commercialization & Tourism. Since the city is located closer to Attractive conditions for Tourism, the city can act as a subsidiary location for industrial growth. This can be further boosted up by the renovation of the Transportation and connectivity. The Roadway can be used as a shipment center for goods from nearby megacities like Guwahati and Kolkata.

Creation of more recreational centers, educational institutions, healthcare facilities etc. can improve the living conditions of the city. It can also make the city less dependent on the nearby megacities. This could attract more people to live in Itanagar, Naharlagun and Banderdewa, rather than migrating towards larger cities in search of better facilities.

The ICR needs to be connected well internally by an accusable road network. The city also requires a bus stand, which will make the intercity commutation easy and convenient. Connectivity to the city can also be increased by providing a greater number of trains. This can promote easy movement of goods in and out of the city. Creation of a road network will also connect the adjoining villages also to the city. This can boost up the economic activities of the city and can bring about more commercialization.

Industrial development has been identified as one of the major pathways towards the economic development of the city. Locations are to be identified, which are well connected with roadways or any other means of transportation as well as which are located such that it won't cause any hindrance to residential development.

Agriculture is the predominant sector in this area and major part of land is under agricultural use. Since it is not possible to leap forward directly from agriculture to secondary or tertiary sector, protection of some of the agricultural land is important. The major industries in Itanagar includes rice mills, and hence, it can be seen that the city is dependent on its farms and farmers. The city

area is also having almost one-fourth of the area under forests. It is important to conserve these lands to maintain the ecological balance of the city.

Another major factor in the formation of proposals is the provision of public amenities and utility services. The open spaces are also needed to be distributed evenly. All these facilities are to be made easily accessible for the public. The existing public or semi-public buildings are located closer to the city center. With the city boundary being expanded, it is essential to take into consideration, the new villages that are joined to the city and provide them with the above-mentioned provisions and amenities.

CHAPTER-11: LAND USE DISTRIBUTION

The Landuse distribution of Itanagar Capital Region planning area has been classified into following major heads and subheads:

- **Transportation** - Under the head transportation, the entities that have been included are: Roads, Bus Depots, Railway Track, Railway station and Airport.
- **Public/Semi-Public** – This mainly includes the areas, which are dedicated for public services. This involves Governmental/ semi-governmental buildings, educational/ institutions, Medical & Health facility, the social, cultural & the religious places and the utilities and services.
- **Agriculture** - This encompasses the agricultural land within the planning area.
- **Residential** - The residential area has been divided into Primary and Mixed residential areas.
- **Open Space** - The open spaces and multi-purpose open space (maidan) are clubbed under the same head as open space.
- **Commercial** - The area, which is dedicated for commercial purpose, is considered under this head.
- **Water Bodies** - The entities like rivers, canals, lakes etc. are grouped under this head.
- **Recreational** - The areas like parks, playgrounds, stadium and sport complex are considered as recreational areas altogether.
- **Industries** - In Itanagar, heavy & extensive industries and service & light industries exist within the planning area limit, so under the category of industries, these two types of industries are included.

Table 21: Existing Landuse distribution in ICR region

S. No	Landuse	Area (Sq.KM)	Area (Hect.)	Area (Acr.)	% Area
1	Agricultural Land	16.96	1695.90	4190.65	6.26
2	Canal	0.00	0.11	0.26	0.00
3	Central Govt. Property	0.26	25.79	63.72	0.10
4	Commercial	0.80	79.96	197.59	0.30
5	Communication	0.10	9.67	23.89	0.04
6	Eco-Sensitive Areas	0.28	27.78	68.65	0.10
7	Educational	2.13	212.80	525.85	0.79
8	Green Areas	197.26	19725.67	48743.11	72.79

9	Health Services	0.11	10.94	27.03	0.04
10	Heritage	0.00	0.27	0.67	0.00
11	Industrial	0.39	38.61	95.40	0.14
12	Island (River/Lake)	1.12	111.81	276.29	0.41
13	Mixed	0.54	54.06	133.58	0.20
14	Others	0.13	12.93	31.94	0.05
15	Ponds Dry	0.09	9.42	23.29	0.03
16	Ponds Wet	0.62	61.90	152.96	0.23
17	Public Utilities	0.07	7.04	17.38	0.03
18	Public& Semi-public	0.26	26.07	64.42	0.10
19	Railway Property	0.20	19.92	49.23	0.07
20	Recreational	0.47	46.70	115.40	0.17
21	Religious	0.14	14.26	35.24	0.05
22	Residential	21.38	2137.79	5282.58	7.89
23	River Dry	5.34	533.78	1319.00	1.97
24	River Wet	3.15	314.86	778.02	1.16
25	Road	2.75	275.33	680.36	1.02
26	Solid Waste Management	0.01	1.08	2.68	0.00
27	Specific Land use	0.13	12.52	30.95	0.05
28	State Govt. Property	1.45	144.92	358.10	0.53
29	Stream Dry	4.09	409.17	1011.08	1.51
30	Stream Wet	0.90	89.70	221.66	0.33
31	Traffic related	0.01	1.13	2.80	0.00
32	Transportation	0.18	18.11	44.75	0.07
33	Vacant Land	9.13	912.60	2255.09	3.37
34	Wastelands	0.57	57.40	141.83	0.21
	Grand Total	**271.00**	**27100.00**	**66965.46**	**100.00**

Table 22: Existing Landuse distribution in Itanagar

S.No	Landuse	Area(Sq.KM)	Area(Hect.)	Area(Acr.)	% Area
1	Agricultural Land	0.86	86.24	213.11	5.06
2	Canal	0.00	0.11	0.26	0.01
3	Central Govt. Property	0.16	15.52	38.36	0.91
4	Commercial	0.24	24.00	59.30	1.41
5	Communication	0.09	8.81	21.77	0.52

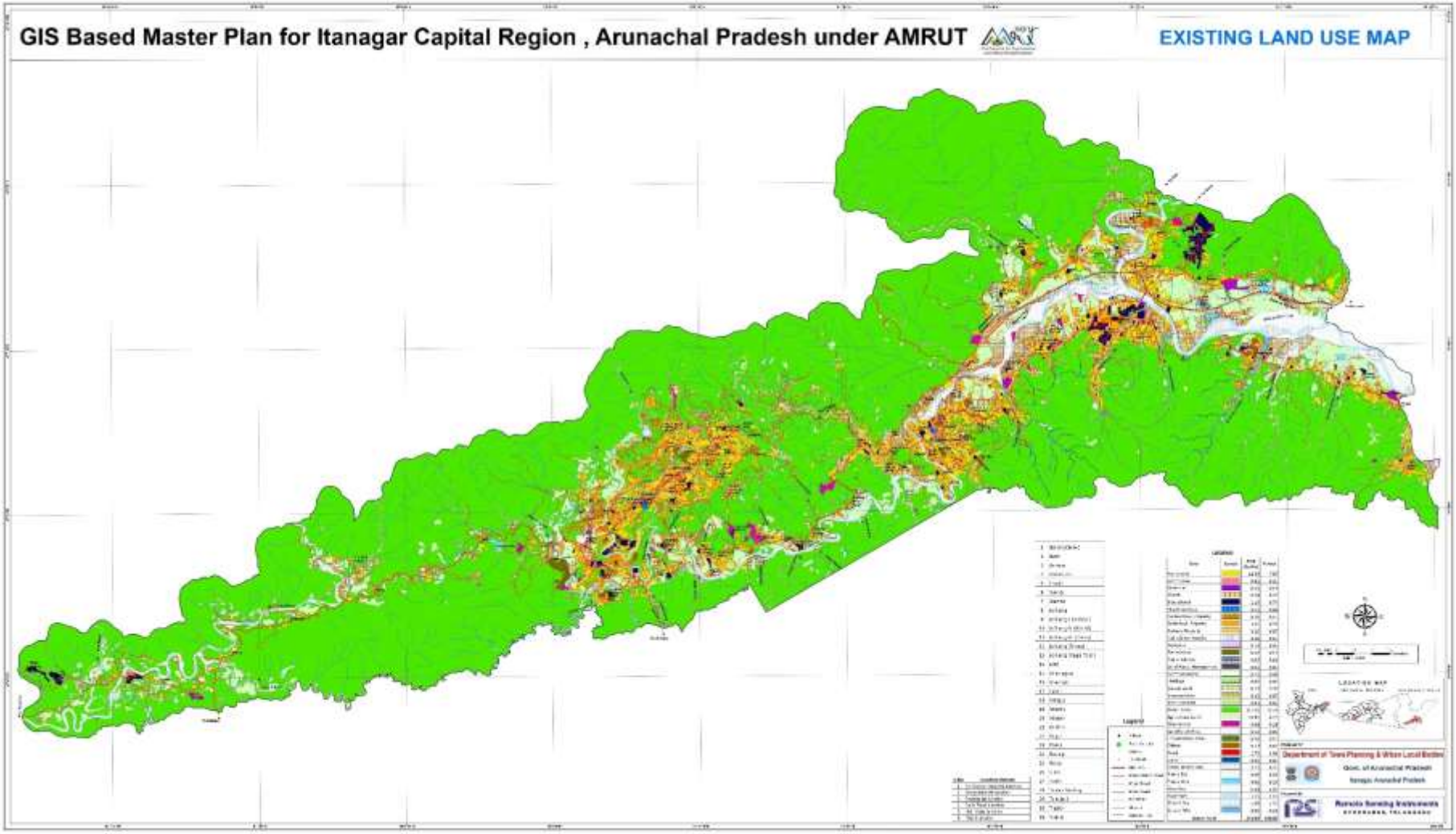
6	Educational	0.40	40.00	98.84	2.35
7	Green Areas	5.25	525.36	1298.18	30.82
8	Health Services	0.06	5.54	13.68	0.32
9	Heritage	0.00	0.27	0.67	0.02
10	Industrial	0.01	0.53	1.30	0.03
11	Mixed	0.34	34.34	84.87	2.01
12	Ponds Dry	0.02	2.17	5.36	0.13
13	Ponds Wet	0.02	1.96	4.85	0.12
14	Public Utilities	0.03	3.32	8.19	0.19
15	Public& Semi-public	0.14	14.15	34.97	0.83
16	Recreational	0.21	20.64	51.01	1.21
17	Religious	0.05	4.84	11.95	0.28
18	Residential	6.33	633.00	1564.18	37.14
19	River Dry	0.15	14.71	36.34	0.86
20	River Wet	0.18	17.92	44.29	1.05
21	Road	0.69	69.35	171.37	4.07
22	State Govt. Property	0.81	80.86	199.81	4.74
23	Stream Dry	0.21	21.46	53.04	1.26
24	Traffic related	0.00	0.36	0.90	0.02
25	Transportation	0.02	2.41	5.96	0.14
26	Vacant Land	0.70	70.21	173.50	4.12
27	Wastelands	0.06	6.45	15.93	0.38
	Grand Total	**17.05**	**1704.53**	**4211.98**	**100.00**

Table 23: Existing Landuse distribution in Naharlagun

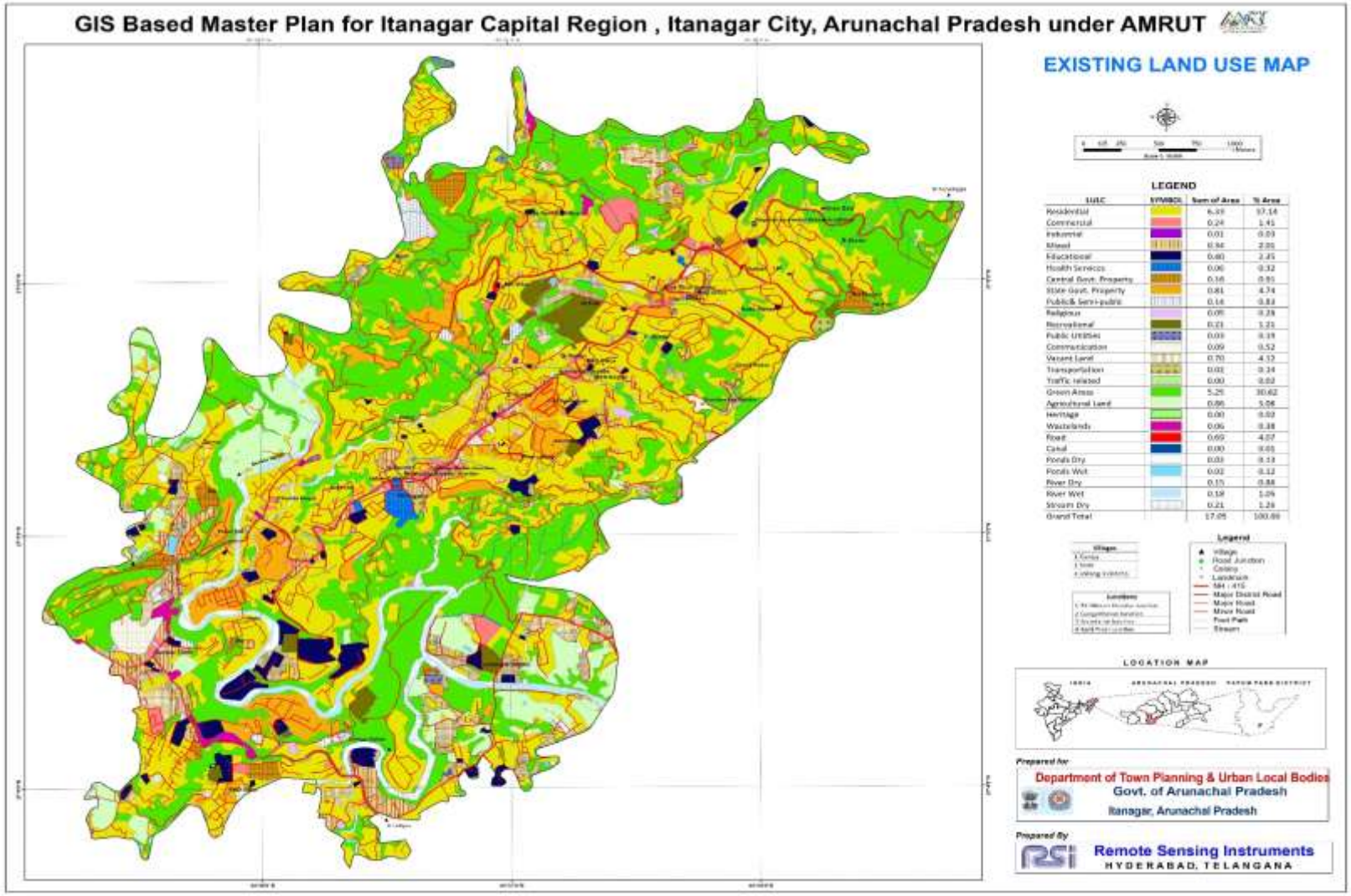
S.No	Landuse	Area(Sq.KM)	Area(Hect.)	Area(Acr.)	% Area
1	Agricultural Land	0.73	72.95	180.27	8.23
2	Central Govt. Property	0.03	2.81	6.94	0.32
3	Commercial	0.27	27.16	67.12	3.07
4	Communication	0.01	0.76	1.87	0.09
5	Educational	0.14	14.11	34.87	1.59
6	Green Areas	1.27	127.02	313.88	14.34

7	Health Services	0.04	3.92	9.68	0.44
8	Industrial	0.06	6.44	15.90	0.73
9	Island (River/Lake)	0.09	8.65	21.36	0.98
10	Mixed	0.13	12.63	31.21	1.43
11	Others	0.00	0.32	0.80	0.04
12	Ponds Dry	0.00	0.13	0.31	0.01
13	Ponds Wet	0.00	0.48	1.18	0.05
14	Public Utilities	0.01	0.81	1.99	0.09
15	Public& Semi-public	0.03	3.02	7.46	0.34
16	Recreational	0.10	9.84	24.31	1.11
17	Religious	0.03	3.09	7.63	0.35
18	Residential	3.92	392.50	969.88	44.30
19	River Dry	0.21	20.93	51.71	2.36
20	River Wet	0.15	15.45	38.19	1.74
21	Road	0.36	36.01	88.99	4.06
22	State Govt. Property	0.13	12.72	31.44	1.44
23	Stream Dry	0.12	12.17	30.06	1.37
24	Stream Wet	0.07	7.22	17.84	0.81
25	Traffic related	0.00	0.01	0.03	0.00
26	Transportation	0.04	3.98	9.84	0.45
27	Vacant Land	0.91	90.95	224.74	10.26
	Grand Total	**8.86**	**886.07**	**2189.53**	**100.00**

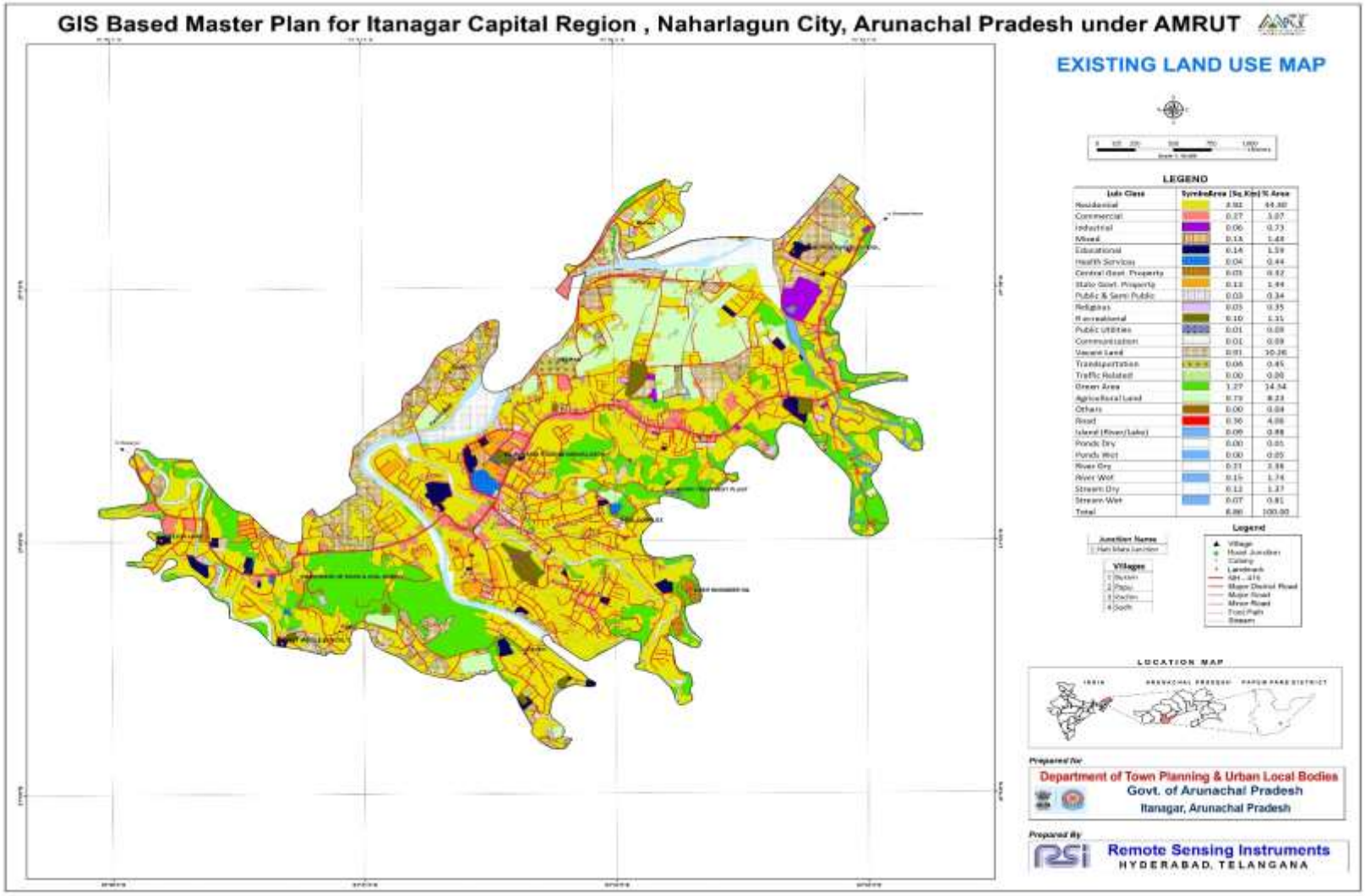
Source: Calculated values



Map 11: Existing Land Use Map under Municipal Boundary



Map 12: Existing Land Use map of Itanagar



Map 13: Existing Land Use map of Naharlagun

11.1 Residential Area

The area of land coming under residential area in the city is 2137.8 Hectares. This is just 7.89% of the total planning area. As per the projected population for 2040, the city has to accommodate 4,70,000. This indicates a growth of no. of households by 45%. The maximum residential development is near the railway station area, Jollang, Chimpu, Ganga market area, Naharlagun, Itanagar, Karsingsa and Birsa Chowk. Residential development is also observed in villages that are added to the current municipal boundary, but this growth is in a scattered and unorganized manner.

11.2 Commercial Areas

Land under commercial area accounts for 0.3% of the planning area. Commercial growth is limited to the areas adjacent to the major roads. The adjoining village areas lack in commercial centers and overall commercial activities are limited in the city on a daily basis. Weekly market takes place on Fridays, which attract people from adjoining villages to the city. The major commercial activities in the town include grocery stores, daily need stores, textiles, sweet shops etc.

11.3 Industrial Areas

The area coming under industries is 0.14% of the total developed land. There is no specified industrial zone. Industries are scattered in the city and lie closer to the core area of the city. The major industries include rice mills and soap factories. Bamboo industry, saw mill etc. are also present within the city.

11.4 Public Semi-Public Areas

Land under educational institutions, medical facilities, police stations and police lines, religious, graveyards and other community facilities which is grouped under public and semi-public use constitutes 0.1% of the developed area. Nagar Panchayat office, PHED Office, Electricity office, Schools etc. are the major public or semi-public building within the city. There are no public or semi-public areas in the village areas.

11.5 Transport & Communication

Road network and related infrastructure is the most important sector for urban development. Efficient connectivity and improved linkages help in developing linkages between the market and the produce. The area coming under Transport & Communication is 1.12% of the developed area, without considering airport, which is non-functional as of now.

11.6 Recreational Areas

There is only 0.17% of developed land coming under recreational use. This is equal to just 46.7 hectares of land, which is very much less when compared to the URDPFI Guidelines. There are open areas available for development of parks or recreation centers in the planning area.

11.7 Distance Based Land Use Distribution from the Centre

It is very important to understand the spatial distribution of the planning area from the core area towards the periphery. In order to get an outlook over the Landuse distribution of planning area a distance based spatial analysis has been taken into account. The interval of 2 km is considered until 4.5km whose Landuse distribution is illustrated below:

Table 24: Landuse within 0 km – 2 km from the center

Landuse	Area (in Hectare)	Area (in %)
Agriculture	825.95	66.04
Residential	120.99	9.67
Commercial	3.58	0.29
Industrial	23.23	1.86
Public & Semi Public	17.99	1.44
Recreational	0	0.00
Open Space	113.32	9.06
Transport & Communication	124.78	9.98
Water Bodies	20.91	1.67
Total	**1250.75**	**100.00**

Source: Calculated values

Table 25: Landuse within 2 km – 4 km from the center

Landuse	Area (in Hectare)	Area (in %)
Agriculture	2479.57	84.51
Residential	71.98	2.45
Commercial	0.08	0.00
Industrial	2.14	0.07
Public & Semi Public	1.15	0.04
Recreational	0.98	0.03
Open Space	224.91	7.67
Transport & Communication	106.12	3.62
Water Bodies	47.12	1.61
Total	**2934.05**	**100.00**

Source: Calculated values

Table 26: Landuse within 4 km – 6 km from the center

Landuse	Area (in Hectare)	Area (in %)
Agriculture	1592.95	96.83
Residential	29.91	1.82
Commercial	0.00	0.00
Industrial	0.00	0.00
Public & Semi Public	0.00	0.00
Recreational	0.00	0.00
Open Space	8.86	0.54
Transport & Communication	13.41	0.82
Water Bodies	0.00	0.00
Total	**1645.13**	**100.00**

Source: Calculated values

Table 27: Landuse within 6 km – 8 km from the center

Landuse	Area (in Hectare)	Area (in %)
Agriculture	174.9	89.19
Residential	6.83	3.48
Commercial	0.00	0.00
Industrial	0.00	0.00
Public & Semi Public	0.00	0.00
Recreational	0.00	0.00
Open Space	8.86	4.52
Transport & Communication	1.06	0.54
Water Bodies	4.44	2.26
Total	**196.09**	**100.00**

Source: Calculated values

It is required to reallocate the land use in such a way that it will ease up the process of transformation of ICR from a rural settlement to an urban center. There are possibilities of emergence of new industries, but land has to be allocated for that so that the development won't happen in a haphazard manner. Areas need to be earmarked for open spaces or play ground or parks. It is also required to allocate area for residential development considering the future expansion of city and growth of population.

CHAPTER- 12: SWOT ANALYSIS

WATER SUPPLY			
Strengths	**Weaknesses**	**Opportunities**	**Threats**
-Availability of ground water sources sufficient to cater the population of horizon year 2041 in the urban area. -The water from bore wells is of potable quality.	-No coverage with metered connection. 54% of total Population doesn't have pipe water supply. -Intermittent water supply for duration of 4 hours a day. -Inadequate power supply to supply water for longer period of time. -The existing water pipelines are more than 10 years old. -Shortage of technical manpower both at ULB and state level.	-100% metering will lead to 100% collection of water taxes, thereby increasing the revenue. -Improvement in quality of water supply. -Per capita supply of 135 lpcd with adequate pressure in town, especially in outer areas.	-Pollution concerns in ICR due to the presence of soap and other industries and lack of proper sewerage and solid waste management system. -Untreated sewage disposal to open areas and surface water sources will result in water pollution.
SEWERAGE			
Strengths	**Weaknesses**	**Opportunities**	**Threats**
-Topography of the town to provide easy passage to sewage.	-Current system is unplanned and	-People are aware about the problems	-Sewage is getting mixed with storm water drains

	constructed in a haphazard manner. -Large-scale investment is required. -No sewage treatment plan.	due to lack of sewerage network.	polluting natural water bodies. -Limited resources available for ULB
STORM WATER DRAINAGE			
Strengths	**Weaknesses**	**Opportunities**	**Threats**
-Topography of the town to provide easy passage to storm water -Town is generally free from major water logging and flooding.	-Dumping of solid waste in drains resulting in clogging -Discharge of untreated sewage into storm water drains and then into ponds and Nallah -Absence of storm water drainage in squatter settlements	-Opportunity to use natural drains as recreational spots -Opportunity to practice rain water harvesting	-Pollution of natural drains and ponds by untreated sewage -Construction of storm water drains in narrow streets and squatter settlements is challenging -Huge investment is required for the development of storm water drains
SOLID WASTE MANAGEMENT			
Strengths	**Weaknesses**	**Opportunities**	**Threats**
-Due to high percentage of organic waste, setting up of	-No door to door collection of waste	-Manure pits or compost plants can be developed	-Environmental degradation

compost plant or vermin compost or manure pits would be successful -Willingness of citizens to pay -Availability of Land for setting up infrastructure	-Open dumping of waste -No segregation of waste -Dumping of waste in drains -No recycling methods are adopted	-Recycling can be practiced -Collection of user charges can be a source of income for ULB	-Ignorance of public on solid waste management
POWER SUPPLY			
Strengths	**Weaknesses**	**Opportunities**	**Threats**
-Initiatives are taken towards electrifying all households within the municipal area	-Adjoining villages have poor electrification -Heavy investment is required	-100% electrification can have a positive impact in overall living conditions of the people of Chakulia. -Solar power can be used in villages that are not well electrified	-Theft in the sector, especially for unmetered connections

Other Analysis:

A careful look at possible strengths and opportunities besides existing and potential thresholds available in the area has been made to develop an optimal development scenario for Itanagar Capital Region.

Strengths

The major strengths of the ICR city are:

- The location of the city is in between two major industrial areas

- Itanagar & Naharlagun is the major commercial and economic centers for the nearby villages.
- Availability of clean groundwater makes the city independent from outside sources for drinking water.
- Large amount of open land is available for future development in ICR.

Weaknesses

The following are the major weaknesses of the city.

- Unplanned network of internal roads and poor road conditions.
- Lack of employment opportunities for graduates within the city, resulting in migration from Itanagar to other cities, mainly Guwahati.
- Poor coverage of basic infrastructure such as water supply, electricity, drainage, sewerage etc. resulting in substandard living conditions.
- Poor sanitary conditions exist in the city.
- Lack of revenue generating options for Urban Local Body.

Opportunities

There are several opportunities to improve the existing condition of the city. They are:

- The villages around ICR are dependent on the city for education, trade and other facilities. Thus, there is potential for future development.
- The abandoned Tourism in ICR can be put into use that can boost up the economic activities within the city.
- Large amount of barren land is available which can be put into productive purposes.
- The ULB can impose different forms of taxes so that revenue can be generated and operation and maintenance cost of services can also be recovered by taxation.

Threats

The following are the major threats that city of ICR may have to face in future:

- Depletion of the ground water reserve due to increasing population and industries.
- Pollution of surface water sources because of poor sewerage and solid waste management.
- Unhygienic living conditions in many areas of the city and threats caused by epidemics.
- Inability of the city to cater for the employment requirements of the growing population. Growth is concentrated only to the core area of the town.

CHAPTER-13: PROPOSALS FOR ICR

Many alternatives for the project area were designed and tested with a view to implement the desired design principles and to test the workability and feasibility of achieving the project objectives. They have been very useful in identifying the land to be allocated to various urban elements i.e., residential & commercial pockets, roads and open spaces, the typology of development and the built form character. These alternatives helped envisage physical manifestations of the vision and program brief proposed for the project area. The main goal of each was to create a logical and efficient use of land in response to the natural features.

In the course of planning the ICR, planning issues were surfaced. The planning proposals for ICR will outline the development objectives of the town. The focus of the land use proposal is to ensure adequate and balanced spread of residential, industrial & other uses so that sustainability can be achieved. Active allocation of complementing land uses is displayed through seamless integration of land uses, transport and economic activities.

13.1 Draft Proposals

To address the issues of erratic urbanization, to direct the growth direction of the city in a planned manner and to cater for the future demands of the growing population of the city & influx of the migrating population into the city, there is a need to develop both short-term and long-term goals that affect cross-sectoral issues and provide better physical and social infrastructural facilities for the existing and future population demands of the region.

Table 28: List of Draft proposals

Sl.no.	Master plan Proposals	
1	Road widening	1.1 Road widening along various stretches of roads in ICR to 40-, 60-, 80- and 100-feet roads
2	Junction Improvement	2.1 Junction improvement of Rama Krishna mission hospital junction
		2.2 Junction improvement of Ganga Market junction
		2.3 Junction improvement of Secretariat junction
		2.4 Junction improvement of Bank Tinali junction
		2.5 Junction improvement of Hathi matha junction
		2.6 Junction improvement of Nirjuli junction

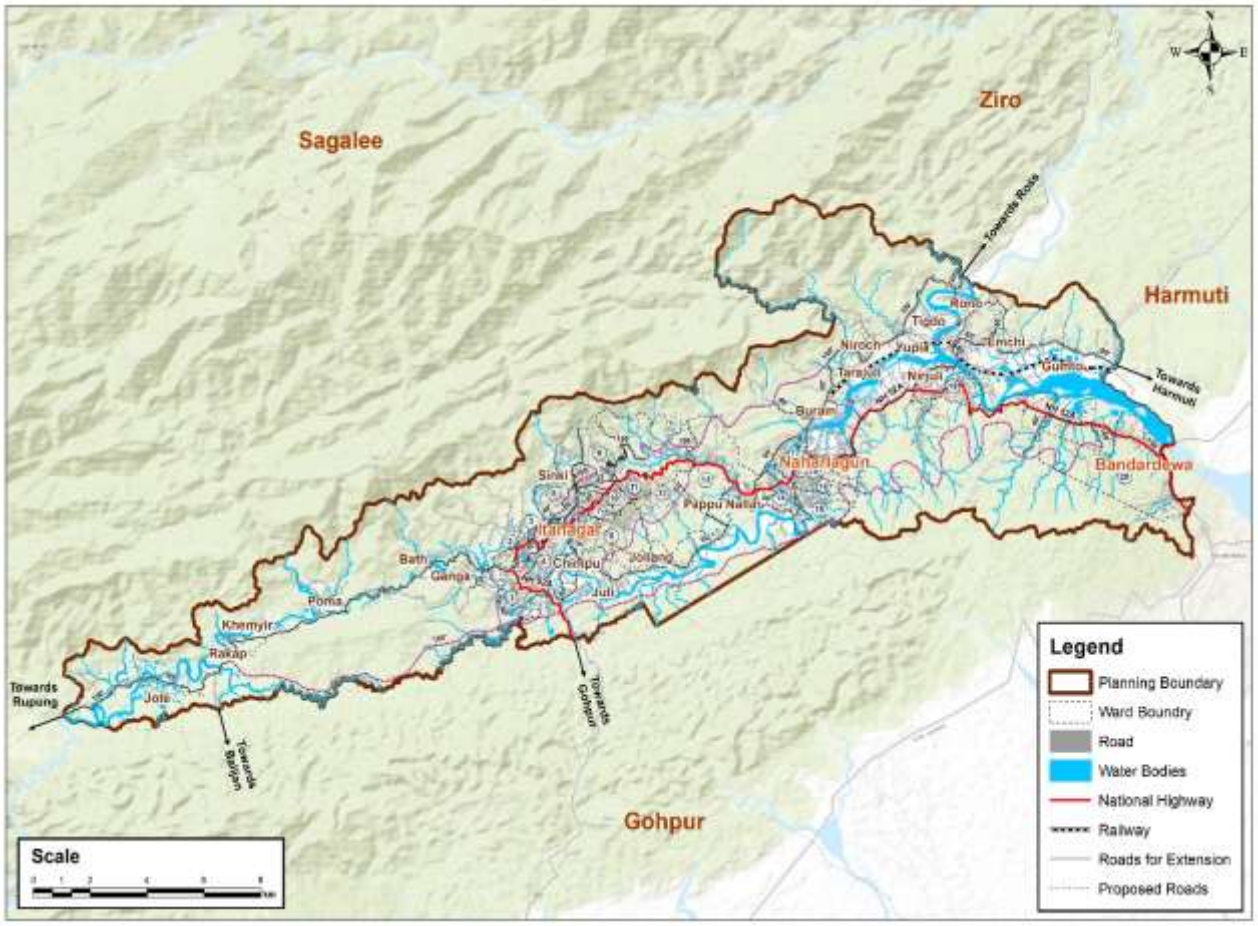
3	Footpaths	3.1 Provision of footpaths of 1.8 mts wide along Ganga Market road in Itanagar
		3.2 Provision of footpaths of 1.8 mts wide along Hathi Matha stretch in Naharlagun
		3.3 Provision of footpaths of 1.8 mts wide along Nirjuli stretch
		3.4 Provision of footpaths of 1.8 mts wide along Banderdewa stretch
4	Inter connecting bridge	4.1 Inter connecting bridge linking Naharlagun railway station road and National highway-415.
5	Flyover	5.1 Flyover at Ganga market junction and Bank Tinali junction
6	Alternative routes	6.1 Alternative route from Itanagar to Near Pappu Nalla via Juli Basti Road
		6.2 Alternative route from Pappu Nalla to Rono basti via Yupia and Kula Camp
		6.3 Alternative route from Nirjuli to Banderdewa via Doimukh, Emchi and Gumto
7	Median	7.1 Developing median for NH-415 in ICR
8	Housing	8.1 Scope of residential expansion near Chimpu and Jule basti, Railway station and Helipad in Naharlagun.
9	Drainage	9.1 New drainage network is proposed in Itanagar and Naharlagun
10	Sewerage	10.1 Provision of STP at Itanagar & Naharlagun with 4 MLD capacity
11	SWM	11.1 Proposed Solid Waste management facilities across ICR area
12	Police station	12.1 Provision of Police station near Jote
13	Tourism	13.1 Development of Ganga lake as Eco-tourism area
		13.2 Promotion of Arts and Culture hub
		13.3 Adventure park near Nirjuli bus terminal
14	Commercial	14.1 Developing commercial corridor along NH-415 and other major commercial areas.
15	Industrial area	15.1 Provision of Industrial area near Helipad

16	New roads	16.1 Bypass road from Rakap to Karsingsa
		16.2 Interconnecting road from Bath to Bypass road
		16.3 Hakka village to Donyi Polo
		16.4 Itanagar to Tarajuli
		16.5 Interconnecting roads in Itanagar
17	Education	17.1 Educational regions are allocated near Jote, Juli, Jollang, Nirjuli, Poma, Emchi and Chimpu areas
18	Health	18.1 health regions are allocated near Poma, Chimpu, Itanagar and Naharlagun areas
19	Optical Fiber grid	19.1 New Optical fiber lines are proposed in region
20	Freight and Parking	20.1 Freight and Parking facilities are allocated near Poma area
21	Mass rapid Transit system	21.1 Metro rail/Mono rail transit system
		21.2 Cable car transit system
22	Street Vending Zones	22.1 Street vending zones in ICR

13.2 Road Widening

The National Highway 415, besides providing vital access, acts as a major artery to the city system marked with the presence of large number of markets and commercial areas generating parking demand and high volume of mixed traffic including pedestrians. Poor enforcement has caused severe problems of encroachment. The National Highway has a number of defects like riding quality, poor geometrics, severe bends and s-curves aggravating safety concerns.

The quality of almost the entire road system is extremely poor marked with excessive pavement failure, distressed pavement, potholes and poor maintenance of the road. Poor condition of roads and improper maintenance of the road network are the major issues that ICR faces in the sector of Transportation and communication. As part of the Master Plan, the road stretches that require complete re-laying, or extensive strengthening are identified.

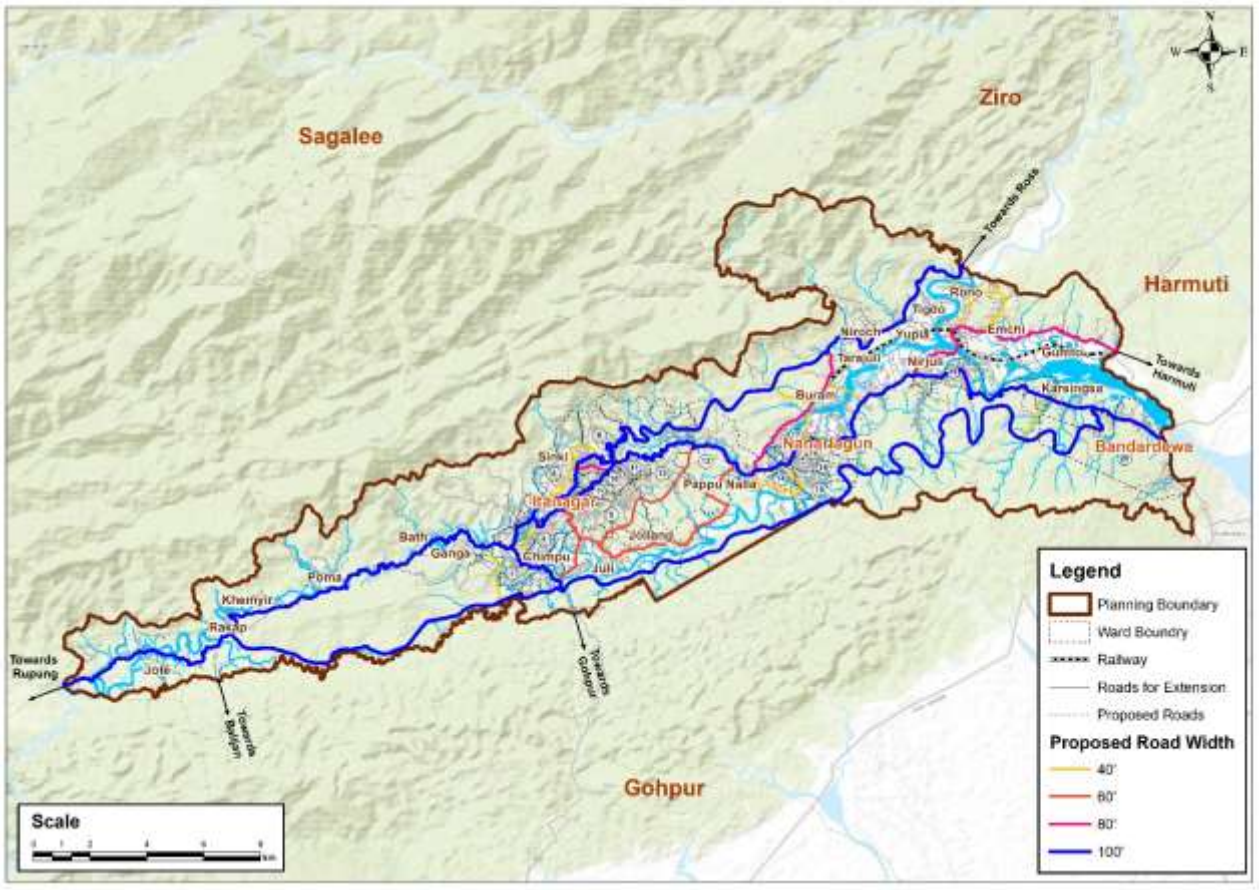


Map 14: Road Network map of ICR area

The road widening is proposed for various stretches of roads on the NH-415, which are majorly located along the major settlements of the ICR region. The road widening is necessary in the city as the existing road NH 415 is chaotic due to increasing in flow of vehicles, improper planning & implementation and unprecedented urban sprawl.

The proposed stretches of road widening are of four different widths based on the existing width of Right of Way and existing shoulder along the stretch of the roads. The proposed stretches of road widths are –

a) 40 feet width
b) 60 feet width
c) 80 feet width
d) 100 feet width



Map 15: Proposed road hierarchy map of ICR region

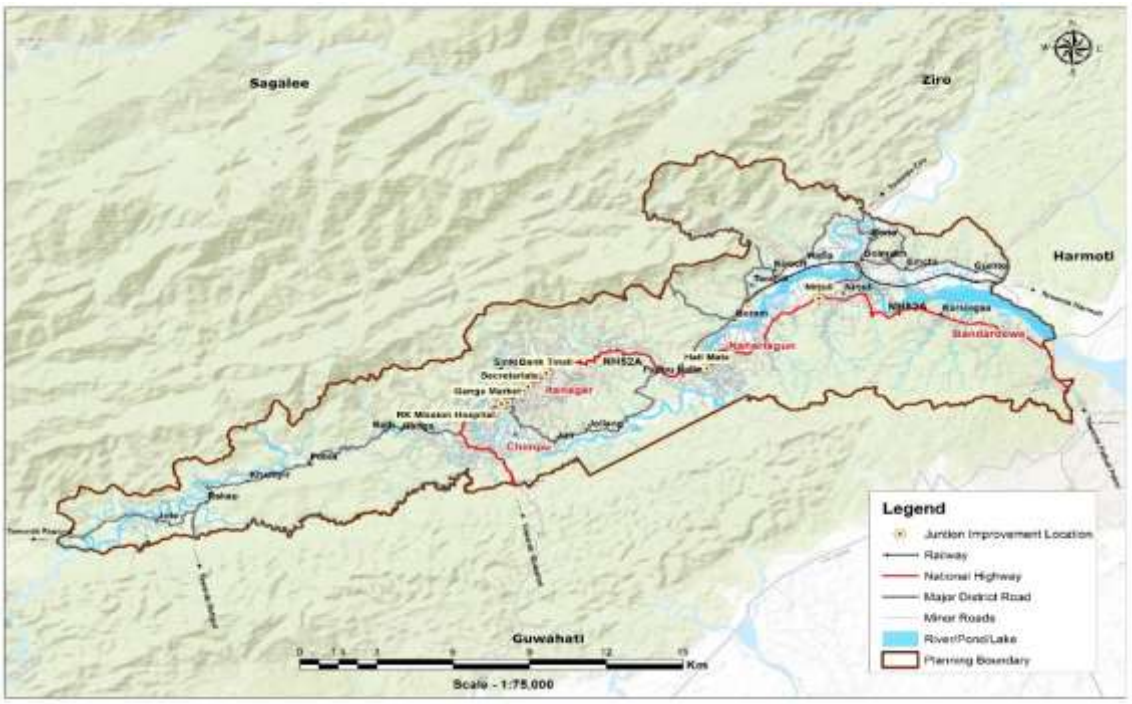
13.3 Junction Improvement

The existing junctions are chaotic and congested due to improper planning & implementation and inefficient traffic management. The Junction improvement plans are proposed for the six major junctions in the ICR region i.e.

1. RK Mission hospital junction
2. Ganga Market junction
3. Secretariat junction
4. Bank Tinali junction
5. Hathi Matha junction
6. Nirjuli junction

Junctional improvement includes provision of disabled/physically handicapped friendly footpaths, spacious medians or dividers, erection of appropriate signboards, traffic signals and construction of traffic islands to regulate and maintain the traffic flow in the junction.

Junction improvement/enhancement are proposed with specific recommendations for each junction separately taking into the recommendation of the municipal officials and based on the observations made from the TVC junction analysis of each junction. The carriageway, footpaths, medians and traffic islands are given a major importance in each junction improvement to regulate the traffic in each arm of the junction



Map 16: Junction improvement locations

RK Mission hospital junction

Rama Krishna Mission hospital junction is situated at the very beginning of the city where the major commercial activity and residential settlements are observed. RK mission hospital junction is a peculiar three arm Y-junction with a small fourth arm protruding from the stalk of the Y-junction. The small protruding arm is the entrance point to the Arunachal Pradesh State Transport Services (APSTS) Bus station of Itanagar.

Figure 1: Existing RK Mission Hospital junction

Being situated on the Start/Exit point of the Itanagar city, the RK mission hospital junction has significant traffic flow that needs immediate management strategy to regulate the flow. An improvement plan is proposed at this junction and the changes for each component of the road area detailed out.

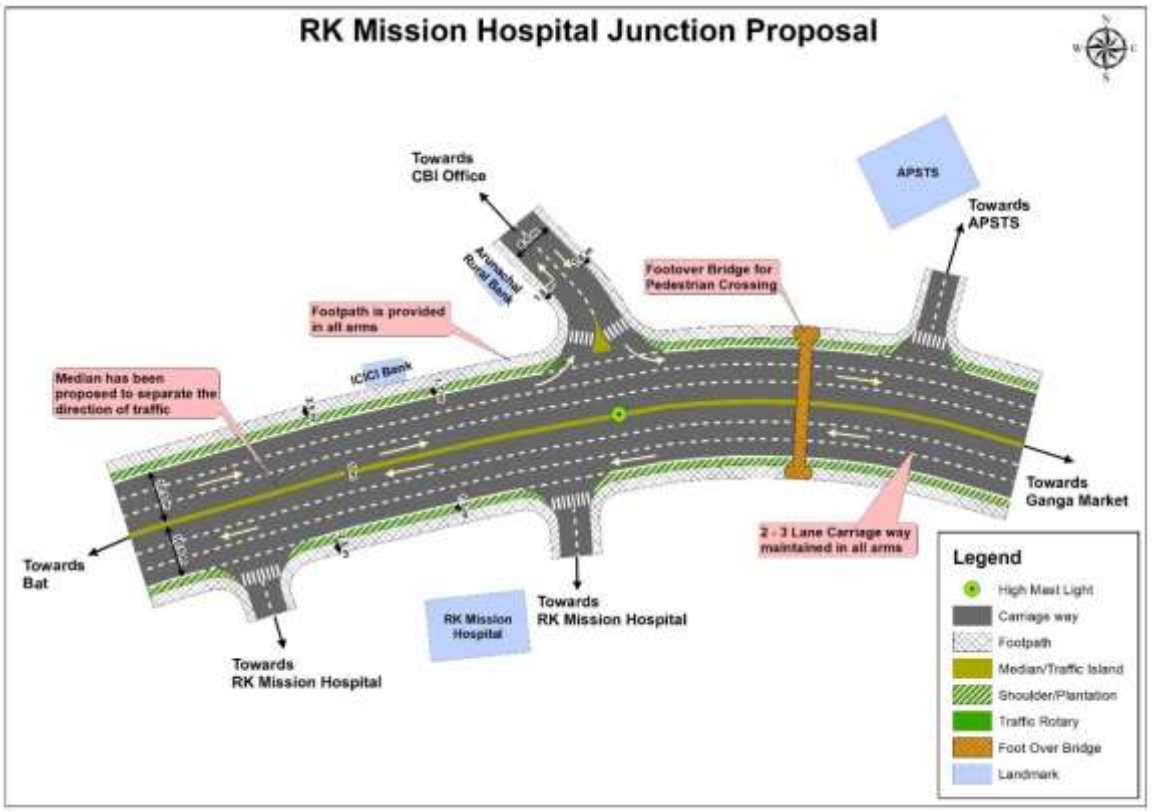


Figure 2: Proposed changes in RK mission Hospital junction

The proposed changes in the existing junction are –

1. Maintenance of carriageway of 10.5 mts on each side of the National highway corridor.
2. A median of 1.0 mts separating the traffic on the National highway corridor.
3. Footpath of 1.8 – 2.5 mts on either sides of all the roads to cater for the pedestrians and physically handicapped/disabled citizens.
4. A high mast light at the intersection of Y-junction.
5. Zebra-crossing lines at all the arm intersection points of the junction.
6. A U-turn at the intersection of the Y-junction on the National highway corridor.
7. A Foot over Bridge (FoB) over the highway for the pedestrians.

Ganga Market junction

Ganga Market junction is situated typically at the center of the Itanagar city where the major public transportation and commercial activity is observed. Ganga market junction acts as the node of transportation for the tourists visiting Itanagar or passing through Itanagar. Ganga Market junction is an asymmetrical four-arm junction with National highway corridor as the major arms and the remaining arms in the direction of Jully Basti road and APSTS bus stand.

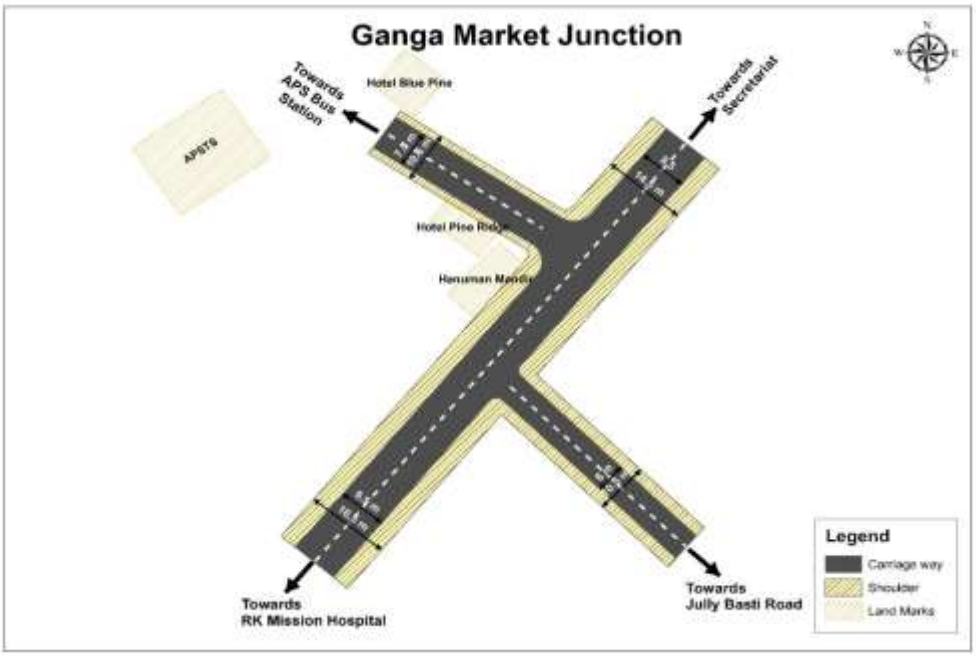


Figure 3: Existing Ganga Market junction

An improvement plan is proposed at this junction and the changes for each component of the road area detailed out.

Figure 4: Proposed changes in the Ganga Market junction

The proposed changes in the existing junction are –

1. Maintenance of carriageway of 10.5 mts on each side of the National highway corridor.
2. A median of 1.0 mts separating the traffic on the National highway corridor.
3. Footpath of 1.8 – 2.5 mts on either side of all the roads to cater for the pedestrians and physically handicapped/disabled citizens.
4. A high mast light at the intersection of three-road junction.
5. Zebra-crossing lines at all the arm intersection points of the junction.
6. Traffic signals at the intersection of the roads on either side of the road.
7. Traffic islands near the intersection point of Jully basti road.
8. Free left from Secretariat to Jully Basti near the intersection.
9. Free left from Jully Basti to RK Mission hospital near the intersection.
10. A Foot over Bridge (FoB) over the highway for the pedestrians.
11. Bus bay on the Secretariat arm of the junction with 0.5 mts median separating it from the main traffic flow on the National Highway corridor.

Secretariat junction

Secretariat junction is situated near the Arunachal Pradesh State Civil Secretariat Bhavan on the National Highway corridor. Secretariat junction is an inverted Y-junction with one arm and the stalk being the National Highway corridor while the other arm of the junction is the entrance point into the Arunachal Pradesh state assembly. Although located on the National highway stretch, the carriageway has reduced to 8.5 mts combining both sides of the road causing stress all along the stretch in this junction.

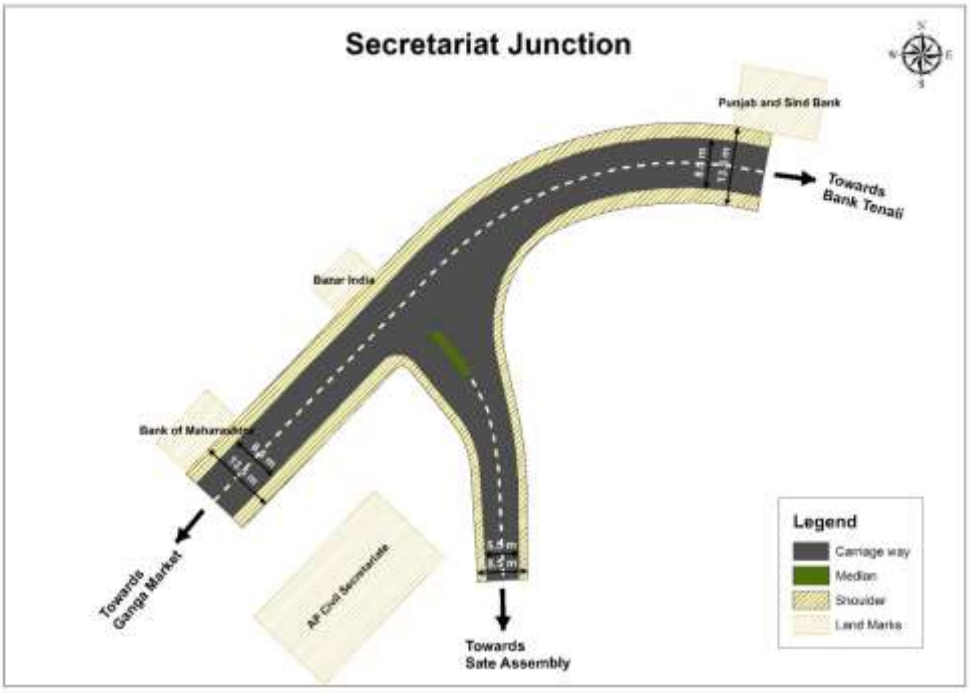


Figure 5: Existing Secretariat junction

Being situated in the center of the city, the Secretariat junction is one of the major junctions handling majority of the traffic flow from Itanagar to Naharlagun. This junction has also significant importance due to its close proximity to the Arunachal Pradesh State Civil Secretariat Bhavan and its development is of prime importance to reduce the traffic flow and regulate the vehicular stress on the junction. An improvement plan is proposed at this junction and the changes for each component of the road area detailed out.

Figure 6: Proposed changes in the Secretariat junction

The proposed changes in the existing junction are –

1. Maintenance of carriageway of 10.5 mts on each side of the National highway corridor.
2. A median of 1.0 mts separating the traffic on the National highway corridor.
3. Footpath of 1.8 – 2.5 mts on either side of all the roads to cater for the pedestrians and physically handicapped/disabled citizens.
4. A high mast light at the intersection of three-road junction.
5. Zebra-crossing lines at all the arm intersection points of the junction.
6. Traffic signals at the intersection of the roads on either side of the road.
7. Traffic islands near the intersection point of road towards State Assembly.
8. Free left from Bank Tinali to State Assembly near the intersection.
9. Free left from State Assembly to Ganga Market near the intersection.
10. A Foot over Bridge (FoB) over the highway for the pedestrians.
11. Maintenance of carriageway of 7mts on the road towards State Assembly.

Bank Tinali junction

Bank Tinali junction is situated on the National Highway Corridor where the VIP road meets the highway. Bank Tinali junction is an asymmetrical four-arm junction with two arms located on the highway and other arms directing towards VIP road and Ita fort.

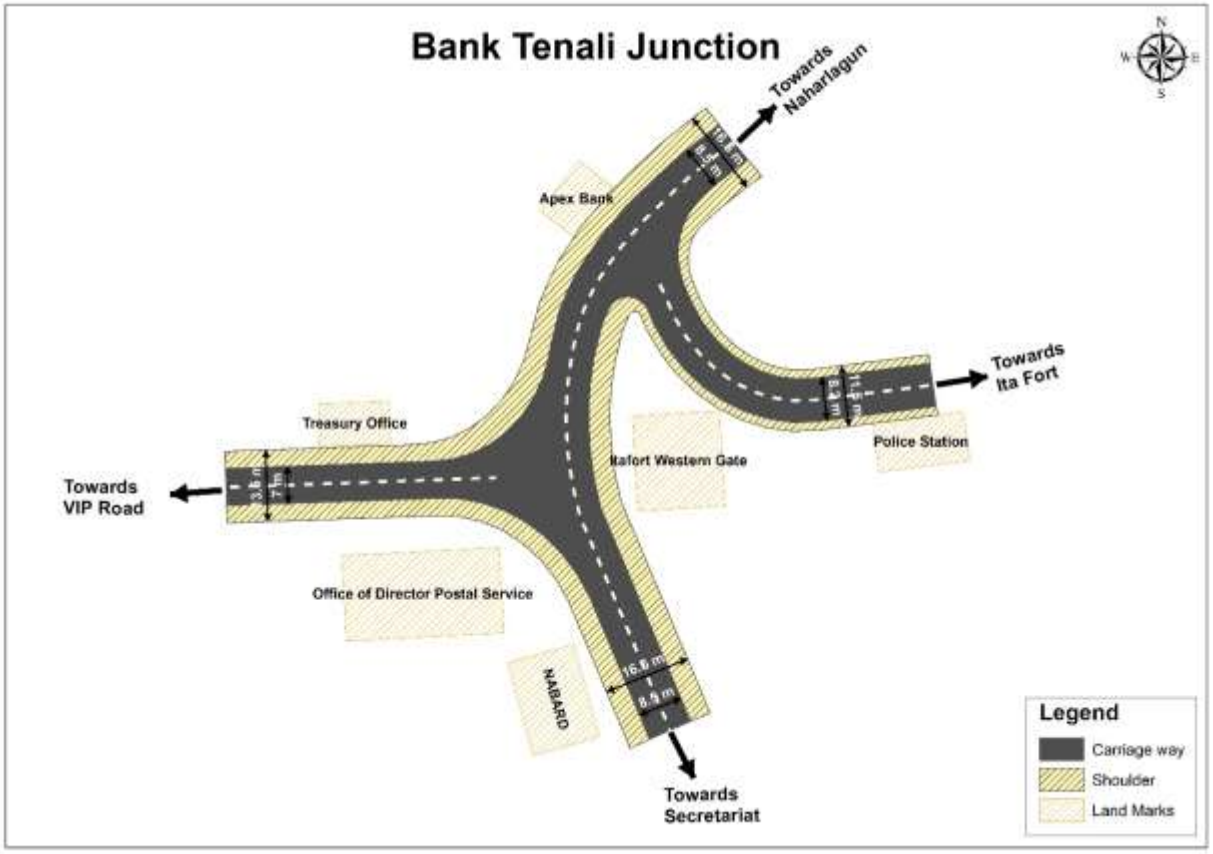


Figure 7: Existing Bank Tinali junction

Bank Tinali junction has significant importance in Itanagar city as the most important economic and financial trade happens in the VIP road. The junction connects Ita fort with National highway corridor and is one of the junction located on the highest terrains of the city. Topography of the junction is highly varied and the VIP road has a downward slope of ~15^0 which leads to the Indira Gandhi Park, Energy park, other major Government offices of the state etc.

Bank Tinali junction is the last junction situated in Itanagar on the National Highway corridor that connects Itanagar and Naharlagun. This junction also connects the National Highway corridor with the rest of the city lying on the North side of the city. An improvement plan is proposed at this junction and the changes for each component of the road area detailed out.

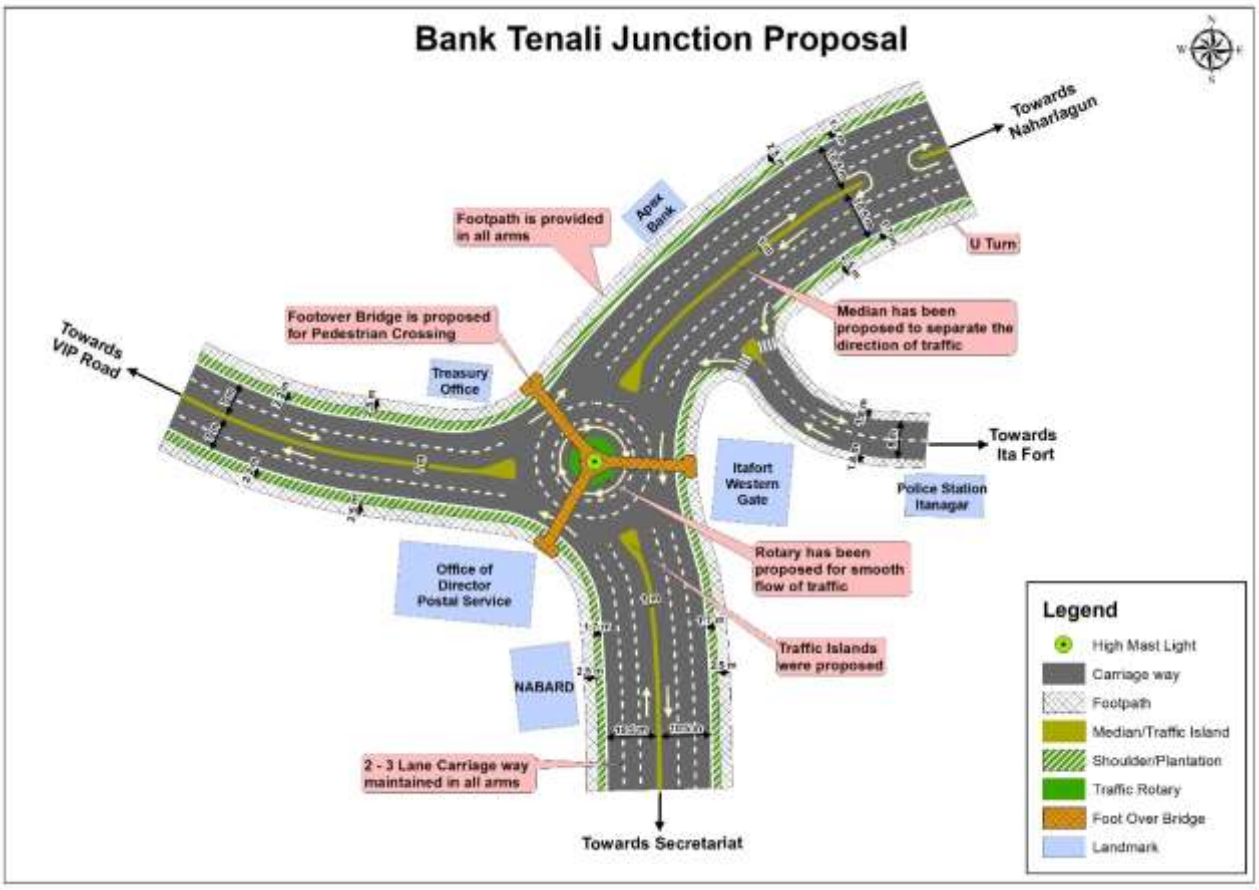


Figure 8: Proposed changes in the Bank Tinali junction

The proposed changes in the existing junction are –

1. Maintenance of carriageway of 3.5 mts on each lane on either side of the National highway corridor in the junction.
2. A median of 1.0 mts separating the traffic on the National highway corridor.
3. Footpath of 1.8 – 2.5 mts on either sides of all the roads to cater for the pedestrians and physically handicapped/disabled citizens.
4. A roundabout at the intersection of three major roads on the National highway corridor.
5. A high mast light at the intersection of the junction.
6. Zebra-crossing lines at all the arm intersection points of the junction.
7. A Foot over Bridge (FoB) over the highway for the pedestrians.
8. Traffic signals at the intersection of the roads on the traffic island roundabout.
9. Traffic islands near the intersection point of road near the Traffic roundabout and near the Ita fort road.
10. Free left from Naharlagun to Secretariat near the intersection.
11. Free left from Secretariat to VIP road near the intersection.

12. Free left from VIP road to Naharlagun near the intersection.
13. Free left from Naharlagun to Ita fort near the intersection.
14. A U-turn on the arm towards Naharlagun.
15. Maintenance of carriageway of 8mts on the road towards Ita fort.

Hathi Matha junction

Hathi Matha junction is situated at the very beginning of the Naharlagun city near Pappu nallah. Hathi Matha junction is a three arm Y-junction with the National highway corridor on the two arms of the junction and third arm directed towards Administrative Training Institute.

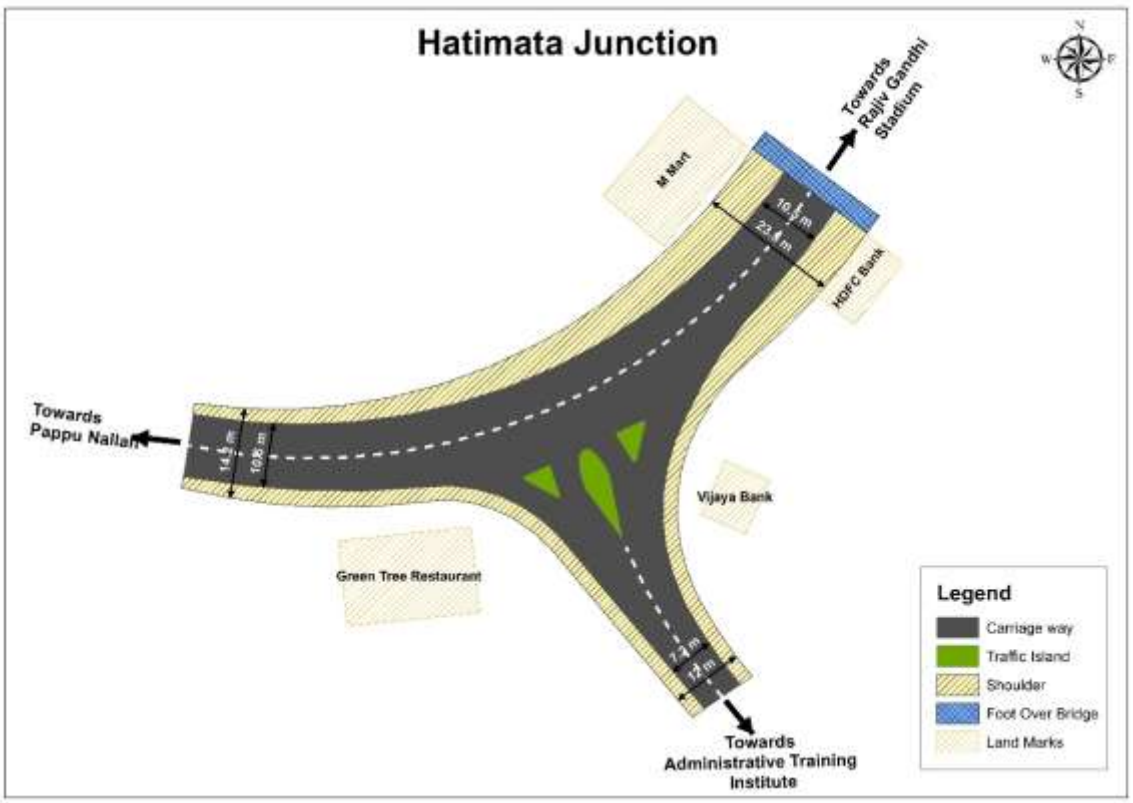


Figure 9: Existing Hathi Matha junction

Being situated at the entry/exit point of the city, Hathi Matha junction is the major junction handling the majority of the traffic flow from the Itanagar into Naharlagun. This junction has significant importance as the major traffic flow stress in Naharlagun can be observed.

Hathi Matha junction has prominent importance due to the presence of Three headed elephant stone carving located at the center of the junction. An improvement plan is proposed at this junction and the changes for each component of the road area detailed out.

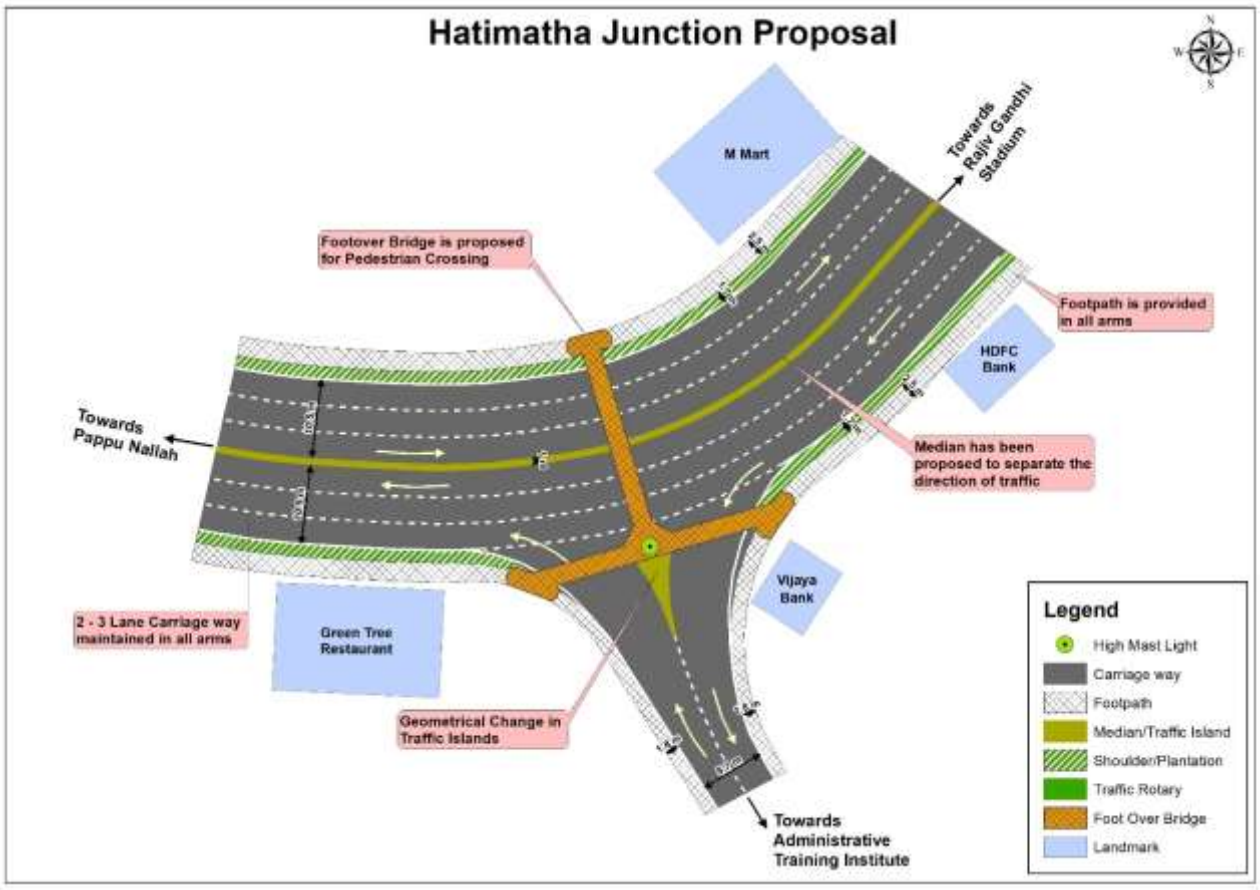


Figure 10: Proposed changes in the Hathi Matha junction

The proposed changes in the existing junction are –

1. Maintenance of carriageway of 3.5 mts on each lane on either side of the National highway corridor of the junction.
2. Maintenance of carriageway of 8.7 mts on the road towards Administrative Training institute office.
3. A median of 1.0 mts separating the traffic on the National highway corridor.
4. Footpath of 1.8 – 2.5 mts on either side of all the roads to cater for the pedestrians and physically handicapped/disabled citizens.
5. A high mast light at the intersection of the junction.
6. Zebra-crossing lines at all the arm intersection points of the junction.
7. A Foot over Bridge (FoB) over the highway for the pedestrians.
8. Traffic signals at the intersection of the roads on the National Highway corridor.
9. Free left from Administrative Training institute to Pappu nallah near the intersection.
10. Free left from Naharlagun city to Administrative Training institute near the intersection.
11. Geometrical changes to the Hathi Matha statue in the junction.

12. Traffic islands near the intersection point of the three arms.

Nirjuli junction

Nirjuli junction is situated at the very beginning of the Naharlagun city near Pappu nallah. Nirjuli junction is a three arm Y-junction with the National highway corridor on the two arms of the junction and third arm directed towards Doimukh connecting Itanagar Capital Region (ICR) with the Northeastern frontier regions of the state.

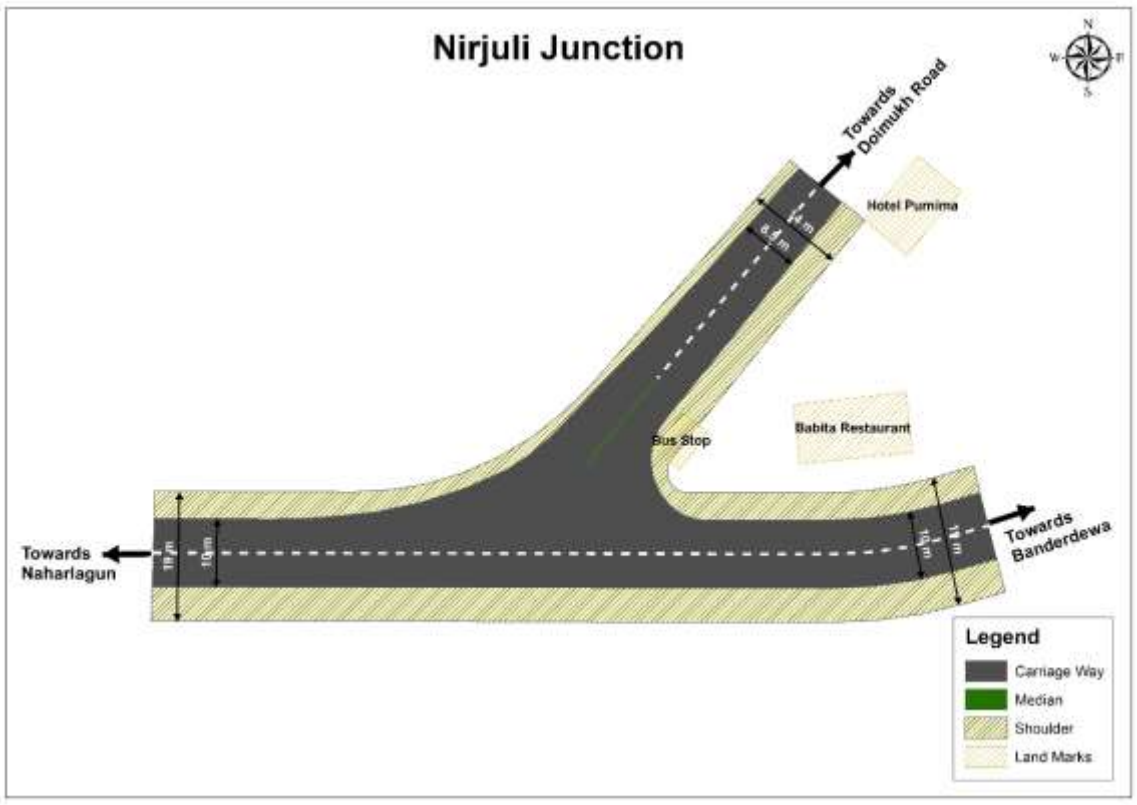


Figure 11: Existing Nirjuli junction

Nirjuli junction is last junction in the Nirjuli region that handles the majority of the traffic flow from the Nirjuli to Banderdewa & Doimukh. This junction has significant importance as the junction connects the Naharlagun-Nirjuli region with Banderdewa & Doimukh/Yupia region.

Nirjuli junction is the major junction that connects the Northern villages and hamlets/settlements with the major portion of the ICR and acts as a gateway for the important destinations like Ziro, Tawang etc. An improvement plan is proposed at this junction and the changes for each component of the road area detailed out.

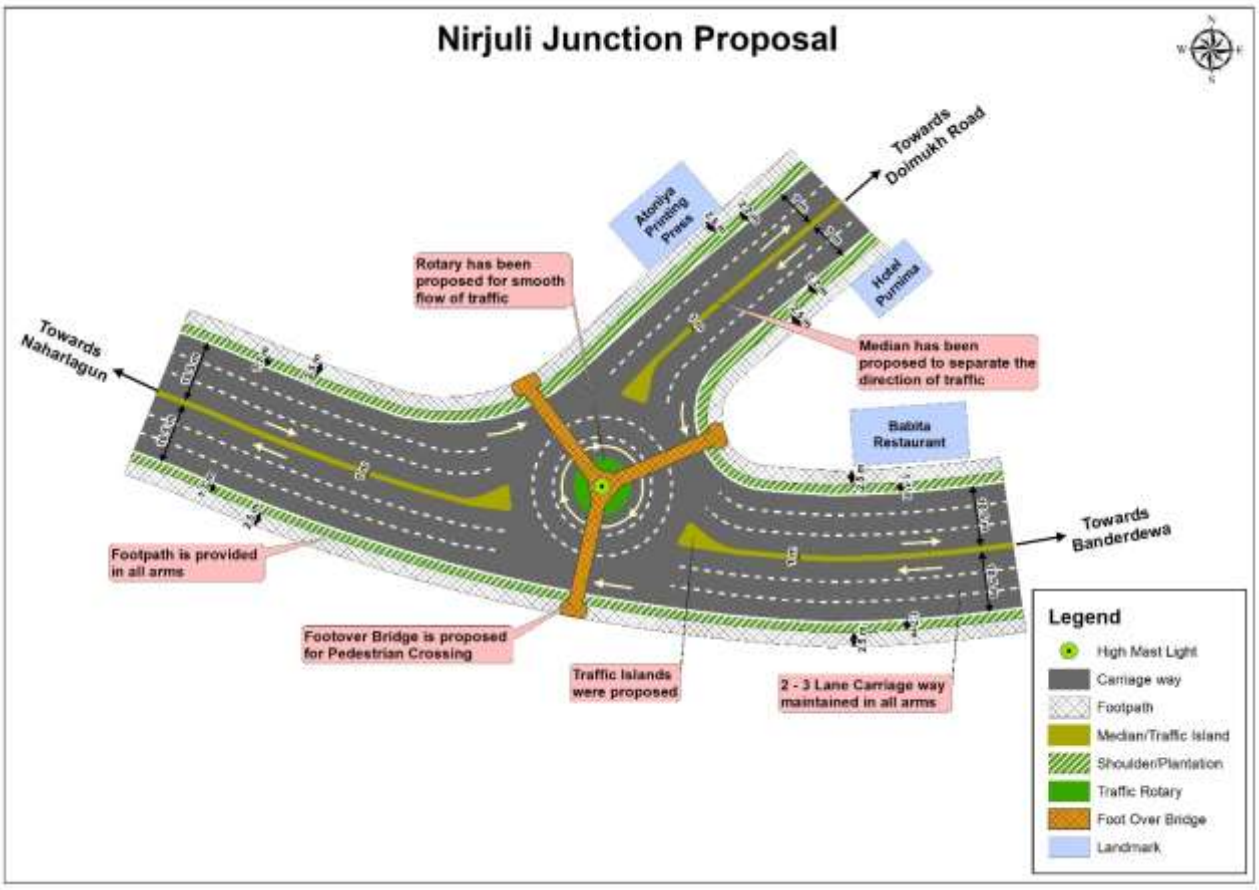


Figure 12: Proposed changes in the Nirjuli junction

The proposed changes in the existing junction are –

1. Maintenance of carriageway of 3.5 mts on each lane on the either side of the National highway corridor.
2. A median of 1.0 mts separating the traffic on the National highway corridor.
3. Footpath of 1.8 - 2.5 mts on either side of all the roads to cater for the pedestrians and physically handicapped/disabled citizens.
4. A high mast light at the intersection of the junction on the traffic island.
5. Zebra-crossing lines at all the arm intersection points of the junction.
6. A Foot over Bridge (FoB) over the highway for the pedestrians.
7. Free left from Naharlagun to Doimukh near the intersection.
8. Free left from Doimukh to Banderdewa near the intersection.
9. Traffic islands near the intersection point of the three arms on the road towards Doimukh.
10. Maintenance of carriageway of 7.0 mts on the road towards Doimukh.

13.4 Provision of footpath

The major commercial areas in the Itanagar Capital Region are located on the National highway corridor and other intercity connecting roads. All the commercial areas located on the major roads have occupied the shoulder region of the carriageway creating a demand for the parking and footpaths for the commuting and pedestrians of the city.

There are no specific footpath zones dedicated for the pedestrians & disabled citizens of the city along all the roads in the ICR region.

Picture 14: Existing walkway

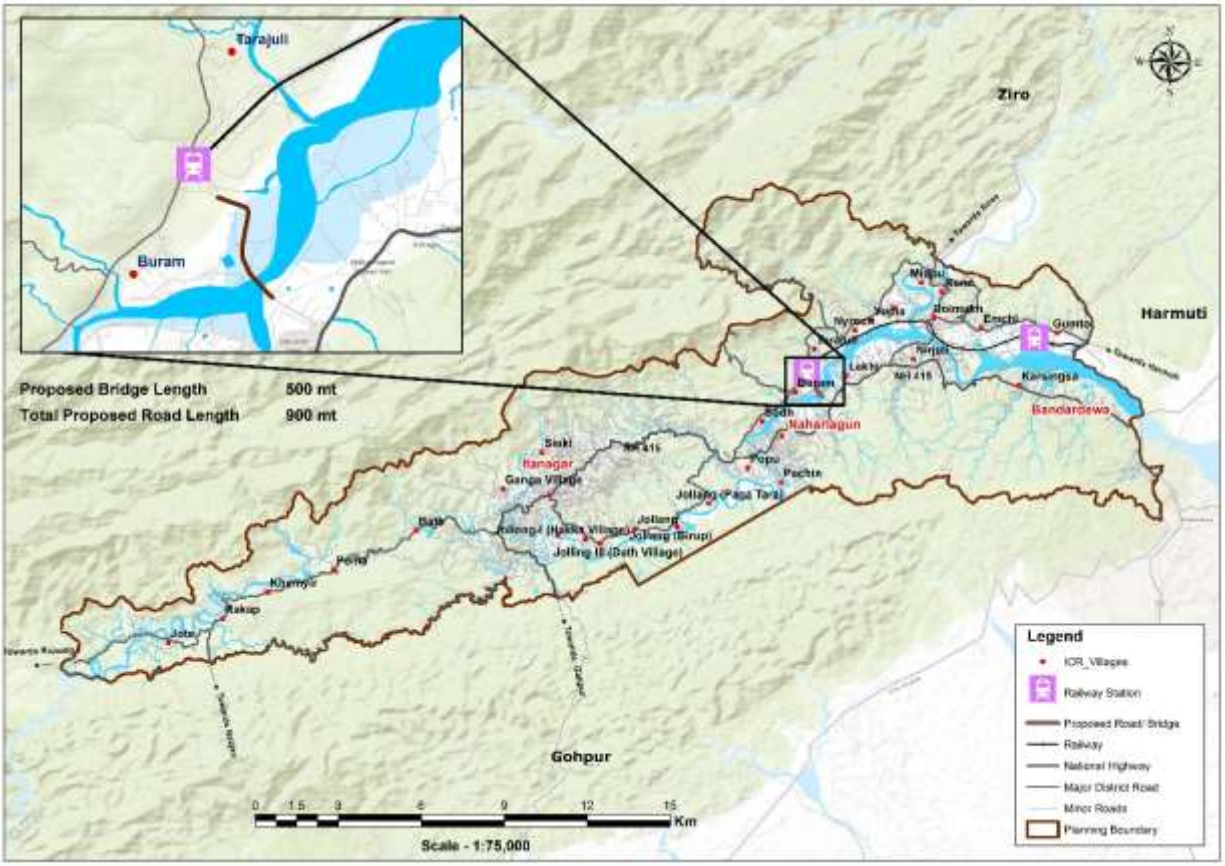
Hence, a minimum standard width of 1.8 mts wide footpath is proposed along all the roads of ICR region. For the commercial corridors in the ICR region, a footpath of 2.5 mts is proposed to cater for the increased demand of the pedestrian traffic. The commercial stretches of the city where the 2.5 mts footpath is proposed are –

1. Ganga Market road - from APSTS entry road to Network bus counter.
2. Hathi Matha stretch – from IGNOU center to foot over bridge.
3. Nirjuli stretch – Indian oil petrol bunk to Nirjuli Police station.
4. Banderdewa stretch – FCI district office to United Bank of India.

Covering the footpaths with greenery for the aesthetics of the area and special provisions like seating facilities, shelters & railing near the commercial areas for the safety of the pedestrians and commuting people are proposed.

13.5 Interconnecting bridge:

Although the Inter State Bus Terminal and Railway station are located on the either side of the Dikrong River, lack of connecting route between Inter State Bus Terminal (ISBT) and Naharlagun railway station is making the people to travel till Pappu nallah and take a long route of 8 kms to railway station and vice versa. The total travel time takes an average of 1 hr 40 mins of time, which makes it inconvenient for the passengers descending in Naharlagun railway station and travel further for the adjacent settlement villages using Inter State Bus Terminal services in Naharlagun.



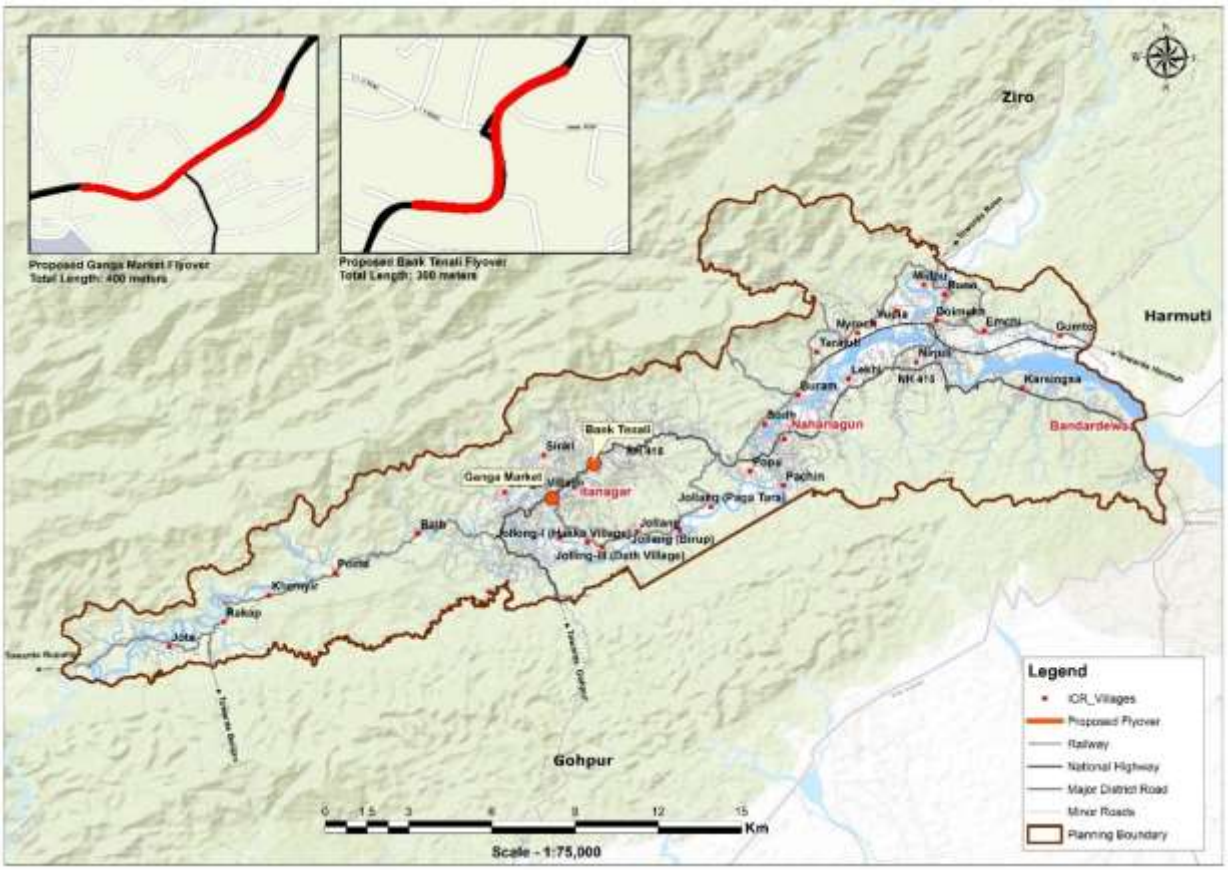
Map 17: Interconnecting bridge map

Hence, an interconnecting bridge of 500 mts is proposed across the Dikrong river connecting the railway station and National highway 415, which reduces the traffic flow and the travel time to less than 30 mins making it convenient for the entry into the city from railway station to the State Bus stand in Naharlagun.

13.6 Proposition of Flyover

To regulate the traffic stress on the roads and maintain uninterrupted traffic flow in the major junctions of the city, construction of flyovers is proposed in the two major junctions of the ICR regions i.e.

1. Ganga market junction – 400 mts flyover
2. Bank Tinali junction – 300 mts flyover



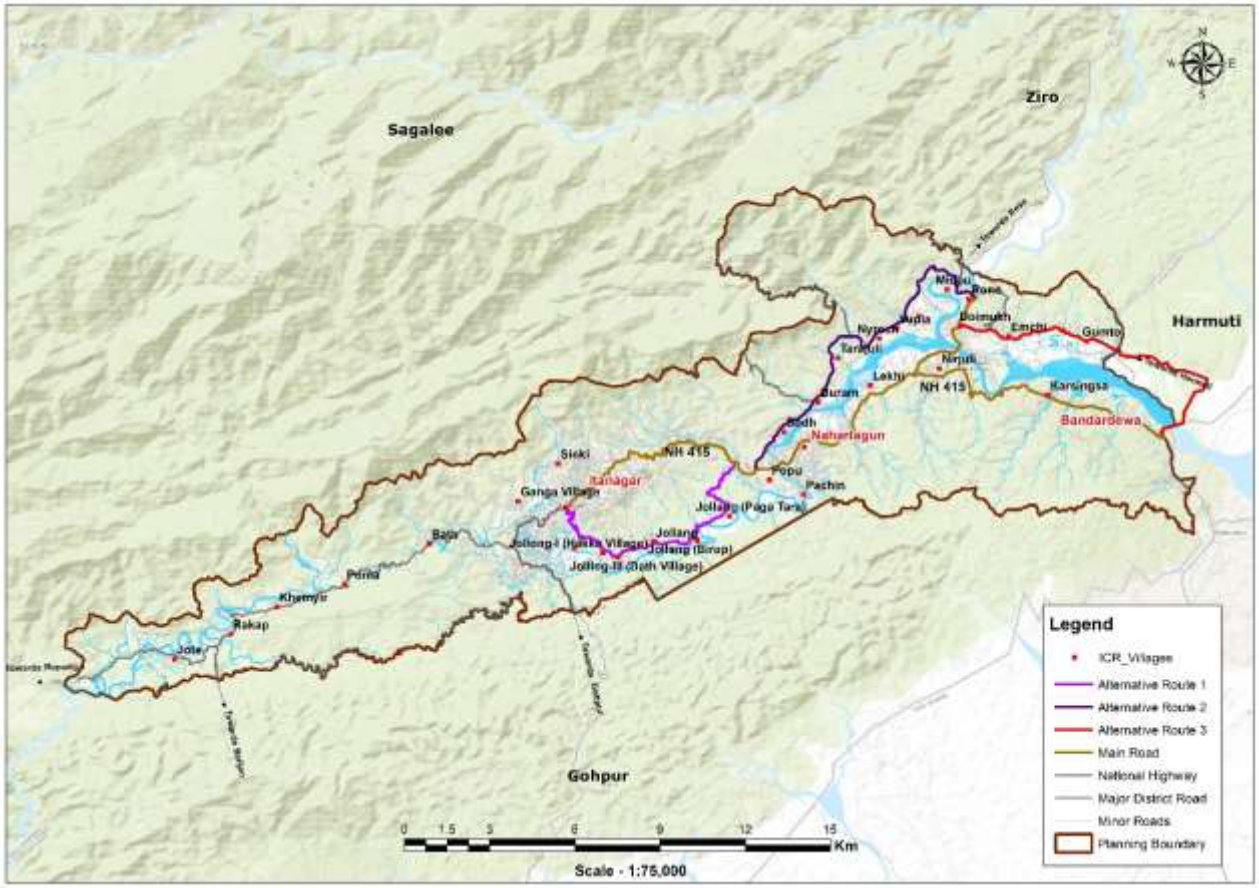
Map 18: Proposed Flyovers near junctions

Map 19: Flyover near Ganga market junction

Map 20: Flyover proposal near Bank Tinali junction

13.7 Alternate routes

Itanagar is situated on the foothills of Himalayas, which is the most active seismically active zone. Although the occurrence of the earthquakes or landslides is rare, the smallest disaster can cut off the access to Itanagar from the rest of the world logistically. The National Highway 415 is the only access road, which the majority of the people uses for all the transportation purposes. Hence, alternate feeder roads are proposed to serve as emergency roads in the time of disaster and to connect the nearby hamlets/settlements with the major settlements in the ICR region.



Map 21: Proposed alternate routes

Proposed alternate routes has various purposes based on its location. Three stretches of alternate route stretches are proposed in the ICR region. They are-

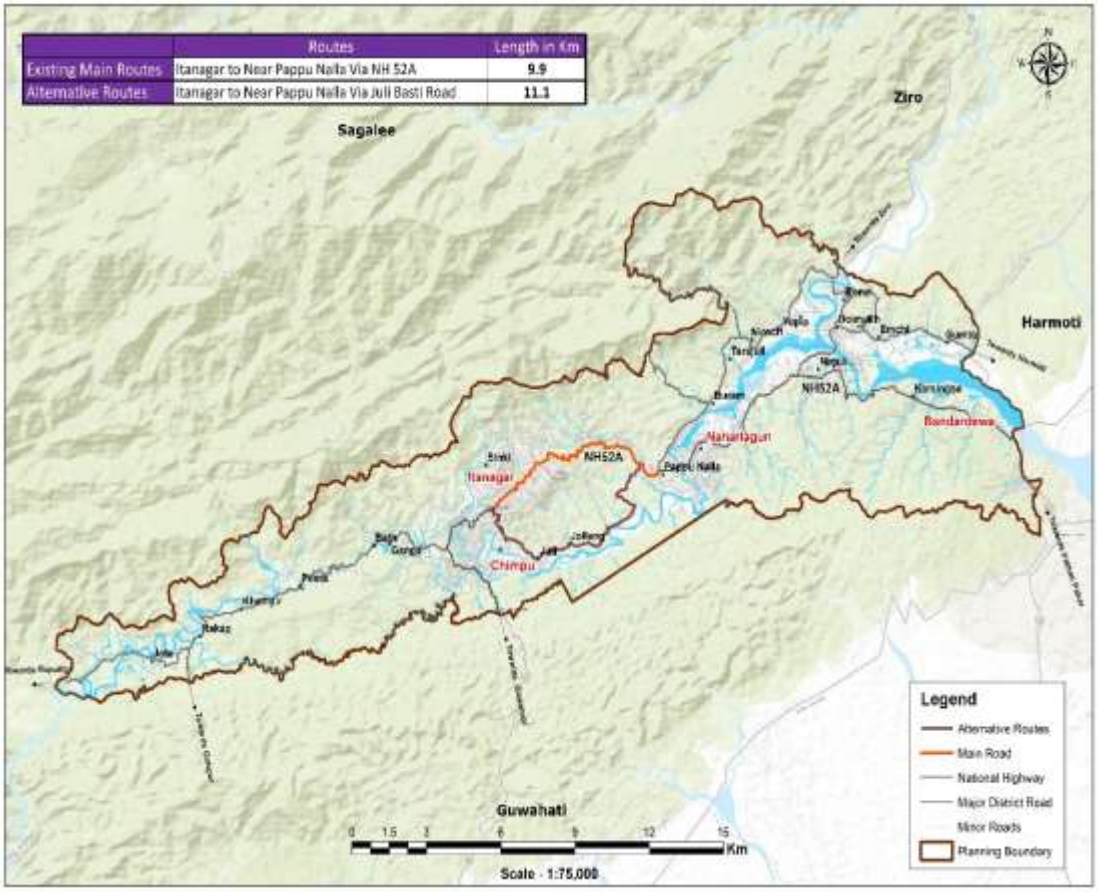
1. Alternative route from Itanagar to Near Pappu Nalla via Juli Basti Road
2. Alternative route from Pappu Nalla to Rono basti via Yupia and Kula Camp
3. Alternative route from Nirjuli to Banderdewa via Doimukh, Emchi and Gumto

Travel time for each of the alternate route is similar to the original route, inspite of the increase in the travel distance between the two points of travel.

Stretch - 1

NH- 415 is the most preferred route for most of the travelers for the travel between Itanagar and Pappu nallah that are almost 9.9 kms apart. Hence, there is a huge traffic stress on this stretch making the travel time 2 hr 30 mins. The NH-415 on this stretch is situated on a highly varied sloppy terrain making it even more difficult for the vehicles to ascend and descend during the journey.

The alternate route for this stretch uses the already existing road from Ganga market junction to Jully Basti, which continues until the Pappu nallah and merges with NH-415 just before entering into Pappu nallah area. The alternate road is 11.1 kms in length but the travel time is similar to that of the original road. The terrain of the road in the alternate route is not very much sloppy and has less traffic stress than the NH-415.



Map 22: Alternate route from Itanagar to Pappu nallah

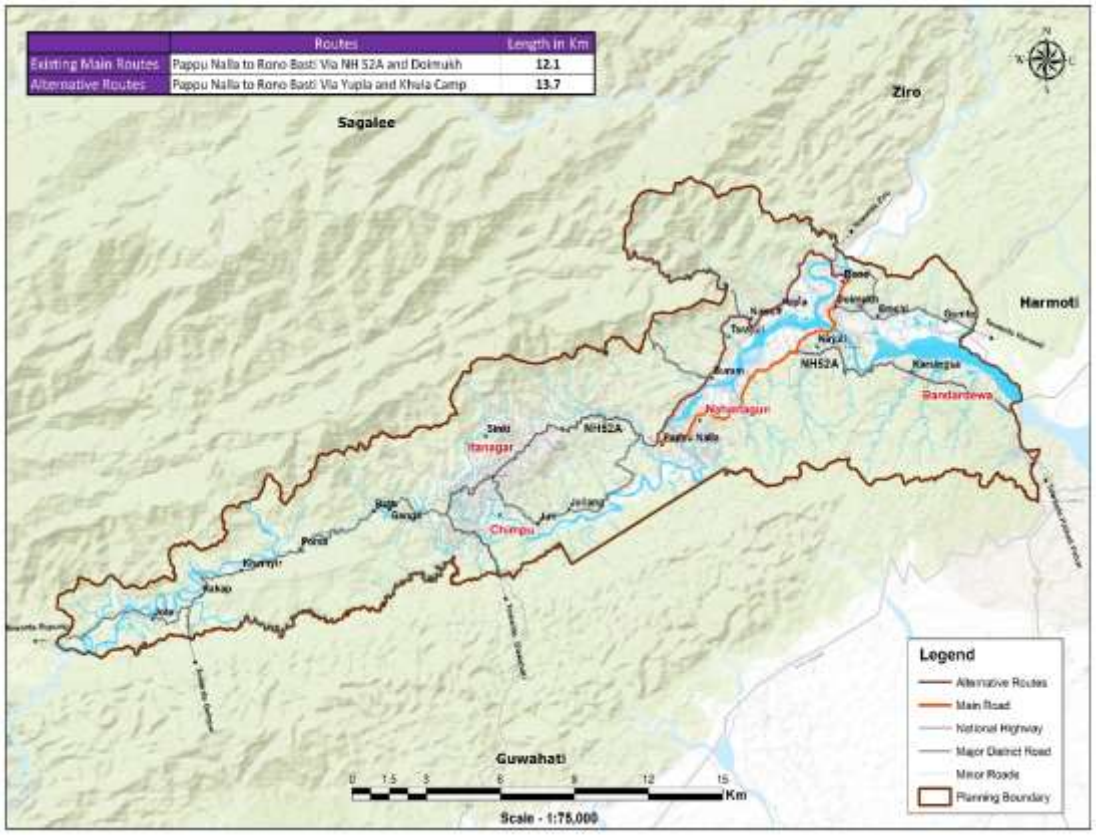
The development of this alternate route can open opportunities for the enhancement of the economic activities in this area, as the availability of the resources, vacant lands and green spaces is high all along this stretch with less interference from the settlements. It also provides scope for

the development of the tourism as the road passes along the Dikrong river for the majority of its length.

Stretch - 2

The road from Pappu nallah to Rono basti usually is directed towards NH-415 and Doimukh, which is nearly 12.1 kms in length. The travel time is nearly 2 hr 40 mins for the distance of 12.1 kms but covers only two major settlements i.e. Naharlagun and Nirjuli in the ICR region.

Proposed alternate route is 13.7 kms in length but provides access to almost seven settlements i.e. Buram, Tarajuli, Niroch, Yupia, Rono, Doimukh and Nirjuli areas in the ICR region

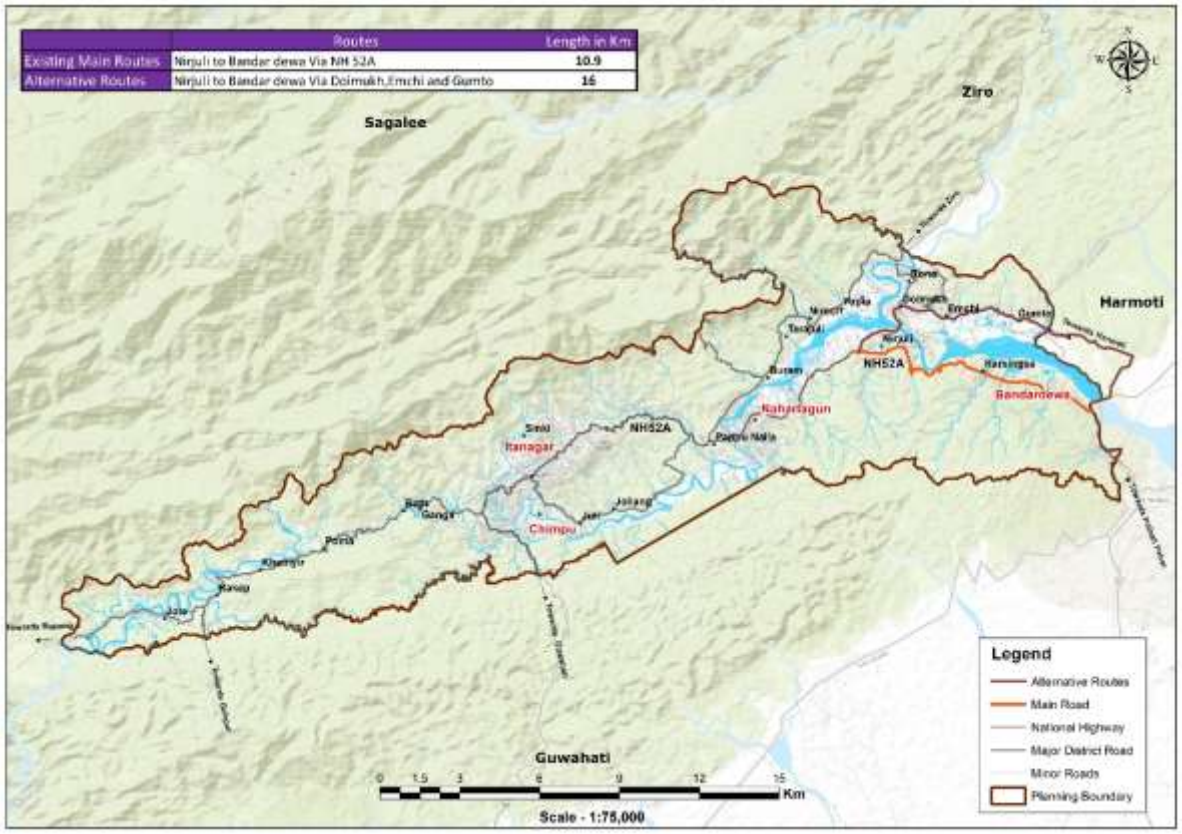


Map 23: Alternate route from Pappu nallah to Rono basti

Stretch – 3

The road from Nirjuli to Banderdewa usually is directed towards NH-415, which is nearly 10.9 kms in length. The travel time is nearly 2 hr 20 mins for the distance of 10.9 kms but covers only two major settlements i.e., Nirjuli and Banderdewa in the ICR region.

Proposed alternate route is 16 kms in length but provides access to almost five settlements i.e., Nirjuli, Doimukh, Emchi, Gumto and Banderdewa areas in the ICR region.



Map 24: Alternate route from Nirjuli to Banderdewa

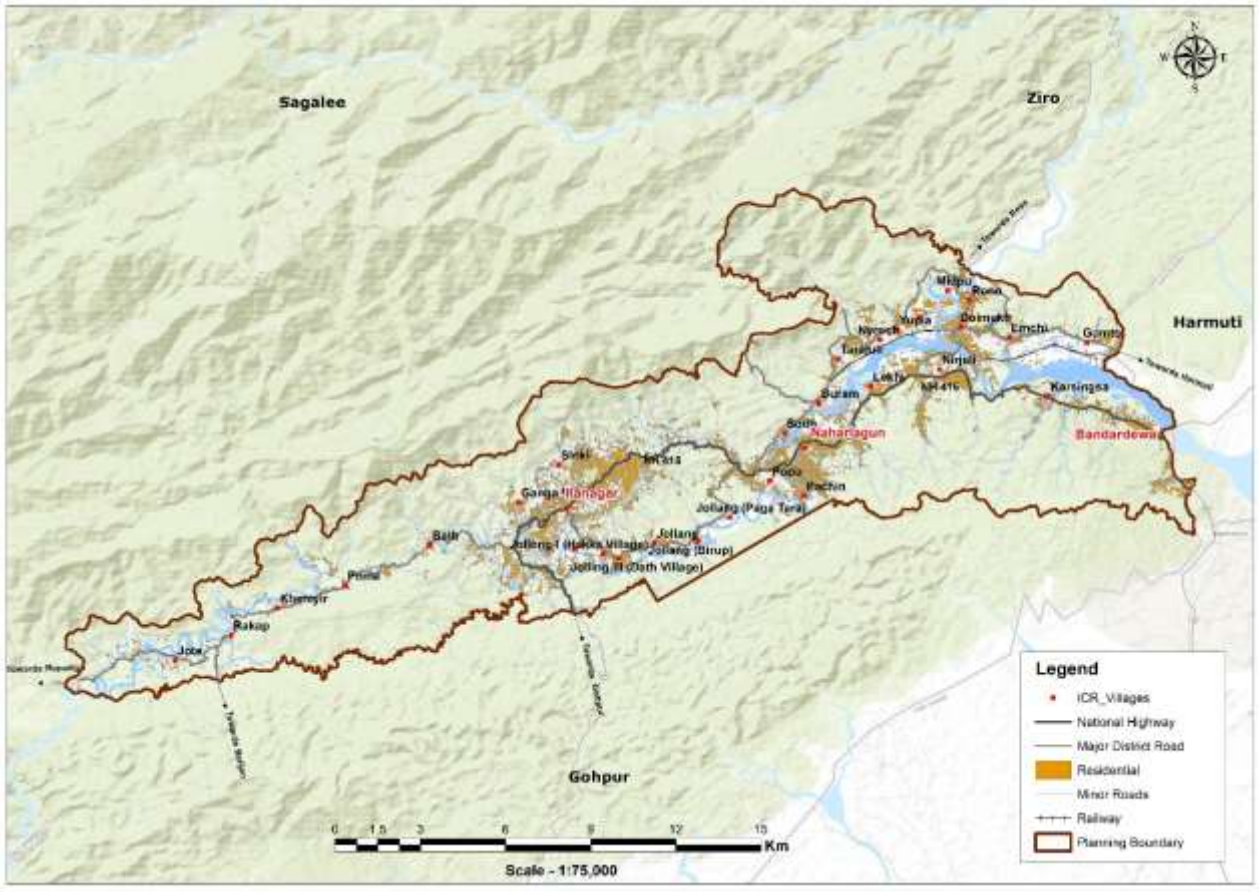
13.8 Median

The National Highway 415 is the major corridor passing through the center of the ICR region but it lacks the basic amenity of median separating the traffic flow on the both sides of road. All the roads in ICR region are devoid of any medians, which is causing serious traffic stress on the roads leading to traffic jams, as there are no alternate roads to NH-415. Hence, a median of 0.5 mts width is proposed to regulate the traffic flow on NH-415 for a stretch of 32 kms from Itanagar to Banderdewa.

13.9 Housing

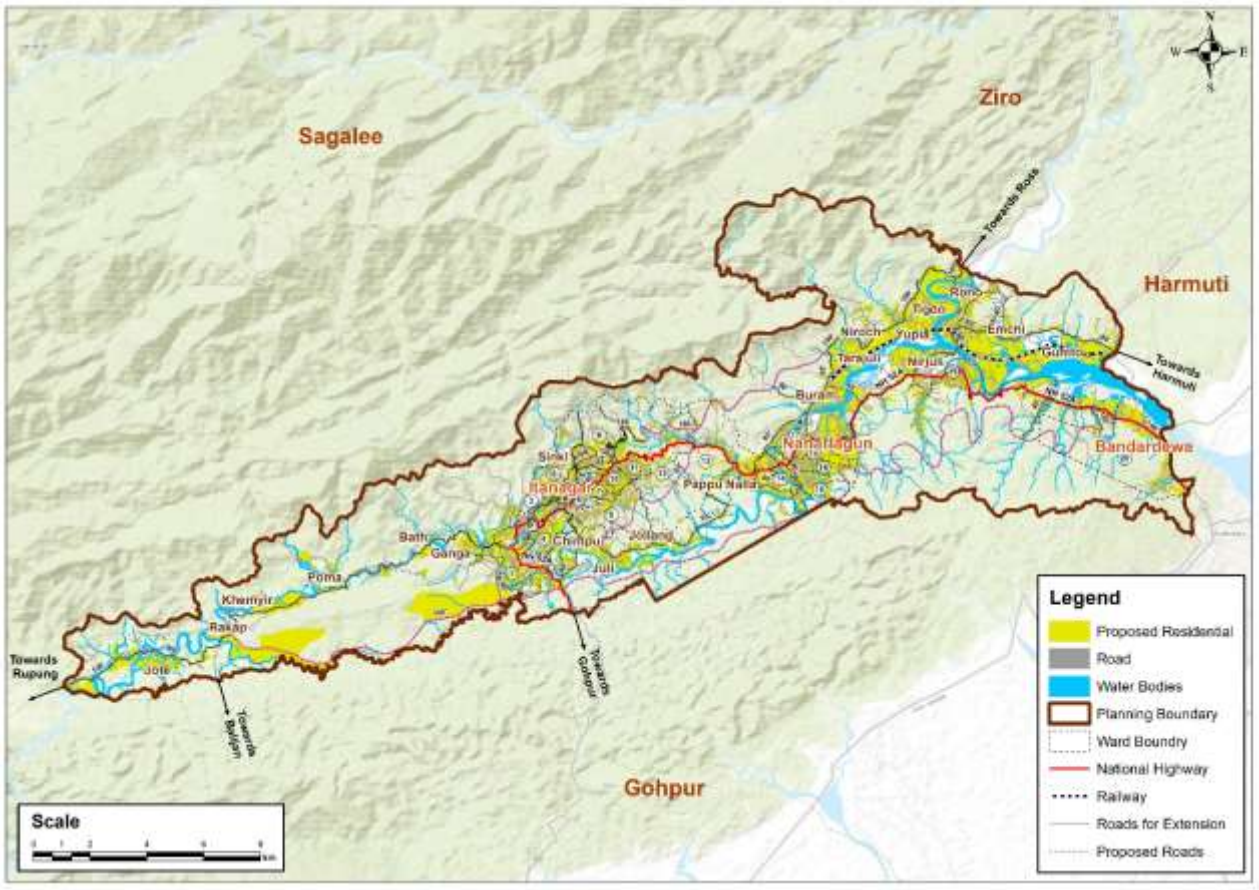
Due to the typical Sub-Himalayan hilly topography, ease of access to the roadway i.e., NH-415 and being covered by the reserve forests, sanctuaries & rivers on all the sides, the growth of the city and Urban sprawl has been restricted to the regions where the NH-415 has been passing through the ICR region, which constricted the development of the ICR region into concentrated pockets leaving major chunks of the vacant or under-developed areas/lands on the North Eastern, Southern and Western parts of the ICR region.

Currently, there are 24,182 households for a population of 1,10,767 as per 2011 census in the ICR region. As per the population projections done for the horizon year of 2041, the average population of the ICR region is estimated to be 4,70,000.



Map 25: Existing Residential areas

In order to cater for the growing population in the Itanagar & Naharlagun regions, a new allocation for the residential area with mixed land use is proposed. Proposed residential areas are situated along the existing settlements across the entire ICR region with special provision of roads and physical infrastructure facilities.

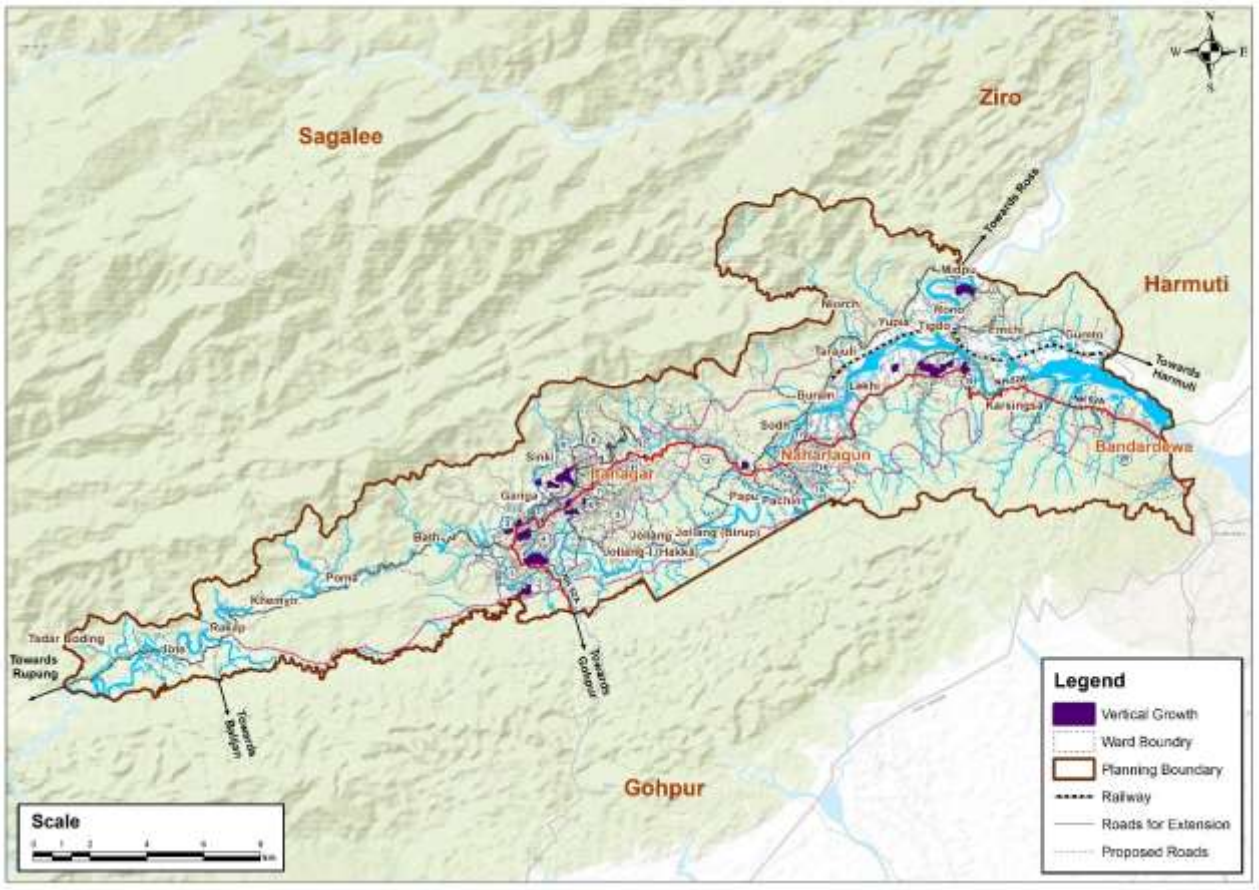


Map 26: Proposed Residential areas

The major allocation for the new residential areas is done in the areas of Jote, Khemyir, Ganga, Chimpu, Naharlagun, Tarajuli, Niroch, Rono and Karsingsa.

Considering the typical Sub-Himalayan hilly topography in the Itanagar Capital Region (ICR), few pockets of the proposed residential areas in the ICR are marked for vertical development generating new spaces for commercial development. The areas/regions earmarked for the vertical development are majorly situated in the government quarter`s area or in the age-old buildings of Assam era or SPT type of buildings/constructions. The SPT type of buildings are very old and they shall be demolished & all such buildings shall be added in a phased manner based on the availability of the land and requirement of the land as a resource in the region.

Decongestion of the core city has been one of the major concepts in selecting the newly proposed residential areas to decentralize the accumulation of the development in the core city area. These areas have been finalized post the consultation with various stakeholders and analyzing the viability of developing them.

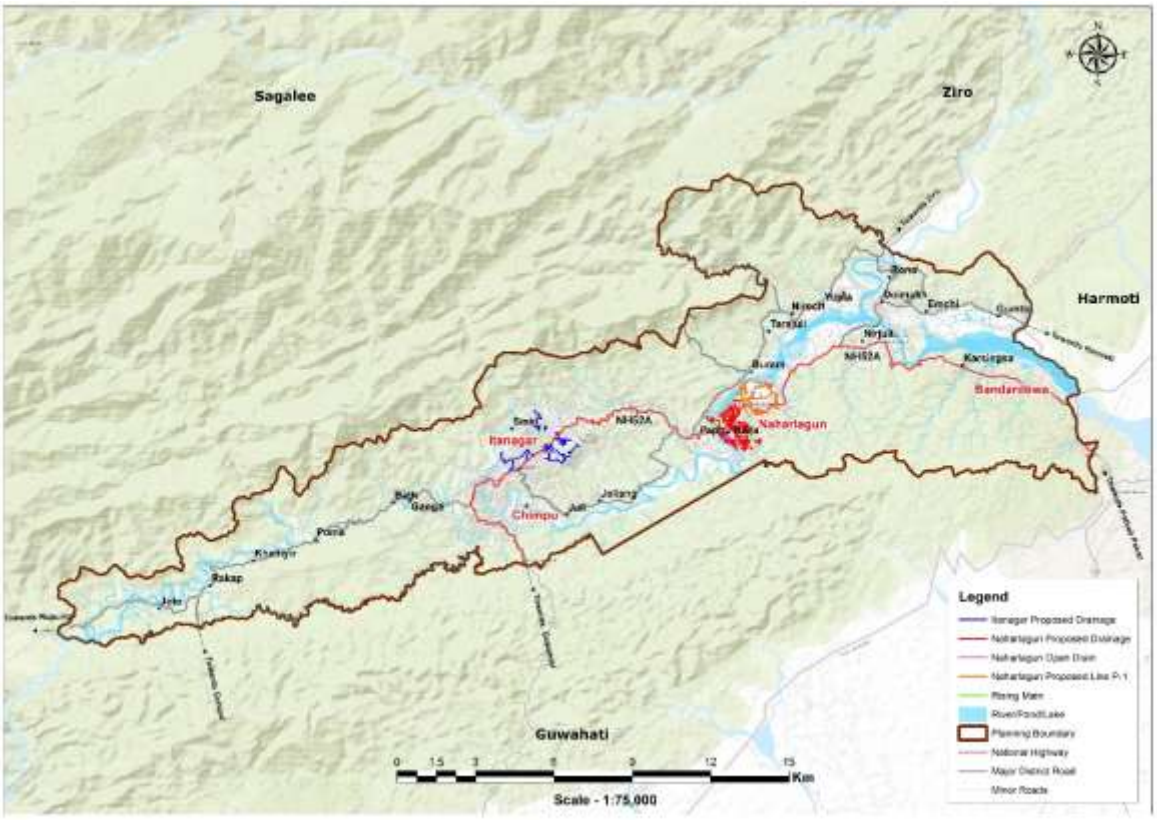


Map 27: Vertical development zones of Residential areas in the ICR area

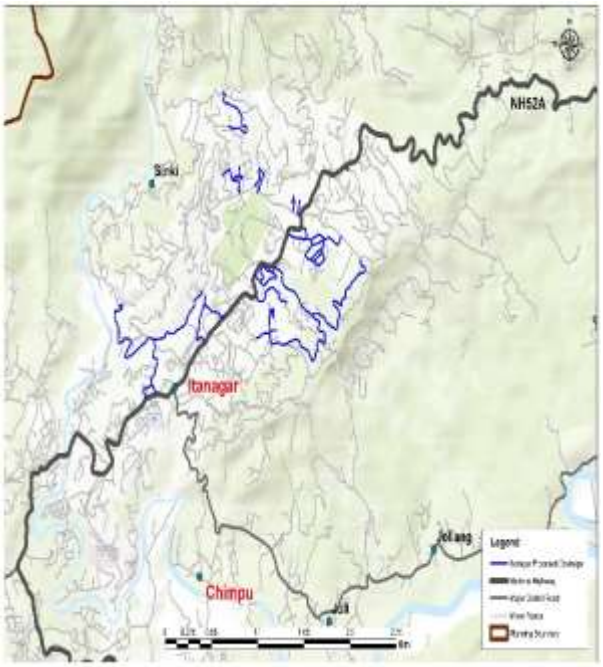
13.10 Drainage

In Itanagar, the storm water drainage system consists of natural drainage system (Nallah) and major drains in the town. The existing drains are not engineered and are either open drains or kutcha drains without any flow gradient and restriction mechanism of any kind preventing the grey water to overflow onto the roads. Due to lack of proper channeling of drainage, the grey water is being mixed with sewage and creating serious health issues in the region.

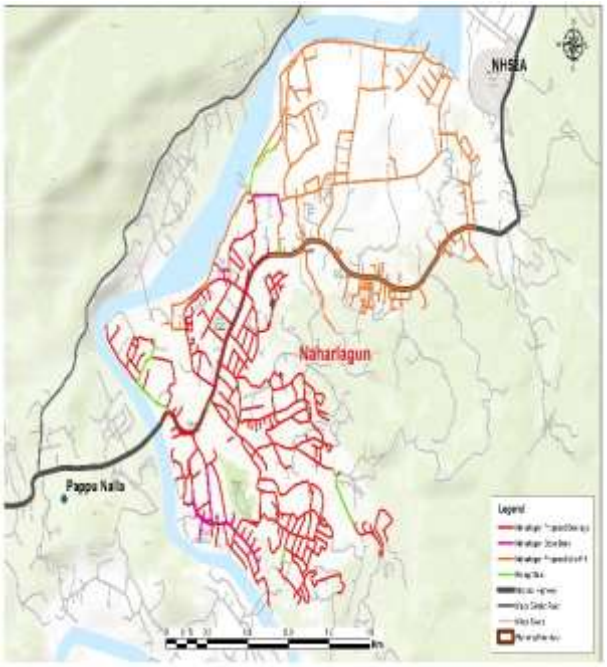
Hence, new drainage network is proposed in the Itanagar and Naharlagun regions taking into consideration of the topography of the region and flow gradient of the grey water.



Map 28: Proposed drains in the ICR region



Map 29: Proposed drains in Itanagar

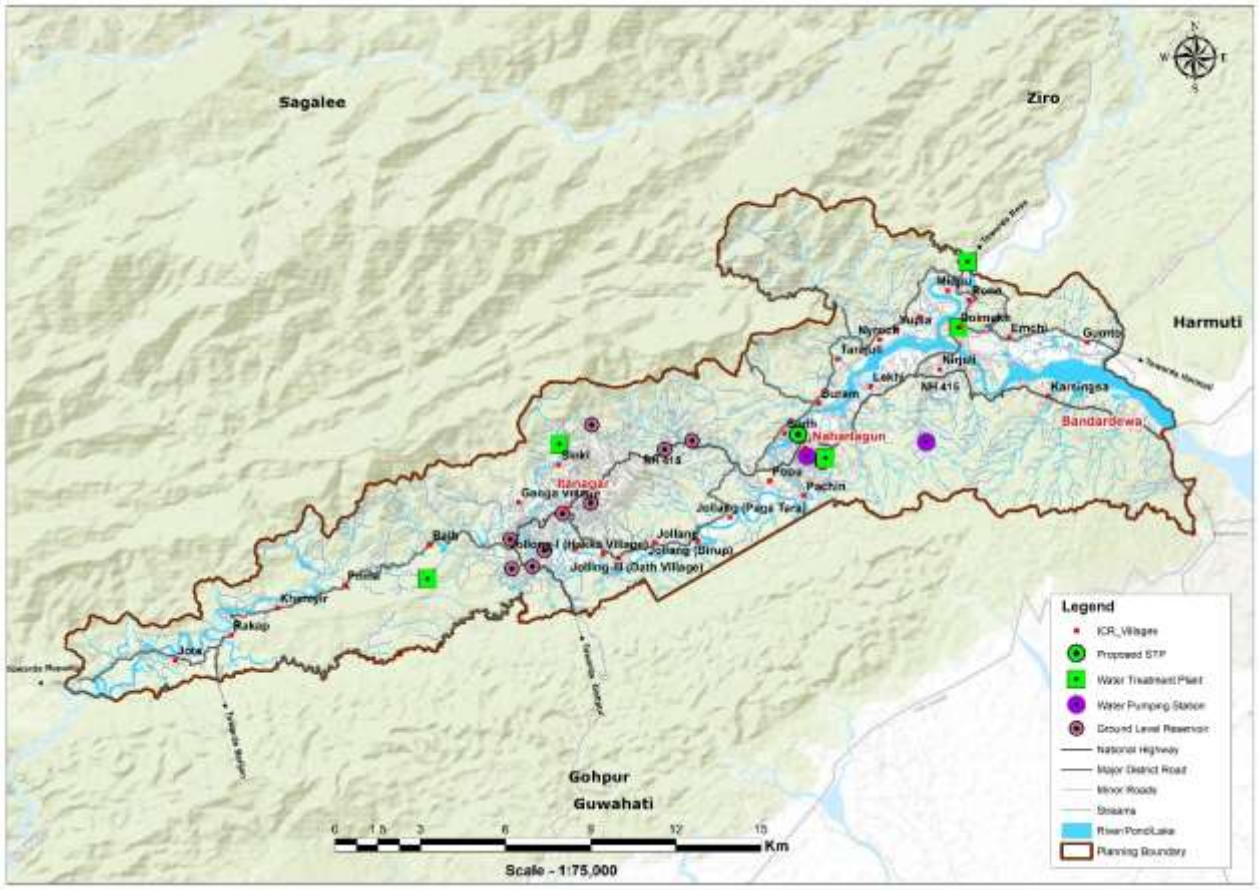


Map 30: Proposed drains in Naharlagun

13.11 Sewerage

Matching with the topographic features of the town, the sewer network system is hereby proposed as a gravity-based model. To take the maximum advantage of the topography in laying of sewer network and to minimize pumping requirement, zoning is preferred.

As there is no sewerage system in the town, a sewerage network is proposed along the top hierarchal roads to facilitate proper functioning of the sewerage network. Two Sewage Treatment Plans are proposed in the CSP, but this does not include the areas that are newly added to the municipal limits. Hence, revision of this is done in the master plan and a location has been identified for construction of STP. One STP at the southernmost point of city with a capacity of 4 MLD will be sufficient for catering the projected demand of 4.8 MLD by the horizon year with the scope of expansion in the future years of redevelopment.

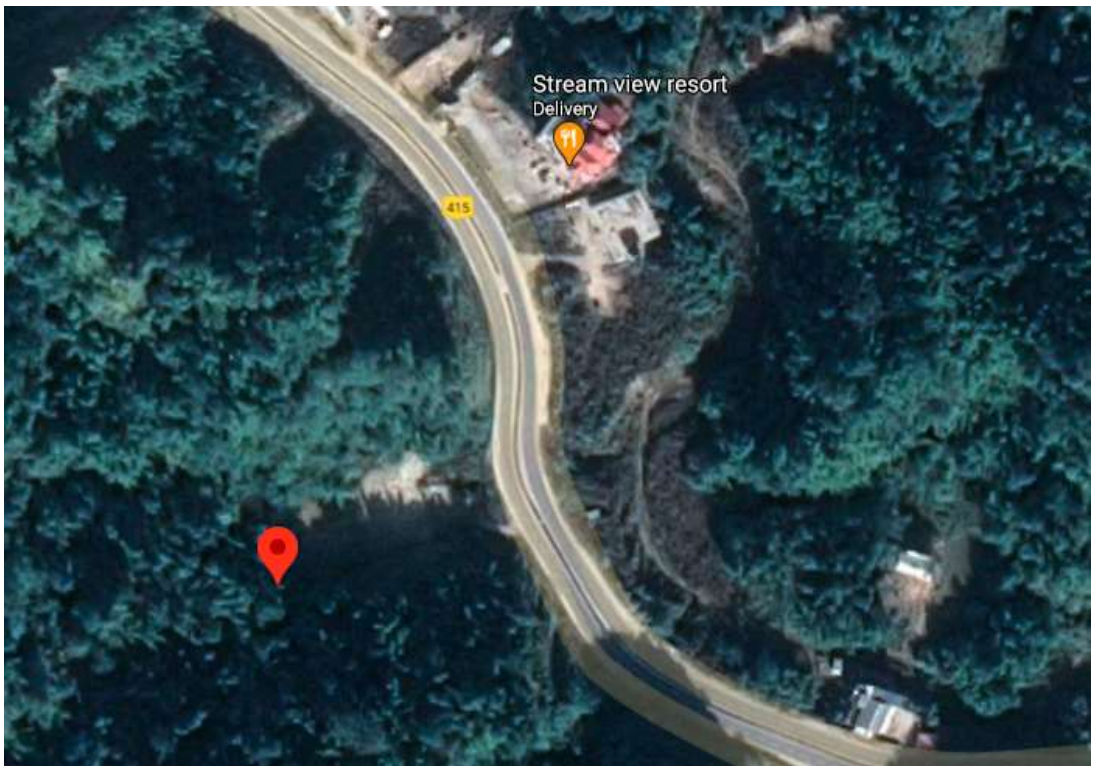


Map 31: Proposed STP near Naharlagun

The location of the 3.9 MLD Sewage Treatment Plant is identified near the Dikrong River in Naharlagun to facilitate easy disposal of the treated water post treatment of the sewage. The site is proposed taking into consideration of the terrain and topography of the region.

Picture 15: Proposed Sewerage Treatment plant in Naharlagun

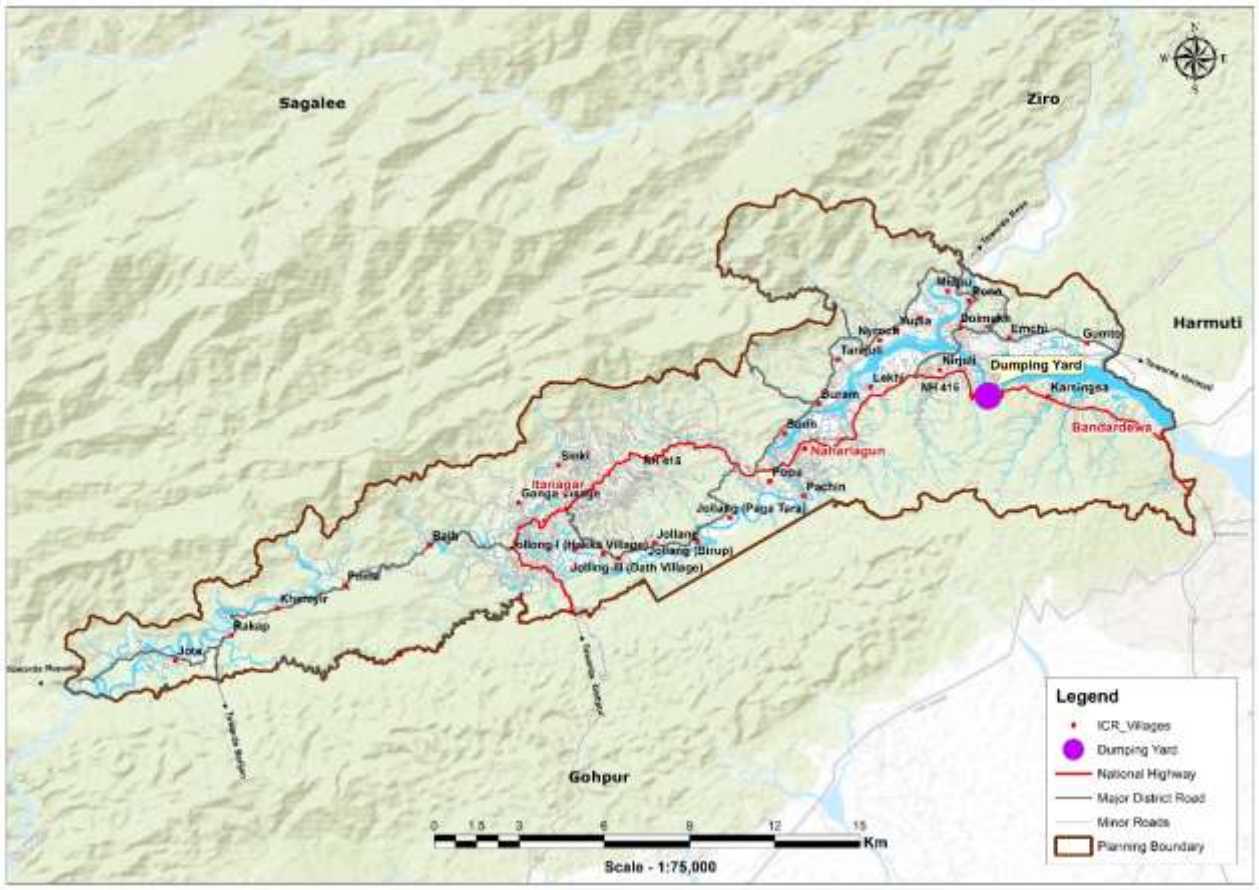
The location of the 3.9 MLD Sewage Treatment Plant is identified near the Dikrong River in Naharlagun to facilitate easy disposal of the treated water post treatment of the sewage.



Picture 16: Proposed Sewerage Treatment plant in Chimpu

13.12 Solid Waste Management

The city generates about 80 MT of solid wastes a day and 60 MT is the total waste collected per day. The major sources of solid wastes are residential units, markets, slaughterhouses, industries and institutions. There are two landfills – 1 each at Karsingsa and Chimpu. As of now, the solid waste collected is dumped at the site, which does not meet the standards of a site to be used for dumping solid waste.

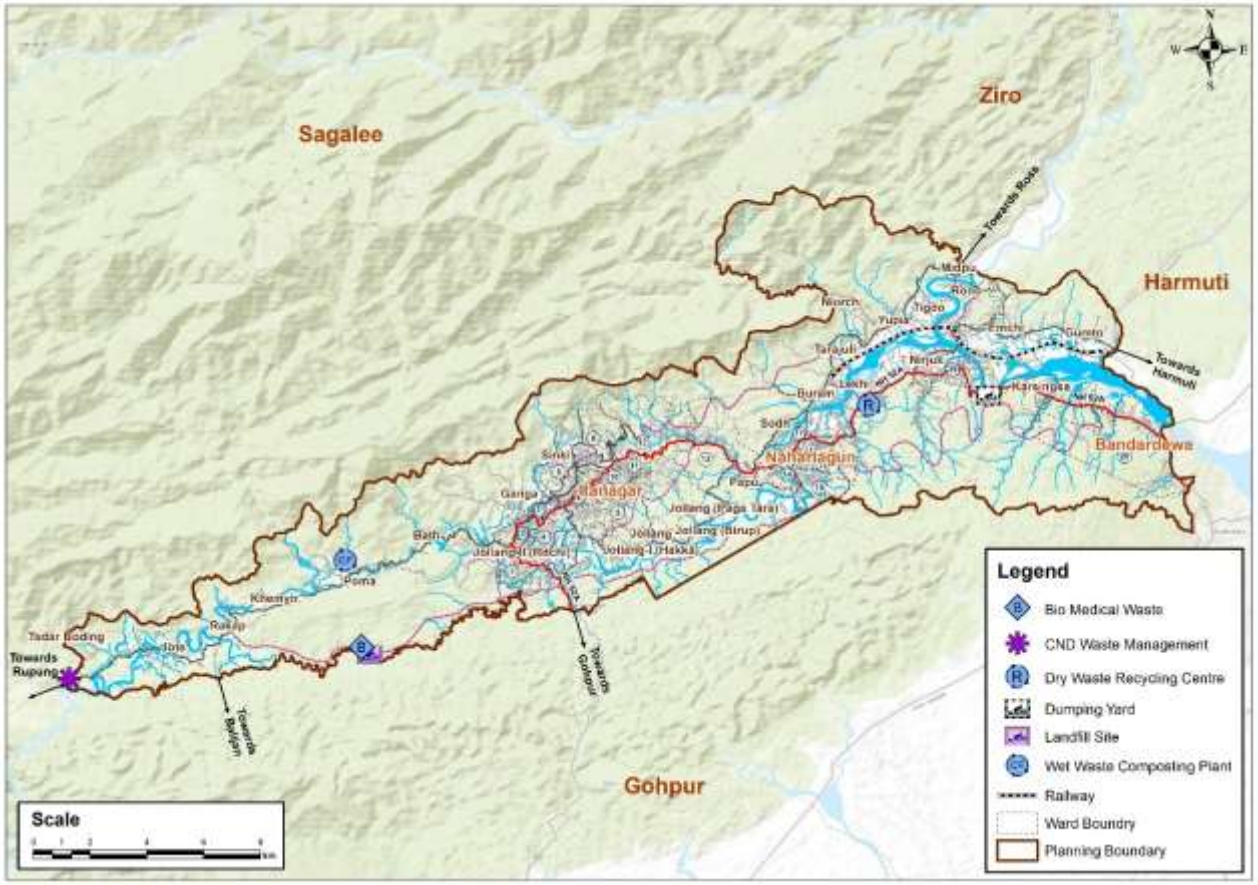


Map 32: Proposed conversion of Dump yard into Landfill

It is not financially viable to close the existing dumping yard and find another dumping yard far from the city. Hence, it is advisable to construct an engineered landfill with a buffer of 250m by remediating the legacy waste in the existing dumping yard and process the daily waste generated in the city. Although, it is a financially strenuous project, it will attract necessary traction if proper incentives and infrastructure are provided for the project.

Separate waste management facilities shall be proposed in the ICR area, adhering to the National Sanitation policy and Swachh Bharat standards.

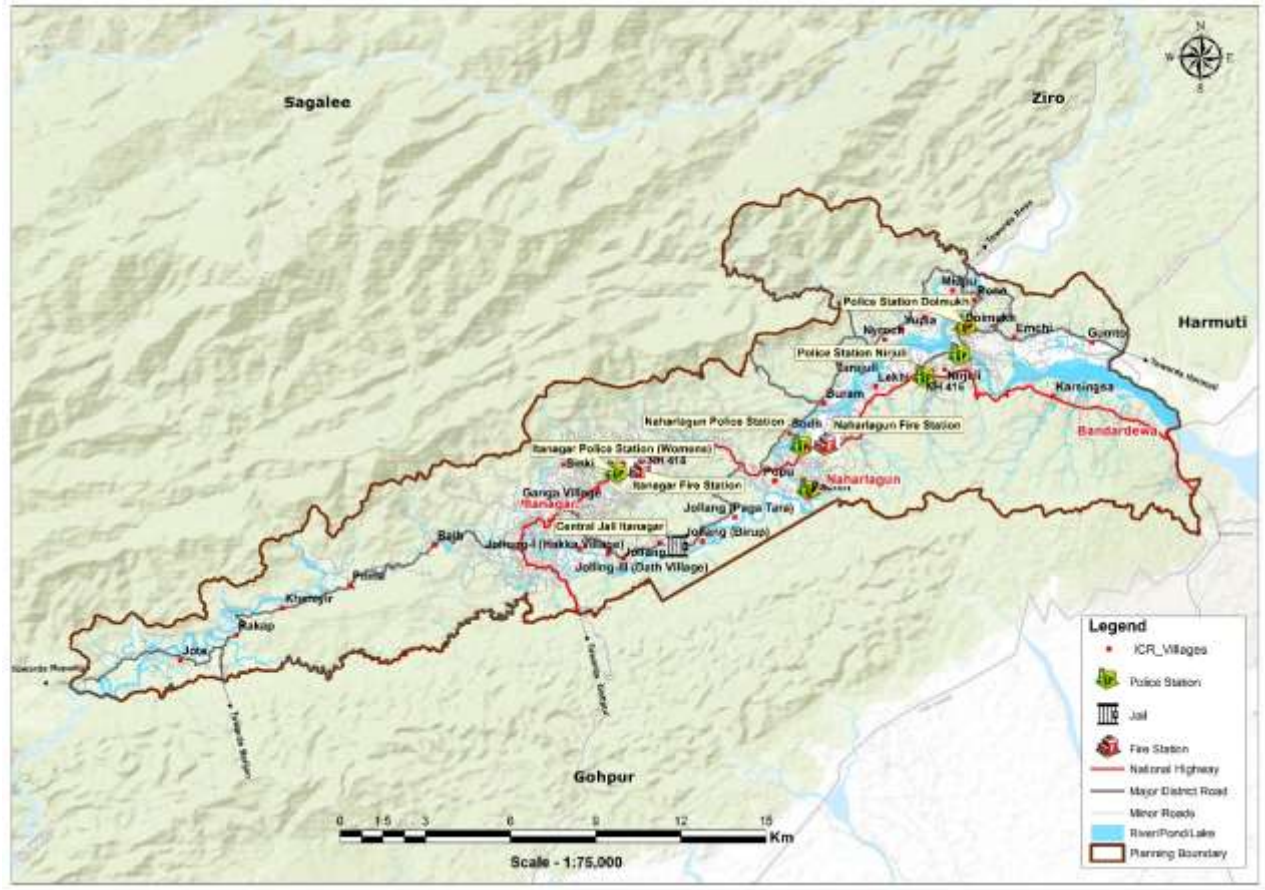
Picture 17: Proposed Sanitary landfill near Nirjuli



Map 33: Proposed Solid Waste management facilities

13.13 Police Station

Police station comes under the Public 7 Semi-Public category of land use. There are six police stations in the ICR region that are catering for the total population of 1,10,767. As per the minimum Public & Semi-public requirement of URDPFI guidelines, a single police station is required for every 15,000 population in the hilly areas.



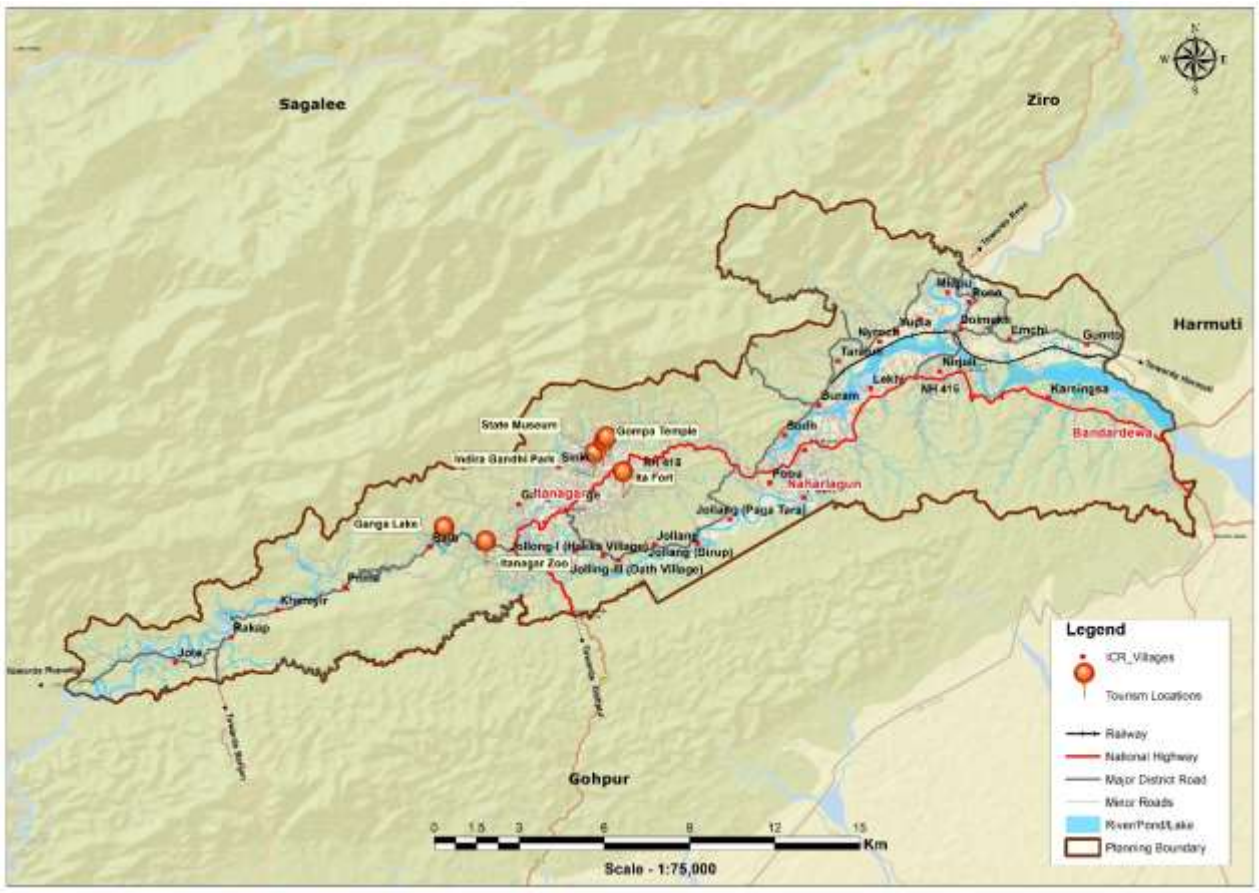
Map 34: Existing and Proposed Police station in ICR region

As per the URDPFI standards, a new police station is proposed near Jote area in the ICR region. The proposition of the new police station satiates the requirement of the current population demand and the future demand of 15 police stations is met in phased manner by the end of Vision period.

13.14 Tourism

Itanagar is situated in the lap of majestic Himalayas and with a blissful weather all through the year; Itanagar is an enchanting tourist destination in North East India. There is 348 Ha (5.78 % of total land) coming under Open Space and recreational use, there is only 0.98 Ha coming under

developed space such as park or playground. The proposals include creation of parks that can attract local tourism and improve the living standards for the residents.



Map 35: Existing Tourism Locations

Development of Ganga Lake

Ganga Lake is to be developed as the major tourist attraction in ICR by providing activities like boating and developing landscape designed park around the lake.

Protection and Conservation of Lakes & water bodies

1. Protecting and conserving the valleys
2. Proper Guidelines to be prepared for developments adjoining lakes and water bodies.
3. Dikrong river development

The Dikrong River passes through Itanagar and finally falls into the Brahmaputra in Lakhimpur District of Assam. The Dikrong River can be developed as tourist attraction by providing activities like boating, canoeing and fishing.

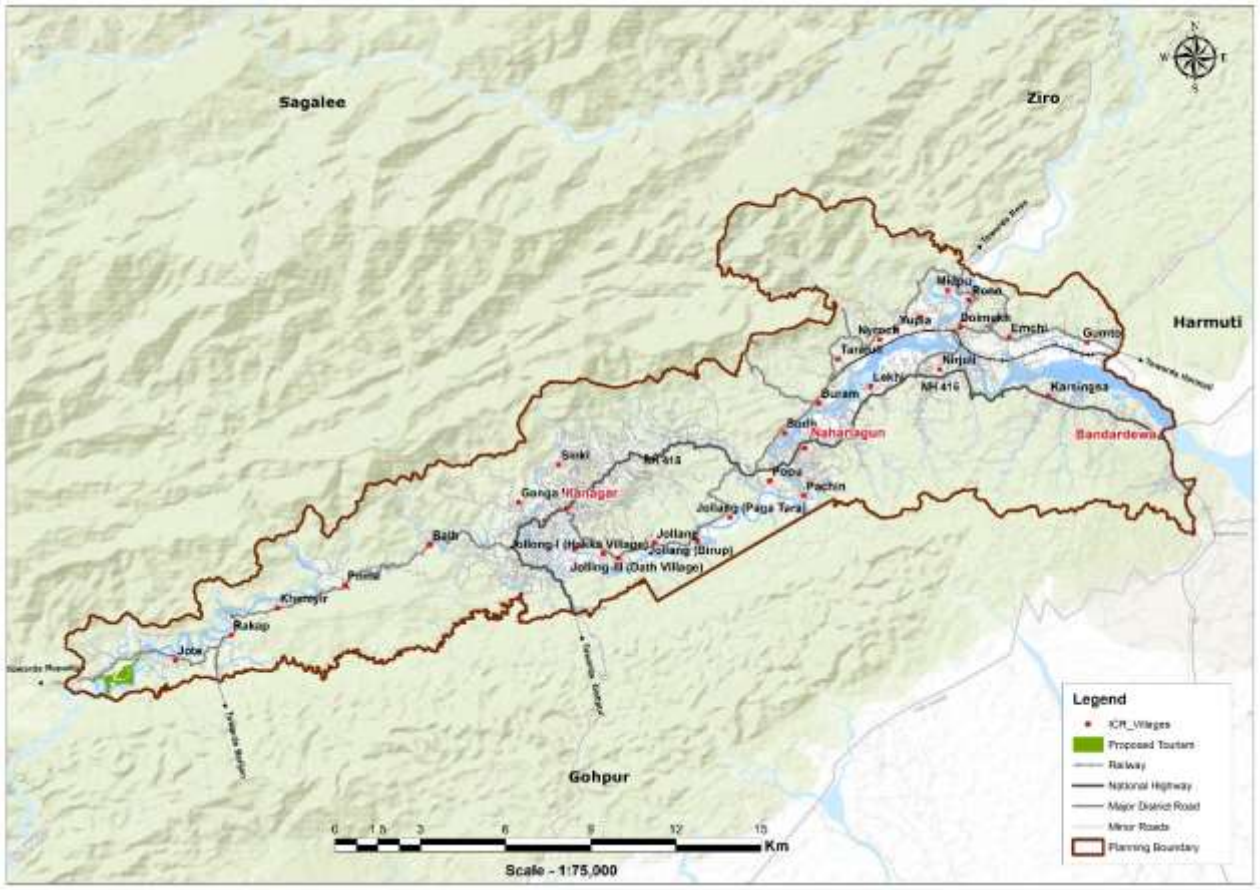
Picture 18: Dikrong River

Picture 19: Ganga Lake

Promote Art and Culture

Attracting tourist by a museum showing Itanagar cultural and art & crafts- wall paintings, traditional costumes made of natural vegetable and herbal dye yarns, and attractive utility items made of cane and bamboo. Creating awareness and organizing programs or events about Itanagar tribal and their culture attracts tourists and generate economy.

Picture 20: Art and Culture

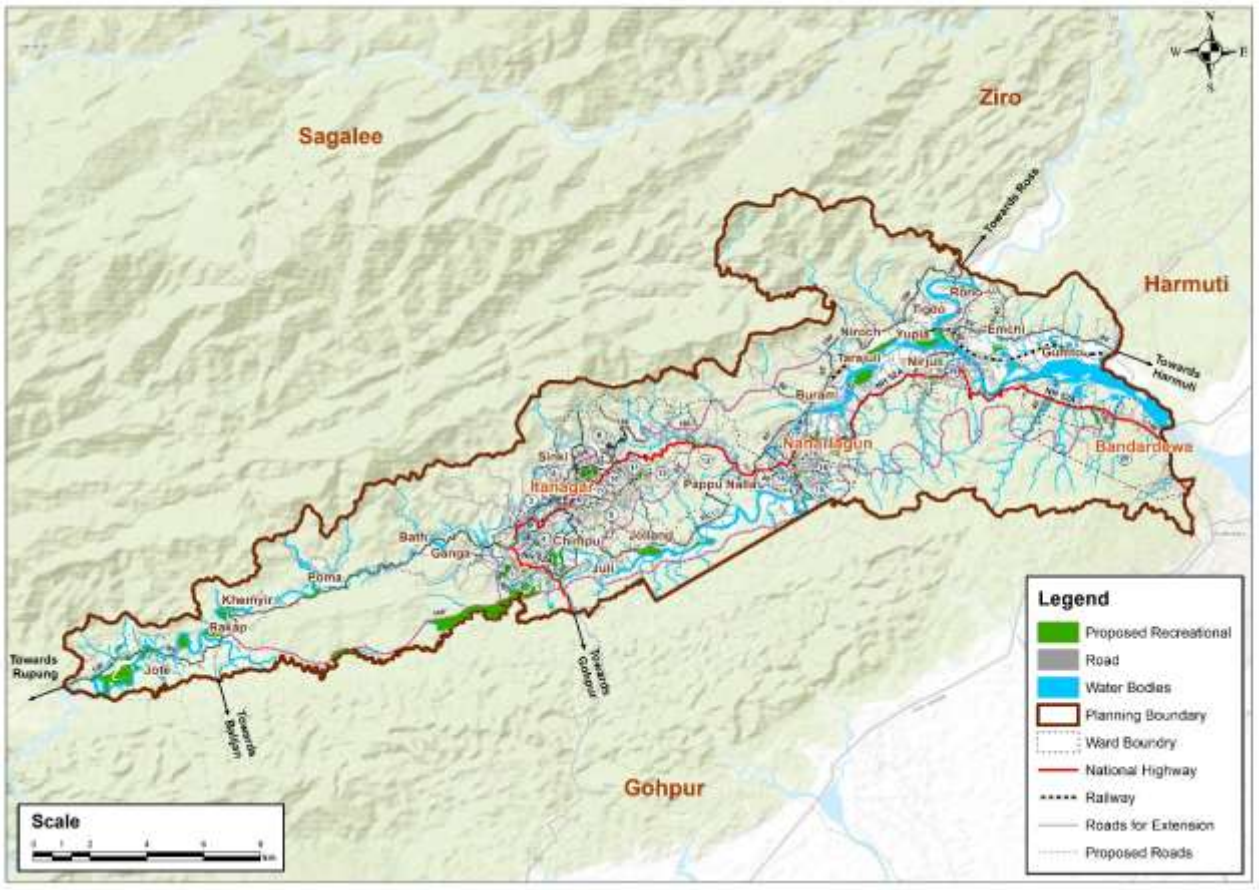


Map 36: Proposed Culture hub

Adventure Park

The existing adventure park near Nirjuli is catering for only small set of population because of the lack of proper publicity and awareness from the organizers end. Hence, it is proposed that the adventure park be notified as a Public Adventure park maintained and promoted by the Tourism department of Arunachal Pradesh creating the opportunities like –

1. Water skiing
2. Canoeing
3. Para Gliding
4. Camping
5. Eco-tourism
6. Bird tourism
7. Fishing
8. Water rafting

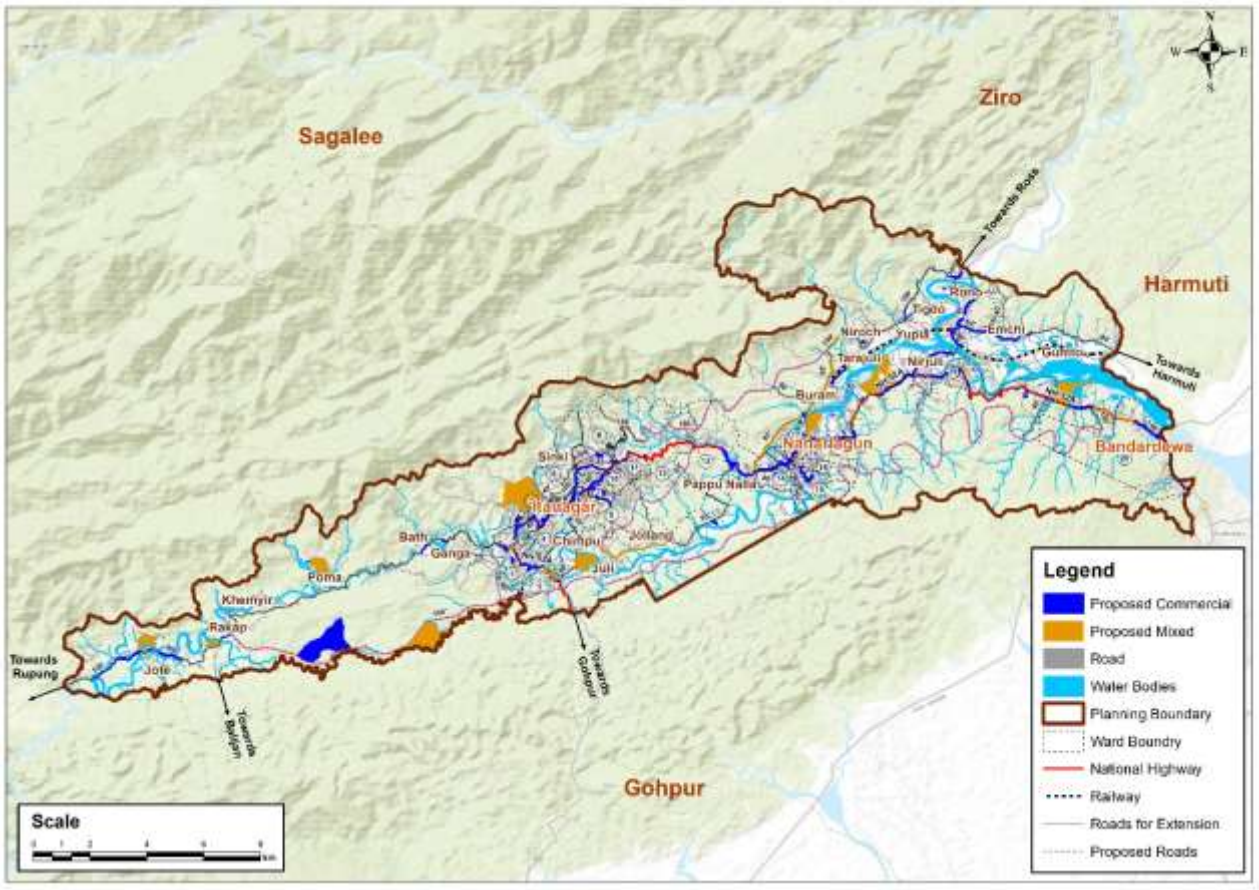


Map 37: Proposed recreational areas in ICR region

13.15 Commercial and Mixed areas

Commercial area in any urban area defines the economy and urban dynamics of the city. Landuse classification and delineation of commercial areas in the city is important for the creation of commercial zones in the city. Presently only 79 hectares or 190 acres of land is under commercial usage in the ICR region. As per URDPFI guidelines, the total commercial area in the hilly areas should be 4-6 % of the total planning area in the hilly terrain cities.

Hence, a total of 329 hectares or 835.42 acres of land is proposed under future commercial Landuse in the future Landuse map of the ICR region and a total of 520.5 hectares or 1322.2 acres of land is proposed under future commercial Landuse in the future Landuse map of the ICR region. The major commercial pockets are situated in Itanagar and Naharlagun, but the total NH-415 corridor is proposed as commercial corridor to develop economic activities in the ICR region.



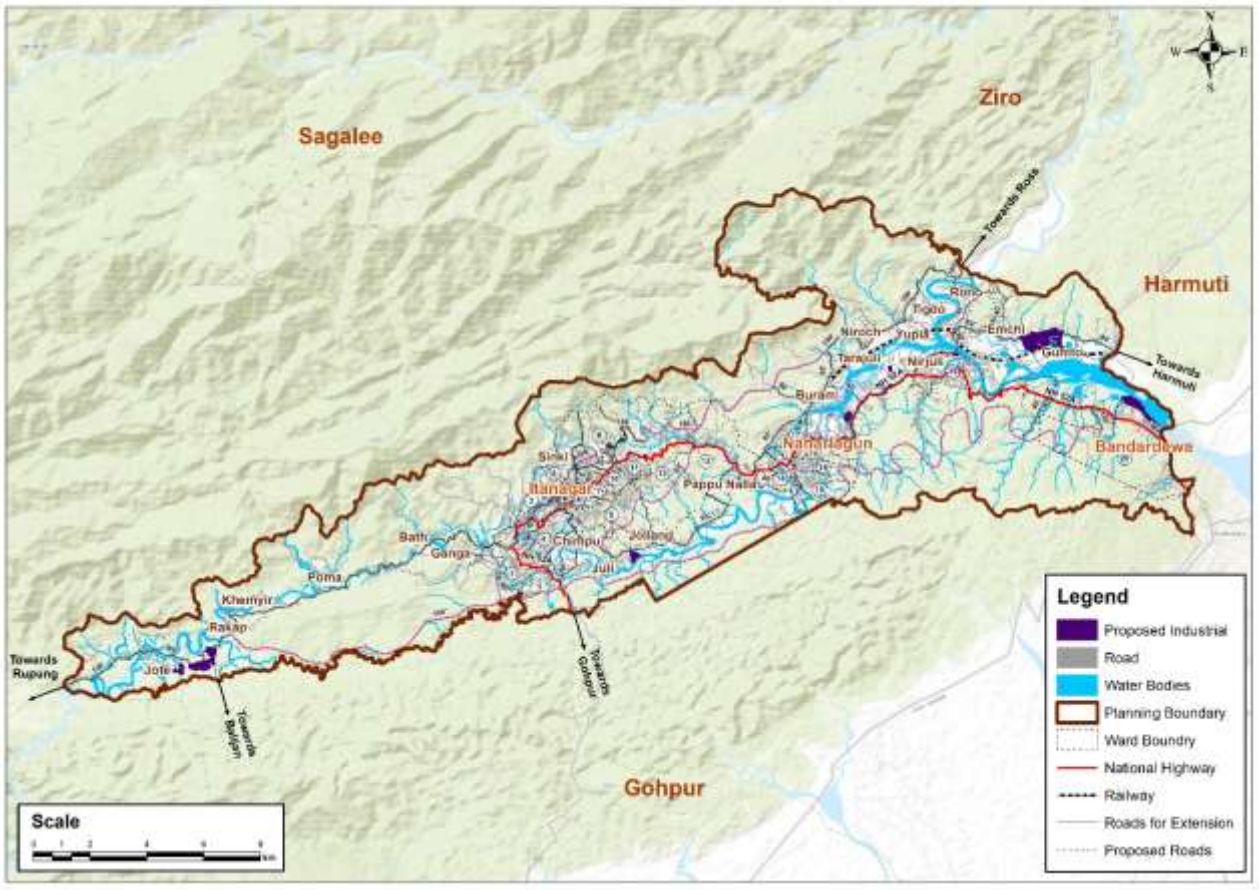
Map 38: Proposed commercial areas and mixed areas in ICR region

13.16 Industrial

Although situated on the hilly terrain, ICR region favors and facilitates the development the industries in the pockets situated near the water bodies and river streams where the terrain is flat. Currently, ICR region has industrial areas concentrated in the Naharlagun, Nirjuli and Emchi stretches of the ICR regions.

The prominent industries situated in the ICR region are Rice mills, soap factories, Bamboo-based industries etc. There is a beer factory in the Nirjuli area situate near the Helipad of the Naharlagun area.

To favor decentralization and to achieve a sustainable economy in the ICR region, the proposed industrial regions are allocated near Jote, Emchi, Jollang, Gumto and Karsingsa areas, which are logistically connected and situated fairly far from the settlements of the region.

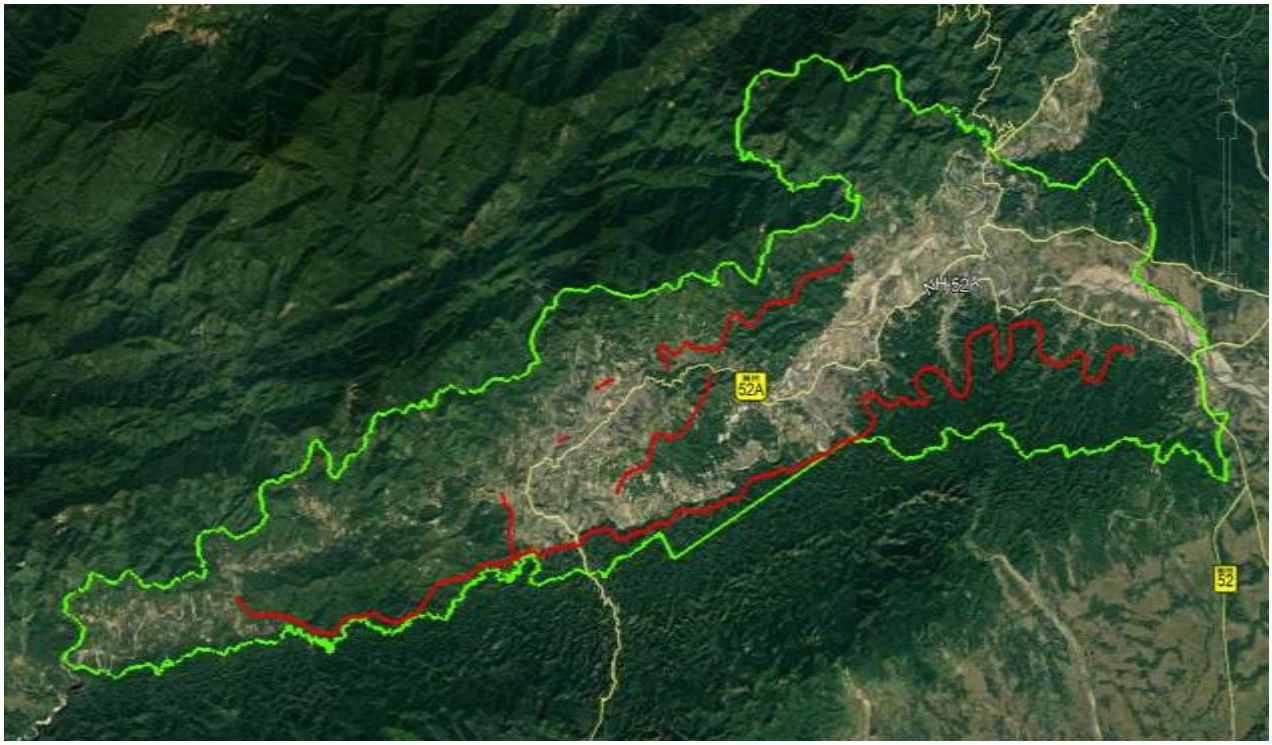


Map 39: Proposed Industrial areas

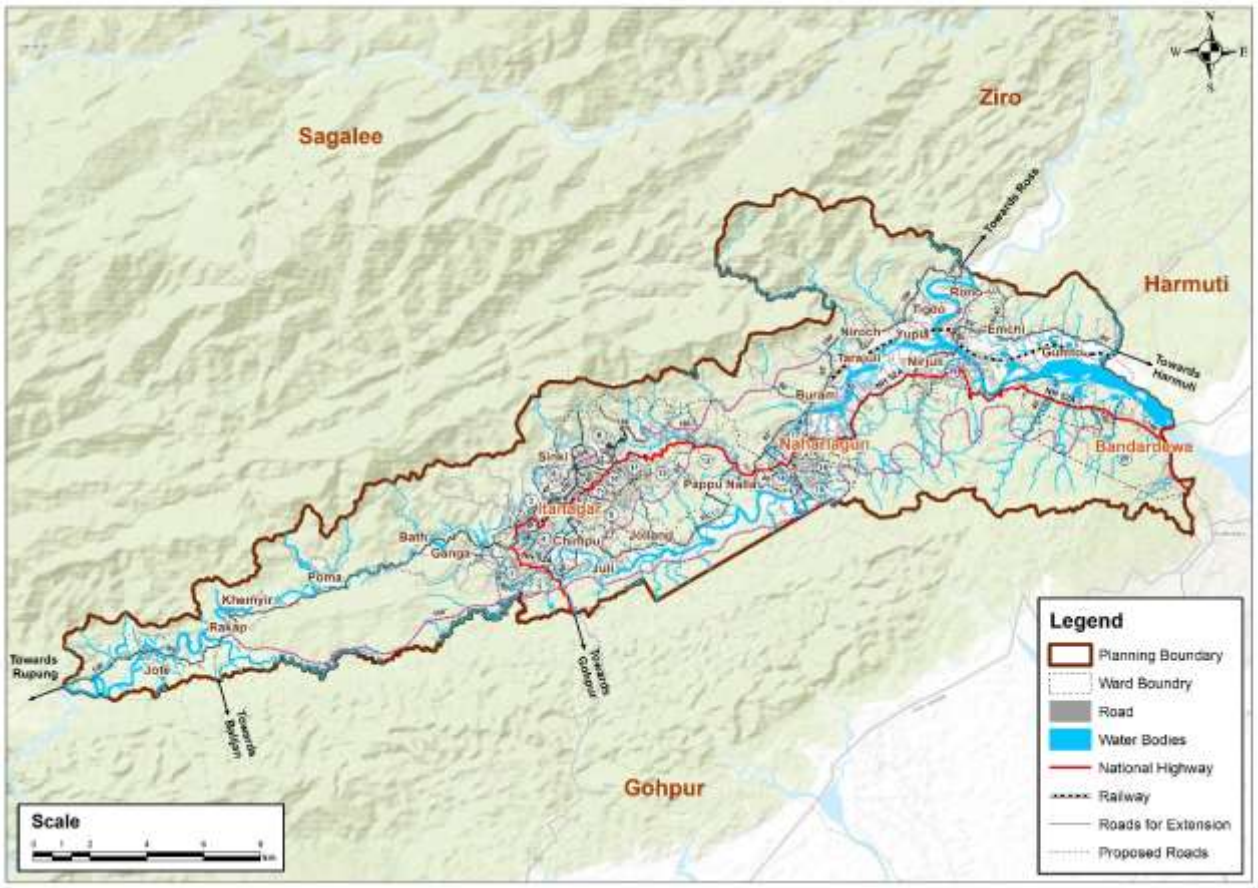
13.17 New roads

New roads have been proposed additionally to the existing road network of ICR region. Five patches of roads are proposed to increase the access of the roads to the public and to decrease the time of travel. The five patches of the roads that have been proposed in the ICR are –

1. By pass road from Rakap to Karsingsa
2. Interconnection road from Bath village to Bypass road
3. Hakka village to Donyi Polo
4. Itanagar to Tarajuli
5. Two road interconnections in the Itanagar city



Map 40: Proposed New roads



Map 41: Proposed roads in ICR region

- The Bypass road from Rakap to Karsingsa is a total length of 42.82 kms with a width of 15.24 mts.
- The Interconnection road from Bath village has a total length of 2.15 kms with a width of 15.24 mts.
- New road connecting Hakka village and Donyi Polo of 5.43 kms has been proposed to connect the villages via an alternate route with a width of 15.24 mts.
- Itanagar to Tarajuli road of 9.41 kms has been proposed with a width of 15.24 mts.
- Interconnecting roads in the residential areas of the Itanagar city with a length of 0.35 kms and 0.81 kms having width of 9.14 mts, have been proposed to increase the connectivity of the roads in the city for the free flow of the traffic.

13.18 Educational

Literacy plays important role in providing skilled work force as well as literate consumer demands more for better lifestyle.

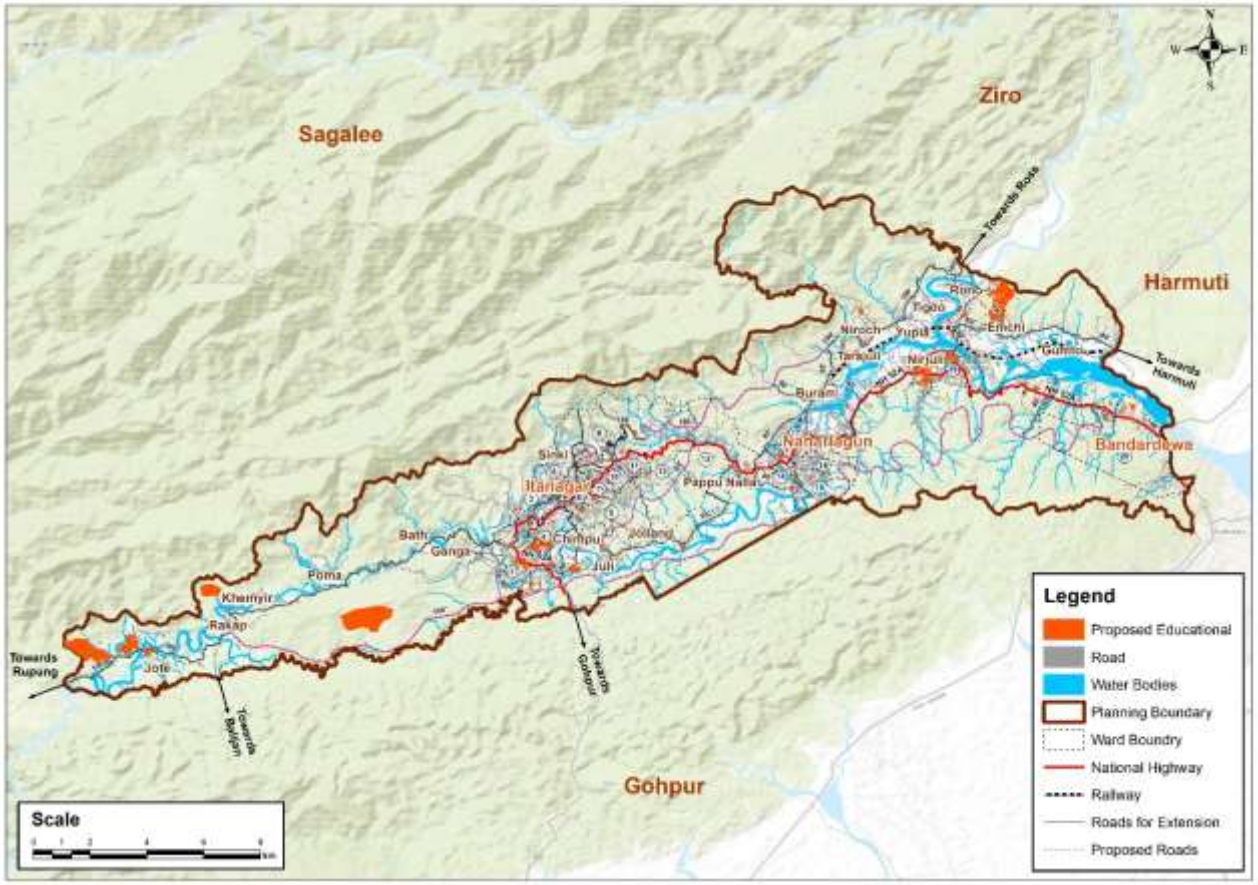
As per 2011 census, total 44,172 people out of the total population in Itanagar town are literate, among them 23,997 are male and 20,175 are female. Literacy rate of Itanagar town is 74.25%. Male literacy is around 90.51 % while female literacy rate is at 79.58 %.

There are 17 primary schools, 12 middle schools, 1 secondary school and 3 senior secondary schools in Itanagar. There are two Government Arts degree colleges and there are two Government Science degree colleges in Itanagar town. There are six middle schools, two secondary schools and two senior secondary schools in Naharlagun. There are no Government Arts degree colleges and there exists two Government Science degree colleges in Naharlagun town.

As per URDPFI standards, the Itanagar Capital region lacks in some basic educational facilities and have to be provided with more facilities as that of in table given below:

Facility	Population served per unit	Existing	Current Requirement	Future requirement
Pre-Primary / Nursery / Anganwadi	2500	28	39	48
Primary School	5000	17	19	24
Middle School	7500	18	13	23
Secondary School	7500	3	13	27

Senior Secondary School	7500	5	13	29
School for physically Challenged	45,000	0	2	2
Technical & Vocational Education Center	1,25000	1	1	4
General College	1,25000	3	1	5



Map 42: Proposed Educational areas in ICR region

13.19 Health

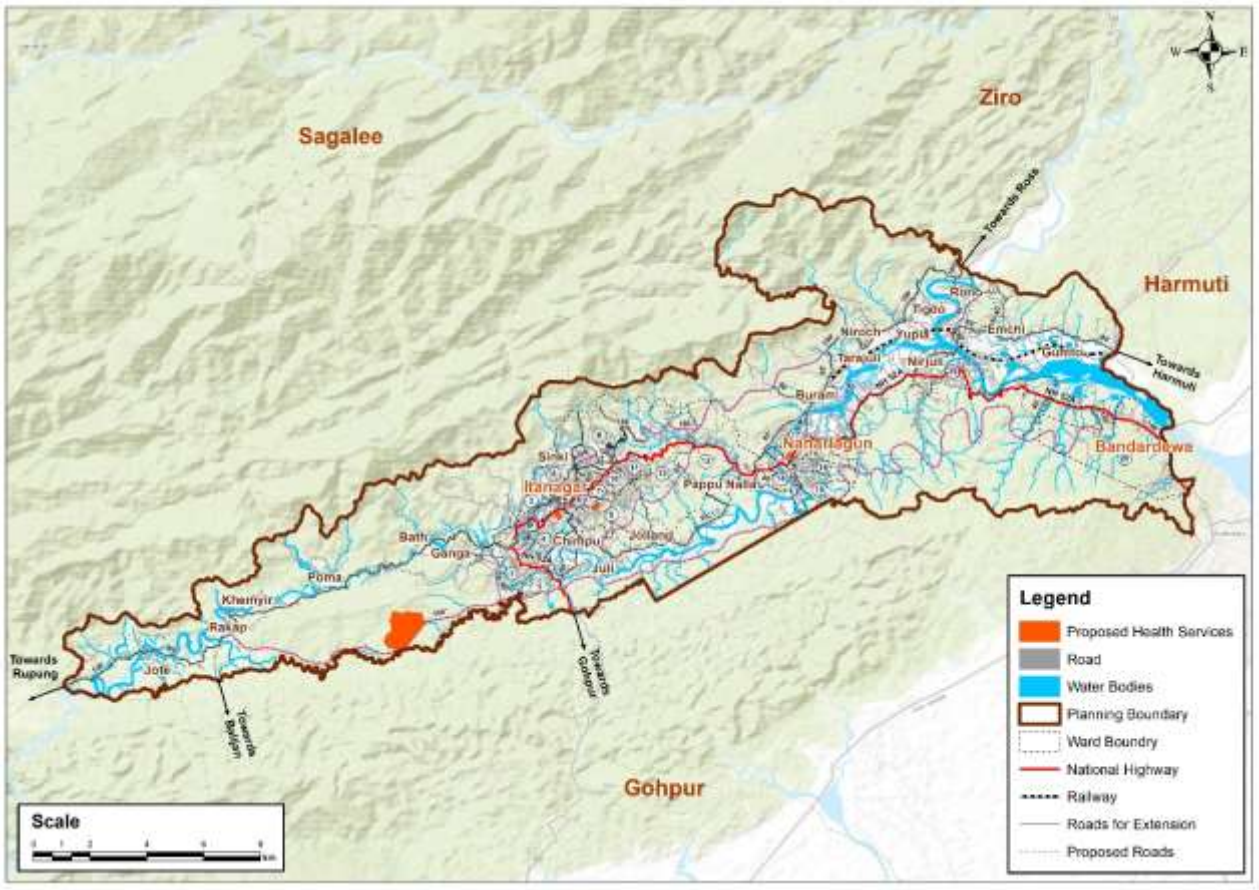
Itanagar does not have a government allopathic hospital. There is an allopathic hospital in Naharlagun, which is 12 kms from the town. It has 162 beds, 72 doctors, 86 paramedical staff. There is one hospital for alternative medicine in Itanagar with two doctors and one hospital for alternative medicine with six doctors in Naharlagun town.

There are one dispensary each in both Itanagar and Naharlagun towns. Itanagar dispensary has a strength of four doctors and 26 para medical staff, whereas there is one doctor and 5 para medical staff in Naharlagun dispensary.

There is a family welfare center in Naharlagun with two doctors. There is a Maternity and Child Welfare Centre in Naharlagun with eight beds and three doctors. Apart from this, there in 1 TB hospital in Naharlagun.

Facility	Population Served per unit	Existing	Current Requirement	Current Gap	Future requirement
Hospital Allopathic/Referral Hospital	1 lakh	1	1	0	2
Dispensary/Health Centre	15,000	2	7	5	13
Family Centre Welfare	50,000	1	2	1	6
Maternity Home	45,000	0	3	3	8
Nursing Home	45,000	0	3	3	8
Veterinary Hospital	5 lakh	2	1	-1	3
Non-Government Charitable Hospital or Nursing Home	45,000	1	3	2	7

The city is having some healthcare infrastructure facilities, but these hospitals lack in no. of staff available as well as beds available. It is proposed to maintain the staff and beds as per requirement.

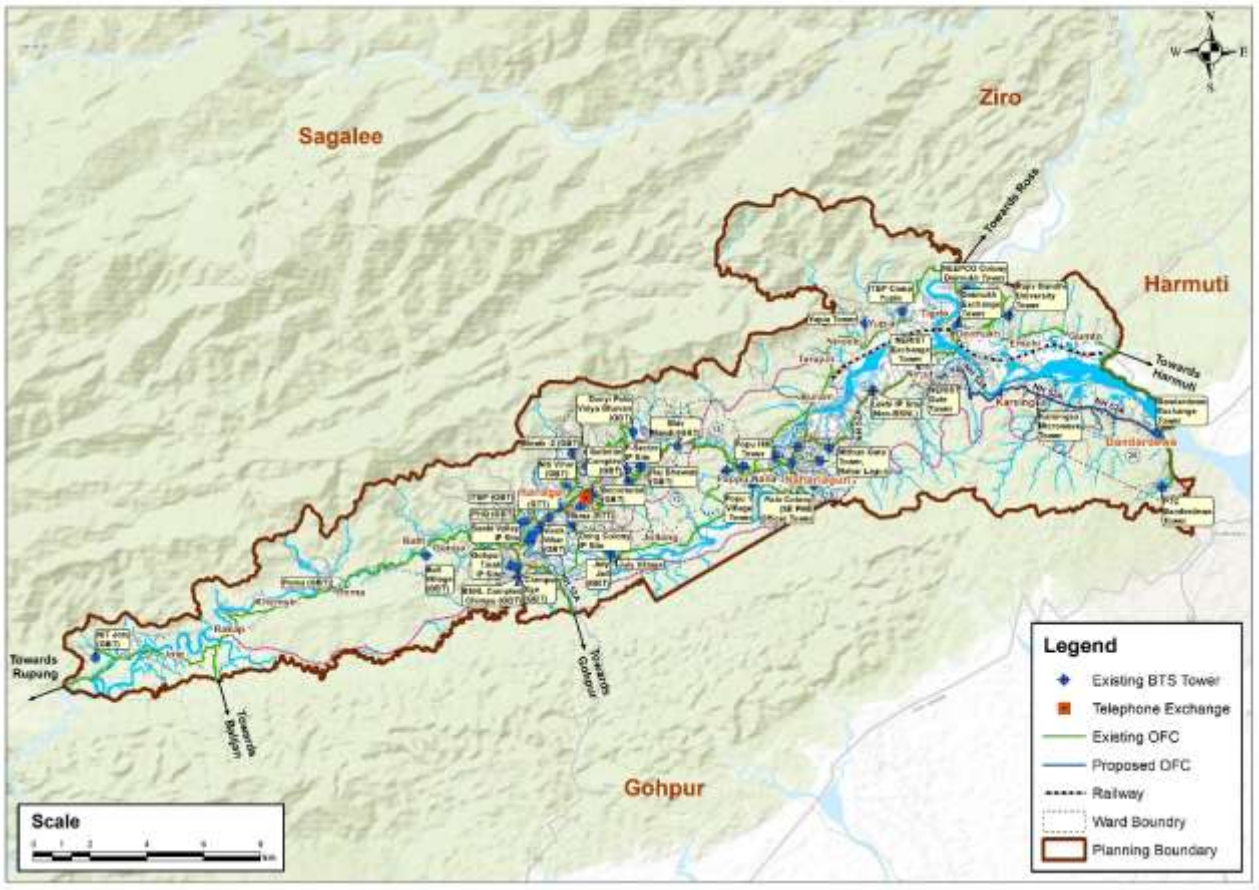


Map 43: Proposed Health facilities in ICR region

13.20 Optical Fiber Grid

Fiber-optic communication is a method of transmitting information from one place to another by sending pulses of infrared light through an optical fiber. The light forms electromagnetic carrier wave that is modulated to carry information. Fiber is preferred over electrical cabling when high bandwidth, long distance, or immunity to electromagnetic interference is required. This type of communication can transmit voice, video, and telemetry through local area networks or across long distances.

Optical Fiber Cabling is a project of Itanagar Smart City Development Corporation Limited under IT & telecom sector. This project comes under the Smart City Mission of Government of India. This project aims at setting up of a new unit in the Papum Pare city of Arunachal Pradesh.

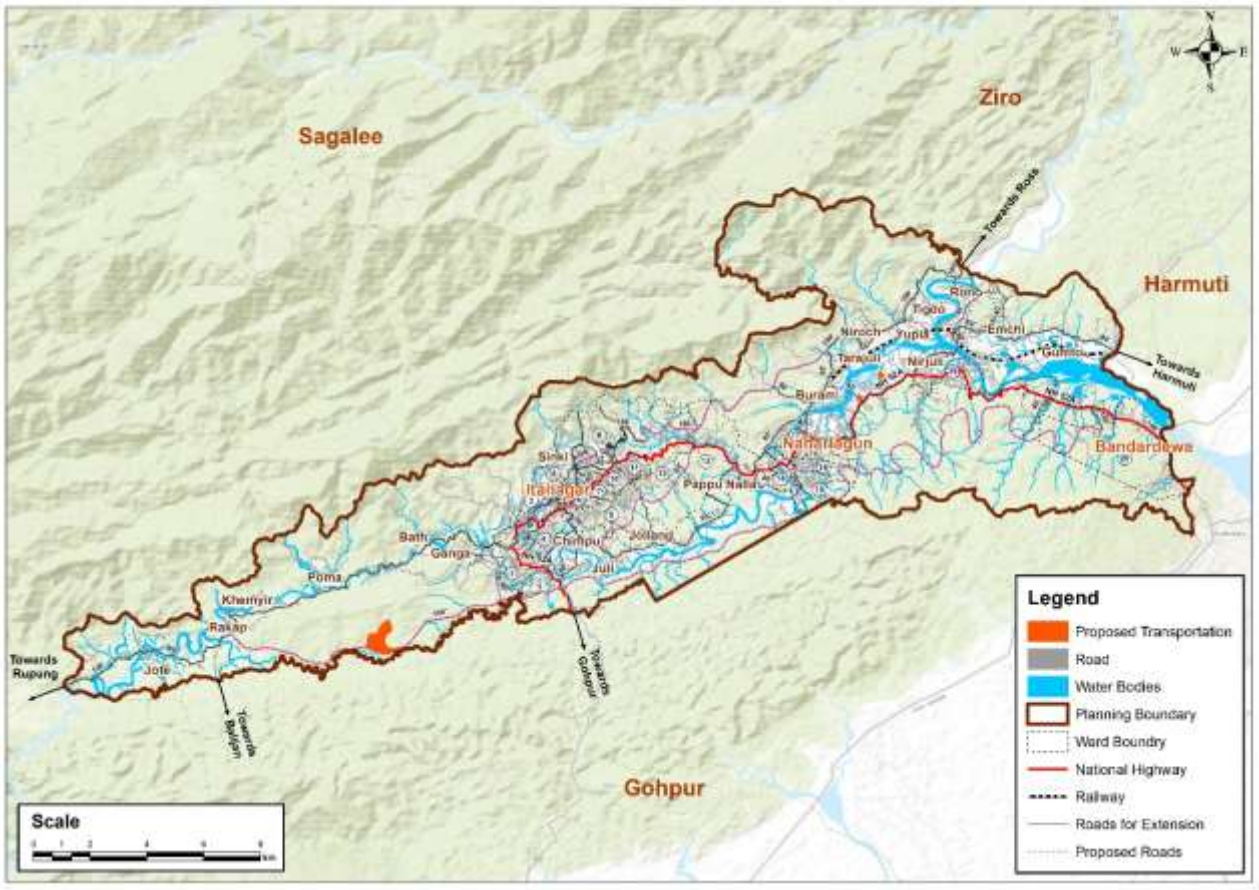


Map 44: Proposed Telecommunications tower and Optical Fiber grid network in ICR region

13.21 Freight and Parking facilities

Freight transport is the physical process of transporting commodities and merchandise goods and cargo. A freight terminal is a processing node for freight. Land or "ground" shipping can be made by train or by truck. In air and sea shipments, ground transport is required to take the cargo from its place of origin to the airport or seaport and then to its destination because it is not always possible to establish a production facility near ports due to the limited coastlines of countries. Ground transport is typically more affordable than air, but more expensive than sea, especially in developing countries, where inland infrastructure may not be efficient.

Freight parking facilities are equally important in allocation as the intended freight movement generates the significant requirement for the parking facilities in the freight movement and trucking areas.



Map 45: Proposed transportation areas in ICR region

13.22 Mass Rapid Transit System:

Rapid transit or mass rapid transit system (MRTS) is a type of high-capacity public transport generally found in urban areas. Unlike buses or trams, rapid transit systems are electric railways that operate on an exclusive right-of-way, which cannot be accessed by pedestrians or other vehicles of any sort, and which is often grade-separated in tunnels or on elevated railways.

'Mass Rapid Transit' (MRT) is a term used to describe modes of urban transport (both road and rail based) that carry large volumes of passengers quickly. They tend to be along well-defined corridors connecting suburbs to city centers, and in most cases have reserved right-of-way for some or all of their route length.

Mass Rapid Transportation systems (MRTS) is one of the modes of urban mobility, its importance, especially when cities are seen as a growth node of an economic region rises significantly as inclusive growth is determined not only by the state of transport system within a city limit, but its connectivity to its periphery, rather is entire zone of influence. A clear appreciation of the urban

context in India at this stage of her development has the potential to inform our decision on prioritizing investment towards MRTS, a sector which is under-invested.

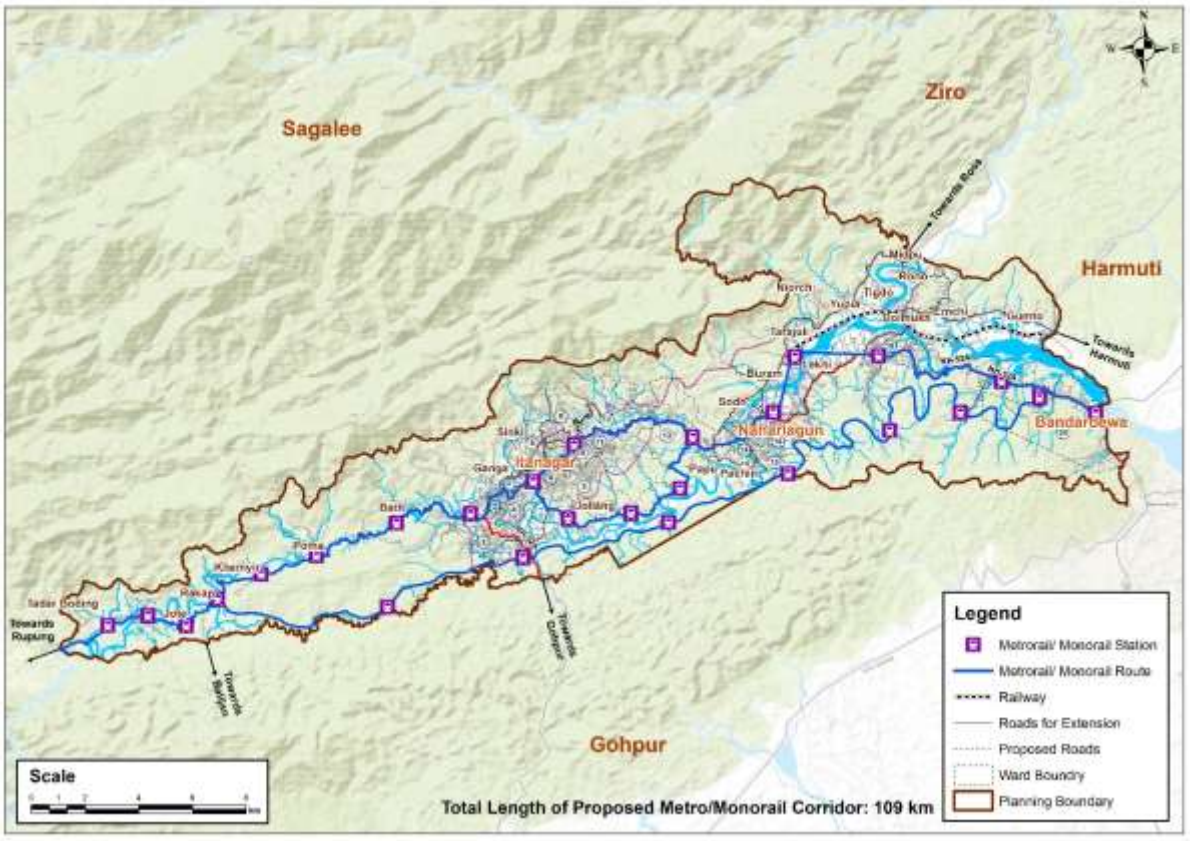
13.22.1 Metro rail/Mono rail transit system:

Two different MRTS systems are proposed along the existing and proposed roads in the ICR area i.e., along Jote to Banderdewa, Rakap to Karsingsa and Itanagar to Poppu nallah stretches.

Separate MRTC system has been proposed along two different road corridors of the ICR area. Elevated mono rail/Mono rail system has been proposed on the existing National highway passing through the city from Jote to Banderdewa. The land necessary for the future development of the Metro rail has been earmarked along the proposed road stretch from Rakap to Karsingsa.

Table 29: Proposed Metro rail/Mono rail network routes

Metro routes	Length - Kms
Jote to Banderdewa	53.63
Rakap to Karsingsa	43.52
Itanagar to Naharlagun via Jully basthi	11.07



Map 46: Proposed Metro rail/Mono rail route map

13.22.2 Cable car transit system:

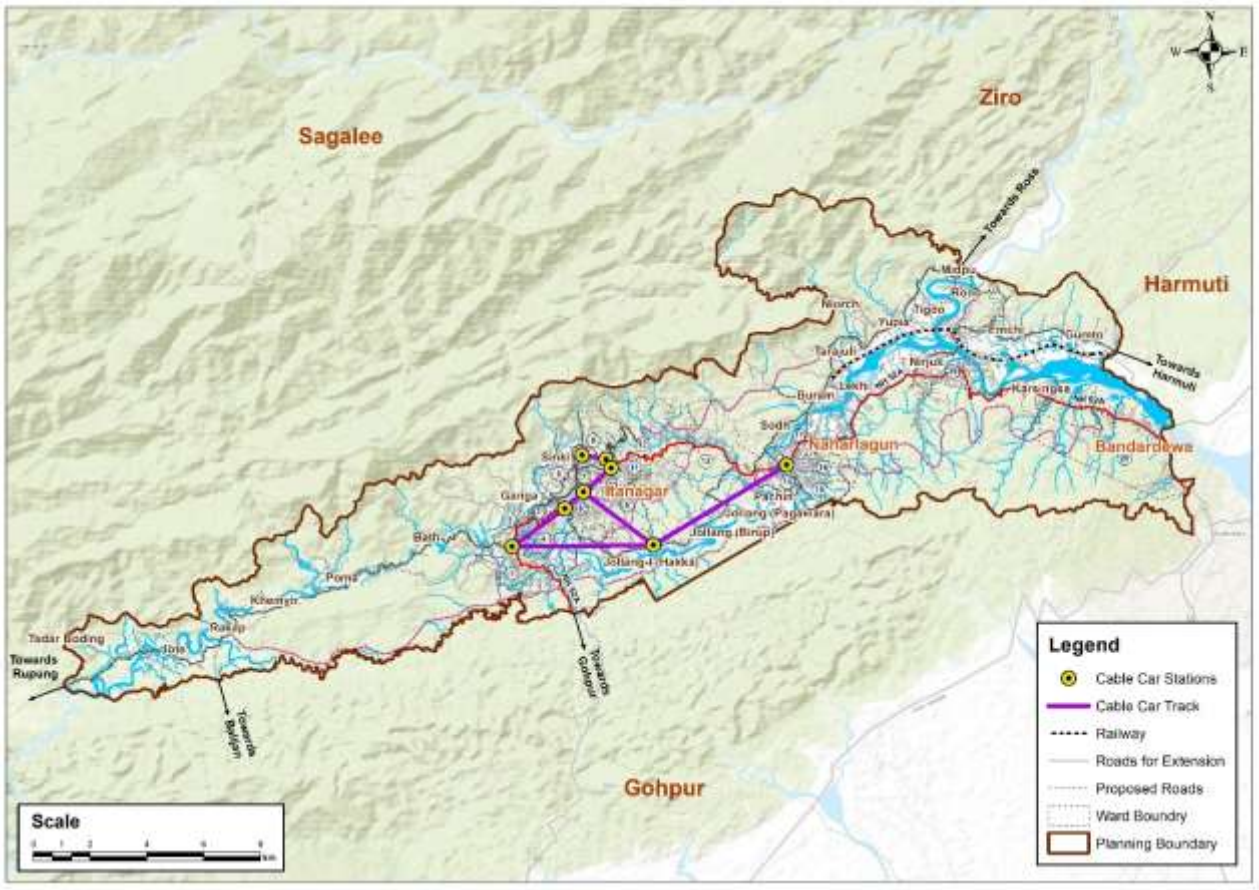
An aerial tramway, sky tram, cable car, ropeway or aerial tram is a type of aerial lift which uses one or two stationary ropes for support while a third moving rope provides propulsion. With this form of lift, the grip of an aerial tramway cabin is fixed onto the propulsion rope and cannot be decoupled from it during operations.

An aerial tramway consists of one or two fixed cables (called track cables), one loop of cable (called a haulage rope), and one or two passenger or cargo cabins. The fixed cables provide support for the cabins while the haulage rope, by means of a grip, is solidly connected to the truck (the wheel set that rolls on the track cables). An electric motor drives the haulage rope which provides propulsion. Aerial tramways are constructed as reversible systems; vehicles shuttling back and forth between two end terminals and propelled by a cable loop which stops and reverses direction when the cabins arrive at the end stations.

Eight different aerial cable car stations have been proposed based on the topography and also to cater for the travelling needs of the commuters with an additional aspect of tourism as an additional advantage.

Table 30: Proposed Cable car network map

Cable car proposal routes	Length - kms
Gohpur Tinali to Clock tower junction	2.3
Clock tower to Secretariat	0.9
Secretariat to Bank tinali junction	1.3
Bank tinali to Gompa temple	0.4
Gompa to Mowb II	0.9
Secretariat to Jully Basthi	3.1
Jully Basthi to Naharlagun	5.5
Gohpur Tinali to Jully Basthi	5.0



Map 47: Proposed Cable car route network routes

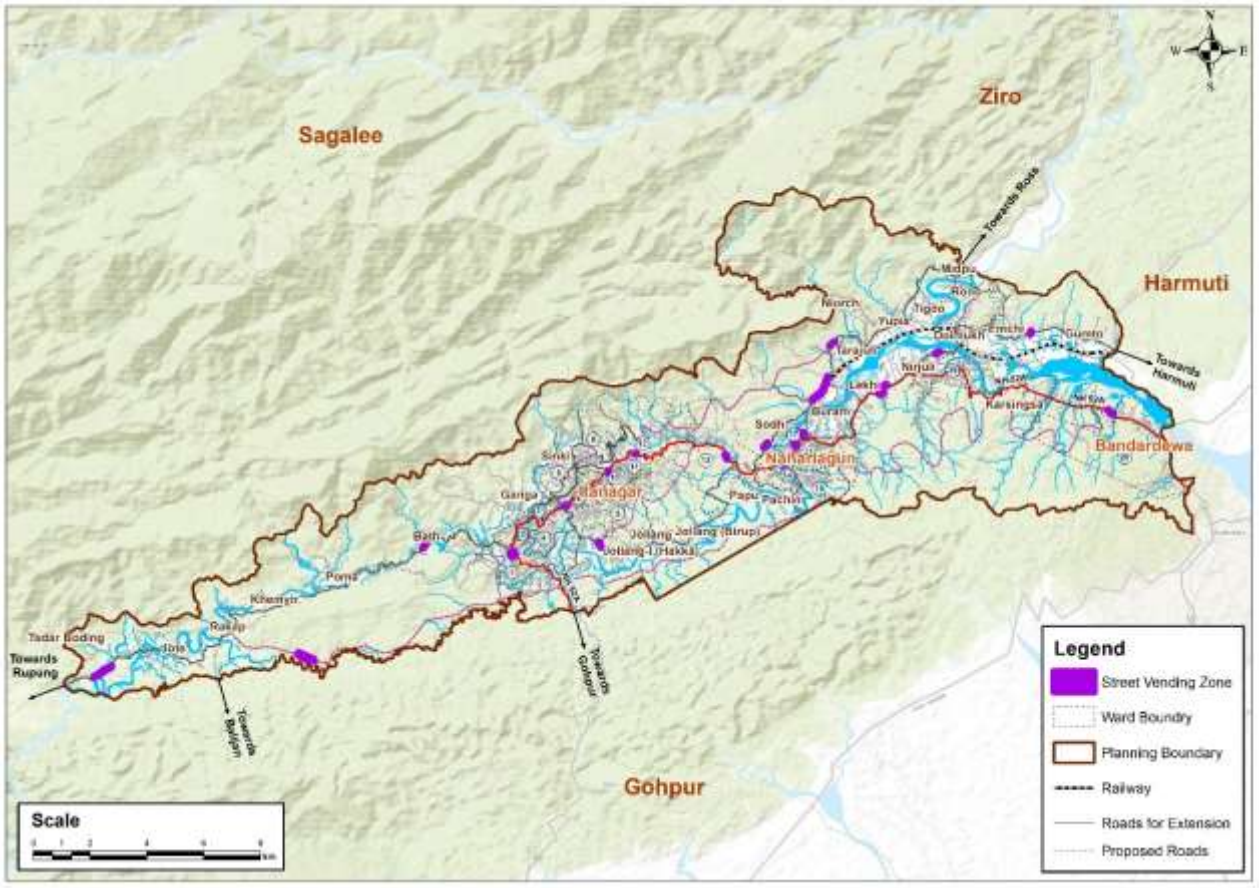
13.23 Street Vending Zones:

Street vending is a well-known activity practiced around the globe especially in developing and under developed countries. In India, street vending has been practiced from ages due to low startup costs and it became part of community. Street vending provides a source of self-employment, and acts as a measure of urban poverty alleviation for the urban poor. Street vending also has a prominent place in the urban supply chain and it provides inexpensive and convenient access to goods and services to all the segments of population including the poor. Street vending is therefore an integral part of the economic growth in urban areas. To address the issues, the Government of India has framed the National Policy on Urban Street Vendors in 2009 duly modifying the earlier policy of 2004. Later, the parliament enacted a bill to protect the rights of urban street vendors and to regulate street vending activities. It is referred to as the Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014.

In this context, the central government launched National Urban Livelihood Mission (NULM) scheme aiming to promote the sustainable development of the large informal and unorganized

workforce in the urban areas. Support to Urban Street Vendors (SUSV) is extended as a component under NULM. The component facilitates access to suitable spaces for vending, institutional credit, improved skills and social security linkages.

To facilitate the development of the Street vending zones across the ICR area, some spaces/areas have been earmarked across the ICR areas to be developed to new vending zones/market areas or to be utilized as open market areas for weekend market fairs etc.



Map 48: Proposed Street Vending Zones in ICR area

13.24 Public & Semi-public:

There is huge demand of public or semi-public areas within the city. Current land use under public or semi-public use is only 2.08%. There was inadequacy in community facilities, health care facilities and amenities such as Telephone exchange and Fire station. In the proposals, efforts are made to distribute public and utility space in such a manner that it will be accessible for people from all over the planning area and for the people from adjoining villages.

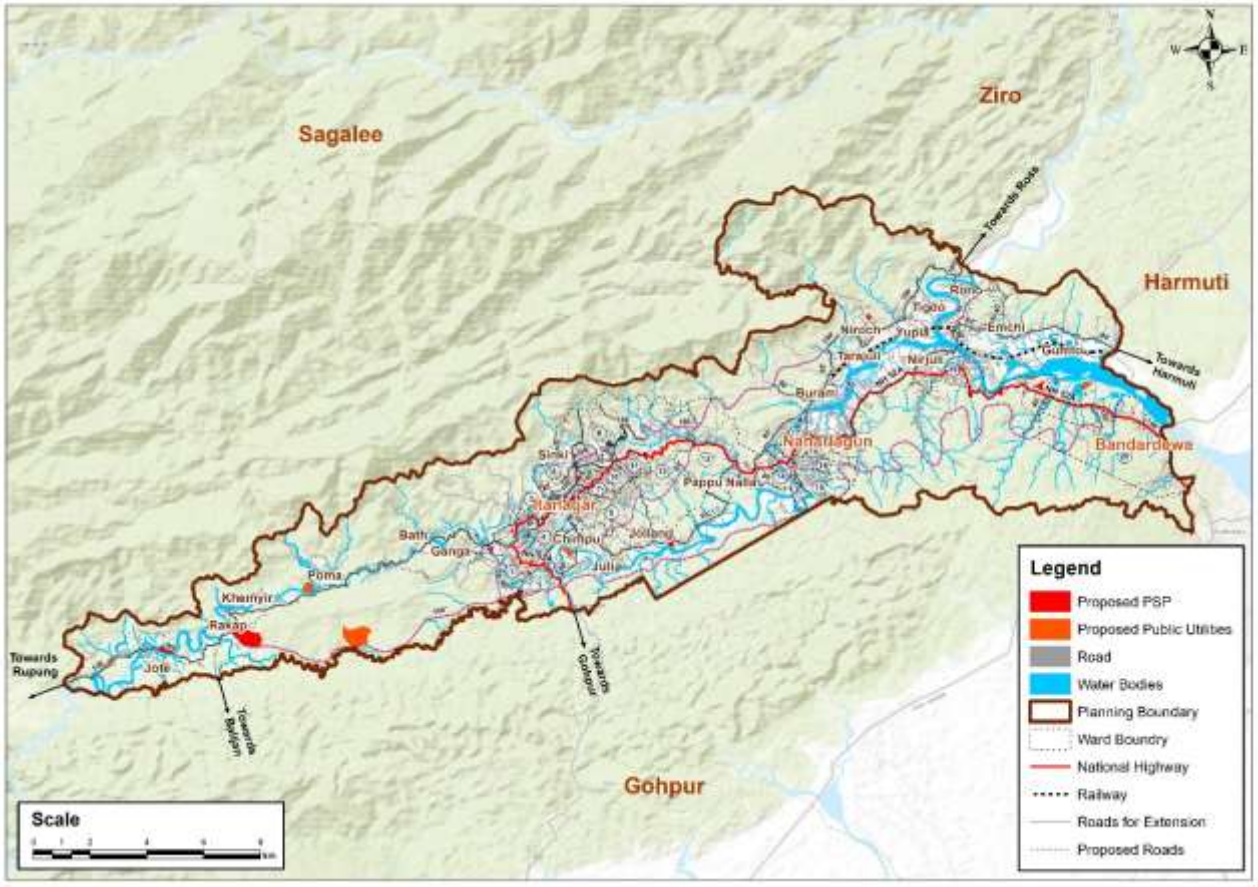
LULC	Existing LULC Area		Proposed LULC Area	
	Sum of Area Sqkm	**% Area**	**Sum of Shape Area**	**% Area**
Public Semi Public	1.04	2.08	2.425	4.67

The public facilities zoning is intended to provide area for buildings and facilities that are owned and operated by National, State, or local Governments. Public land-use category includes facilities that benefit the public but are not publicly owned.

Semi-Public facilities include places of worship, cemeteries, private educational institutions, temples and recreation. Existing Public and Semi-public land use.

Proposals includes areas identified for public and semipublic land use can be used for provision of facilities like an Allopathic Hospital, Fires station, telephone exchange, community halls, library and reading rooms and schools.

In total, the area coming under Public semi-public land use as per proposals is 2.424 Hectares.



Map 49: Proposed Public & Semi-public usage areas in ICR region

13.25 Implementation of the Proposals:

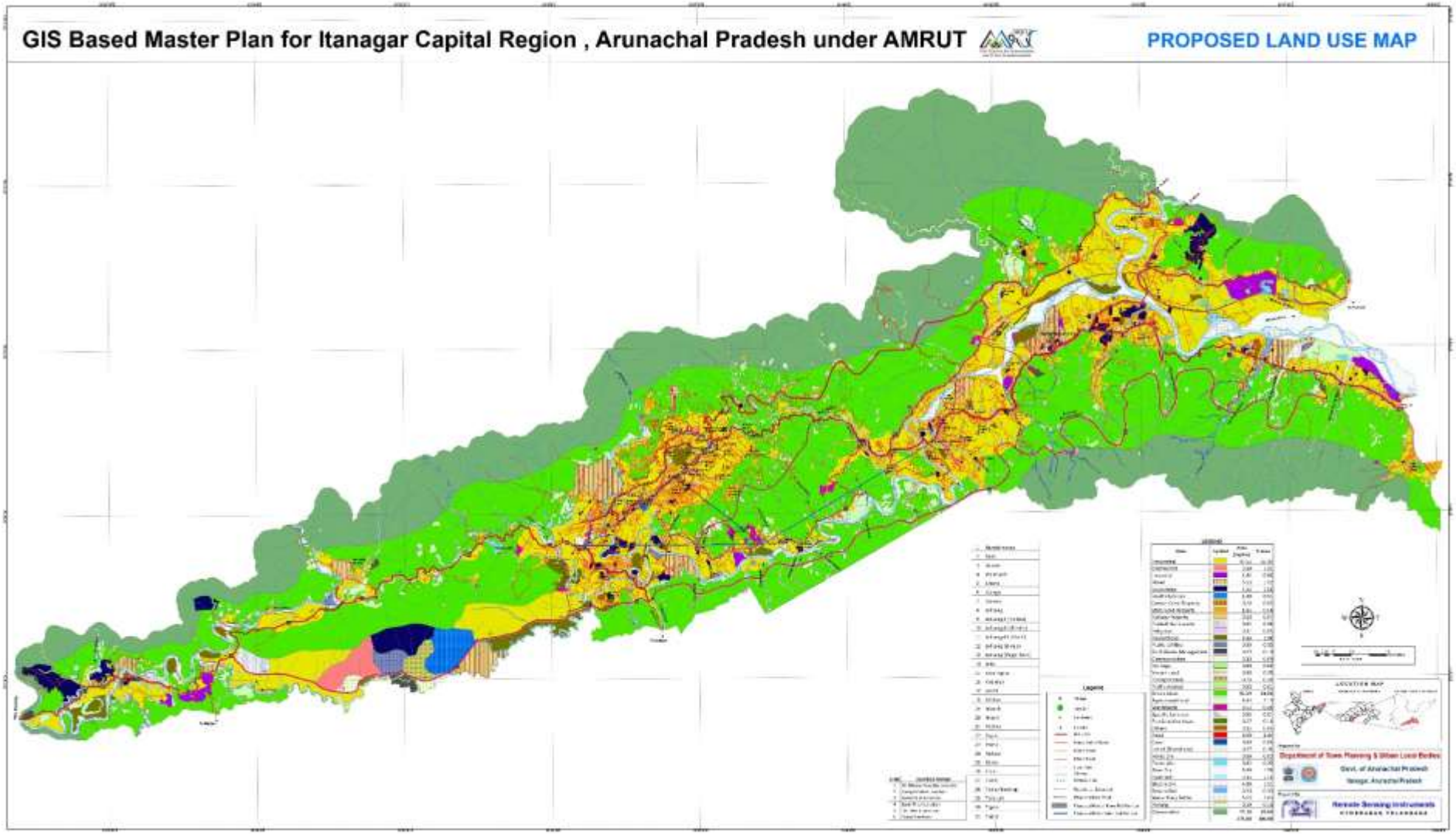
The proposals stated in above chapter are to be implemented only after acquiring the acceptance of the stakeholders from all the sects of the society that are headed and coordinated by the Town Planning Authority of the region.

Necessary Inter-departmental coordination and amalgamation of the individual departmental proposals to generate effective utilization of the land has to be promoted and constant timely review of the proposals and the requirements/demands of the city/citizens have to be analyzed and necessary changes have to be made upon consulting and reviewing the opinion of the various sects of stakeholders in the society.

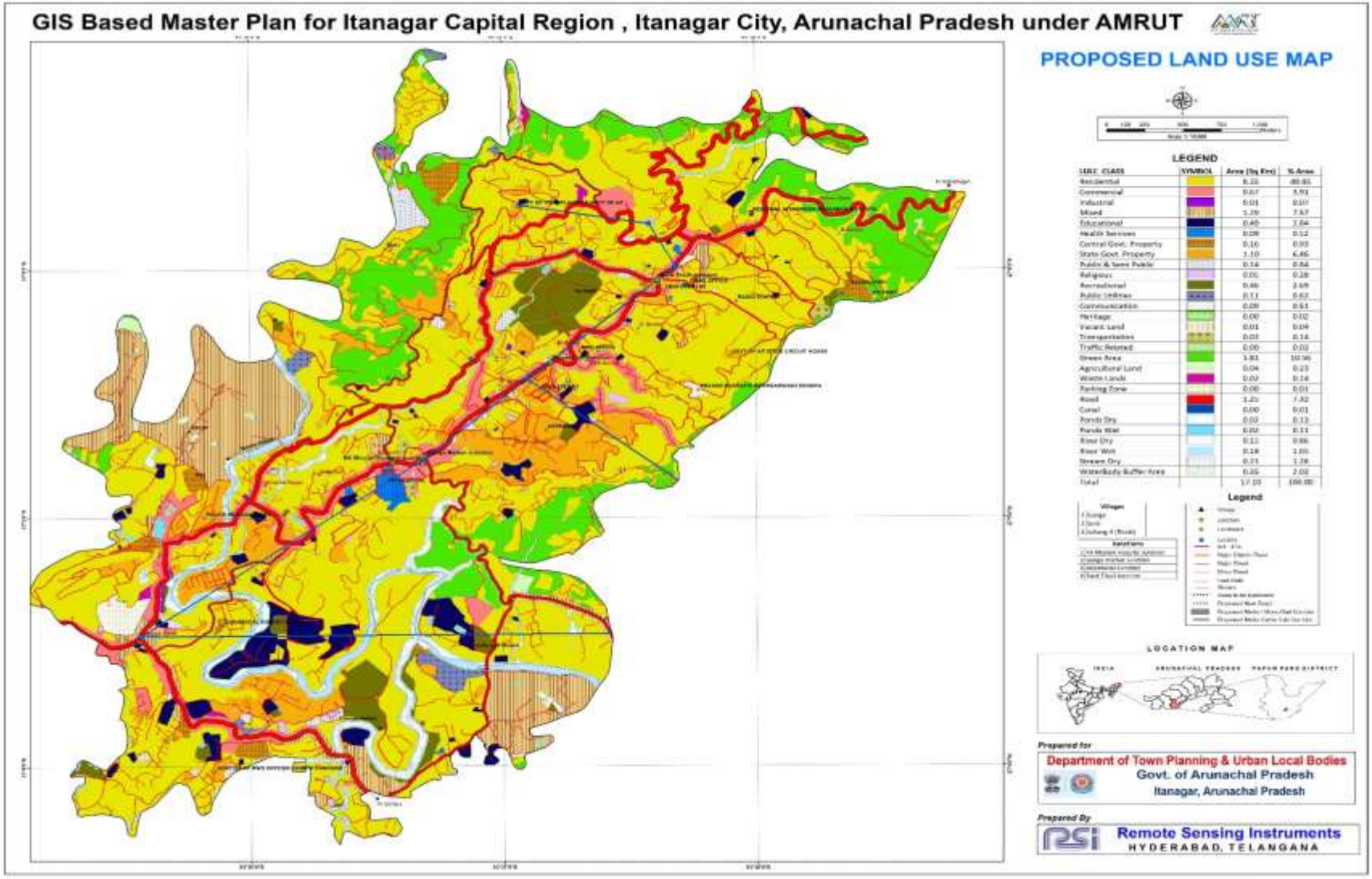
Land acquisition for the necessary future developmental proposals has to be done with prior intimation to the local residents and all the stakeholders in the region. The local residents or land owners have to be intimated prior to the land denotification and proper settlement has to be made to the resident/land owner before implementing the developmental proposals in the area.

The decentralization concept has been adhered to and the new zones/areas of development have been proposed in the western and north eastern parts of the ICR area. Decongestion of the core city has been one of the major concepts in selecting the newly proposed development areas towards the western and north-eastern parts of the ICR region. These areas have been finalized post the consultation with various stakeholders and analyzing the viability of developing them.

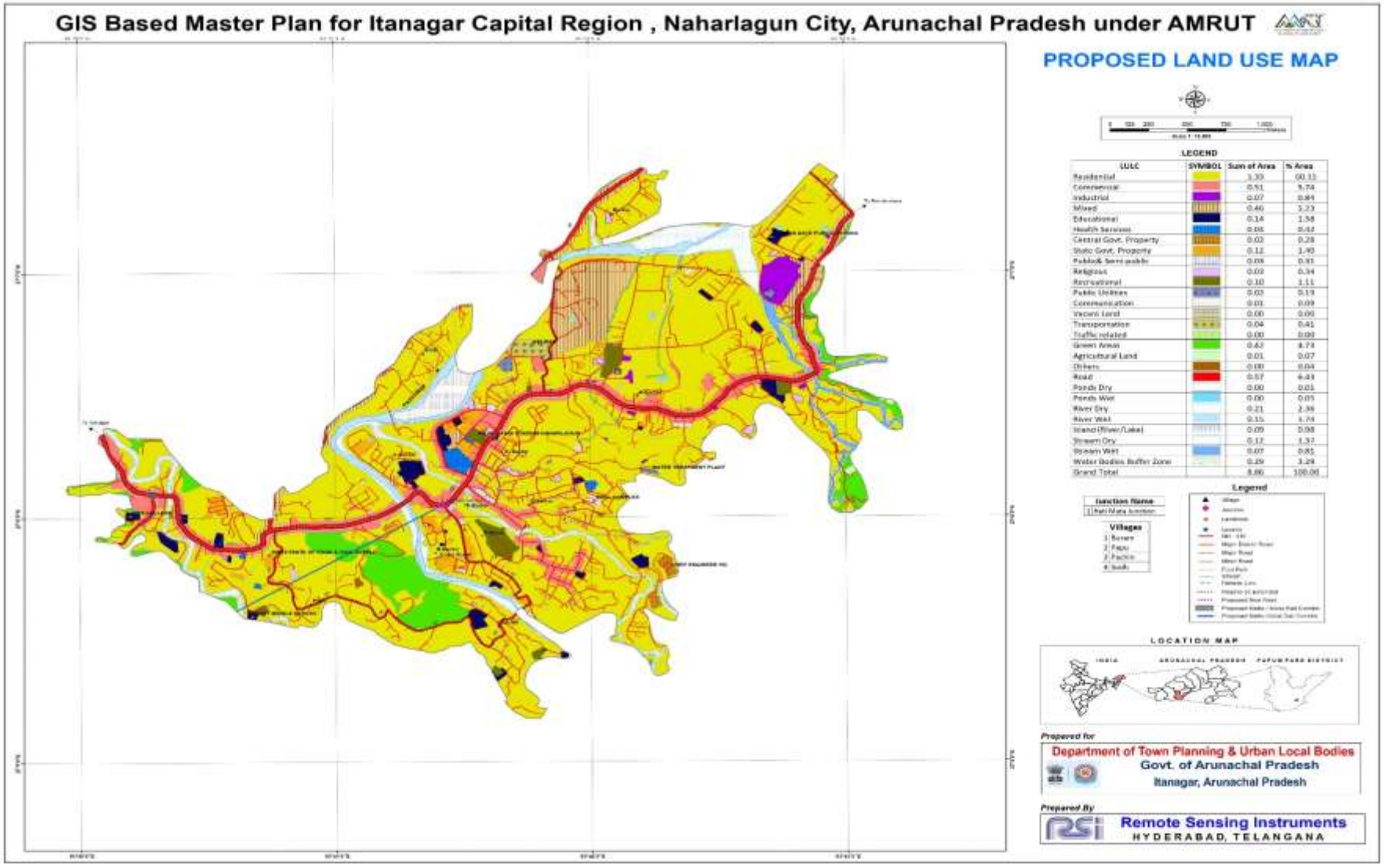
Strict adherence to the vision of the city and developmental guidelines has to be mediated by the Town planning department to facilitate the development of the city in a positive way.



Map 50: Proposed Landuse map of ICR region



Map 51: Proposed Landuse map of Itanagar



Map 52: Proposed Landuse map of Naharlagun

Table 31: Proposed Landuse percentages of ICR region

S.No	Landuse	Area (Sq.Km)	Area (Hect.)	Area (Acr.)	% Area
1	Residential	44.63	4463.41	11029.31	16.47
2	Commercial	3.29	328.90	812.74	1.21
3	Industrial	1.64	163.51	404.03	0.60
4	Mixed	5.21	520.55	1286.30	1.92
5	Educational	4.34	434.10	1072.69	1.60
6	Health Services	1.39	138.52	342.29	0.51
7	Central Govt. Property	0.26	25.63	63.33	0.09
8	State Govt. Property	1.86	185.52	458.43	0.68
9	Railway Property	0.20	19.93	49.25	0.07
10	Public& Semi-public	0.82	82.22	203.18	0.30
11	Religious	0.14	13.82	34.15	0.05
12	Recreational	3.26	326.06	805.72	1.20
13	Public Utilities	0.86	86.05	212.62	0.32
14	Solid Waste Management	0.39	38.76	95.78	0.14
15	Communication	0.10	9.63	23.79	0.04
16	Heritage	0.00	0.27	0.67	0.00
17	Vacant Land	0.68	67.70	167.28	0.25
18	Transportation	0.79	78.75	194.59	0.29
19	Traffic related	0.01	1.41	3.49	0.01
20	Green Areas	94.39	9438.91	23324.02	34.83
21	Agricultural Land	5.81	581.27	1436.34	2.14
22	Wastelands	0.53	53.46	132.09	0.20
23	Specific Land use	0.03	3.04	7.52	0.01
24	Eco-Sensitive Areas	0.27	26.85	66.35	0.10
25	Others	0.15	15.16	37.45	0.06
26	Road	6.69	669.31	1653.89	2.47
27	Canal	0.00	0.11	0.26	0.00

28	Island (River/Lake)	0.97	97.37	240.60	0.36
29	Ponds Dry	0.09	9.42	23.29	0.03
30	Ponds Wet	0.62	61.90	152.96	0.23
31	River Dry	5.36	536.03	1324.55	1.98
32	River Wet	3.16	315.60	779.86	1.16
33	Stream Dry	4.09	408.59	1009.64	1.51
34	Stream Wet	0.90	89.70	221.66	0.33
35	Water Body Buffer	5.51	551.21	1362.08	2.03
36	Parking	0.39	38.95	96.25	0.14
37	Conservation	72.18	7218.40	17837.02	26.64
		271.00	27100.00	66965.46	**100.00**

Table 32: Proposed Landuse percentages of Itanagar

S.No	Landuse	Area(Sq.KM)	Area (Hect.)	Area(Acr.)	% Area
1	Agricultural Land	0.04	3.91	9.67	0.23
2	Canal	0.00	0.11	0.26	0.01
3	Central Govt. Property	0.16	15.97	39.47	0.93
4	Commercial	0.67	66.86	165.21	3.91
5	Communication	0.09	8.74	21.60	0.51
6	Educational	0.49	48.61	120.12	2.84
7	Green Areas	1.81	180.64	446.36	10.56
8	Health Services	0.09	8.93	22.06	0.52
9	Heritage	0.00	0.27	0.67	0.02
10	Industrial	0.01	1.18	2.93	0.07
11	Mixed	1.29	129.40	319.76	7.57
12	Parking Zone	0.00	0.14	0.36	0.01
13	Ponds Dry	0.02	2.17	5.36	0.13
14	Ponds Wet	0.02	1.96	4.85	0.11
15	Public Utilities	0.11	10.53	26.01	0.62
16	Public& Semi-public	0.14	14.28	35.29	0.84
17	Recreational	0.46	46.05	113.78	2.69
18	Religious	0.05	4.72	11.66	0.28
19	Residential	8.35	835.37	2064.23	48.85

20	River Dry	0.15	14.71	36.34	0.86
21	River Wet	0.18	17.92	44.29	1.05
22	Road	1.25	125.24	309.47	7.32
23	State Govt. Property	1.10	110.44	272.90	6.46
24	Stream Dry	0.21	21.46	53.04	1.26
25	Traffic related	0.00	0.45	1.11	0.03
26	Transportation	0.02	2.41	5.95	0.14
27	Vacant Land	0.01	0.64	1.59	0.04
28	Wastelands	0.02	2.43	6.00	0.14
29	Water Bodies Buffer Zone	0.35	34.68	85.71	2.03
	Grand Total	**17.10**	**1710.23**	**4226.06**	**100.00**

Table 33: Proposed Landuse percentages of Naharlagun

S.No	Landuse	Area (Sq.KM)	Area (Hect.)	Area (Acr.)	% Area
1	Agricultural Land	0.01	0.61	1.50	0.07
2	Central Govt. Property	0.02	2.49	6.16	0.28
3	Commercial	0.51	50.85	125.66	5.74
4	Communication	0.01	0.76	1.87	0.09
5	Educational	0.14	14.02	34.63	1.58
6	Green Areas	0.42	41.96	103.69	4.73
7	Health Services	0.04	3.74	9.24	0.42
8	Industrial	0.07	7.47	18.47	0.84
9	Island (River/Lake)	0.09	8.65	21.36	0.98
10	Mixed	0.46	46.37	114.59	5.23
11	Others	0.00	0.32	0.80	0.04
12	Ponds Dry	0.00	0.13	0.31	0.01
13	Ponds Wet	0.00	0.48	1.18	0.05
14	Public Utilities	0.02	1.68	4.15	0.19
15	Public& Semi-public	0.03	2.78	6.87	0.31
16	Recreational	0.10	9.81	24.25	1.11

17	Religious	0.03	3.05	7.54	0.34
18	Residential	5.33	533.12	1317.36	60.15
19	River Dry	0.21	20.93	51.71	2.36
20	River Wet	0.15	15.45	38.19	1.74
21	Road	0.57	56.96	140.75	6.43
22	State Govt. Property	0.12	12.44	30.73	1.40
23	Stream Dry	0.12	12.17	30.06	1.37
24	Stream Wet	0.07	7.22	17.84	0.81
25	Traffic related	0.00	0.01	0.03	0.00
26	Transportation	0.04	3.68	9.08	0.41
27	Vacant Land	0.00	0.02	0.06	0.00
28	Water Bodies Buffer Zone	0.29	29.16	72.05	3.29
	Grand Total	**8.86**	**886.33**	**2190.15**	**100.00**

CHAPTER-14: ZONING REGULATIONS

The purpose of these regulations is to safeguard the health, property and public welfare by controlling the design, location, use or occupancy of all buildings and structures through the regulated and orderly development of land and land uses within this jurisdiction.

14.1 Definitions

Access; - A clear approach to a plot or a building.

Apartments: - A building having five or more dwelling units and common services on a given site or plot in a single or multiple block, without customary sub-division of land by way of individual plots.

Accessory Building: - A Building separated from the main building on a plot and containing one or more rooms for accessory use such as Servant's Quarter, Garage, Store rooms or such areas as may be classified by the Competent Authority.

Accessory Use: - Means any use of the premises subordinate to the principal use and customarily incidental to the principal use.

Ancillary living quarters: - Building used solely as the temporary dwelling of guests of the occupants of the premises; such dwelling having no kitchen facilities and not rented or otherwise used as a separate dwelling unit.

Amenity: - Includes road, street, open space, park, recreational ground, playground, garden, water supply, electric supply, street lighting, sewerage, drainage, public works and other utilities, services and conveniences.

Auditorium: - The accommodation provided for the public to view the cinematograph exhibitions/cultural activities etc.

Assembly Buildings: - A building or part thereof, where groups of people congregate or gather for amusement, recreation, social, religious, patriotic, civil, travel and similar purposes and these includes buildings of drama and Cinema theatres, drive-in-theatres, assembly halls, City halls, town halls, auditoria, kalyana mandapams, places of worship and road, railways, air, sea or other public transportation stations.

Authority having jurisdiction: - The Authority that has been created by a statue and which, for administering the Code/ Rules, may authorize a committee, an official, or an agency to act on its

behalf, hereinafter called the 'Authority'. Authority can be any Urban Local Body/Development Authority/Industrial Development Authority or any other authority as notified by the State Government as the case may be.

Building Height: - The vertical distance measured

- In the case of flat roofs from the upper level of plinth and continuance to the highest point of the building excluding parapet wall, staircase room, lift room and water tank. This shall be subject to concurrence of State Disasters Response and Fire Services Department.
- In case of pitched roofs up to the point where the external surface of the outer wall intersects the finished surface of the sloping roof and
- Architectural features serving no other function except that of decoration shall be excluded from the purpose of measuring heights.
- In case of undulated terrain height can be considered as average of the corresponding formation level of the site.

Building Line: - The line up to which the plinth of building adjoining a street or an extension of a street or on a future street may lawfully extend and includes the lines prescribed, if any, in any scheme and/or development plan. The building line may change from time to time as decided by the Authority

Building set back: - The distance by which any building or structure shall be separated from the boundary lines of the plot.

Balcony: - A horizontal cantilevered projection, including a handrail or balustrade, to serve a passage or as sit out place.

Barsati: - A habitable room / rooms on the roof of the building with or without toilet / kitchen.

Basement/Cellar: - The lower storey of a building below or partly below the ground level, with one or more than one level and to be used for parking of vehicles.

Buffer area: -

- Means an area of land separating adjacent land uses that is managed for the purpose of mitigating impacts of one use on another.
- A buffer area consists of a separation distance and one or more buffer elements. Buffer element is a natural or artificial feature that mitigates an adverse impact; a buffer may include open ground, a vegetation buffer and or acoustic barrier.

- Buffer Area is the area within which certain structures / sensitive uses are either restricted or prohibited.

Building

A structure constructed with any materials whatsoever for any purpose, whether used for human habitation or not, and includes: -

- Foundation, plinth, walls, floors, chimneys, plumbing and building services, fixed platforms etc.
- Verandahs, balconies, cornices, projections etc.
- Parts of a building or anything affixed thereto
- Any wall enclosing or intended to enclose any land or space, sign and outdoor display structures etc.
- Tanks constructed or fixed for storage of chemicals or chemicals in liquid form and for storage of water, effluent, swimming pool, ponds etc.
- All types of buildings shall be considered to be "buildings", except tents, shamianas and tarpaulin shelters erected temporarily for temporary purposes and ceremonial occasions.

Business Buildings: - Includes any building or part thereof used principally for transaction of business and/or keeping of accounts and records therefore including offices, banks, professional establishments, court houses etc., if their principal function is transaction of business and/or keeping of books and records.

Cabin: - A non-residential enclosure constructed of non-load bearing partitions.

Canopy: - Shall mean a cantilevered projection from the face of the wall over an entry to the building at the lintel level provided that:

(a) It shall not project beyond the plot line.

(b) It shall not be lower than 2.3m or 7'-6" when measured from the ground. There shall be no structure on it and the top shall remain open to sky.

Carpet area: - means the net usable floor area of an apartment, excluding the area covered by the external walls, areas under services shafts, exclusive balcony or verandah area and exclusive open terrace area, but includes the area covered by the internal partition walls of the apartment.

Chair Rail: - A fixed glazing bar, or rigid bar, that provides protection from human impact.

Chimney: - An upright shaft containing one or more flues (smoke ducts) provided for the conveyance to the outer air of any product of combustion resulting from the operation of heat producing appliance or equipment employing solid, liquid or gaseous fuel.

Chowk or Courtyard: - means a fully or partially enclosed space permanently open to sky within a building at ground level and serves as lighting and ventilating space besides for outdoor activities, etc.

Clean Industry: - Industries which do not throw out any smoke, noise, offensive odor or harmful industrial wastes and employing not more than 40 workers with/without power and those not included in the list of polluting industries issued by concerned authorities.

Common areas mean:

a) The entire land for the real estate project or where the project is developed in phases, the entire land for that phase;
b) The stair cases, lifts, staircase and lift lobbies, fire escapes, and common entrances and exits of buildings;
c) The common basements, terraces, parks, play areas, open parking areas and common storage spaces;
d) The premises for the lodging of persons employed for the management of the property including accommodation for watch and ward staffs or for the lodging of community service personnel;
e) Installations of central services such as electricity, gas, water and sanitation, air conditioning and incinerating, system for water conservation and renewable energy;
f) The water tanks, sumps, motors, fans, compressors, ducts and all apparatus connected with installations for common use;
g) All community and commercial facilities as provided in the real estate project;
h) All other portion of the project necessary or convenient for its maintenance, safety, etc., and in common use;

Competent Authority means: -

a) The Commissioner of the Itanagar Capital Region Development Authority;
b) The Vice Chairman of the respective Urban Development Authority;

c) The Director of Town & Country Planning in case of Local Authorities not covered in Development Authorities and Gram Panchayat areas covered in Master Plans / General Town Planning Schemes notified under Arunachal Pradesh Town Planning Act, 1920.

Congested Area: - Congested Area means the areas falling in the Local Authority notified by the Competent Authority based on the existing development.

Conversion: - The change from one occupancy to other occupancy or any change in building structure or part thereof resulting in a change of space and use requiring additional occupancy certificate.

Corner site: - Means a site at the junction of and fronting on two or more intersecting streets.

Corridor: - Corridor means a common passage or circulation space including a common entrance hall in a building;

Cottage Industry" or "Customary Home Occupation: - means a home occupation customarily carried out by a member of the family residing in the premises without employing hired labor, without display of goods, and which shall be non-hazardous and not affecting the safety of the inhabitants of the building and the neighborhood, provided that no mechanical equipment is used except that as is customarily used for purely domestic or household purposes and/or employing licensable goods. If power is used, the total electricity load shall not exceed 10 H.P.

Covered Area: - means built up area covered immediately above the plinth level by the building but does not include the area covered by compound wall, gate, cantilevered porch, portico, slide swing.

Detached building: - Includes a building with walls and roofs independent of any other building and with open spaces on all sides within the same plot.

Density: - The residential density expressed in terms of the number of dwelling units per hectare. NOTE: Where such densities are expressed exclusive of community facilities and provision of open spaces and major roads (excluding incidental open spaces) these will be net residential densities. Where these densities are expressed taking into consideration the required open space provision and community facilities and major roads, these would be gross residential densities at neighborhood level, sector level or town level, as the case may be. The provision of open spaces and community facilities will depend on the size of the residential community. Incidental open

spaces are mainly open spaces required to be left around and in between two buildings to provide lighting and ventilation.

"Developer" means,

(a) a person who constructs or causes to be constructed an independent building or a building consisting of apartments, or converts an existing building or a part thereof into apartments, for the purpose of selling all or some of the apartments to other persons and includes his assignees; or

(b) a person who develops land into a project, whether or not the person also constructs structures on any of the plots, for the purpose of selling to other persons all or some of the plots in the said project, whether with or without structures thereon; or

(c) any development authority or any other public body in respect of allotters of

- buildings or apartments, as the case may be, constructed by such authority or body on lands owned by them or placed at their disposal by the Government.
- plots owned by such authority or body or placed at their disposal by the Government, for the purpose of selling all or some of the apartments or plots.

(d) an apex State level co-operative housing finance society and a primary co-operative housing society which constructs apartments or buildings for its members or in respect of the allotted of such apartments or buildings; or

(e) any other person who acts himself as a builder, colonizer, contractor, promoter, estate developer or by any other name or claims to be acting as the holder of a power of attorney from the owner of the land on which the building or apartment is constructed or plot is developed for sale; or

(f) such other person who constructs any building or apartment for sale to the general public.

Explanation:-For the purposes of this clause, where the person who constructs or converts a building into apartments or develops a plot for sale and the persons who sells apartments or plots are different persons, both of them shall be deemed to be the promoters and shall be jointly liable as such for the functions and responsibilities specified in these rules

Development: - Development means the carrying out of building, engineering, mining or other operations in, or over, or under land and water, or in the use of any building or land, and includes redevelopment and layout and subdivision of any land; and 'to develop' shall be construed accordingly.

Development Charge: - Development Charge means a charge levied by the competent authority under the relevant provisions of the Law.

Development Plan: - Development Plan means a plan for the Development, redevelopment, or improvement of the area within the jurisdiction of Authority and includes Perspective Plan, Master Plan, Zonal Development Plan and part Zonal Plan / Area Development Plan prepared under the relevant Acts.

Drain: - A system of line of pipes, with their fittings and accessories, such as manholes, inspection chambers, traps, gullies, floor traps used for drainage of building or yards appurtenant to the buildings with the same cartilage. It includes an open channel for conveying surface water or a system for the removal of any liquid.

Drainage: - A system constructed for the purpose of removal of any wastewater.

Dwelling: - A building or a portion thereof which is designed or used wholly or principally for residential purposes for one family. This shall not include boarding or rooming houses, tents, tourist camps, hotels or other structures designed or used primarily for transient residents.

Dwelling Unit: - Independent housing unit, with separate facilities for living, cooking and sanitary requirements.

Encroachment: - Means an act to enter into the possession or rights of permanent or temporary nature on a land or built up property of local body or state/central Government.

Energy Conservation Building Code or ECBC: - The Energy Conservation Building Code (2008) when locally adapted to Arunachal Pradesh's climate is termed as the "Arunachal Pradesh Energy Conservation Building Code (APECBC)." All definitions included in the Energy Conservation Building Code (2008) and not otherwise defined herein are applicable as amended from time to time.

Enforcement Authority means:

- The Commissioner of the Itanagar Capital Region Development Authority;
- The Vice Chairman of the respective Urban Development Authority;
- The Commissioner of respective Urban Local Body;
- The Executive Authority of the Special Unit created as the case may be for the purpose of sanctioning and monitoring building and development activity, as applicable.

Escalator: - A power driven, inclined, continuous stairway used for raising or lowering passengers.

Existing Use: - Use of a building or structure existing authorized with the approval of the Authority before the commencement of these Rules.

Educational Buildings: - Includes a building exclusively used for a school or college involving assembly for instruction, education or recreation incidental to educational use, and including a building for such other uses as research institution.

Existing Building: - A building or structure existing authorized with the approval of the Authority before the commencement of these Rules.

Fencing: - A barrier of a plant or construction material used to set off the boundary of an area and to restrict visual or physical passage in or out of it.

Fire Resistance: - Fire Resistance is a property of an element of building construction and is the measure of its ability to satisfy for a stated period some or all of the following criteria:

(a) Resistance to collapse

(b) Resistance to penetration of flame and hot gases and

(c) Resistance to temperature rise on the unexposed face up to a maximum of 180^0 and/or average temperature of 150^0.

Fire Resistant Rating: - means the time during which a fire-resistant material i.e. materiel having a certain degree of fire resistant, fulfills its function of contributing to the fire safety of a Building when subjected to prescribe conditions of heat and load or restraint. The fire Resistance test of structures shall be done in accordance with IS 3809-1966 fire Resistance Test of structure.

Fire separation: - It means the distance in meter measured from any other building on the site or from another site or from the opposite side of a street or other public space to the building.

Fire Tower: - Means an enclosed staircase that can only be approached from the various floors through landings or lobbies separated from both the floor area and the staircase by fire resistant doors and open to the outer air.

Floor: - Means the lower surface of any storey on which one normally walks in a building. Note: The sequential number of floors shall be determined by its relation to the determining entrance level. For floor at or wholly above ground level, the lowest floor in the building with direct entrance from the road/street shall be termed as Ground Floor. The other floors above Ground Floor shall be numbered in sequence as floor 1, floor 2 etc., with number increasing upwards. Similarly, floors below ground levels shall be termed Basement floor 1, Basement floor 2 with number increasing downwards.

Floor Area: - means covered area of a building at any floor level.

Floor Area Ratio (FAR): - means the quotient obtained by dividing the total covered area (plinth area) on all floors, by the area of the plot.

F.A.R. = Total covered areas on all floors / Plot area

Foundation: - That part of the structure, which is in direct contact with ground and transmit loads over it. A substructure supporting an arrangement of columns or walls in a row or rows transmitting the loads to the soil.

Gallery: - An intermediate floor or platform projecting from a wall of an auditorium or a hall providing extra floor area, and/additional seating accommodation and includes the structures provided for seating in stadium.

Garage, Private: - Garage, Private means a building or portion thereof designed and used for parking of private owned motor driven or other vehicles.

Garage –Public: - A building or portion thereof, designed other than as a private garage, operated for gain, designed and/or used for repairing, servicing, using, selling or storing or parking motor driven or other vehicles.

Gated Community Development: - Means an exclusive housing development in an area with compound wall, access through gates and having their own facilities and amenities. The housing units may comprise of Apartment blocks, detached, semi-detached or row houses with or without combinations.

Gradient: - The degree of slope of a pipe invert or road or land surface. The gradient is a measure of the slope height as related to its base. The slope is expressed in terms of percentage or ratio.

Group Development Scheme: - is reckoned as development of Buildings for any use in a Campus or Site of 4000 sq.m and above in area and could be row houses, semi-detached, detached Houses, Apartment blocks, Commercial, Institutional, Industrial buildings or High-Rise buildings or mix or combination of the above.

Group Housing/Apartment: - Means a building having five or more multiple dwelling units/apartments and common services on a given site or plot of less than 4,000 sq. mts. in single or multiple blocks each building containing two or more apartments or with total of five or more units/apartments, without customary sub-division of land by way of individual plots.

Hazardous Buildings: - Includes a building or part thereof used for: (i) Storage, handling, manufacture of processing of radioactive substances or of highly combustible or explosive

materials or of products which are liable to burn with extreme rapidity and/or producing poisonous fumes or explosive emanations; (ii) Storage, handling, manufacture or processing of which involves highly corrosive, toxic or noxious alkalis, acids, or other liquids, gases or chemicals producing flames, fumes and explosive mixtures etc., or which result in division of matter into fine particles capable of spontaneous ignition.

High Rise Building: - High Rise Building means a building with 18 meters and above (including stilt floor) in height. However, chimneys, cooling towers, boiler rooms/ lift machine rooms, cold storage and other non-working areas in case of industrial buildings and water tanks and architectural features in respect of other buildings may be permitted as a non-High Rise Building.

Industrial Buildings: - Includes a building or part thereof wherein products or material are fabricated, assembled or processed, such as assembly plants, laboratories, power plants, refineries, gas plants, mills, dairies and factories etc.

Institutional Buildings: - Includes a building constructed by Government, semi-Government organizations or Registered Trusts and used for medical or other treatment, or for an auditorium or complex for cultural and allied activities or for an hospice, care of persons suffering from physical or mental illness, handicap, disease or infirmity, care of orphans, abandoned women, children and infants, convalescents, destitute or aged persons and for penal or correctional detention with restricted library of the inmates ordinarily providing sleeping accommodation and including dharamshalas, hospitals, sanatoria, custodial and penal institutions such as jails, prisons, mental hospitals, houses of correction, detention and reformatories etc.

Jhamp: - A down ward, vertical or sloping projection hanging below any horizontal projection like balcony, canopy, verandah, passage etc., to provide protection from direct sun and rain.

Kerb: - A concrete or stone edging along a pathway or road often constructed with a channel to guide the flow of storm water and thereby serve individual purpose.

Landscape, Hard: - Civil work component of landscape architecture such as pavement, walkways, roads, retaining walls, sculpture, street amenities, fountains and other built environments.

Landscape, Soft: - The natural elements in landscape design, such as plant materials and the soil itself.

Layout: - Layout means the laying out a parcel of land or lands into building plots with laying of road/streets with formation, leveling, metaling or black topping or paving of the roads and

footpaths etc., and laying of the services such as water supply, drainage, street lighting, open spaces avenue plantation etc.

Lift: - An appliance designed to transport persons or materials between two or more levels in a vertical or substantially vertical direction by means of a guided car or platform. The word 'elevator' is also synonymously used for 'lift'.

a) **Fire Lift:** Means a special lift designed for the use of fire service personnel in the event of fire or other agency.
b) **Goods Lift:** A lift designed primarily for the transport of goods, but which may carry a lift attended or other persons necessary for the loading or unloading of goods.
c) **Hospital Lift:** A lift normally installed in a hospital/ dispensary/ clinic and designed to accommodate one number bed/stretcher along its depth, with sufficient space around to carry a minimum of three attendants in addition to the lift operator.
d) **Passenger Lift:** A lift designed for the transport of passengers
e) **Service Lift:** A passenger cum good lift meant to carry goods along with people. Typically, in an office building this may be required to carry food or stationers, in a residential building to carry a bureau or accommodate a stretcher and in a hotel to be used for food trolleys or baggage. There is a need in such lifts, to take care of the dimensions of the car and the door clear opening in line with the type of goods that may have to be carried based on mutual discussion between supplier and customer. Also, such lifts shall have buffer railings in the car at suitable height to prevent damage to the car panels when the goods are transported. Topically such lifts, if provided with an automatic door, may use some means to detect trolleys and stretcher movement in advance to protect the doors against damage. The car floors load calculations and car area of such a lift is as in the case of a passenger lift except that these are not meant to carry heavy concentrated loads.

Light Industry: - Light Industry means Industries which do not throw out excessive smoke, noise, offensive odor or harmful industrial wastes, employing not more than100 workers and using power of not more than 100 H.P. Such Industries except in the case of foundries and smithies do not consume any solid fuel.

Lobby: -Means a covered space in which all the adjoining rooms open.

Low cost housing: - Low cost housing means housing development and schemes for socially and economically weaker/ backward sections of the society at affordable costs of built-up area and

service. The requirements and construction specifications are as specified by the Government from time to time.

Master Plan/General Town Planning [GTP] Scheme: - A Master Plan/General Town Planning [GTP] Scheme formulated under any relevant Act for any area/settlement approved by the Government.

Means of Access: - Means an access to a building or plot from an existing public street or road through a road/street/ pathway.

Mezzanine Floor: - An intermediate floor, not being a loft, between the floor and ceiling of any storey and its area shall not be more than 1/3rd of the area of the floor.

Multi-level Car Parking Building (Parking complex/Parking lot): - A building may be partly below ground level having two or more basements or above ground level, primarily to be used for parking of cars, scooters or any other type of light motorized vehicle. Premises either built or open which is utilized purely for parking of vehicles permitted in specific areas.

Multiplex Complex: - means an integrated entertainment and shopping center/complex of a shopping mall and having at least three (3) cinema halls/screens. Apart from Cinema Halls, the entertainment area may have restaurants, cafeteria, fast food outlets, video games parlors, pubs, bowling alleys, health spa/centers, convention centers, hotels and other recreational activities and IT Offices. However, habitable areas like hotels, service apartments shall not be allowed in the same block where the Multiplexes are set up and shall be allowed only as a separate block. Such a Complex may be spread over the site or be in one or more blocks which may be high-rise buildings or normal buildings.

Mercantile/Commercial Building: - Includes a building or part thereof used as shops, stores or markets for display and sale of wholesale or retail goods or merchandise, including office, storage and service facilities incidental thereto and located in the same building.

Mixed use building: - A building partly used for non-residential activities except industrial purpose and partly for residential purpose.

Occupancy Certificate: - Occupancy Certificate means the Certificate issued by the sanctioning authority permitting occupation of any building which is in conformity with applicable building rules

Occupancy mixed: - The occupancy, where more than one occupancy is present in different portions of the building.

Occupancy of Use Group: - The principal occupancy for which a building or a part of a building is used or intended to be used for the purposes or classification of building according to the occupancy. Any occupancy shall be deemed to include subsidiary occupancies, which are contingent upon it.

Occupier: - Occupier includes any person for the time being, payable or liable to pay rent or any portion or rent of the building in respect of which the ward is used, or compensation or premium on account of the occupation of such building and also a rent-free tenant, but does not include a lodger, and the words 'occupy' and 'occupation' do not refer to the lodger. An owner living in or otherwise using his own building shall be deemed to be the occupier thereof.

Open Space: - An area forming an integral part of a site left open to the sky. It may be left in front, both, rear sides of a plot between the building line and front boundary of the plot.

Owner: - Owner in relation to any property, includes any person who is, for the time being receiving or entitled to receive, whether on his own account or on account of or on behalf of, or for the benefit of any other person or as an agent, trustee, guardian, manager or receiver for any other person or for any religious or charitable institution, the rents or profits of the property and also includes a mortgagee in possession thereof; and also includes a person, company, trust, institute, registered body, State or Central Government and its attached subordinate departments, undertakings and the like in whose name the property rights are vested.
Note: The term Owner is synonymous with the term "Applicant".

Office Building (Premises): - Includes a building or premises or part thereof whose sole or principal use is for an office or for office purposes or clerical work. Office purposes include the purpose of administration, clerical work, handling money, telephone, and computer operation; and clerical work includes writing, book-keeping, sorting papers, typing, filling, duplicating, punching cards or tapes machine calculations, drawing of matter for publication and editorial preparation of matter for publication.

Parapet: - A low wall or railing built along the edge of a roof or floor.

Parking Complex/Parking Lot: - means premises either built or open which is utilized purely for parking of vehicles permitted in specific areas.

Parking Space: - Parking space means an area enclosed or unenclosed, covered or open, sufficient in size to park vehicles, together with a drive-way connection, the parking space with a street or alley and permitting ingress and egress of the vehicles.

Partition: - It means an interior non-load bearing divider, one storey or part storey in height.

Party Wall: -

(a) A wall forming part of a building and being used or constructed to be used in any part of the height or length of such wall for separation of adjoining buildings belonging to different owners or constructed or adopted to be occupied by different persons;

(Or)

(b) A wall forming part of a building and standing in any part of the length of such wall, to a greater extent that the projection of the footing on one side or ground of different owners.

Plinth: - Means the portion of a structure between the level of the surrounding ground and level of floor, immediately above the ground. In no case this shall be less than 450mm.

Plinth Area: - Plinth area means the built-up covered area measured at the floor level of the basement or of any storey.

Plot / Site: - Means a continuous portion of land held in a single or joint ownership other than the land used, allotted, earmarked or set apart for any street, lane, passage, pathway, conservancy lane or for any other public purpose.

Plot Coverage: - Means the ground area covered by the building and does not include the area covered by compound wall, gate, cantilever porch, well, septic tank, open platform and the like. It is expressed as percentage of the site/plot area

Porch: - Means a roof cover supported on pillars or cantilevered for the purpose of pedestrian or vehicular approach to a building.

Public Building: - Public Building means a building used or intended to be used either ordinarily or occasionally as a place or public worship, dharamasala, college, school, theatre, cinema, public concert room, public hall, public bath, hospital, latrine, room, shop or any other place of public assembly.

Ramp: - A sloping surface joining two different levels, as at the entrance or between floors of a building.

Reconstituted Plot: - Reconstituted Plot means a plot, which is in any way altered by the making of a town-planning scheme otherwise than by the severance of land used, allotted or reserved for any public or municipal purpose.

Refuge Area: - An area where persons unable to use stairways can remain temporarily and await instruction or assistance during emergency evacuation situation.

Road Width or Width of Road/Street: - The whole extent of space within the boundaries of a road when applied to a new road/street as laid down in the city survey or development plan or prescribed road lines by any act of law and measured at right angles to the course or intended course of directions of such road.

Room Height: - The vertical distance measured from the finished floor surface to the finished ceiling / slab surface.

Row Houses: - Row Buildings means a row of houses with only front, rear and interior open spaces.

Residential Building: - Residential Building includes a building in which sleeping and living accommodation is provided for normal residential purposes, with cooking facilities and includes one or more family dwellings, apartment houses, flats and private garages of such buildings.

Semi-detached Building: - Semi-detached Building means a building detached on the three sides with open spaces as specified.

Storage Building: - A building or part thereof used primarily for storage or shelter of goods, wares, merchandise and includes a building used as a warehouse, cold storage, freight depot, transit shed, storehouse, public garage, hanger, truck terminal, grain elevator, barn and stables.

Sanctioning Authority means:

- The Commissioner of the Itanagar Capital Region Development Authority
- The Vice Chairman of the respective Urban Development Authority;
- The Commissioner of respective Urban Local Body;
- The Executive Authority of the Special Unit created as the case may be for the purpose of sanctioning and monitoring building and development activity, as applicable.

Sanctioned Plan: - Means the set of plans such as site plan, building plan, service plan, parking and circulation plan, landscape plan, layout plan, zoning plan and such other plan and includes structural designs, if applicable, permissions such as environment permission and such other

permissions, and specifications submitted under the Rules in connection with a building/project and which are approved and sanctioned by the authority prior to start of the building/project.

Scheme: - Scheme means a town-planning scheme / land-pooling scheme and includes a plan relating to a town planning scheme / land pooling scheme.

Service Industry: - Industries, which are not engaged in the manufacture of goods or articles, but are mainly, concerned with the repair, maintenance, servicing and/or/other jobbing work.

Service road: - Means a lane from a wider street provided at the front of a plot for service purposes.

Set back: - Means the space to be left fully open to sky from the edge of the building to the property line or boundary of the street. No built-up space shall be provided within the setback except specifically permitted projections and other structures under the rules.

Sign: - Any device visible from a public place that displays either commercial or non-commercial message by means of graphic presentation of alphabetic or pictorial symbols or representations. Non-commercial flags or any flags displayed from flagpoles or staffs shall not be considered as signs.

Site Depth of: - Site depth of means the mean horizontal distance between the front and rear site boundaries.

Site Double Frontage: - Site Double Frontage means a site, having a frontage on two streets other than a corner plot.

Site for building: - It includes all the land within the cartilage of the building if forming it appurtenance such as outbuildings, yard, with open space and garden attached thereto or intended to be occupied therewith.

Staircase: - Means of access between two floors.

The width of staircase may be fixed by the Competent Authority in relation to the number of floors and the total number of users and in no case, it should be less than 1M in width and minimum of 25Cm of Treads and 17.5Cm of maximum rise and shall have direct ventilation. In the case of public buildings, a staircase shall be provided for every 300 persons who are expected to use the building.

a) **Enclosed Staircase**: Means a staircase separated by fire resistant walls and doors from the rest of the building.
b) **Spiral Staircase:** A staircase forming continues winding curve round a central point or axis having treaded without risers.

Storey: - The portion of a building included between the surface of any floor and the surface of the floor next above it, or if there be no floor above it, then the space between any floor and the ceiling next above it.

Street/Road: - Any highway, street, land, pathway, alley, stairway, passageway, carriage-way, footway, square, place or bridge whether a thorough-fare or over which the public have a right of passage or access or have passed and have access uninterruptedly for specified period, whether existing or proposed in any scheme and includes all bends, channels, ditches, storm water drains, culverts sidewalks, traffic islands, roadside trees and hedges, retaining walls fences, barriers and railing within the street lines.

Street/Road level or Grade: - Street level or Grade means the officially established elevation of grade of the central line of the street upon which a plot fronts and if there is no officially established grade, the existing grade of the street its mid-point.

Street/Road Line: - Street Line means the line defining the side limits of a road/street.

To Abut: - Means to abut on a road such that any portion of the building is fronting on the road.

To Erect: -In relation to a building means:

(a) to erect a new building on any site whether previously built upon or not;

(b) to re-erect any building of which portions above the plinth level have been pulled down, burnt or destroyed

(c) conversion from one occupancy to another

(d) to carryout alterations.

Tower like structures: - Structures shall be deemed to be tower-like structures when the height of the tower-like portion is at least twice the height of the broader base at ground level.

Transferable Development Rights (TDR): - An award specifying the built up area an owner of a site or plot can sell or dispose or utilize elsewhere, whose site or plot is required to be set apart or affected for a community amenity or development for public purpose in the Master Plan or in road widening or covered in recreational use zone etc. The award would be in the form of a TDR Certificate issued by the Competent Authority.

Unauthorized Construction: - Means the erection or re-erection, addition or alternations which is not approved or sanctioned by the Concerned Authority.

Underground/Overhead Tank: - An underground/overhead water tank constructed or placed to store water.

Unsafe Building: - Includes a building which:

- Is structurally unsafe, or
- Is unsanitary, or
- Is not provided with adequate means of ingress or egress or
- Constitutes a fire hazard or
- Is dangerous to human life or
- In relation to its existing use, constitutes a hazard to safety or health or public welfare by maintenance, dilapidation or abandonment Note: All unsafe buildings/structures will be required to be restored by repairs, demolition or dealing with as otherwise directed by the Authority.

Ventilation: - Shall mean the supply of outside air into a building through window or other openings due to wind outside and convection effects arising from temperature or vapor pressure differences (or both) between inside and outside of the building.

Verandah: - A covered area with at least one side open to the outside with the exception of 1 m high parapet on the upper floors to be provided on the open side.

Water Course, Minor: - Minor Water Course means a water course which is not a major one.

Water Course, Major: - Major Water Course means a watercourse, which carries storm water discharging from a contributing area of not less than 160 Ha.

Note: The decision of the authority as regards the calculation of the contributing area shall be final.

Water Course / Anal: - Watercourse means a natural channel or an artificial one formed by draining or diversion of a natural channel meant for carrying storm and wastewater.

Window: - An opening to the outside other than a door, which provides all or part of the required natural light or ventilation or both to an interior space and not used as a means of egress/ingress.

Window Sill: - Solid wall (Brick or concrete wall) starting from the finished floor level to the base of first window or structural member consisting of a continuous horizontal metal/wooden forming the lowest member of a framework or supporting structure.

Whole Sale Building/Establishment: - An establishment wholly or partly engaged in wholesale trade and manufacture wholesale outlets, including related storage facilities, warehouses and establishments engaged in truck transport, including truck transport booking agencies.

Zonal Development Plan: - A plan detailing out the proposals of Master Plan/General Town Planning [G.T.P.] Scheme.

14.2 Land use Zoning

- Residential Zone
- Commercial Zone
- Mixed use Zone
- Public and Semi-Public Zone
- Industrial Zone
- Recreational/environmental zone
- Agriculture Zone

These Regulations and Guidelines are intended to guide and monitor development and construction in residential zones in the AoI, the allowable intensity by specifying the FAR as suitable with respect to site condition, location, layout, height, site coverage, building setbacks, and the requirements of technical authority that effect the site,

Uses permitted, restricted, and prohibited under various categories are mentioned, the uses are exhaustive, similar uses may be permissible in the appropriate locations by competent authority and subjected to such restrictions and conditions as imposed.

14.2.1 Residential Zone:

Uses Permitted-

Plotted, (detached, semi-detached and row housing) group housing houses, residential flat, apartments, tenements, residential-cum-work, hostels, boarding and lodging (accommodation for transit employees of Govt./ Local Bodies) houses, medical clinic, dispensaries, nursing home and health centers (20 bed), educational buildings (nursery, primary, high school) school for mentally/ physically challenged, research institutes, community centers, religious premises, library, gymnasium, park/tot-lots, plant nursery, yoga centers/health clinics, exhibition and art gallery, clubs, banks/ ATM, police stations, taxi stand/three wheeler stands, bus stops, electrical distribution depot, water pumping station, post offices, hostels of non-commercial nature, kindergartens, public utilities and buildings except service and storage yards.

Conditional Uses: -

Dharamshala, night shelters, petrol pumps, motor vehicle repairing workshop/garages, household industry, bakeries and confectionaries, burial-grounds, restaurants and hotels, printing press, godowns/warehousing, bus depots without workshop, cinema hall, auditoriums, markets for retail goods, weekly markets (if not obstructing traffic circulation and open during non-working hours), informal markets, transient visitors camp, municipal, state and central government offices.

Prohibited Uses: -

Residential apartments (all plots NOT accessible by 12m wide road), Organized Informal Market, Service Apartments, General commercial uses, Industrial uses (Heavy, large and extensive industries: noxious, obnoxious and hazardous industries), Major infrastructure (warehousing, storage go-downs of perishables, hazardous, inflammable goods, workshops for buses etc.), slaughter-housing wholesale mandis, hospitals treating contagious diseases, sewage treatment plant/disposal work, water treatment plant, solid waste dumping yards, outdoor games stadium, indoor games stadium, shooting range, zoological garden, botanical garden, bird sanctuary, picnic hut, courts, sports training Centre, reformatory, district battalion office, forensic science laboratory.

14.2.2 Commercial Zone

Uses Permitted-

Shops, neighborhood/convenience shopping centers, commercial complex, Shopping Malls, Super Mart, Vegetable Mart, Chicken/mutton shops, Fish Market, unorganized informal markets, retail shops, repair shop, Eating Outlets, Laundry/Dhobi Ghats, Flour Mills, Gymnasium, LPG Booking Service, Printing Press, Wholesale Business/mandi/shops, Construction material shops, corporate/private offices, Financial institutions, stock exchange, Political Party Offices, petrol pumps, hostel/boarding housing, hostel, banks/ ATM, restaurants, auditoriums, colleges, nursing homes/medical clinics, pet clinics, religious places, offices/work places, commercial centers, research/training institute, commercial service centers/garages/workshop, night shelter, parking site, post offices, government/ institutional offices, telephone exchange/centres, warehousing and covered storage, research institutions.

Conditional Uses: -

Non-pollution, non-obnoxious light industries, warehousing/storage go-downs of perishable, inflammable goods, coal, wood, timber yards, bus and truck depots, Construction material store should be showroom type, Cinema halls/multiplex shall be allowed for plots abutting to 18m

width road and minimum 3000 sqm plot, sports/stadium and public utility installation, hotel and transient visitor's homes, religious buildings, hospitals and nursing homes.

Prohibited Uses: -

All type of industrial uses, Major infrastructure installations, Dwellings except those of service apartment, essential operational, watch and ward personnel, heavy, hospitals/research laboratories treating contagious diseases, poultry farms/dairy farms, slaughter-houses, sewage treatment/disposal sites, agricultural uses, storage of perishable and inflammable commodities, international conference center, courts, sports training center and all other activities which may cause nuisance and are noxious and obnoxious in nature.

14.2.3 Mixed Use Zone

Uses Permitted-

The maximum allowable gross area with minimum 30% to 60% with the dominant uses sharing with other uses, Multi-family residential apartments above 1st or 2nd floor.

Conditional Uses: -

Depending on the locational feasibility of the area commercial and non-polluting industrial land use can be permitted up to 20% - 50% in residential uses.

Prohibited Uses: -

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 Permitted 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.

14.2.4 Public and Semi-Public

Uses Permitted-

Central and state government properties/buildings; Government offices, central, state, local and semi government, public undertaking offices, defense court, banks, police station/police posts, police lines, police headquarters, jails, fire stations/fire posts, post and telegraph, public utilities and buildings, post offices, local state and central government offices and use for defense purposes, public utility and buildings, local municipal facilities, uses incidental to government offices and for their use, monuments, radio transmitter and wireless stations, telecommunication center, telephone exchange, Educational facilities; Primary/upper primary/secondary/high schools,

universities and specialized educational institute, polytechnic, colleges, (not to be located near hospital or health care facility), research and development centers, social and welfare centers, libraries, social and cultural institutes, Health care facilities; health centers, specialty hospitals, nursing homes, dispensaries and clinic.

Conditional Uses: -

Single family residents, Complementary commercial uses, Minor Public Facilities, Supporting Infrastructure, Public Swimming Pools, burial grounds, cremation grounds and cemeteries/graveyards, (Developments in this zone require approval by review panel),

Prohibited Uses: -

Heavy, extensive and other obnoxious, hazardous industries, slaughter-houses, junk yards, wholesale mandis, dairy and poultry farms, farm-houses, workshop for servicing and repairs, processing and sale of farm product and uses not specifically permitted herein.

14.2.5 Open Spaces and Recreational Areas

Uses Permitted-

Regional parks, district parks, playgrounds, children traffic parks, clubs, picnic huts, specialized parks/maidens for multiuse, swimming pool, special recreation and special educational areas, library, public utilities, Special and dedicated recreational spots Such as botanical/zoological garden, bird sanctuary, clubs, stadiums (indoor), outdoor stadiums with/ without health center for players and staff are provided, Buffer zones for all the water bodies/Heavy electric lines, Sewerage/Water treatment Plants Electric Sub Stations.

Conditional Uses: -

Building and structures ancillary to use permitted in open spaces and parks such as stand for vehicles on hire, taxis and scooters, commercial use of transit nature like cinema, circus and other shows, public assembly halls, restaurants and caravan parks, sports stadium, open air cinemas.

Prohibited Uses: -

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.

14.2.6 Industrial Zone

Uses Permitted-

Residential building for essential staff and for watch and ward personnel, all kind of industries, public utilities, parking, loading, unloading spaces, warehousing, storage and depot of non-

perishable and non-inflammable commodities and incidental use, cold storage and ice factory, gas go-downs, cinema, bus terminal, bus depot and workshop, wholesale business establishments, petrol filling stations with garage and service stations, parks and playgrounds, medical centres, restaurants.

Conditional Uses: -

Noxious, obnoxious and hazardous industries except storage of perishable and inflammable goods, junkyards, sports/stadium/playgrounds, sewage disposal works, electric power plants, service stations, cemeteries, government/semi government/private business offices, bank and financial institutions, religious buildings, taxi stands, gas installations and gas works, animal racing or riding stables, workshops/garages, dairy and farming, quarrying of gravel, sand, clay or stone.

Prohibited Uses: -

Residential dwellings other than those essential operational, service and watch and ward staff, schools and colleges, hotels, motels and caravan parks, recreational sports or centres, other non-industrial related activities, religious buildings, irrigated and sewage farms, major oil depot and LPG refilling plants, commercial office, educational institutions, social buildings.

14.2.7 Agriculture Zone

Uses Permitted-

Dwelling for the people engaged in the farm (rural settlement), farm-houses and accessory buildings, agriculture, horticulture and forestry, poultry, piggeries and dairy farm, cottage industries, storage, processing and sale of farm produce, petrol and other fuel filling stations, fishing, public utility and facility buildings.

Conditional Uses: -

Farm houses, extensive industry, brick kilns, sewage disposal works, electric power plant, quarrying of gravel, sand, clay or stone, service industries accessory to obnoxious and hazardous industries, school and library, temple, churches, mosques and other religious buildings, milk chilling stations and pasteurization plants.

Prohibited Uses: -

Residential use except those ancillary uses permitted in agricultural use zone, heavy extensive, noxious, obnoxious and hazardous industries, any activity which is creating nuisance and is obnoxious in nature.

14.2.8 Transportation and Communication Zone

Uses Permitted-

Road transport terminals (bus terminals and depots), goods terminals, parking areas, circulations, airports-building and infrastructure, truck terminal, motor garage, workshop, repair and repair shop and facilities such as night shelter, boarding house, booking offices, transmission centre, wireless station, radio and television station, observatory and weather office.

Conditional Uses: -

Any other use/activity incidental to transport and communication, residential dwelling units for essential staff and watch and ward personnel.

Prohibited Uses: -

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.

14.2.9 Applicability

The planning norms prescribed are applicable for all land uses in the entire Area of Interest of Itanagar Capital Region. The purpose of planning norms is to ensure adequate light and ventilation to all uses premises and promote the health and safety of all citizens through orderly and regulated growth.

Planning norms specify the following:

1.Minimum Plot Size
2.Minimum Plot frontage
3.Minimum Road width
4.Maximum FAR permissible
5.Maximum Plot coverage permissible
6.Maximum permissible height
7.Maximum no. of floors permissible

In addition, the norms which are commonly applicable for all land uses such as set back requirements, parking standards, provisions for persons with disabilities, rain water harvesting, solar water heating, planting trees, etc., are specified separately.

Norms are related the following:

The norms are in general, related to the size of plot, its frontage and the width of the road on which it abuts. For uses permitted with special sanction, the Local Planning Authority may prescribe additional conditions if required.

14.2.10 Planning parameters commonly applicable to all the land uses activities

a. Setback Requirements:

Setbacks in the front, rear and sides are mandatory for all development. The setback requirements given below govern the minimum required spaces to be left in the front, rear and sides.

Front Setback:

Sl. No	Width of Road	Minimum Front Set Back Required (in m.)
1.	Upto 9 m	1.0
2	More than 09 m and upto 12 m	2.0
3	More than 12 m and upto 18 m	3.0
4	More than 18 m and upto 24 m	4.5
5	More than 24 m and upto 30 m	6.0
6	More than 30 m and upto 45 m	7.5
7	More than 45 m and upto 60 m	9.0

Rear Setback

SL. No.	Depth of Plot	Minimum Rear Set Back Required (in m.)
1.	Upto 15m	1.0
2	More than 15m and upto 30m	2.0
3	Above 30m	3.0

Side Setbacks

The side setbacks to be provided on either sides are governed by the width of the Plot for buildings, which are single storied and the height of the building proposed for buildings exceeding one floor in height for detached buildings. For semi-detached buildings, side setbacks are required on one side only. For row type buildings, no side setbacks are required. The minimum requirement of space shall be as under.

Minimum Setback Requirement					
Sl. No.	Width Of The Plot	For Detached Buildings		For Semi-Detached Buildings	
		On One Side	On Other Side	On One Side	On Other Side
1	Upto 9m	1.5m	1.5m	0	1.5m
2	Above 9m and upto 12m	2.0m	2.0m	0	2.0m
3	Above 12m and upto 18m	2.0m	2.5m	0	2.5m
4	Above 18m	2.5m	3.0m	0	3.0m

14.2.11 Solid Waste at Landfill Site:

Municipal solid waste is disposed on landfill with an objective of maintaining health and hygienic condition in the city. Landfill site is designed, constructed with the objective of minimum impact to the environment. Selection of a landfill site is dependent on locational criteria mentioned below:

- The landfill site shall be large enough to last for 20-25 years and preferably within 5 km from present city limits.
- The site shall be at least 500 mts. away from habitation clusters, forest areas, monuments, National Parks, Wetlands and places of important cultural, historical or religious interest.
- No landfill should be constructed within 200 mt of any lake or pond.
- No landfill should be constructed within 100mt. of a navigable river.
- No landfill should be constructed within 200mt. of the right of way of any state or national highway.
- A site should be at least 500mt. away from a notified habitat area. A buffer zone of 500mt. around a landfill boundary should be declared as a No development zone after the landfill location is finalized. No landfill site should be constructed within critical habitat areas.
- A landfill should not be constructed in areas where water table is less than 2 mts. below ground surface.
- No landfill should be constructed within 500 mts. of any water supply.

- Topographical and geographical features (contour, slope, soil type) of the site should be carefully analyzed in order to prevent soil contamination and disturbance of drainage pattern.
- Transportation and linkages will be clearly defined for waste movement from the city. The influence of increased heavy vehicle traffic due to land filling should be taken care in order to avoid nuisance.