GEOSPATIAL WORLD FORUM

“Web Enabled GIS Applications in Natural Resources Management in the Serilingampally Mandal of R.R. District. A case study of Municipal Geological Studies, Telangana State India.”

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The Preamble

- Due to urbanization, It is estimated that India's urban population will reach 600 million by 2031 accounting 40 % of the India's population.

- The peripheral expansion of existing smaller municipalities and large villages surrounding the core city has become part of the large metropolitan area resulting mushrooming of slums

- The Urban Local Bodies (ULB) and Municipal Corporations are primarily responsible for providing basic services.

- There is an increasing demand of quality urban services in peripheral cities due to lack of understanding of natural resources and their proper utilisation

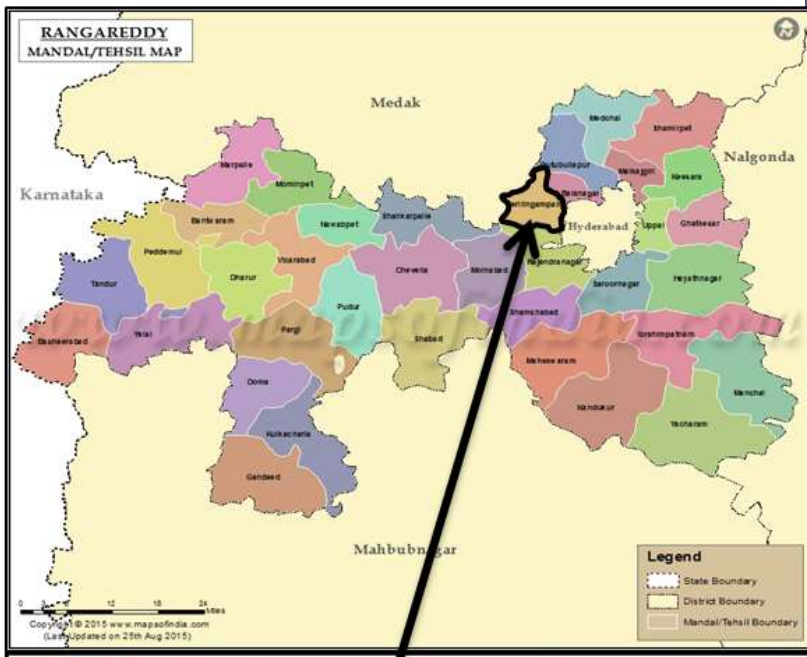
- Slums are plagued with numerous issues and substantial stress on adaptive approaches.

- Many adopted approaches earlier have not being able to address the utilities of slum development in the right geological perspective.

- A permanent solution through the study of Municipal geology to improve living conditions aiming perspective of slum development with an integrated geoscientific approach with the application of web based GIS technology is the need of the hour.

- Hence, the present studies.

Location Map of Study Area



Objectives

- To use existing MIS & GIS sources to develop and integrate map to support future resources use - management in the area.
- To present the integrated maps for further developing high resolution images at 1:12500 scale
- To benefit stakeholder departments of industries, Irrigation, Municipal Administration & UD, Agriculture, Environment, Infrastructure development, and Entrepreneurs, Environmentalist, Watershed development agencies and others.
- To develop Web GIS System
- To utilize this study in various flagship welfare programmes ,

Methodology

- Base Map Preparation
- Property & Utility Mapping
- GIS Application Development
- Web Enabled GIS Application Development

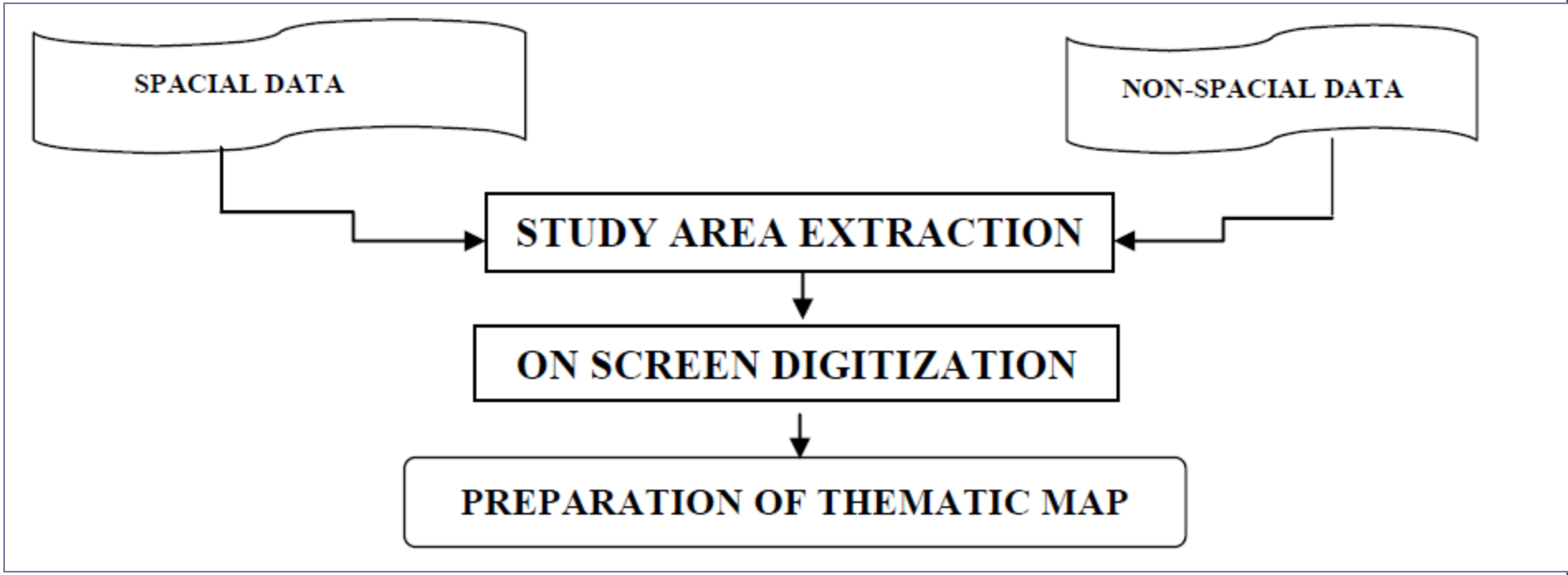
The base map is prepared on 1:5000 scales in DWG format based on the High-resolution satellite imageries (IKONOS/Quick board), CAD and GIS.

Natural Resources Management in the field of Municipal Geology supported by recent trends in Remote sensing with update of the existing GIS Maps became a focal point of typical geoscientific research programmes.

GEOLOGY, GEOMORPHOLOGY AND STRUCTURAL STUDIES

Methodology for Geological Study

Methodology for geological Study



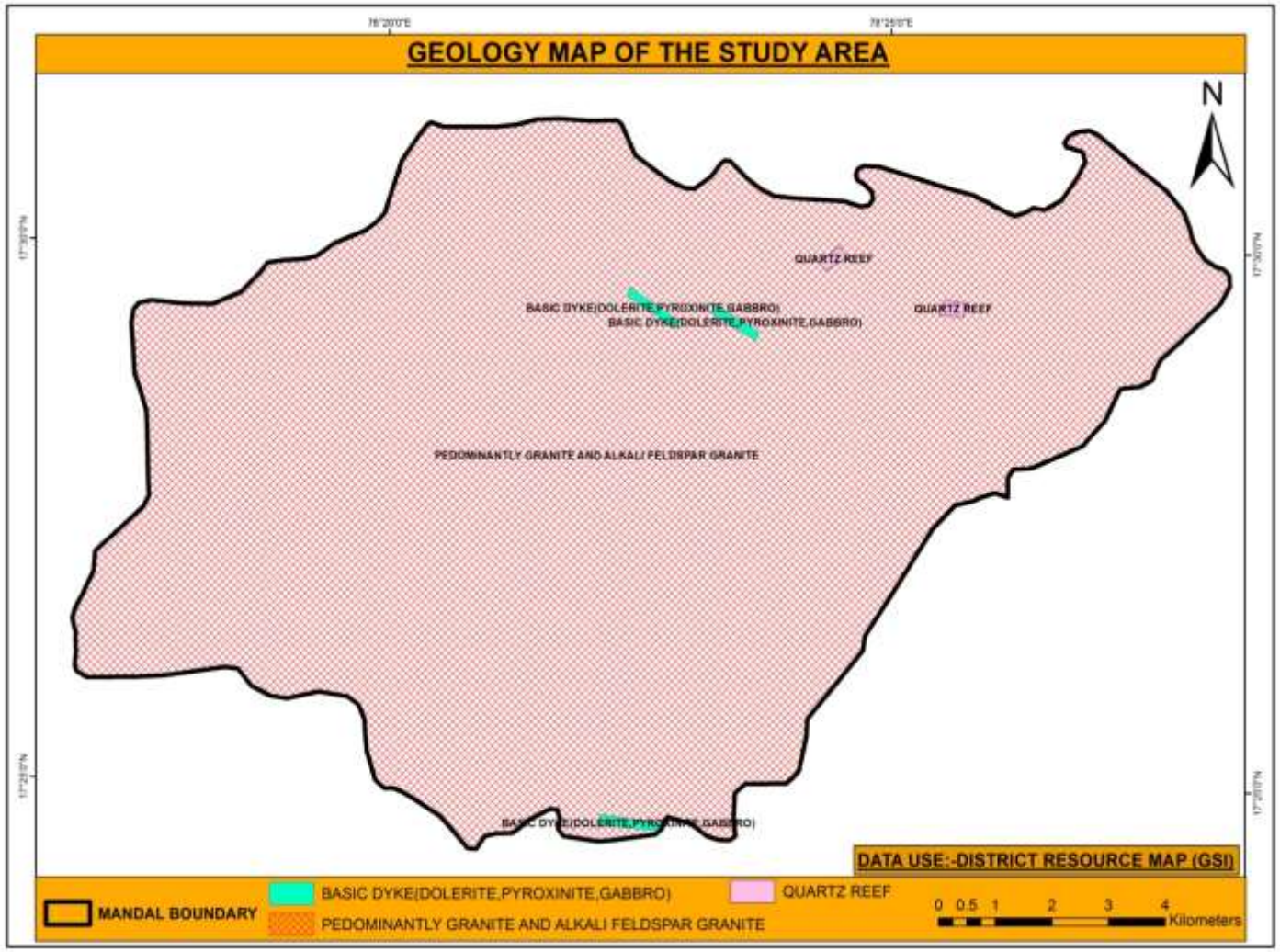
Geology of the study area

Geologically the area constitutes mainly a granitic rocks exposing a variety of Archean granitoids of Peninsular Gneissic Complex (PGC) and schistose (older metamorphic) rock

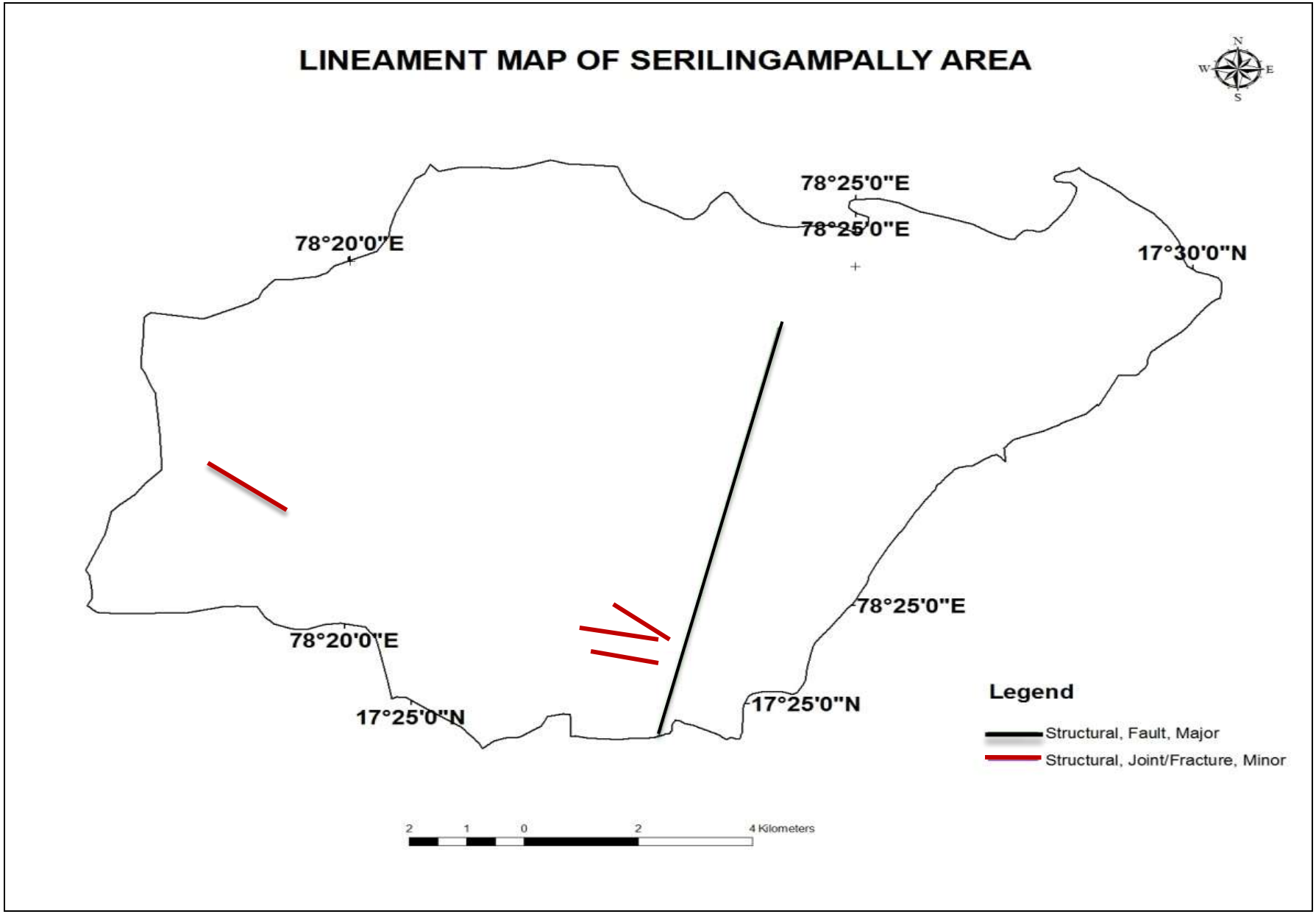
Recent	**Red loamy Soils**
	Black cotton Soils
Cretaceous	**Basalts**
Archaen	**Granites, gneisses**

Geology

Pedominantly granite and alkali feldspar granite. In the study area Basic dyke (dolerite, pyroxinite, gabbro) Quartz reef are also observed.

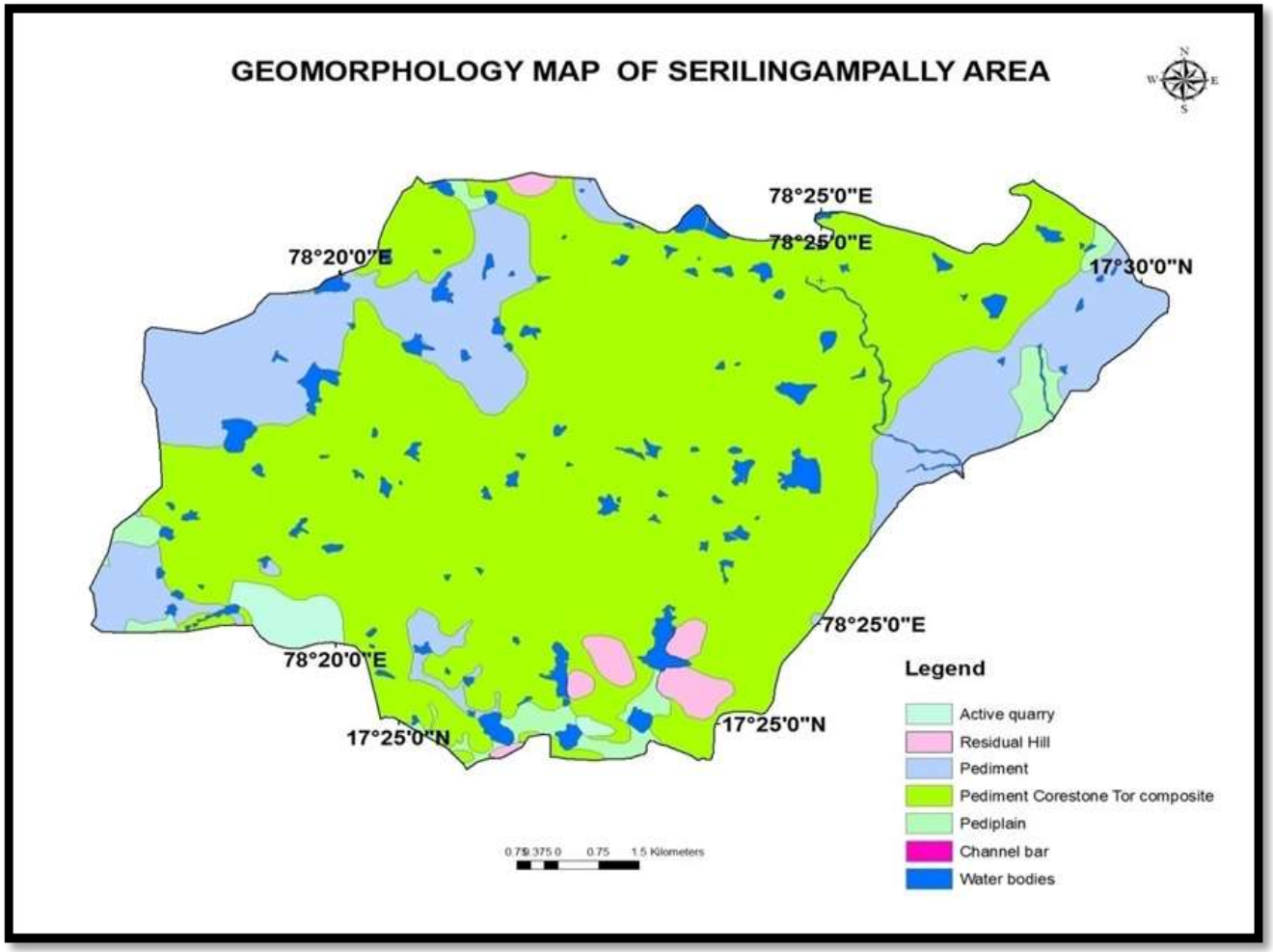


Structural study of study area

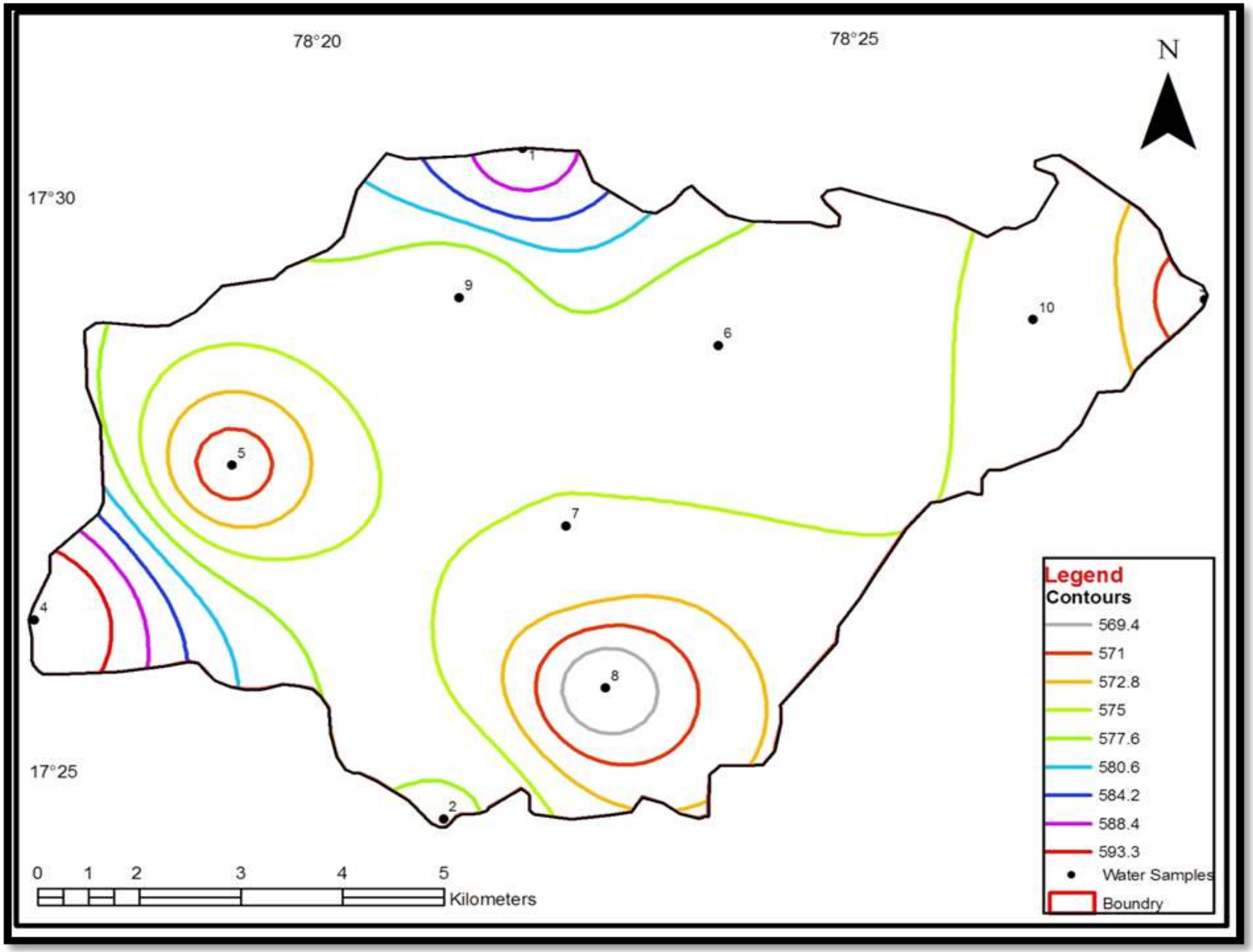


Geo-morphological study area

Geomorphology is the study of landforms, their processes, form and sediments at the surface of the Earth (and sometimes on other planets).

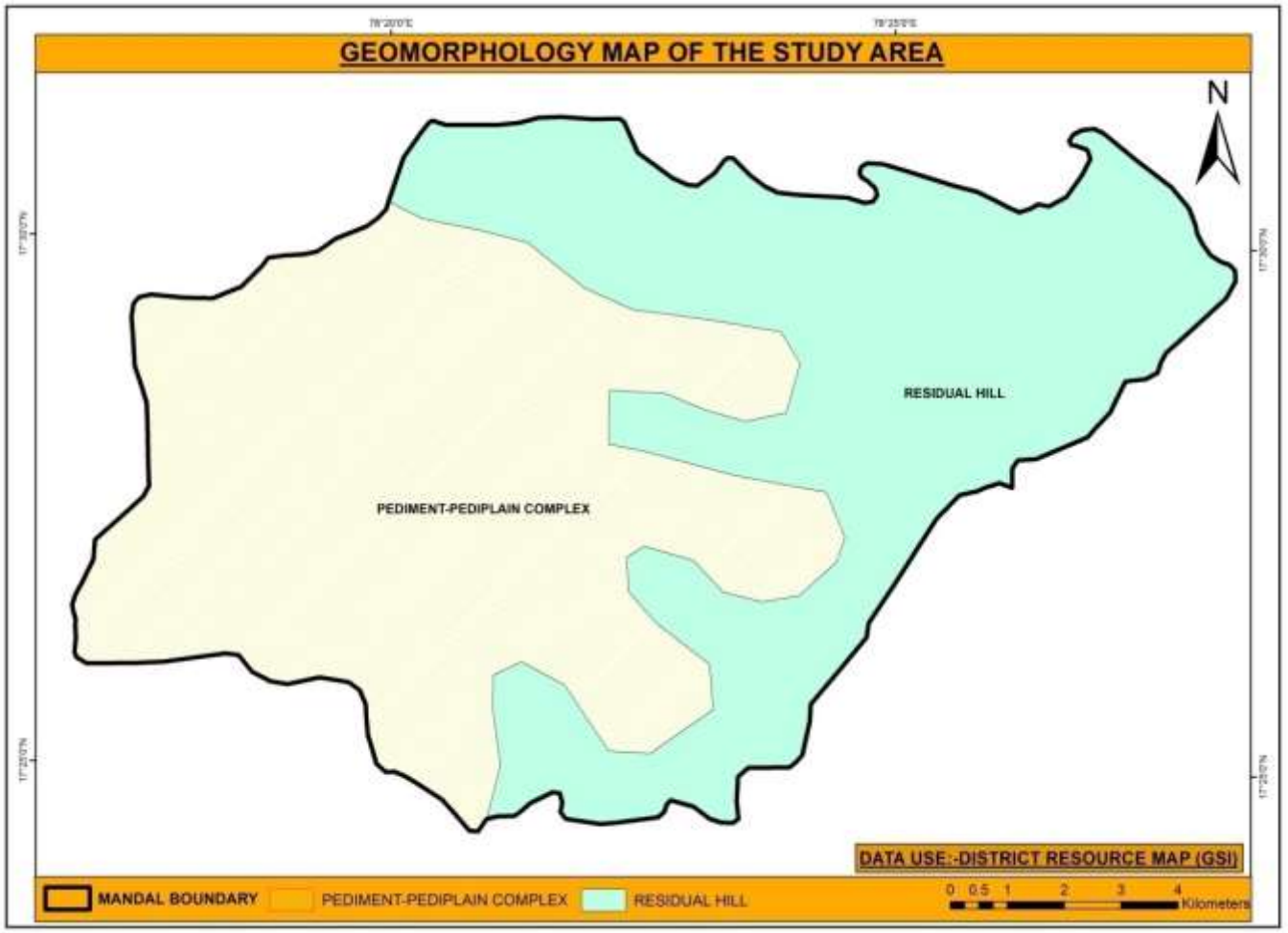


Digital Elevation map of the area



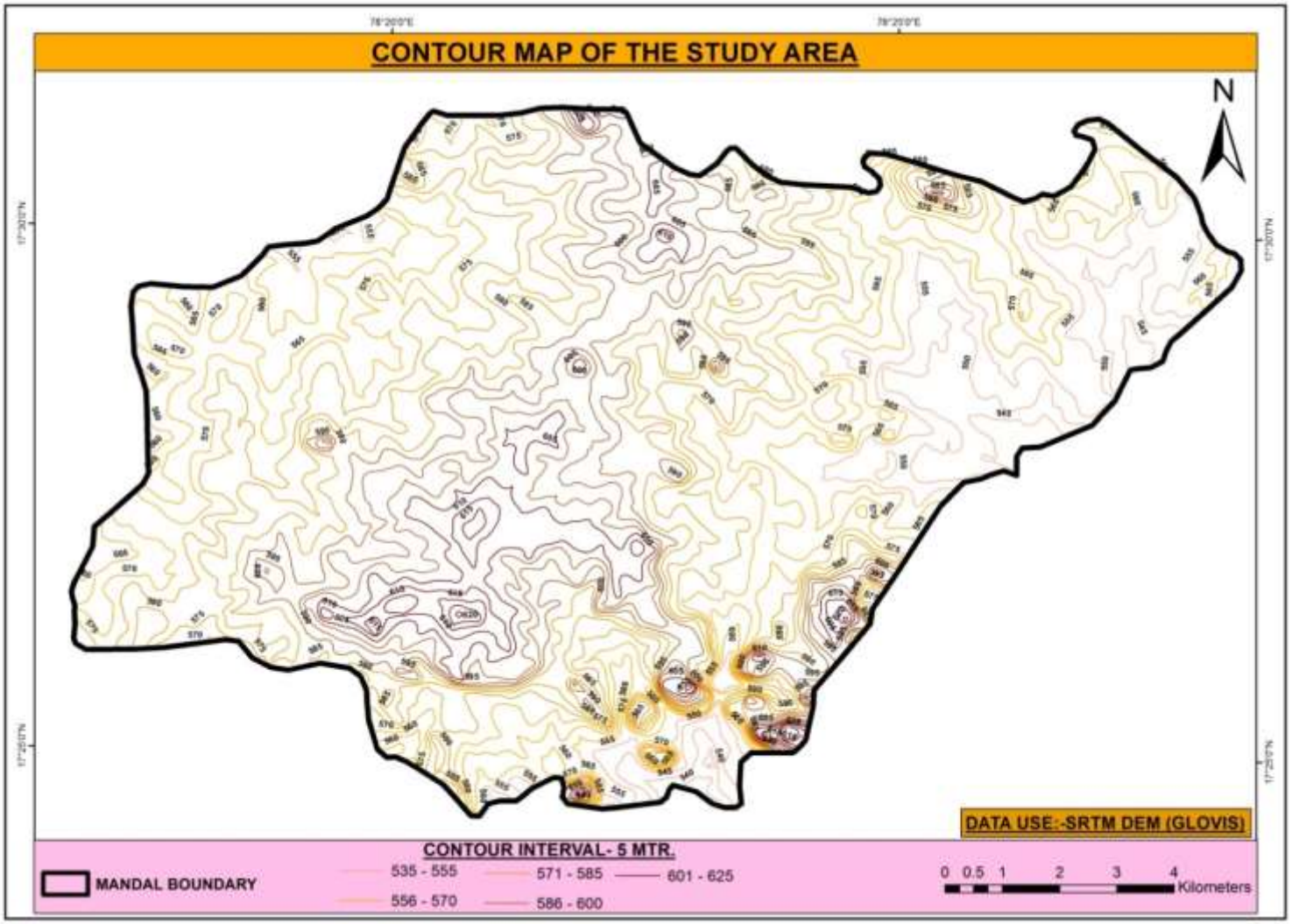
Geomorphology

- There are two types of geomorphology structure in this study area. These are
- Pediment-Pedi plain complex
- Residual hill



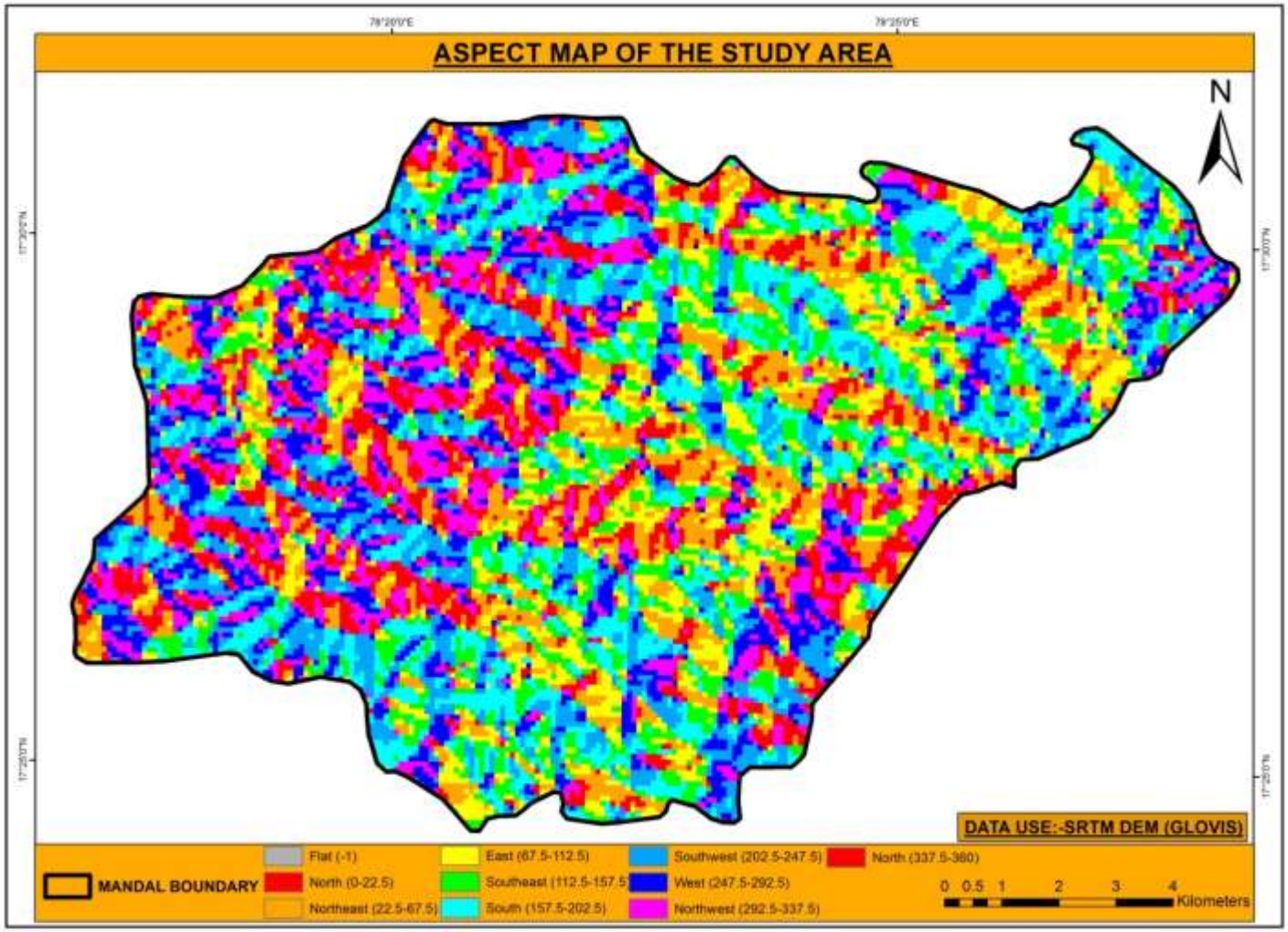
Contour Map

According to this study area we can see the most contour value in southern part. So slope steepness will be from southern to northern.



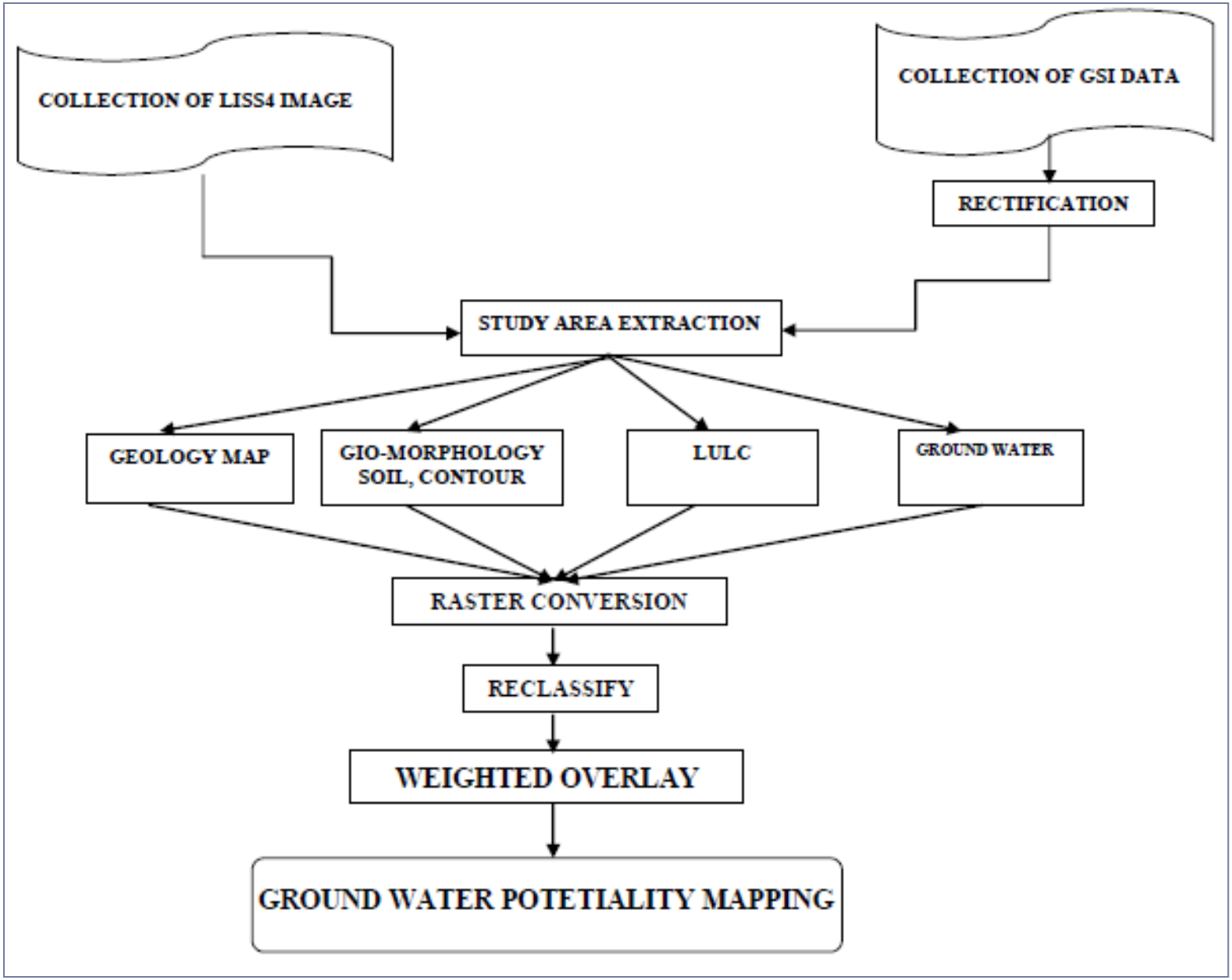
Slope Aspect

The direction a slope faces can affect the physical and biotic features of the slope, known as a slope effect.

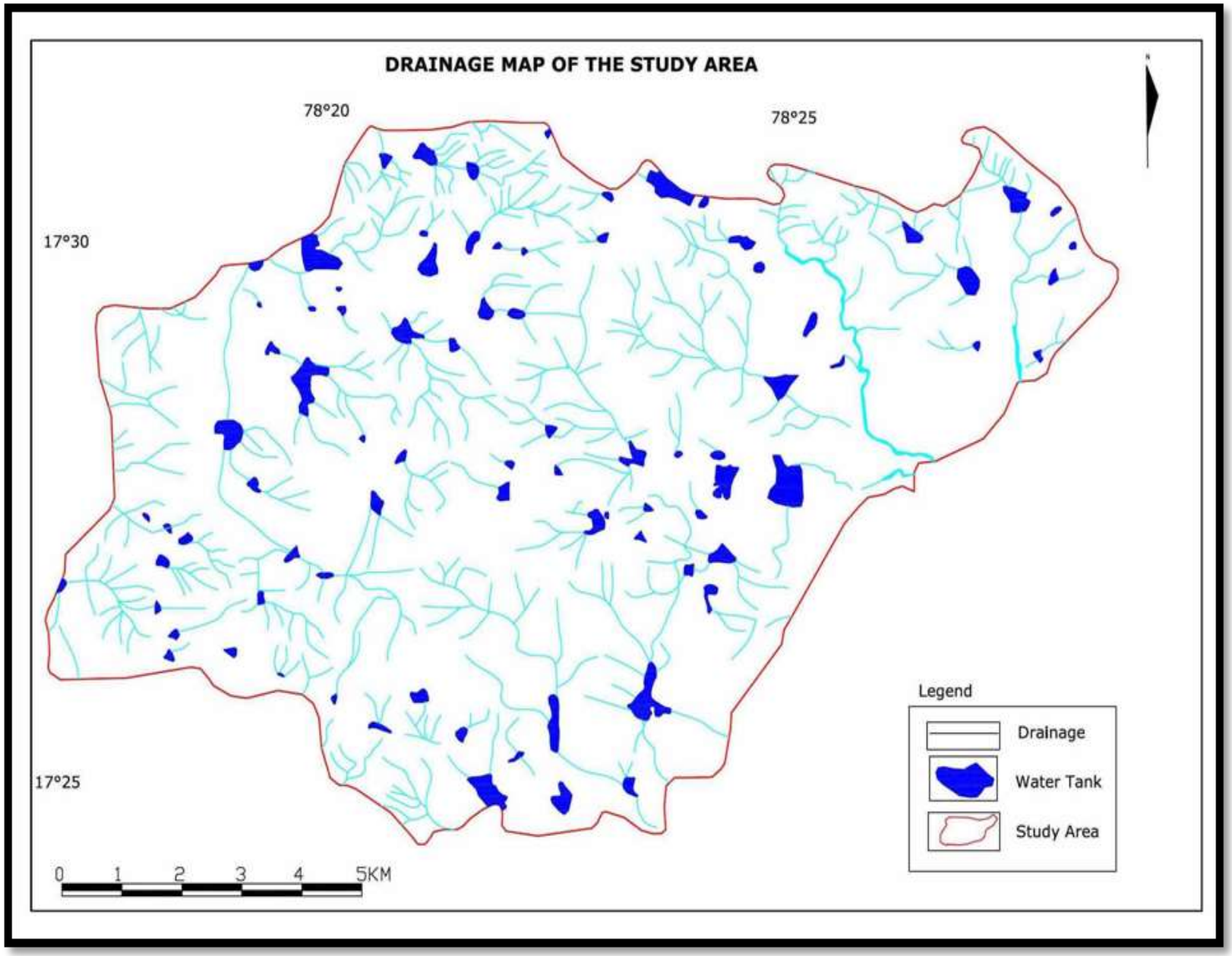


GROUND WATER STUDIES

Methodology for Ground Water Studies



Drainage map of the study area



Ground Water aspects

- Groundwater as one of the most vital natural resource for drinking and irrigation. There is no balance between demand and supply.
- Brief indicators are:

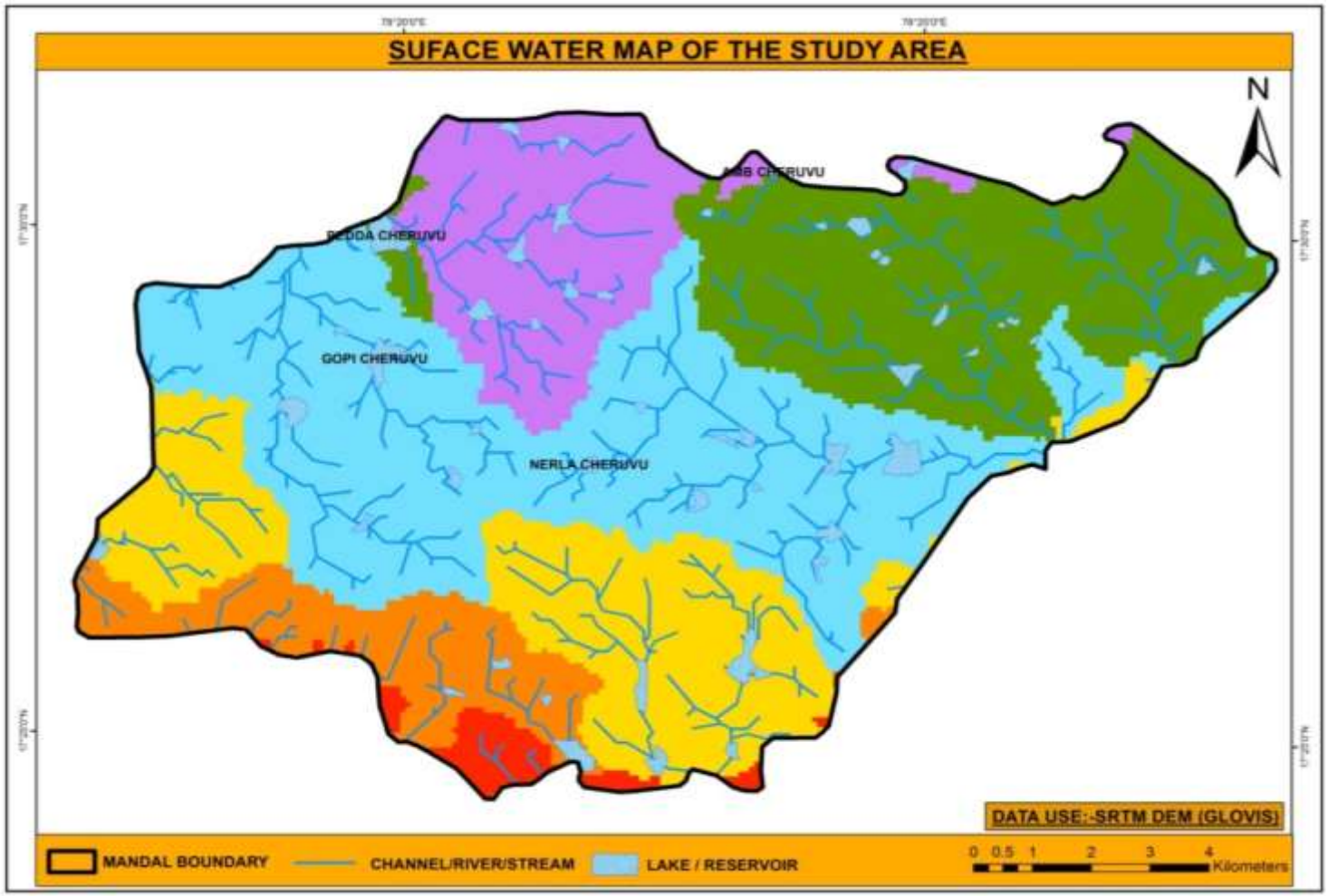
Indicators	**Values**
Geographical area	156.45sq.km
Major rivers of RR dist.	Musi, Kagna, Manjira
RAINFALL	Value
Normal annual rainfall Total	783 mm
Southwest monsoon	578 mm
Northeast monsoon	132 mm

Rain Fall data of Serilingampally

Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	Rainy Days	_	_	_	_	_	6	16	18	12	5	4	2
	Actual Rainfall	_	_	_	_	_	135.6	327.4	424.2	193	120.2	29	13.2
	Normal Rainfall	_	_	_	_	_	108.4	196.4	177	89.9	79.5	28.9	2.9
	Status	_	_	_	_	_	excess	excess	excess	excess	excess	excess	excess
2011	Rainy Days	_	_	_	_	_	3	10	14	9	6	0	0
	Actual Rainfall	_	_	_	1	2	29	179	11	82.2	53.2	1	0
	Normal Rainfall	7.1	4.1	8.6	11	37.4	108.4	196.4	160.4	89.9	79.5	28.9	2.9
	Status	No Rain	No Rain	No Rain	Scanty	Scanty	Scanty	Normal	Normal	Normal	Deficient	Scanty	No Rain
2012	Rainy Days	0	_	_	1	0	9	8	8	5	5	2	0
	Actual Rainfall	0	_	_	25	0	252.8	154.4	93.6	54.6	63.4	55.8	0
	Normal Rainfall	7.1	4.1	15.3	11	37.4	108.4	196.4	177	89.9	79.5	28.9	2.9
	Status	No Rain	No Rain	No Rain	Excess	No Rain	Excess	Deficient	Deficient	Deficient	Deficient	Excess	No Rain
2013	Rainy Days	0	2	0	2	2	7	11	10	8	7	1	_
	Actual Rainfall	0	23.6	0	41.6	9	51.8	151	63.8	174	144	45.4	_
	Normal Rainfall	0	4.1	8.6	11	37.4	108.4	196.4	177	89.9	79.5	28.9	_
	Status	0	Excess	No Rain	Excess	Scanty	Deficient	Deficient	Scanty	Excess	Excess	Excess	_
2014	Rainy Days	0	0	1	1	0	1	7	7	4	4	0	0
	Actual Rainfall	0	0	10.3	9.3	2	9.6	55.2	77	33.8	34.2	0	0
	Normal Rainfall	7.1	4.1	8.6	11	19.5	108.4	196.4	177	89.9	79.5	28.9	2.9
	Status	No Rain	No Rain	Excess	Normal	Deficient	Scanty	Scanty	Deficient	Scanty	Deficient	No Rain	No Rain
2015	Rainy Days	1	0	2	2	1	7	2	6	7	2	0	0
	Actual Rainfall	9	0	17.2	72.4	8	82.6	26	37.4	101.3	30	0	0
	Normal Rainfall	7.1	4.1	8.6	11	37.4	108.4	196.4	177	89.9	79.5	28.9	2.9
	Status	Excess	No Rain	Excess	Excess	Scanty	Deficient	Scanty	Scanty	Normal	Scanty	No Rain	No Rain
2016	Rainy Days	0	0	0	0	6	8	_	_	_	_	_	_
	Actual Rainfall	0	0	0	2.4	116.4	104	_	_	_	_	_	_
	Normal Rainfall	7.1	4.1	8.6	13.1	37.4	108.4	_	_	_	_	_	_
	Status	No Rain	No Rain	No Rain	Scanty	Excess	Normal	_	_	_	_	_	_

Drainage basin in Sherlingampalle

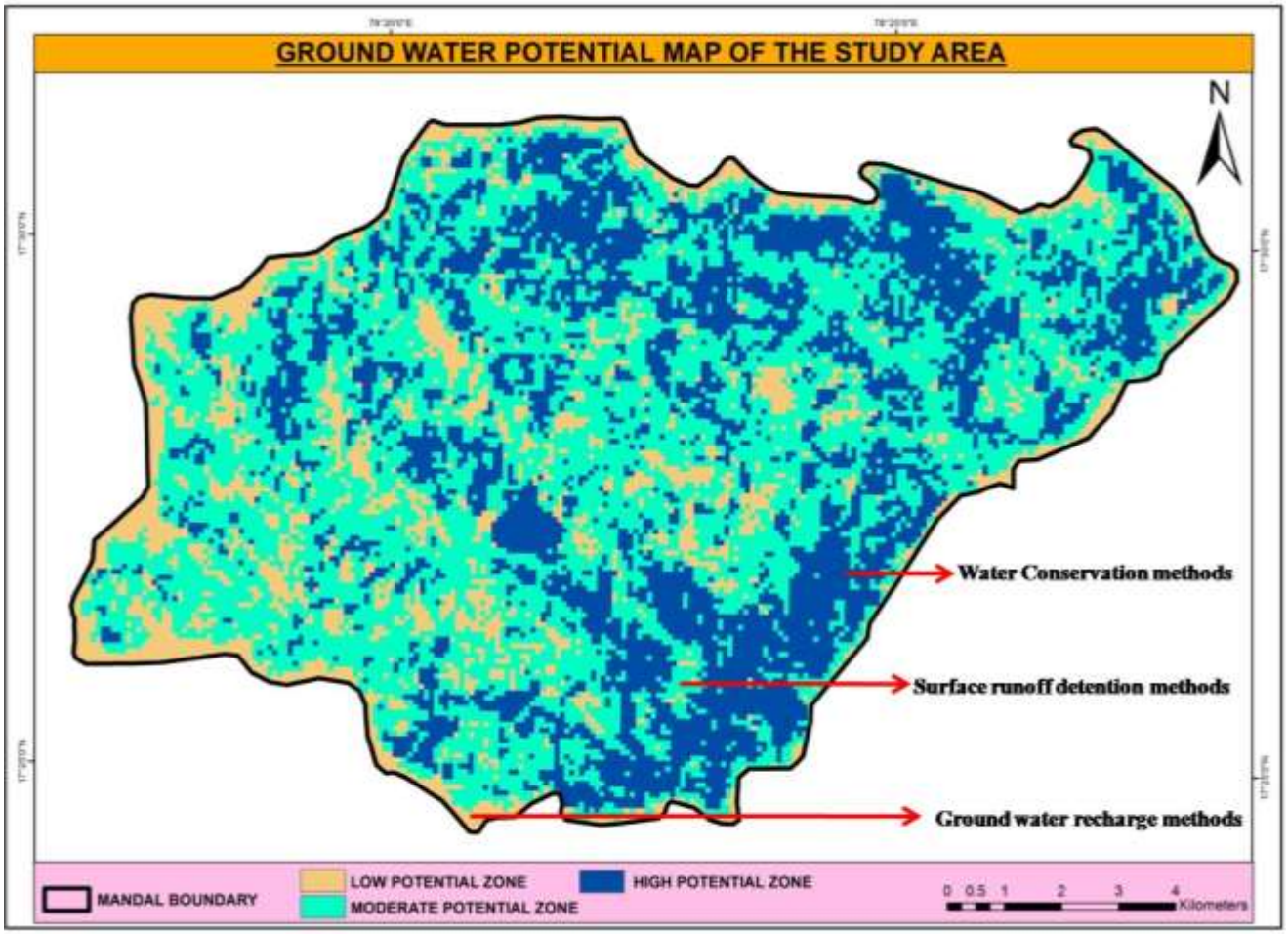
- Geo-morphologists and hydrologists often view streams as being part of drainage basins. A drainage basin is the topographic region from which a stream receives runoff, throughflow, and groundwater flow



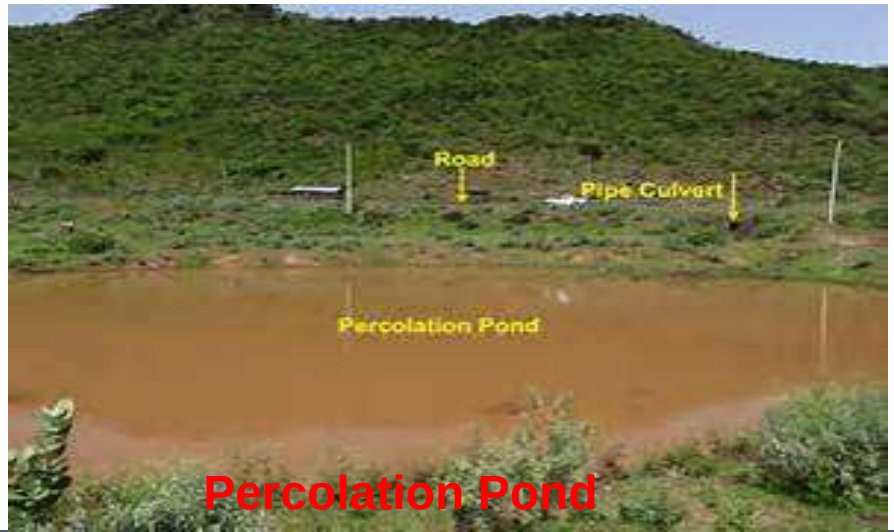
Ground Water Potential Zone

In this study area three types of potential zones observed.

- High potential zone which is represent by deep blue color.
- Moderate potential zone which is represent by green color
- Low potential zone which represent by brown

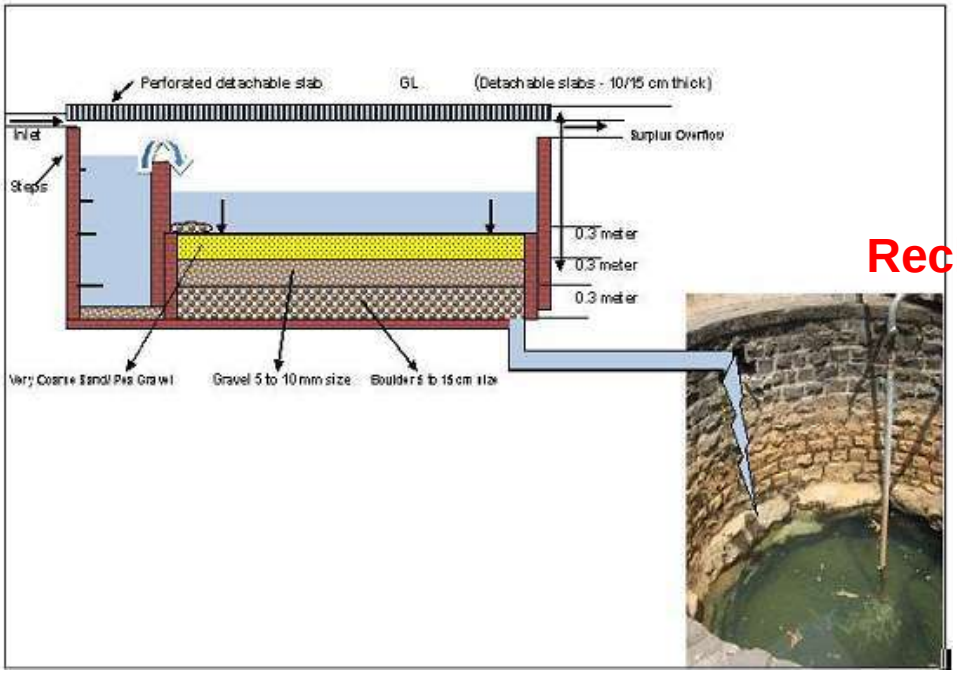


Gully plug, Stone bund & CHECK DAM



Bore well recharge with shaft

Dug well recharge & Bore well recharge

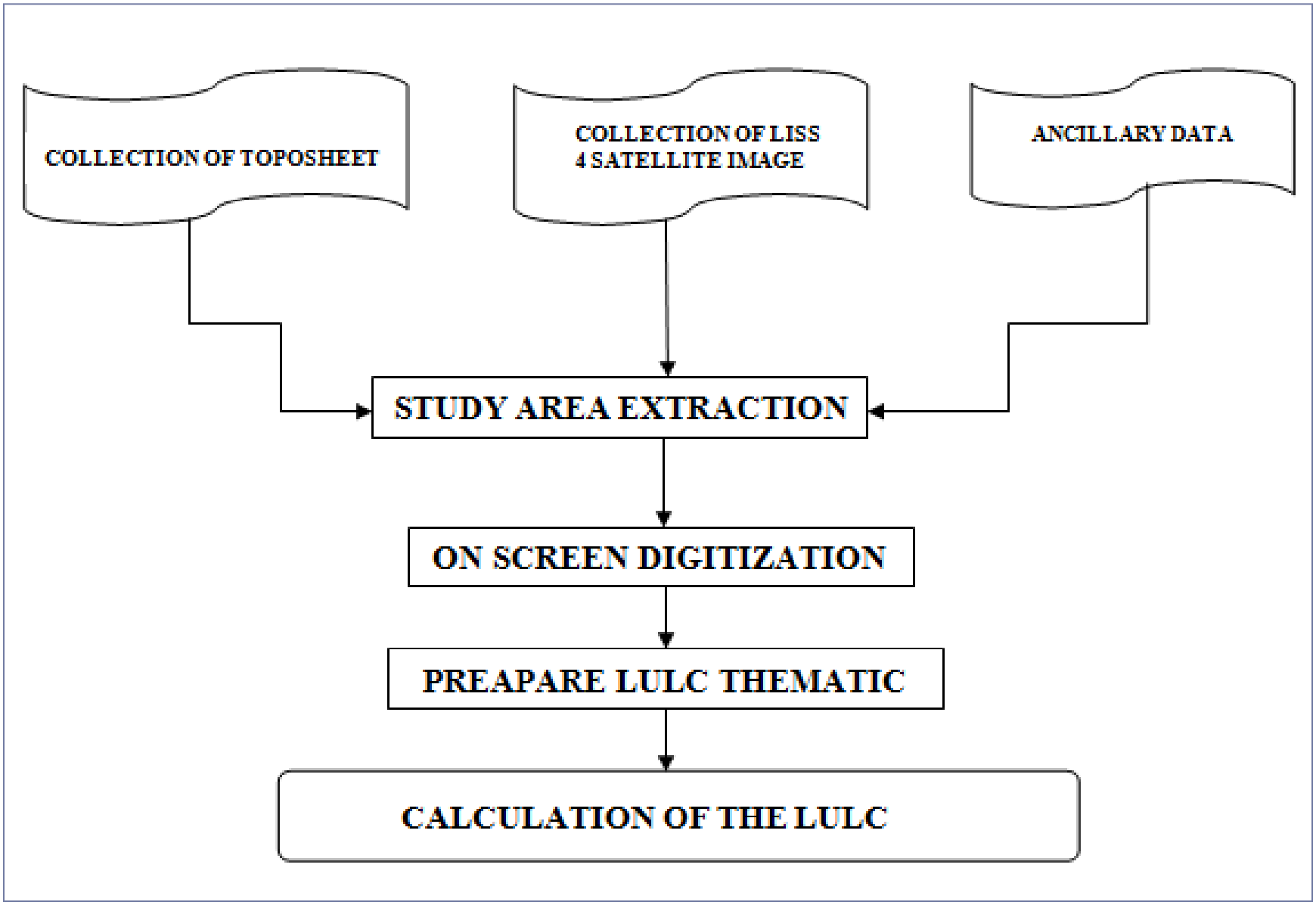


Dug well Recharge

Bore well Recharge

LAND USE LAND COVER OF THE STUDY AREA

Methodology for Land Use and Land Cover of the Study Area



Land Use and Land Cover

- Land use and land cover change has become a central component in current strategies for managing natural resources and monitoring environmental change.

- Land use land cover information is required for many different kind of spatial planning, from urban planning at a local level up to regional development.

- The rapid development of the concept of attribute mapping has led to increased studies of land use and land cover change worldwide.

- Providing an accurate assessment of the existing features concerning natural resources has become an important priority.

Land use land cover of Serilingampally

Serilingampally is located in Ranga reddy District with a geographical study area is 156.45sq.km.

It lies between North Latitudes 170 28’ 48”

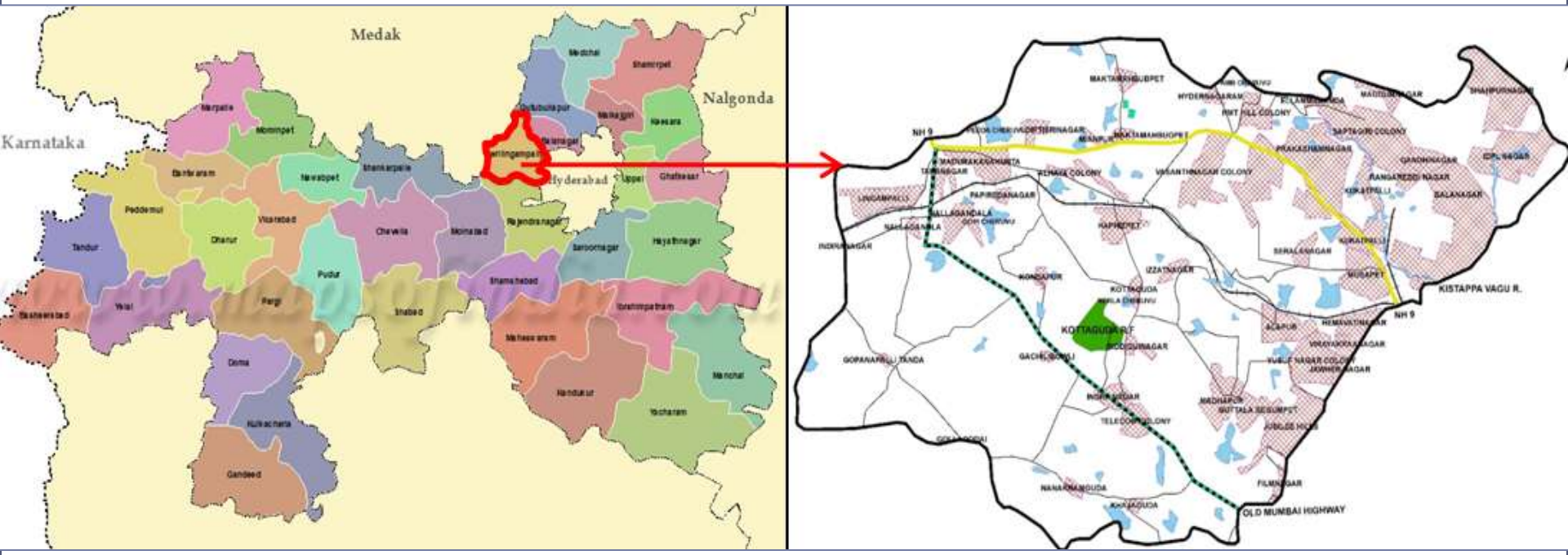
East longitudes780 19’ 48”

The study area is a part of Grater Municipal Corporation of Hyderabad, Is bounded in

- North -Medak district,
- East - Rajendra Nagar mandal,
- South -Shenkar pally mandal
- West - Quthbullapur mandal.

Physical Characteristics of Study Area

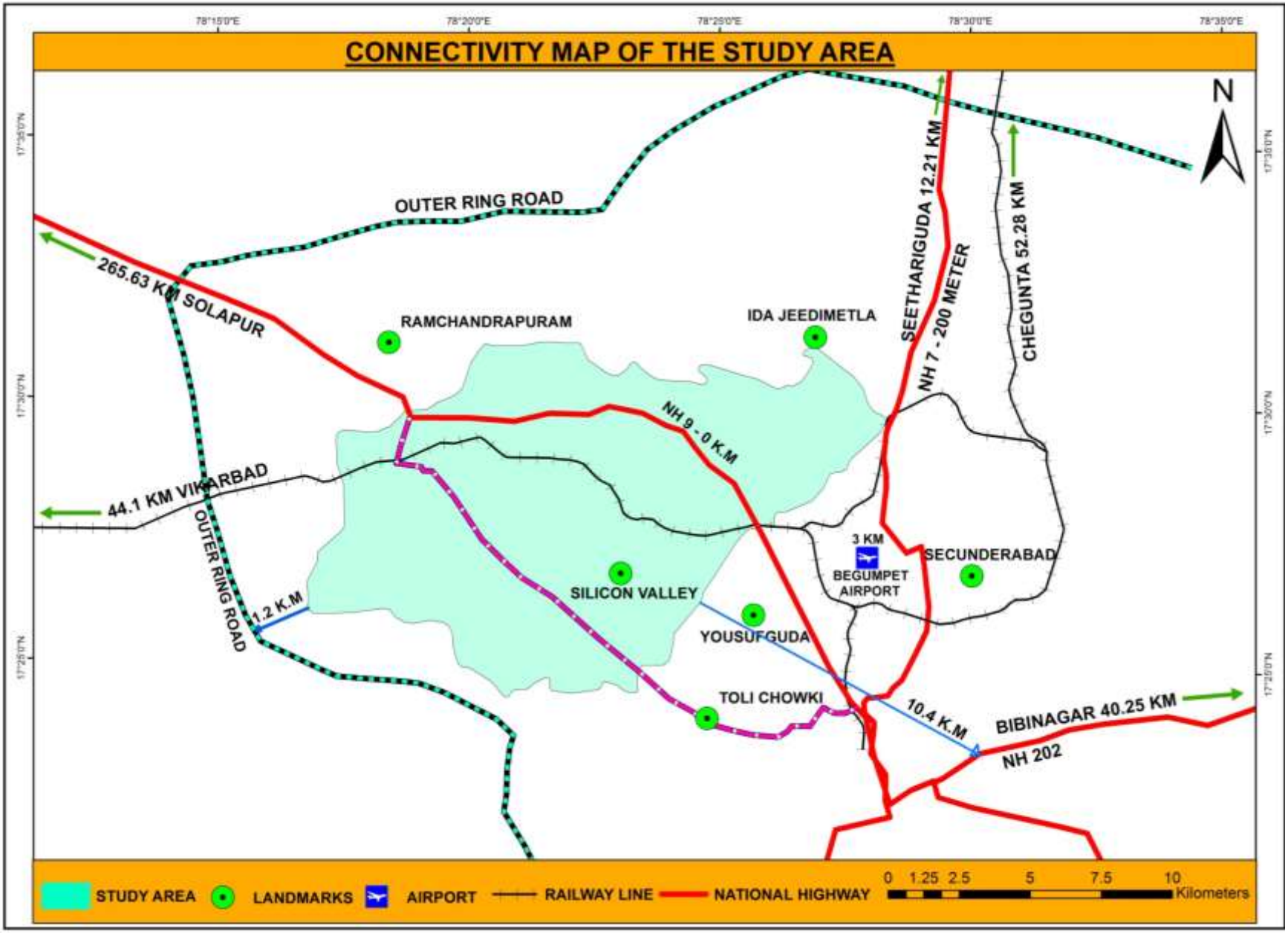
Location:



Base map of the study area

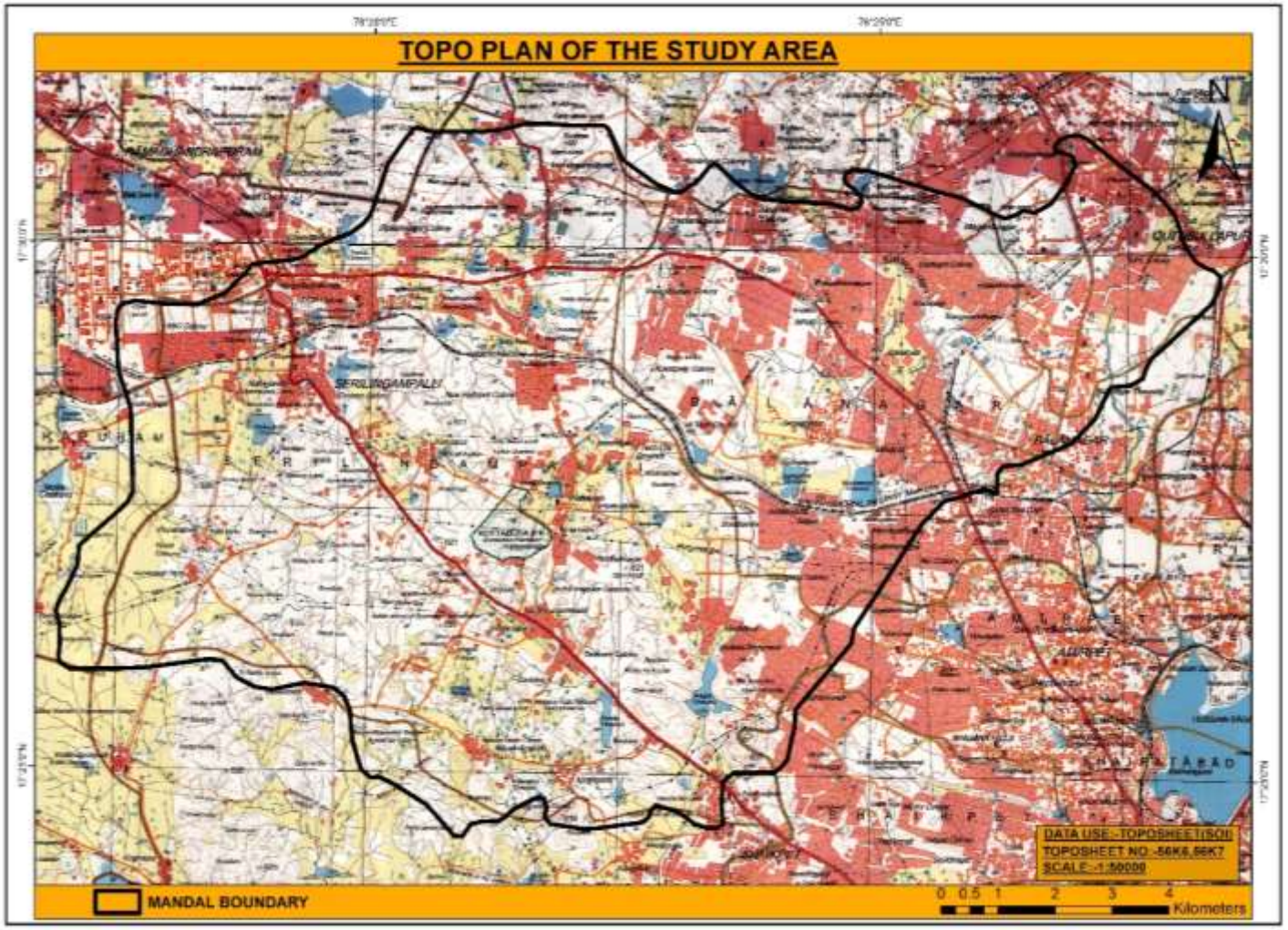
Study area is part of the GHMC because most the area covered by settlement and connectivity of this study area.

Regional Setting & Connectivity



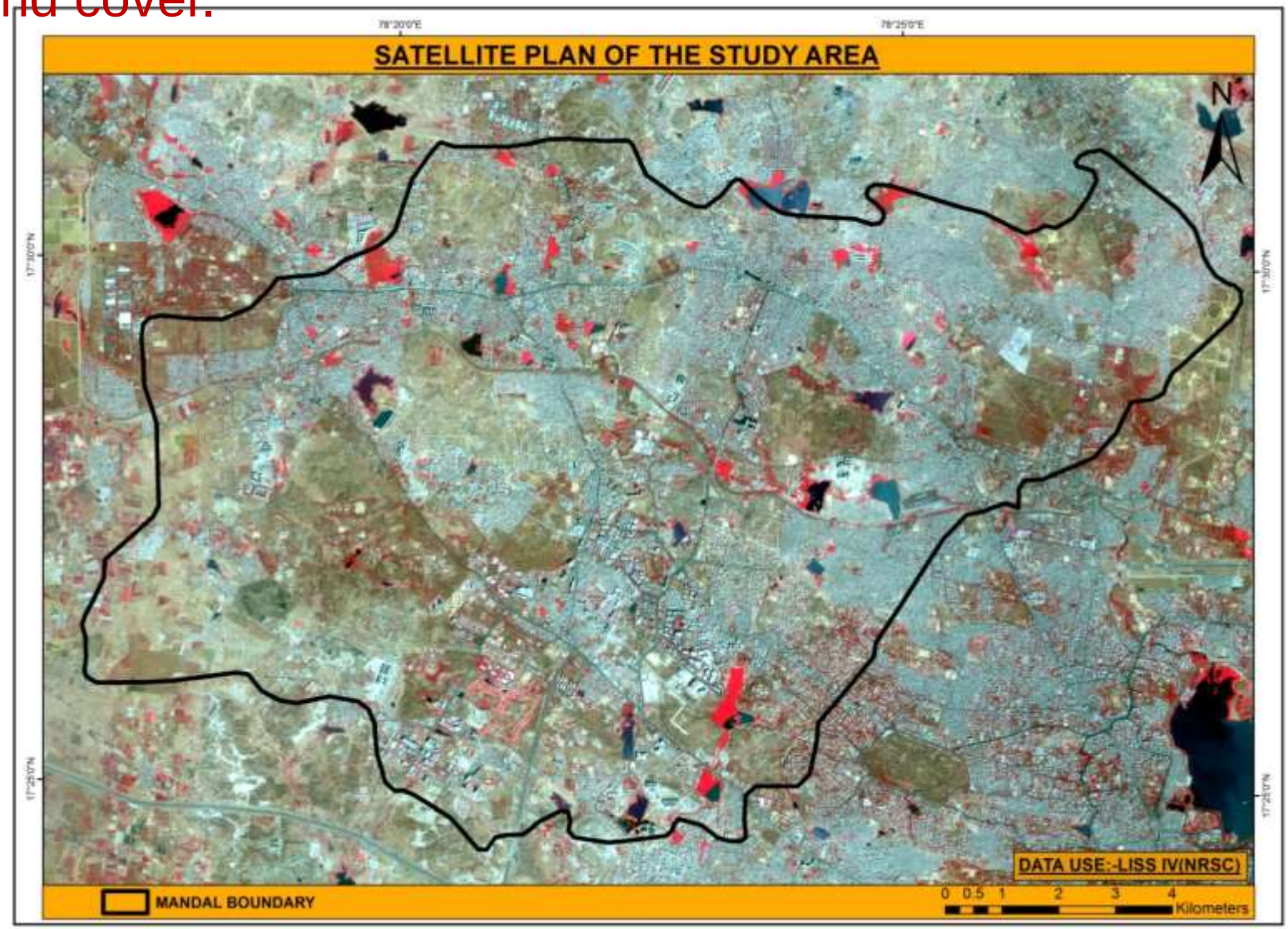
Topo plan of the study area

Topo plan showing the location of study area in topo sheet. It is a reference map for preparing base map. SOI topo sheet data from 56k7 and 56k6 was used

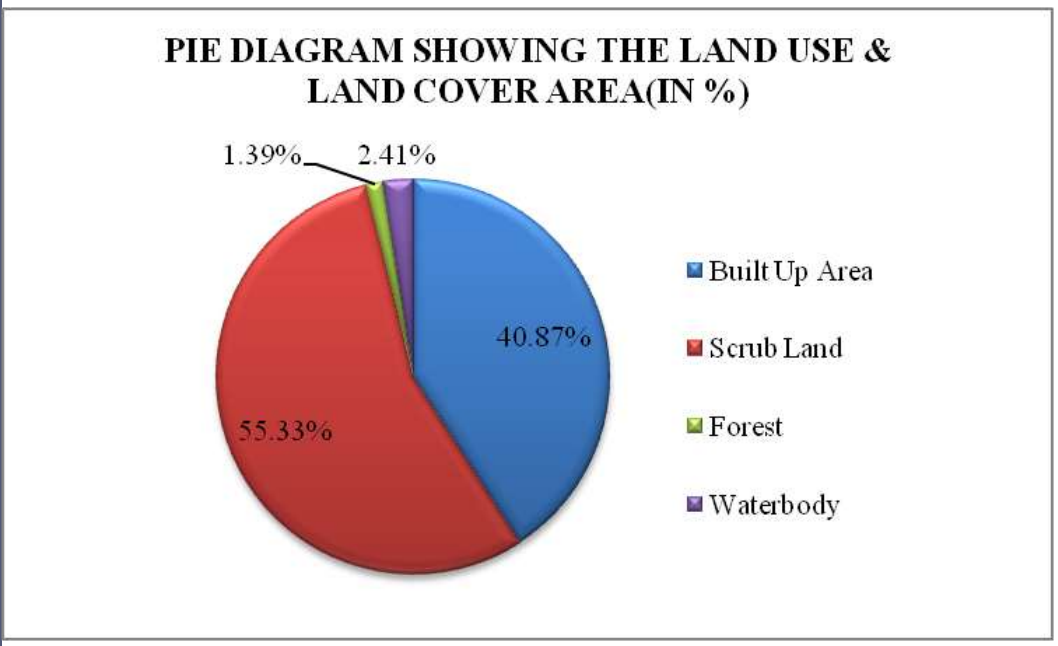


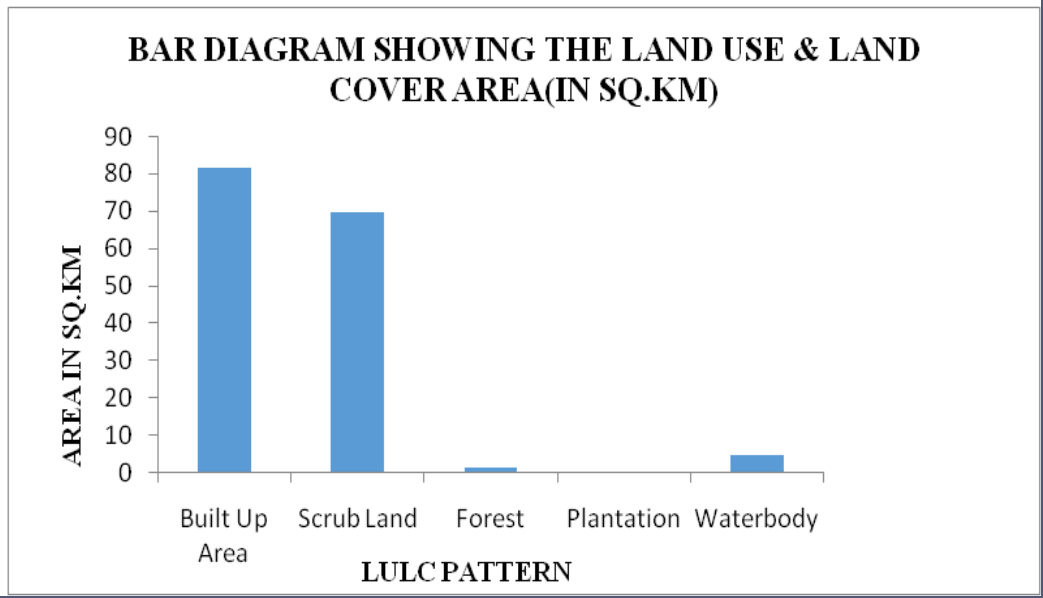
Satellite map of the study area

Satellite plan showing the location of study area in satellite image. It is a reference map for preparing land use and land cover.



Existing land use and land cover



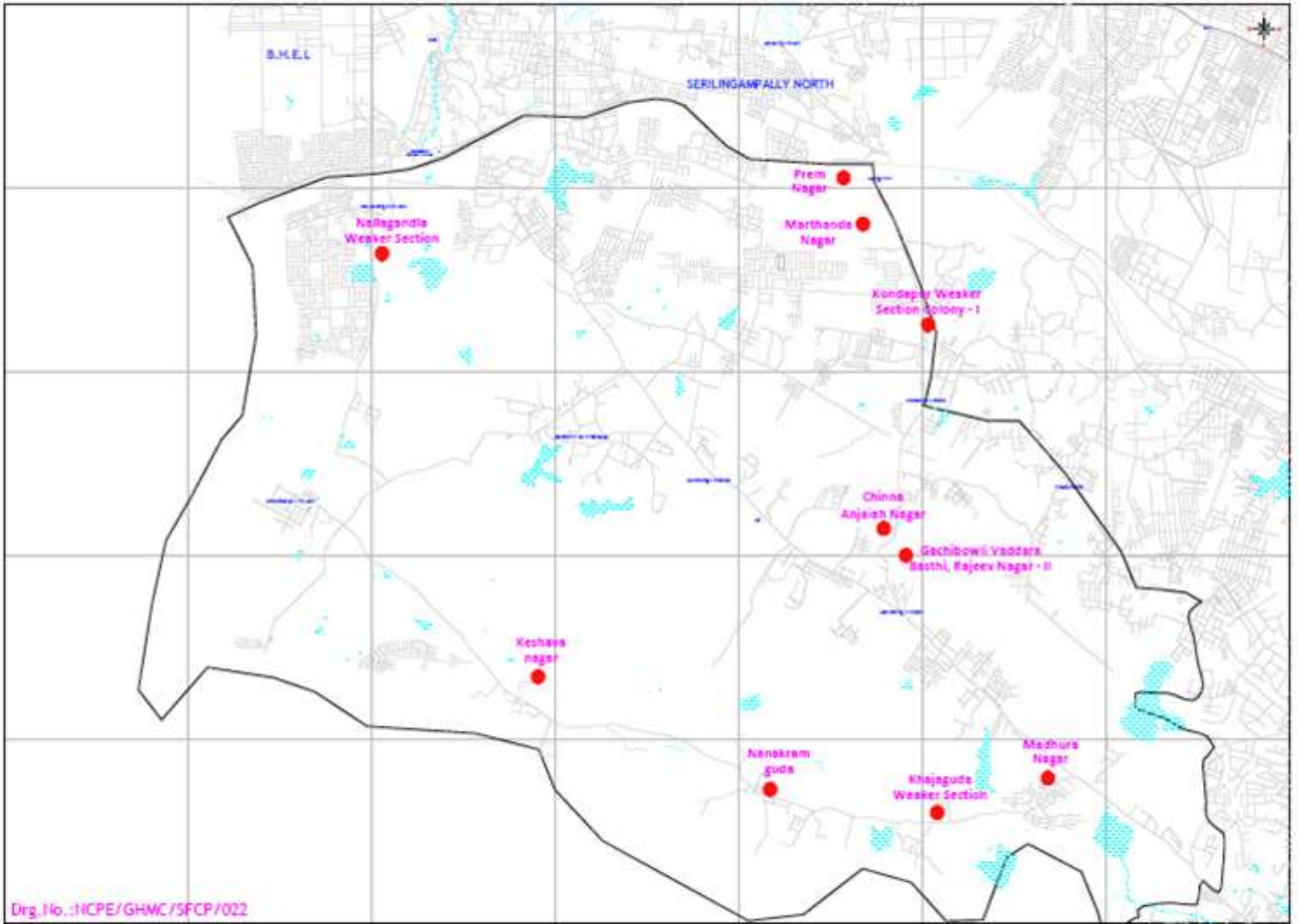


Land Use and land cover of Study Area

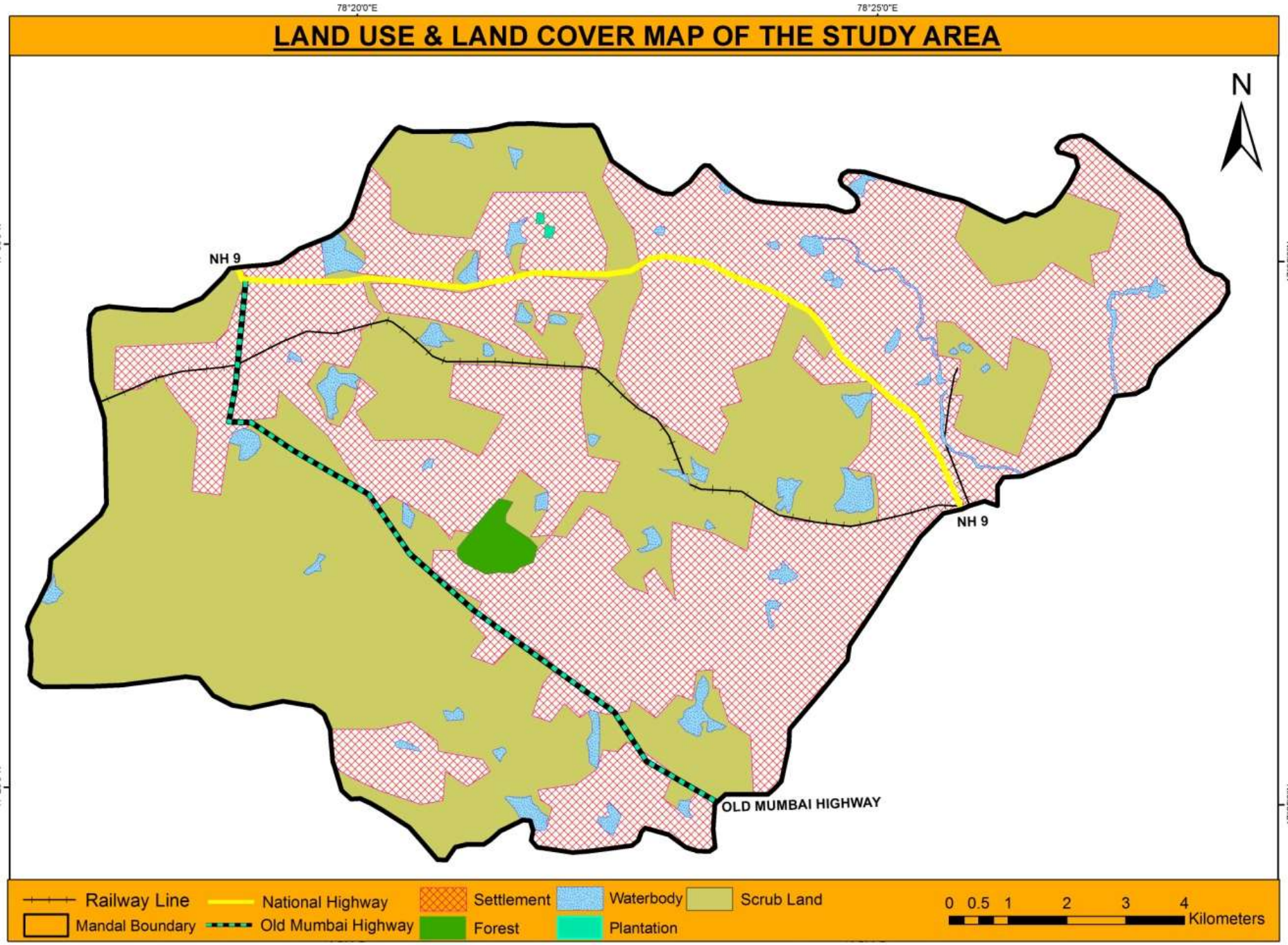
LULC Pattern	Area (in Sq.KM)	Area (in %)
Settlement area	81.56	52.14
Scrub Land	69.39	44.35
Forest	1.02	0.65
Plantation	0.06	0.04
Water body	4.42	2.82
Total Area	156.45	100

Satellite Plan of Serilingampally urban area

Map showing urban land use of study area Serilingampally

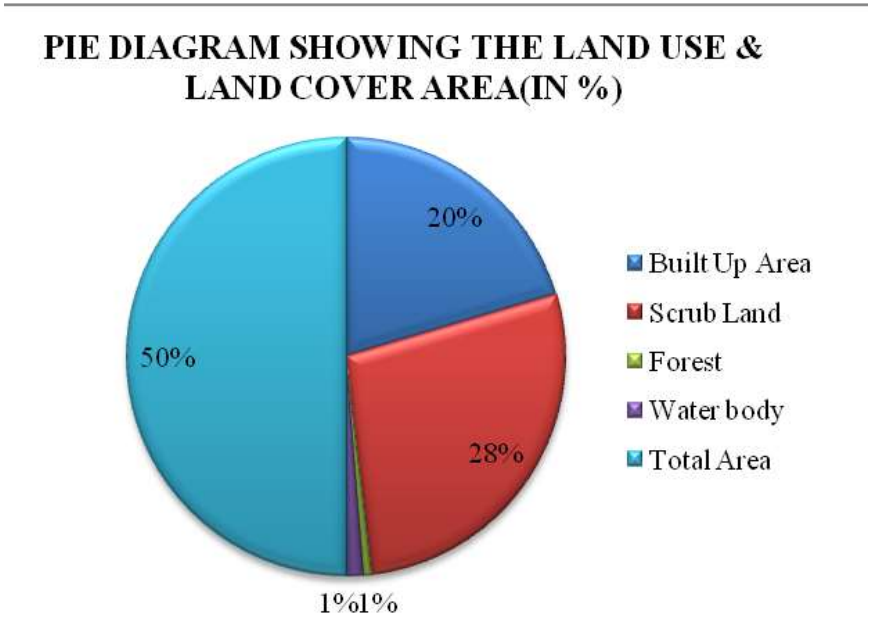


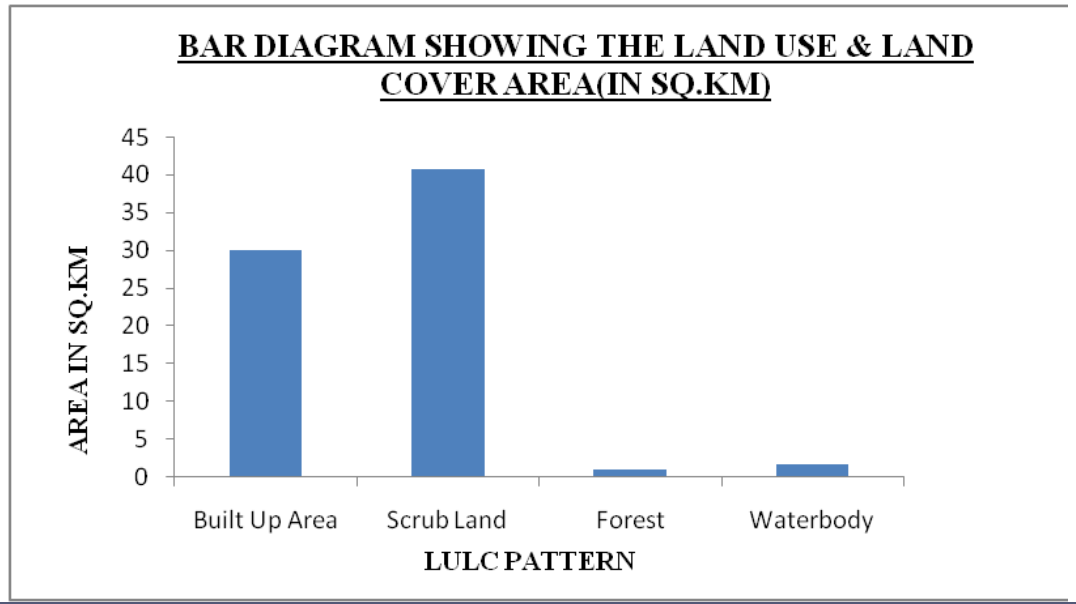
LAND USE & LAND COVER MAP OF THE STUDY AREA



Land Use Land Cover of Serilingampally Urban Area

Existing land use of Serilingampally Urban area		
LULC Pattern	**Area (in Sq.KM)**	**Area (in %)**
Settlement area	30	40.87
Scrub Land	40.62	55.33
Forest	1.02	1.39
Water body	1.77	2.41
Total Area	**73.41**	**100**





Economic Profile

Workers	Main Workers	Marginal Workers	Non-workers	Total
Population	93351	21803	186940	122380

In accordance with the Working population of Serilingampally urban area, the urban region has more than 1.22 lakh working population

- More than 31% of the working force in primary sector,
- 4% in secondary sector and
- 62% non-workers.

CASE STUDY KESHAVA NAGAR SLUM

Location of Kesavanagar in Serilingampalli Mandal in Rangareddy District


Kesavanagar
JAYA BHERI
APARNA SHANGRILLA

Case study of the Keshava Nagar – slum Sherlingampalle area

KeshavaNagar Slum is located in ward no. 111 (Gachibowli-SC(G)) of Circle XI of GHMC.

- Area of the slum is 4.67 Ha
- population is 1026.
- Number of dwelling units is 237.

  Katcha units- 56

  Semi-pucca units 154

  Pucca units 27

ETS Survey & DGPS

DEMOGRAPHIC ELEMENTS and DETAILS OF KESAVA NAGAR

1	No.of houses	:	237
2	No. of households	:	334
3	Land ownership	:	A.P. State Government
4	Land Tenure		
	- Pattas issued	:	112
	- Encroached	:	125
	- Total	:	237
5	Average Monthly Income	:	Rs. 5636
6	Average Monthly Expenditu	:	Rs. 4393
7	Debts outstanding	:	Rs. 27,991 Per family
8	Type of structures		
	- Pucca	:	29
	- Semi Pucca	:	155
	- Katcha	:	53
	- Total	:	237

EXISTING PLAN

Pucca Houses

Semipucca Houses

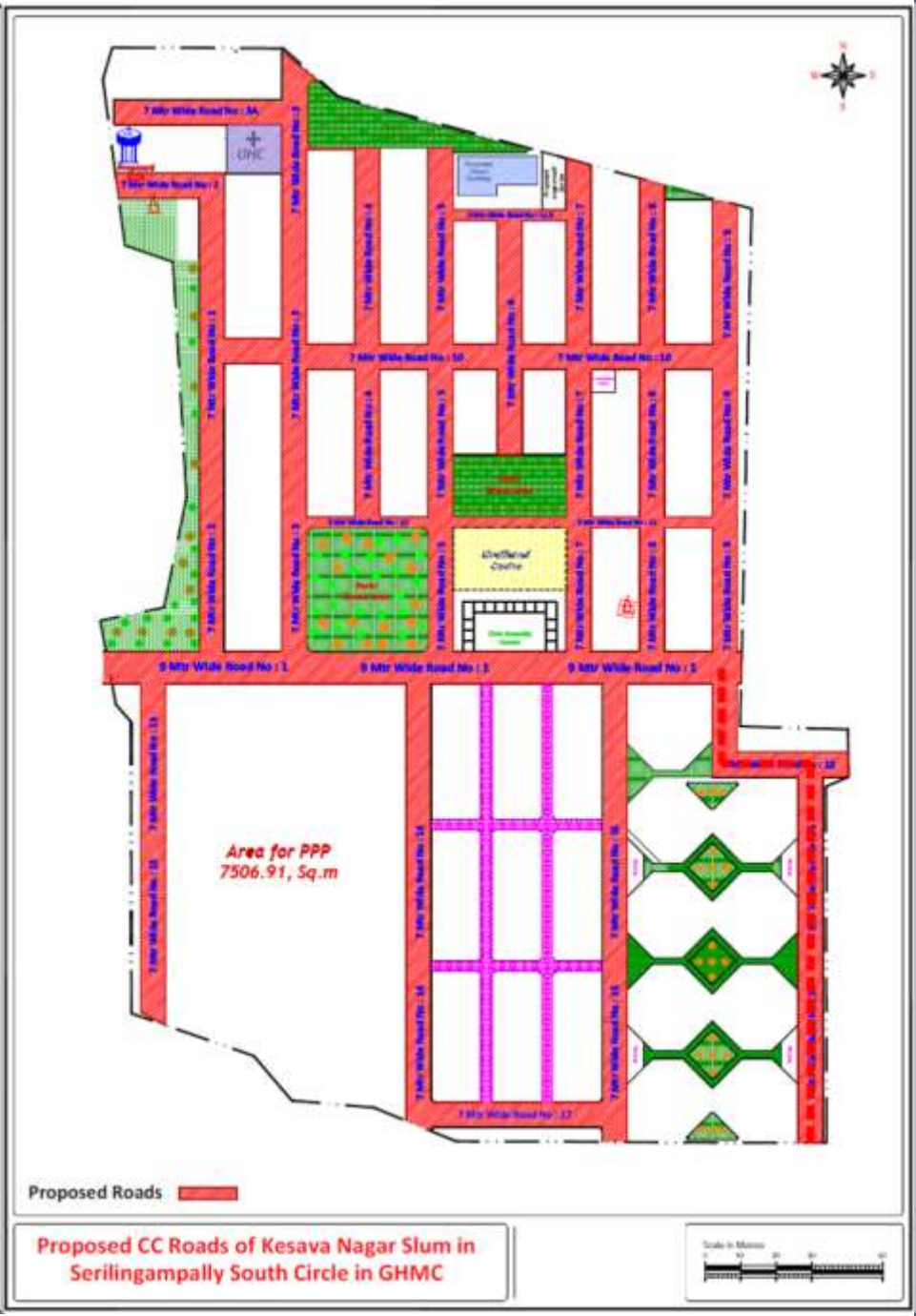
Katcha Houses

CC Roads

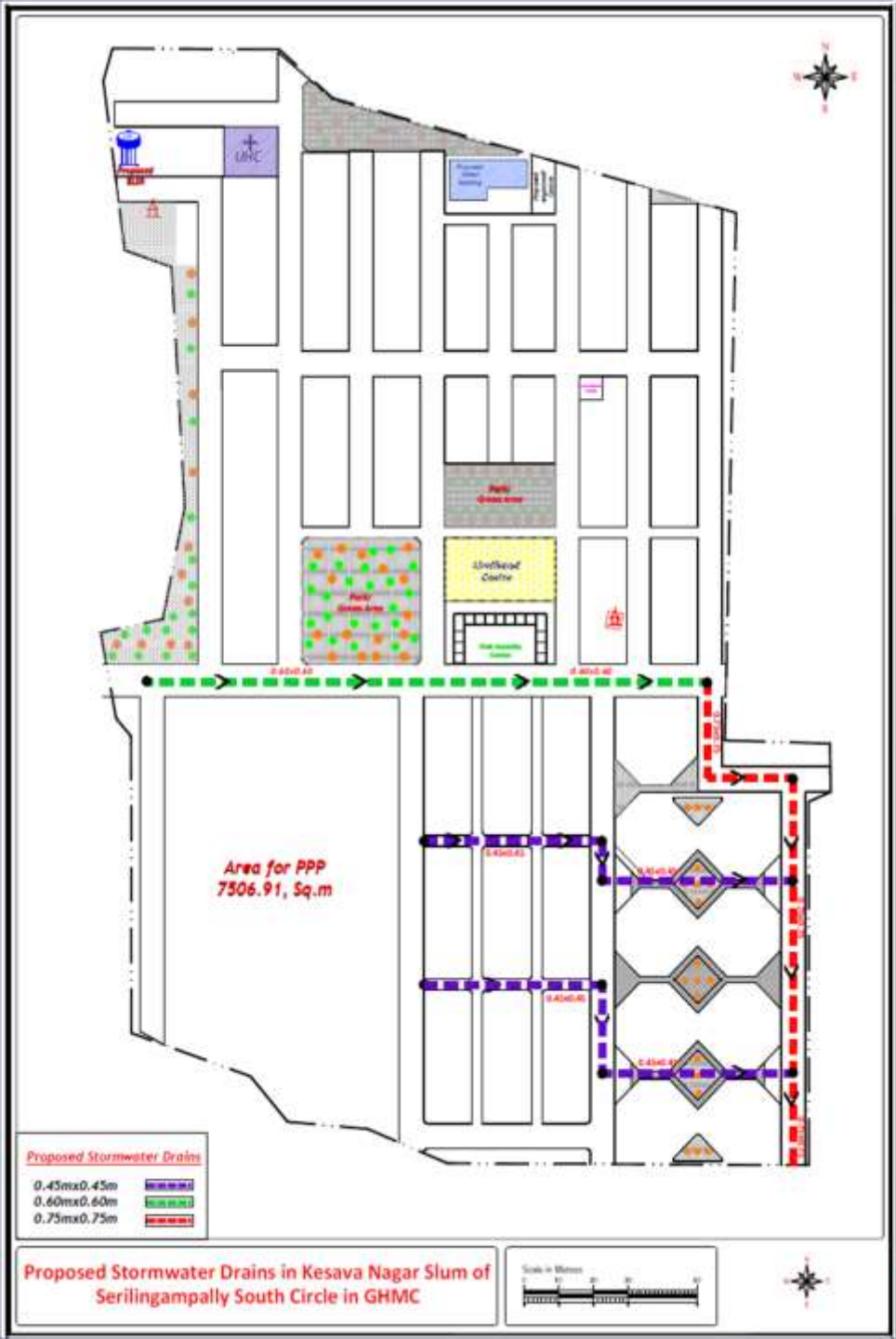
Katcha Roads

Area : 4.9 Ha.

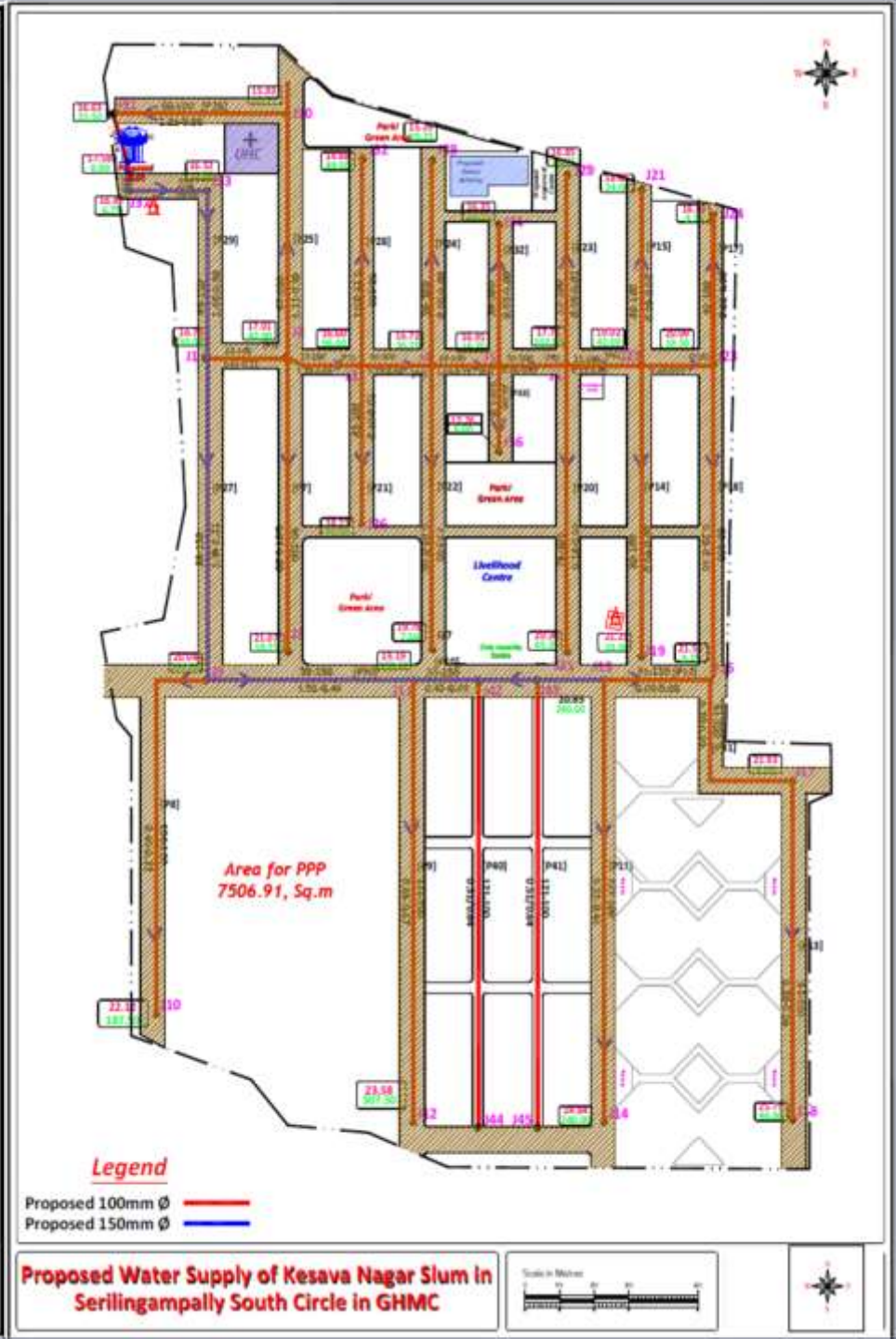
Proposed Layout of Kesava Nagar Slum in Serilingampally South Circle in GHMC



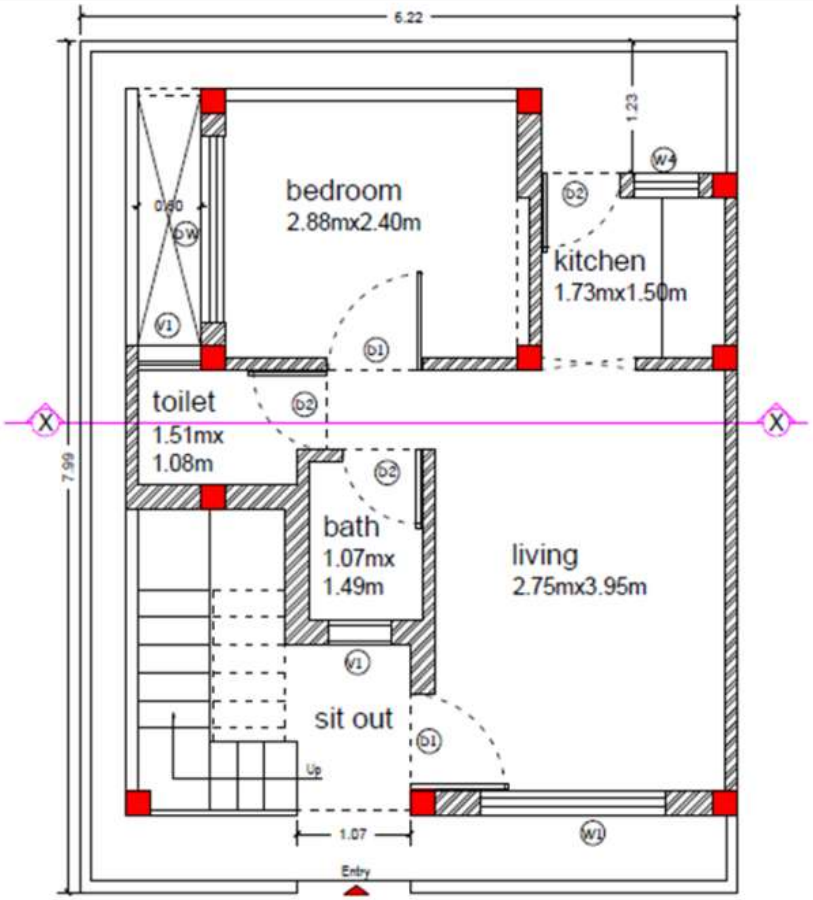
Proposed CC Roads of Kesava Nagar Slum in Serilingampally South Circle in GHMC

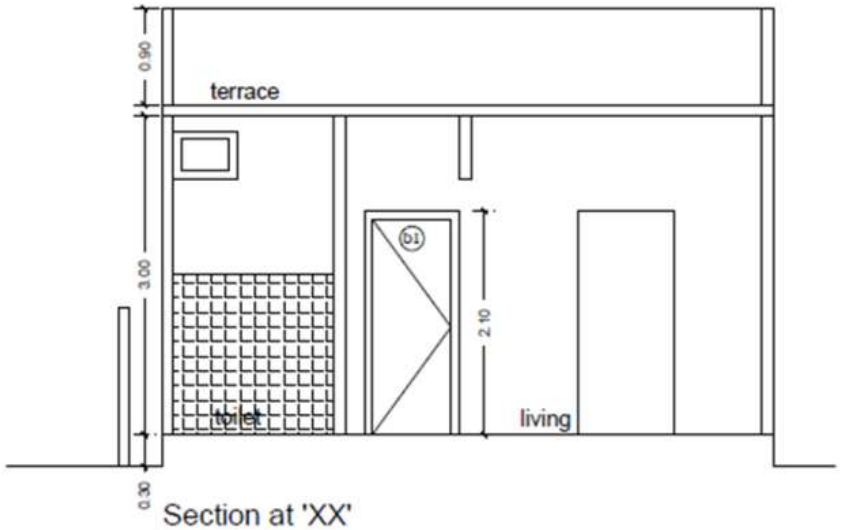


Proposed Stormwater Drains in Kesava Nagar Slum of Serilingampally South Circle in GHMC

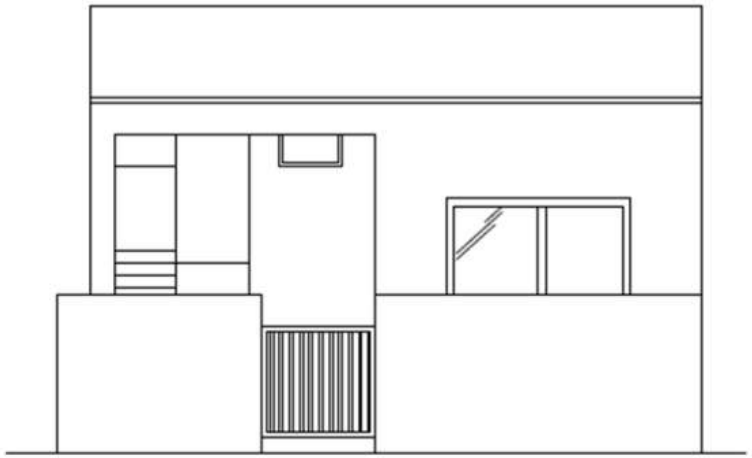


Proposed Water Supply of Kesava Nagar Slum in Serilingampally South Circle in GHMC





Section at 'XX'



Front Elevation

Area statements-Type I

Plot Area= 50.16 sqm(60.0 sqyds)

Carpet Area= 25.16 sqm

Built-up Area = 36.33 sqm

Living room	11.08 sqm
Bedroom	6.91 sqm
Kitchen	2.88 sqm
Bath	2.44 sqm
Toilet	1.85 sqm
Total	25.16 sqm

Opening Schedule		
Name	Size	Nos
D1	0.9mx2.1m	2
D2	.75mx2.1m	3
W1	1.5mx1.2m	1
W4	0.9mx1.2m	1
V1	0.6mx0.45m	2
DW	1.5mx1.2m	1

Lintel Level- 2.1 m from FFL
Sill Level- 0.9 m from FFL
Slab Height- 3.0 m (clear ht.)
Tread - 254 mm
Riser - 177 mm

Proposed UNIT Floor Plan of residence for remodelling of Slums under RAY

TYPE I

Scale in Meters

GEOSPATIAL LAYERS OF WEB-GIS

Web analysis GIS Applications:

- Single centralized dataset
- No need of proprietary GIS software at the client end
- Easy of use

Soft wares used.

- SQL Server 2000, Arc SDE 9.1
- Platform: NET
- Front-end: ASP. Net, C#
- Back-end: SQL Server 2000, Arc SDE 9.1
- Web-server:IIS6.0
- Application server spatial server: ArcIMS9.1

Functional benefits of Web GIS

- Single centralized dataset.
- No need of proprietary GIS software at the client end.
- Easy to use.
- Wide access to GIS data & functionality.
- Can be linked to other departments & organizations.
- Improve management of resources.
- Inter-departmental information sharing and communication
- Better planning of public utilities and Town Planning.
- View & present information (visualization of municipal assets geographically)
- Tools to query, analyze and map data in support of the decision making process.
- Ease in maintenance and better monitoring of municipal resources.
- Online Decision-Making

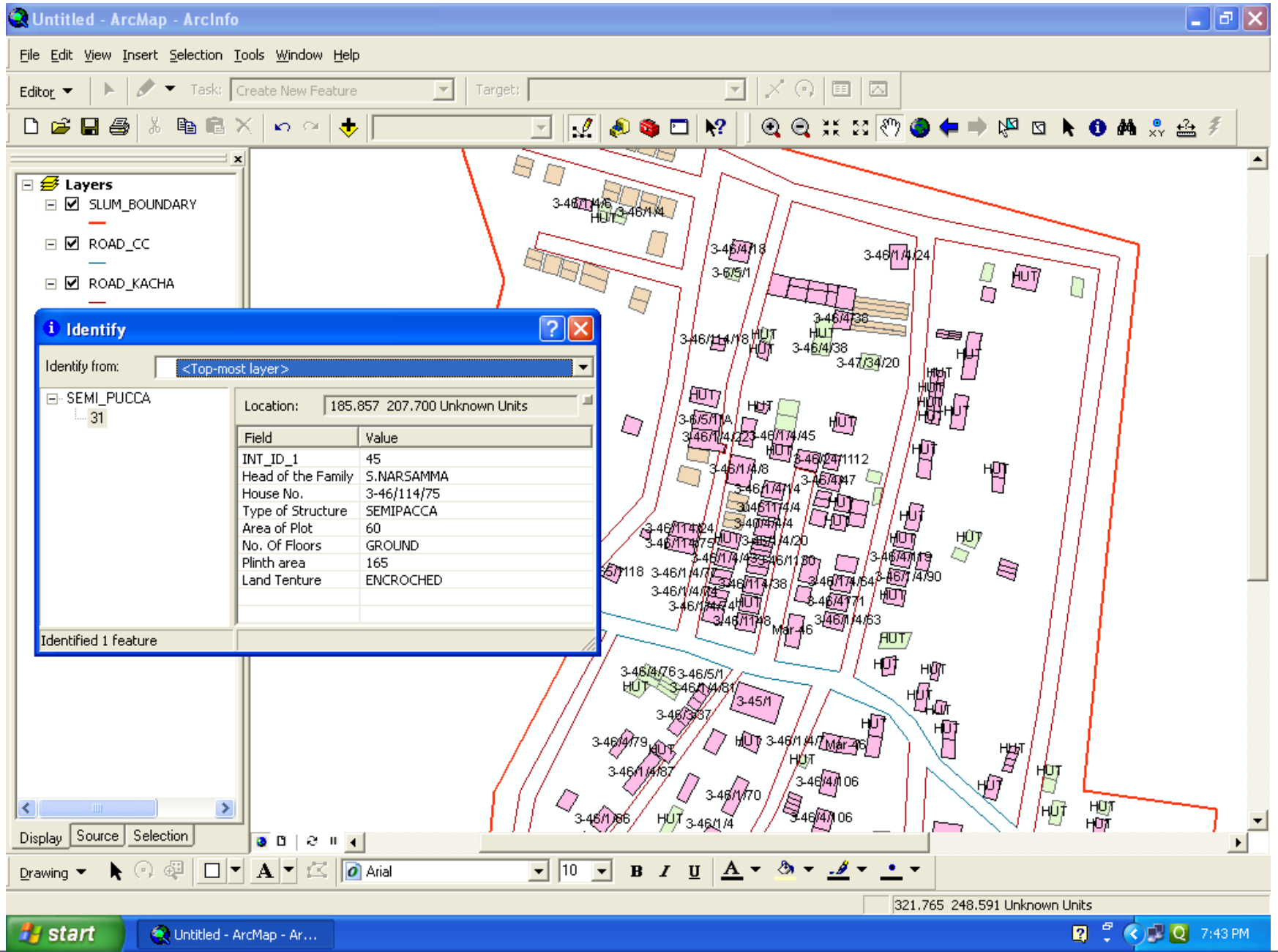
Merits of web-based system

- **There is not much investment in the infrastructure required for implementation of the MIS/GIS as there is no requirement of separate hardware and software**
- **No additional technical manpower is required.**
- **Applications can be accessed with necessary restriction policy in place.**
- **It provides compatibility to run the applications on any operating system in most cases (i.e., Windows, Linux, etc.)**
- **There are no issues of data Synchronization because the web based tool stores the data in central data base itself.**

The Demerits

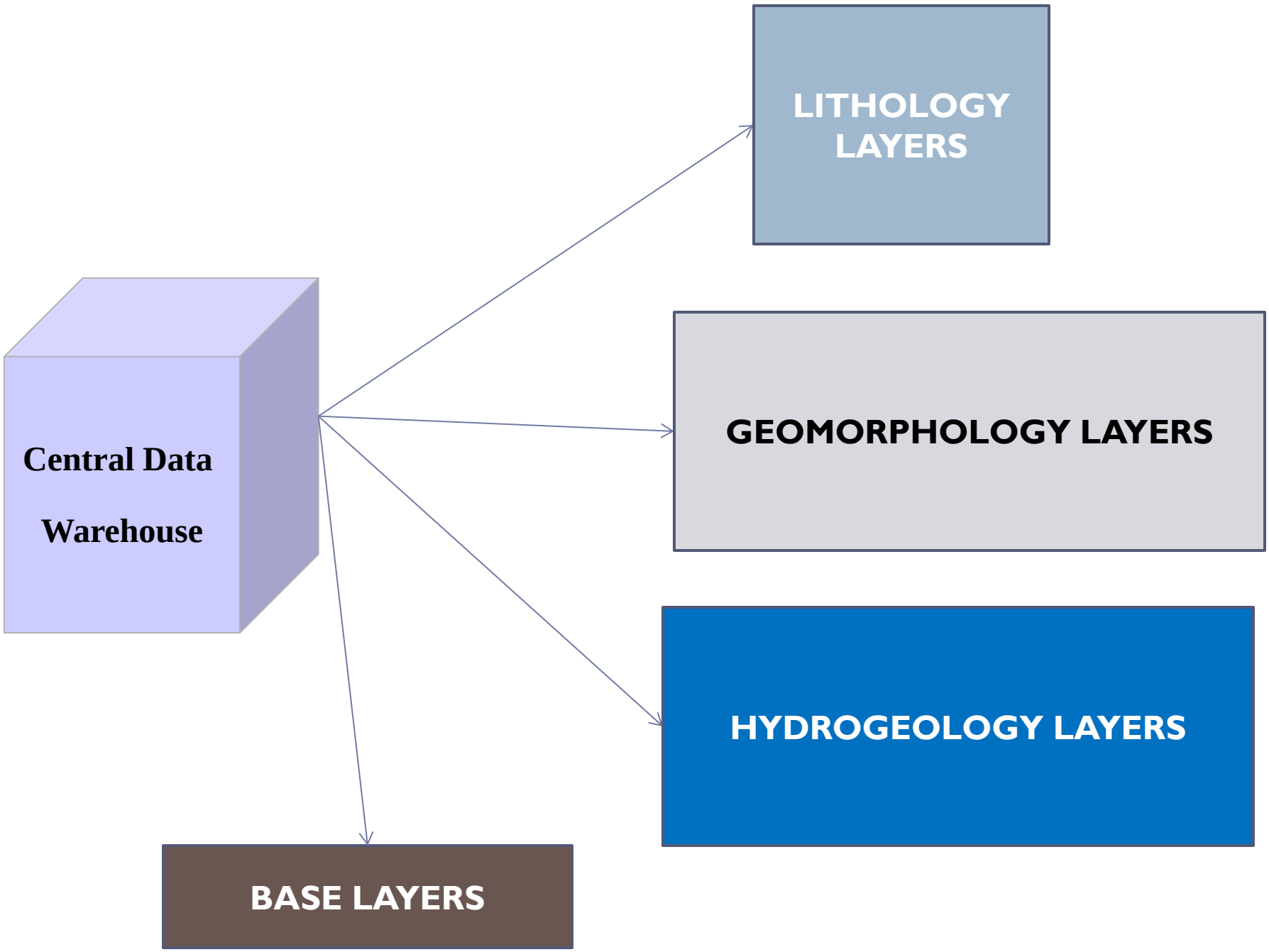
Clients may experience difficulty in data entry in places where internet connectivity either does not exist or is slow.

GIS Application Development



Development of Web GIS System

1. Project Planning
2. Database design
3. Verification /Editing of data
4. Database Development
5. Web GIS Application Coding
6. Quality assurance
7. Documentation


LITHOLOGY LAYERS
Central Data Warehouse
GEOMORPHOLOGY LAYERS
HYDROGEOLOGY LAYERS
BASE LAYERS

Web GIS Components

CAD/GIS Database

Central Data Warehouse

External Data

Web GIS MAP SERVER

PC2

PC1

INTERNET

PC3

Web GIS Development Tools

- Database used: **Post Gre SQL, Post GIS(ESRI)**
- OS Platform: **Linux**
- Development Technologies: **PHP, ZEND(softwares)**

Framework

- Web-server: **Apache Web Server**
- Application Spatial server: **Map Server**
- GIS Database: Shape Files, Geo Data Base

The customized Web GIS Application

1. Revenue Module
2. Town Planning Module
3. Engineering Geological Module
4. O&M Module
5. Disaster Management Module
6. Public Grievance Module

Town Planning Module:

1. Property Search
2. Query Builds for Parcel Information
3. Building Permission Application
4. Property identification tool
5. Query Builder
6. Measure Tool
7. Buffer Analysis Tool
8. Specialized area selection tool

Revenue Module:

1. Building Application Fee Calculator
2. Reporting Tools

Engineering Module:

1. Display and query road network data based on the type of roads
2. Display surface water features and natural drainage such as rivers, nalas, canals etc.
3. Display and query water supply network with main categories.
4. Display Sewerage network including manholes.(with SQL)
5. Display and query properties which have municipal water supply connection. And or drainage connection.

Results and observations of the present work

1. **Provision of large government financial assistance is observed for Poverty Alleviation Schemes and Projects towards the development of slum areas of GHMC example Serilingampalle including Keshavnagar.**

2. **Due to lack of geo-scientific information and its implementation large funding was returned to the government by GHMC.**

3. **With the present studies it is hoped to produce desired geoscientific solutions to the funding agencies and also to the GHMC and helps in mitigating the issues.**

Cont.....

4. **The present studies not only serve the purpose and go a long way stating that the 'geology in service of man' would be highlighted in all administrative and technical services.**

5. **The Plan of action enunciated in the present study may be implemented on various on going government schemes.**

Thank You