Flood Risk Mapping KDMC using GIS and Remote sensing techniques

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Format for the presentation

- Introduction
- Scope of the study
- Aim and Objectives
- Study area
- Literature Review
- Methodology
- Data Generation
- GIS data Integration
- Data analysis
- Output
- Results and Discussions

INTRODUCTION

- Urban areas facing the threat of environment degradation, earthquakes, floods, cyclones
- Developing nations further burdened
- Bangladesh, Sub-Saharan Africa, India, Nepal
- Floods of different types, nature, and area-specific
- Mumbai on 26th of July 2005
- Accounts on
  - What went wrong?
 - Are remedial measures the solutions?

SCOPE OF THE STUDY

- Floods every monsoons
- Unplanned urban development
- Improper drainage management
- Health and housing concerns
- Economic damages
- Transport services disrupted

AIM & OBJECTIVE

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- The main aim of the study is flood risk mapping in Kalyan-Dombivli area with respect to the physical, demographical and socio-economical vulnerability indicators.

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- To identify the low-lying areas with built-up lands.

- Land use/land cover map

- To analyze the flood risk factors and provide the structures which will help to minimize the flood risk

Study area:
Kalyan-Dombivli Mumbai

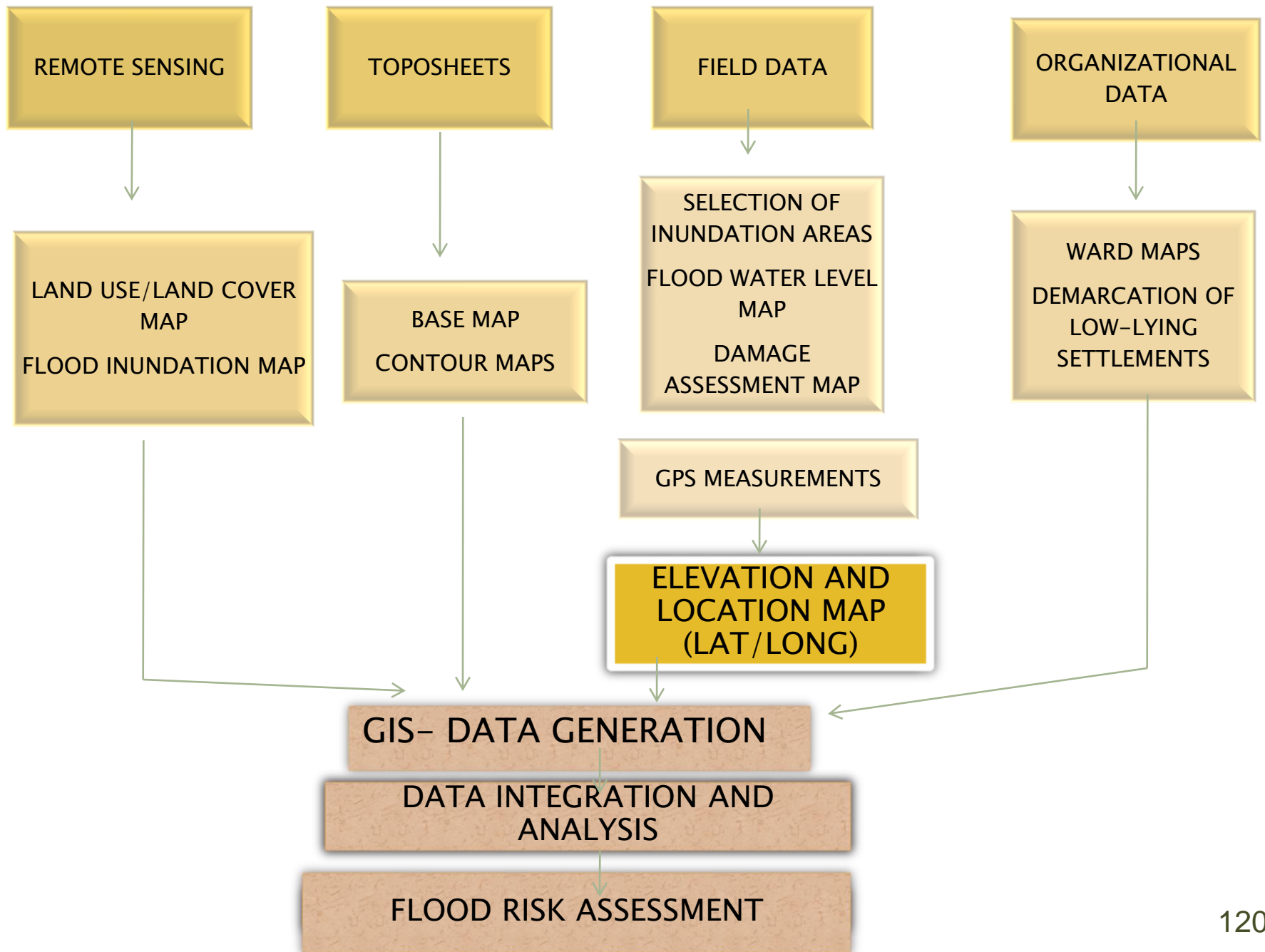Kalyan Dombivli Municipal Corporation, Mumbai

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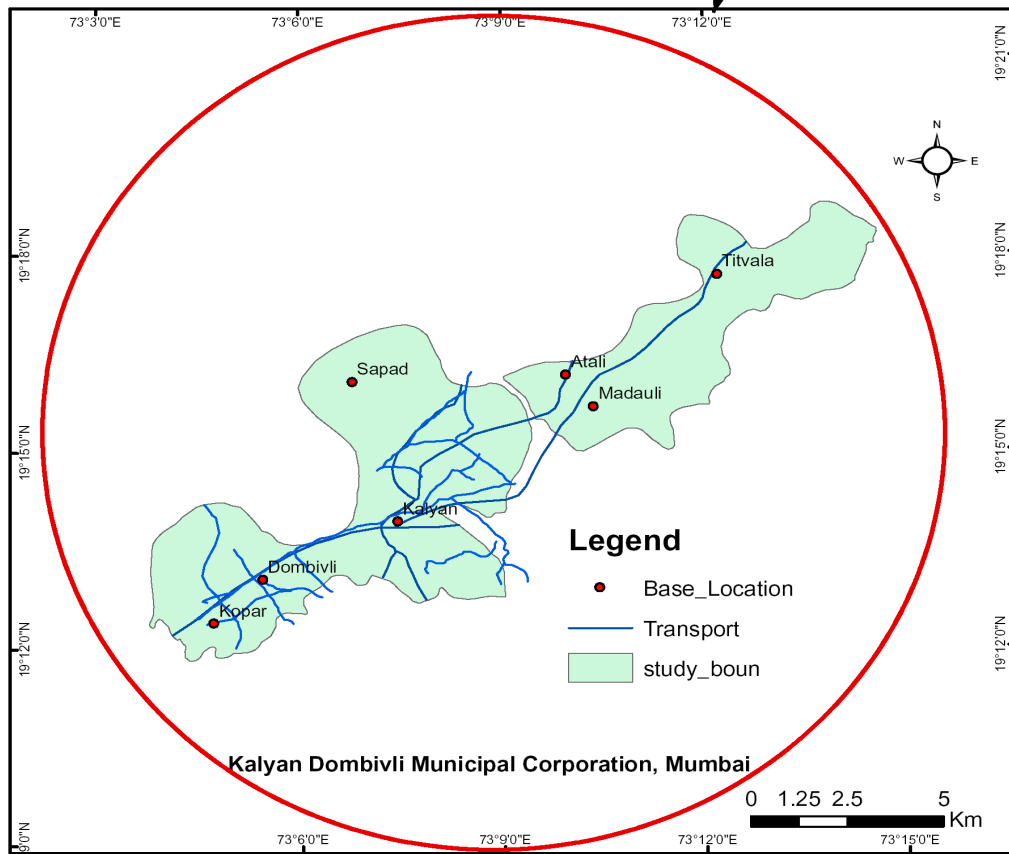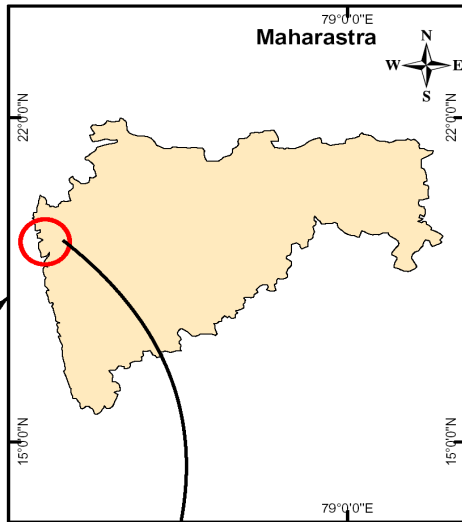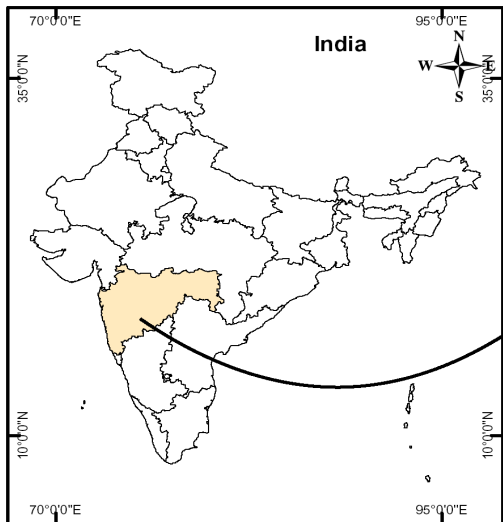
LITERATURE REVIEW

- Floods :– Defined as relatively high flow that overtakes natural channel provided for run-off. (Chow)
- Flood as a body of water that overflows land that is not normally submerged.(Ward)
- Types of floods:– Flash floods, Single-event floods, Multiple event floods and seasonal floods.
- Causes of floods:– Meteorological
- Anthropogenic and geomorphic causes

Contd...

- GIS and remote sensing applications in Cyclones and downpours drawing from international, national and studies in Mumbai
- Flood damages
- Remedial measures

METHODOLOGY

REMOTE SENSING → LAND USE/LAND COVER MAP, FLOOD INUNDATION MAP

TOPOSHEETS → BASE MAP, CONTOUR MAPS

FIELD DATA → SELECTION OF INUNDATION AREAS, FLOOD WATER LEVEL MAP, DAMAGE ASSESSMENT MAP

ORGANIZATIONAL DATA → WARD MAPS, DEMARCATION OF LOW-LYING SETTLEMENTS

GPS MEASUREMENTS → ELEVATION AND LOCATION MAP (LAT/LONG)

GIS- DATA GENERATION → DATA INTEGRATION AND ANALYSIS → FLOOD RISK ASSESSMENT
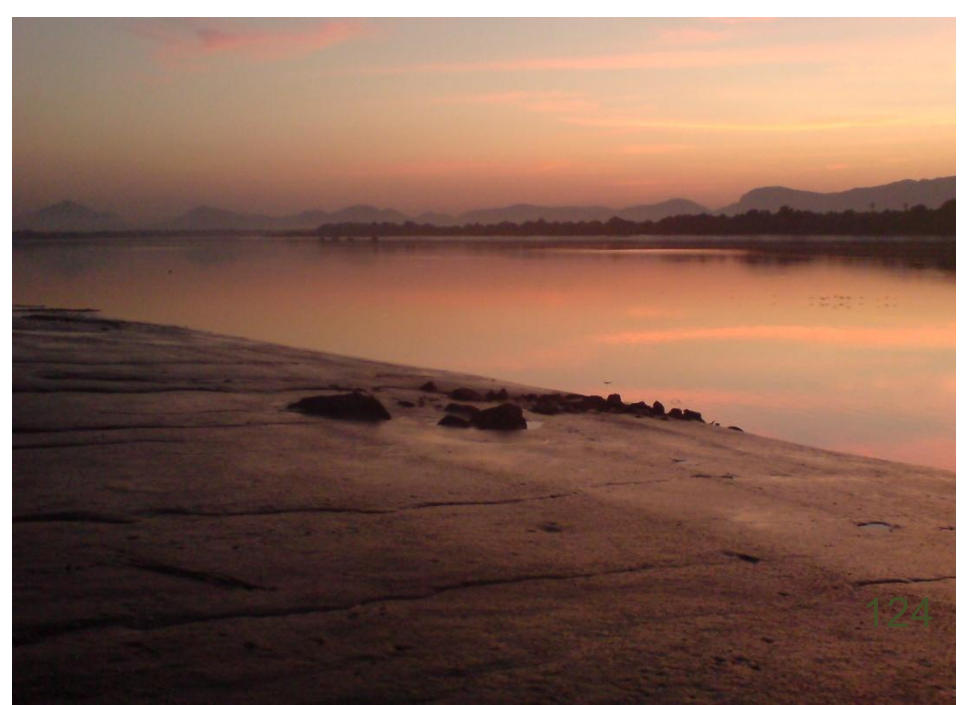
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METHODOLOGY

- Primary Data

Field Surveys, House Hold Interviews(60)

- Secondary Data

 Kdmc, Web Links, Journals, Articles.

- Rainfall data

- **GIS DATA GENERATION**
- Study area map
- Contour map
- DEM
- LU/LC map
- Drainage map
  - From both Toposheet as well as Satellite image
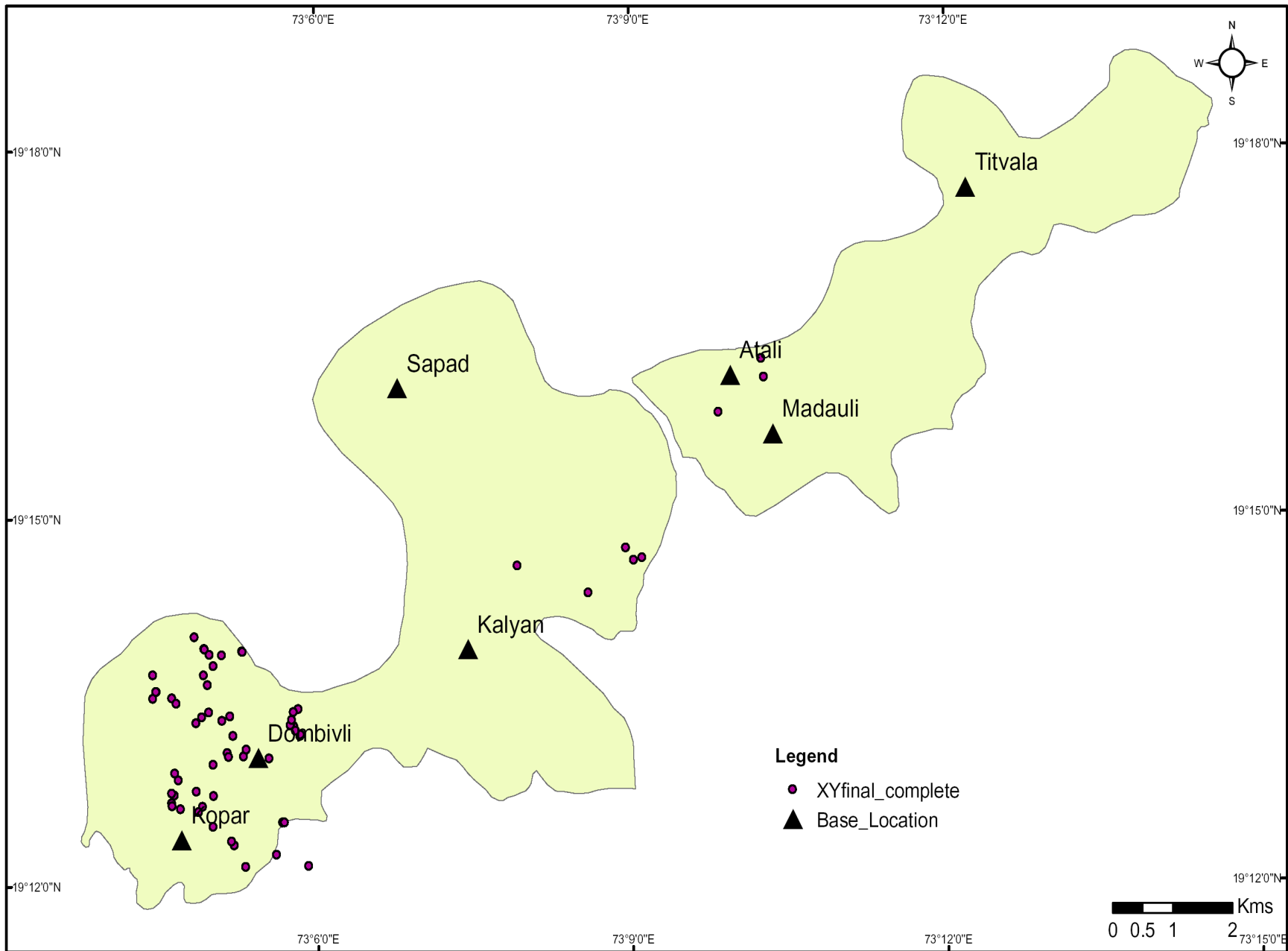- Water level map

DATA GENERATION
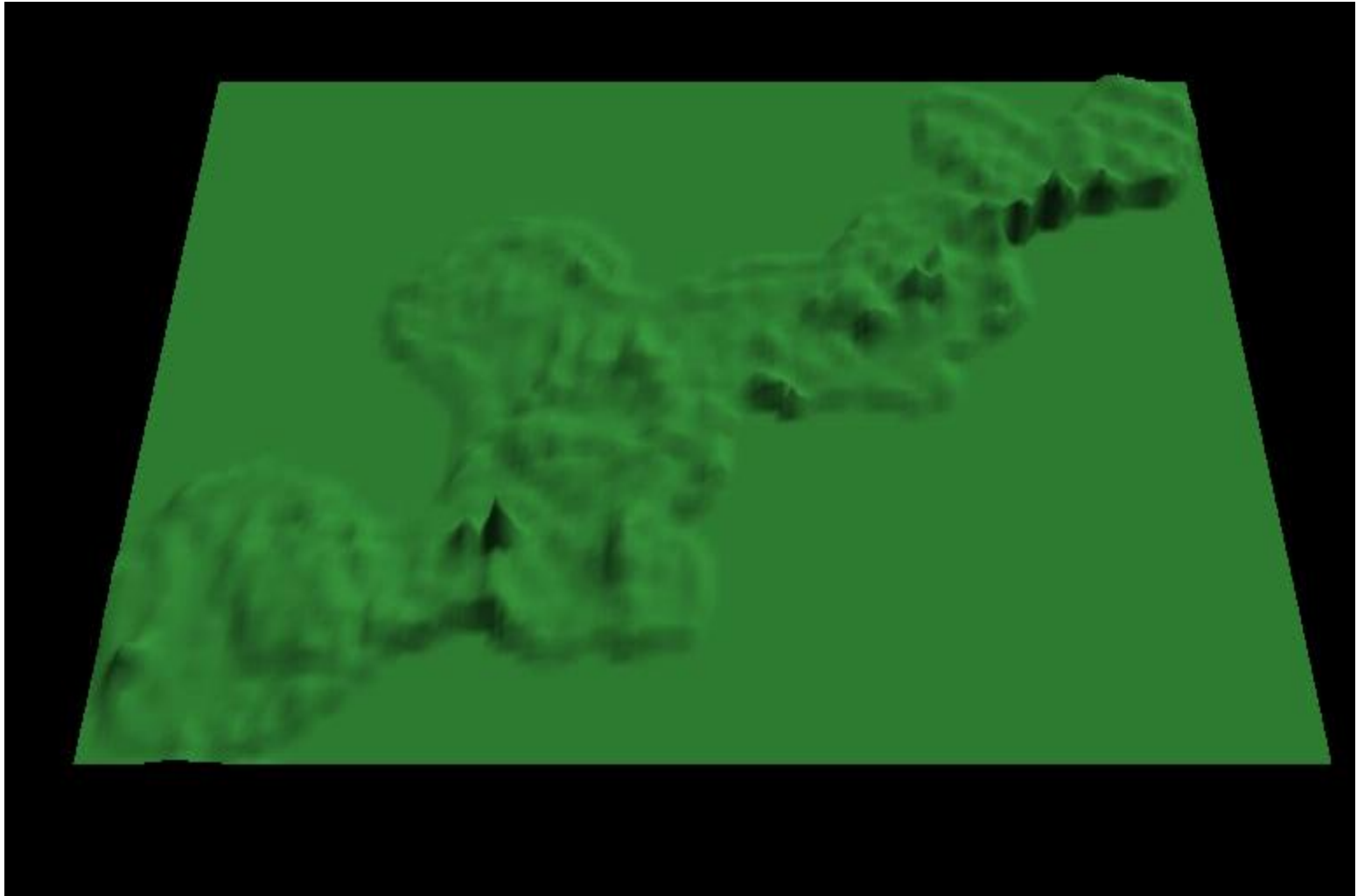
FIELD PHOTOGRAPHS

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PICTURES –26/7/2005,KDMC,MUMBAI

GIS DATA INTEGRATION

Legend

● XYfinal_complete

▲ Base_Location

128

Legend

Boun_Final

Drainage

River Ulhas

DEM

Contour map of KDMC

Sapad

Kalyan

Dombivli

Kopar

73°6'0"E

73°9'0"E

19°15'0"N

19°12'0"N

N
W   E
S

Legend

▲ Base_Location

—— Final_contour

Km
0   0.5   1   2

132
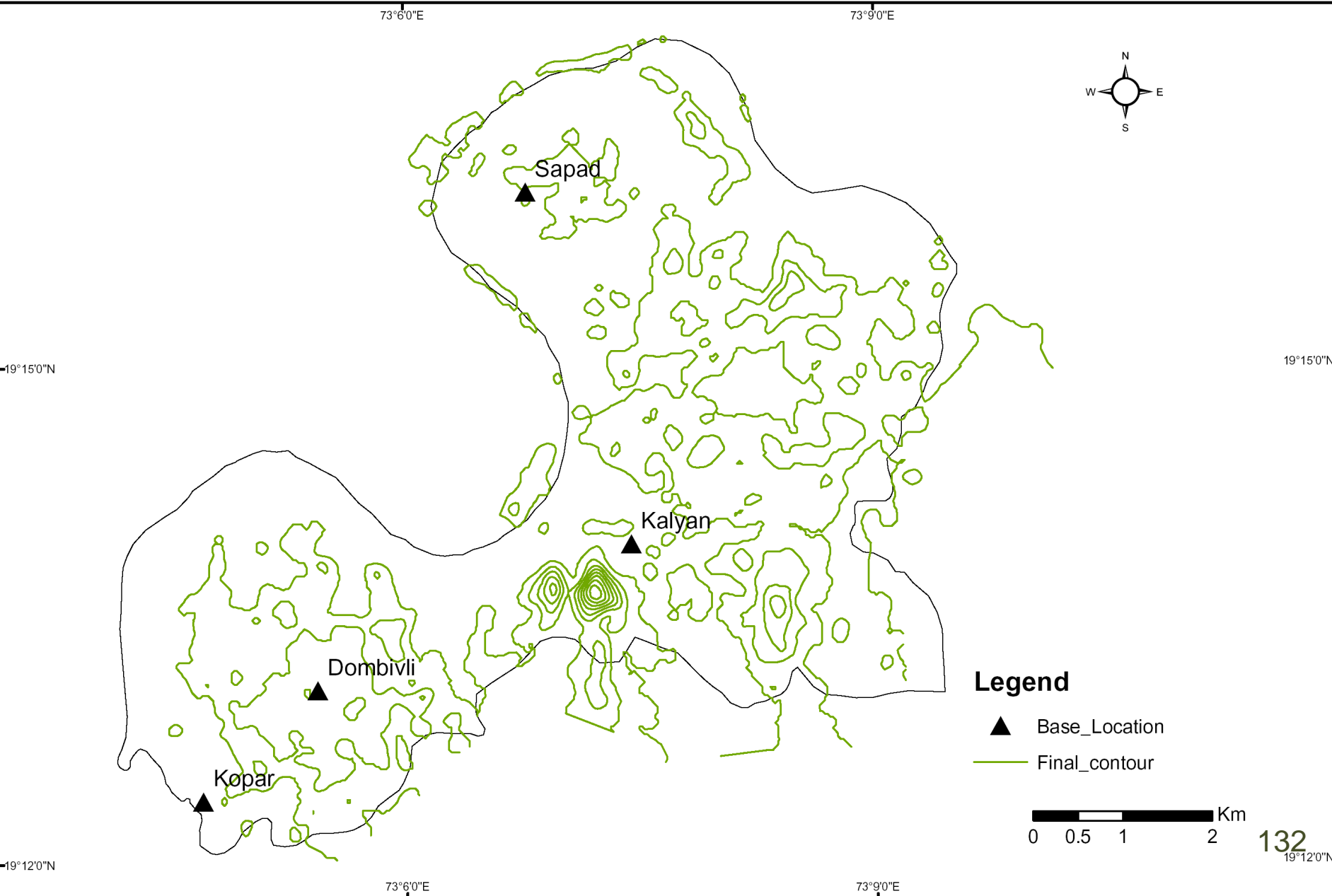
LU/LC map from toposheets of KDMC

Legend

LULC_topo

NRSA_class

- 1.1 Transport
- 1.1 Urban
- 1.2 Rural
- 4.2 Marshy/Swampy Land
- 4.5 Land without Scrub
- 4.8 Stone Quarry
- 5.1 River
- 5.2 Reservoir

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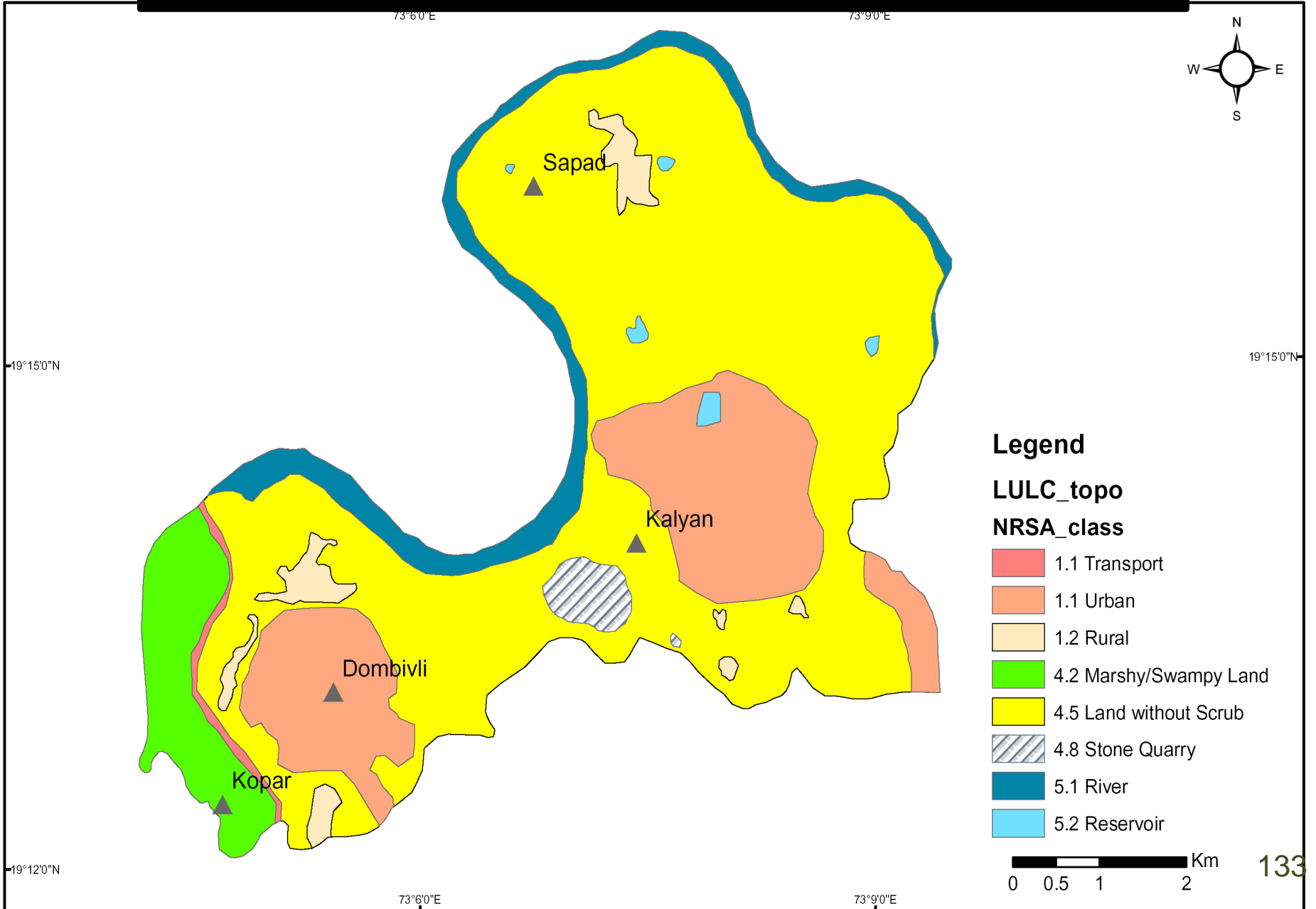
LU/LC map from Satellite image of KDMC

73°6'0"E
73°9'0"E

Sapad ▲

19°15'0"N

9°15'0"N

Kalyan ▲

Dombivli ▲

Kopar ▲

9°12'0"N

73°6'0"E
73°9'0"E

N
W E
S
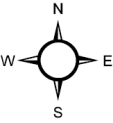
Legend

Lu_Lc_Image

NRSA_Level

■ 1.1 Transport

■ 1.1 Urban

■ 1.2 Rural

■ 2.1 Cropland

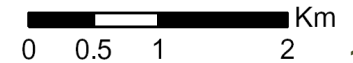■ 4.2 Marshy/Swampy Area
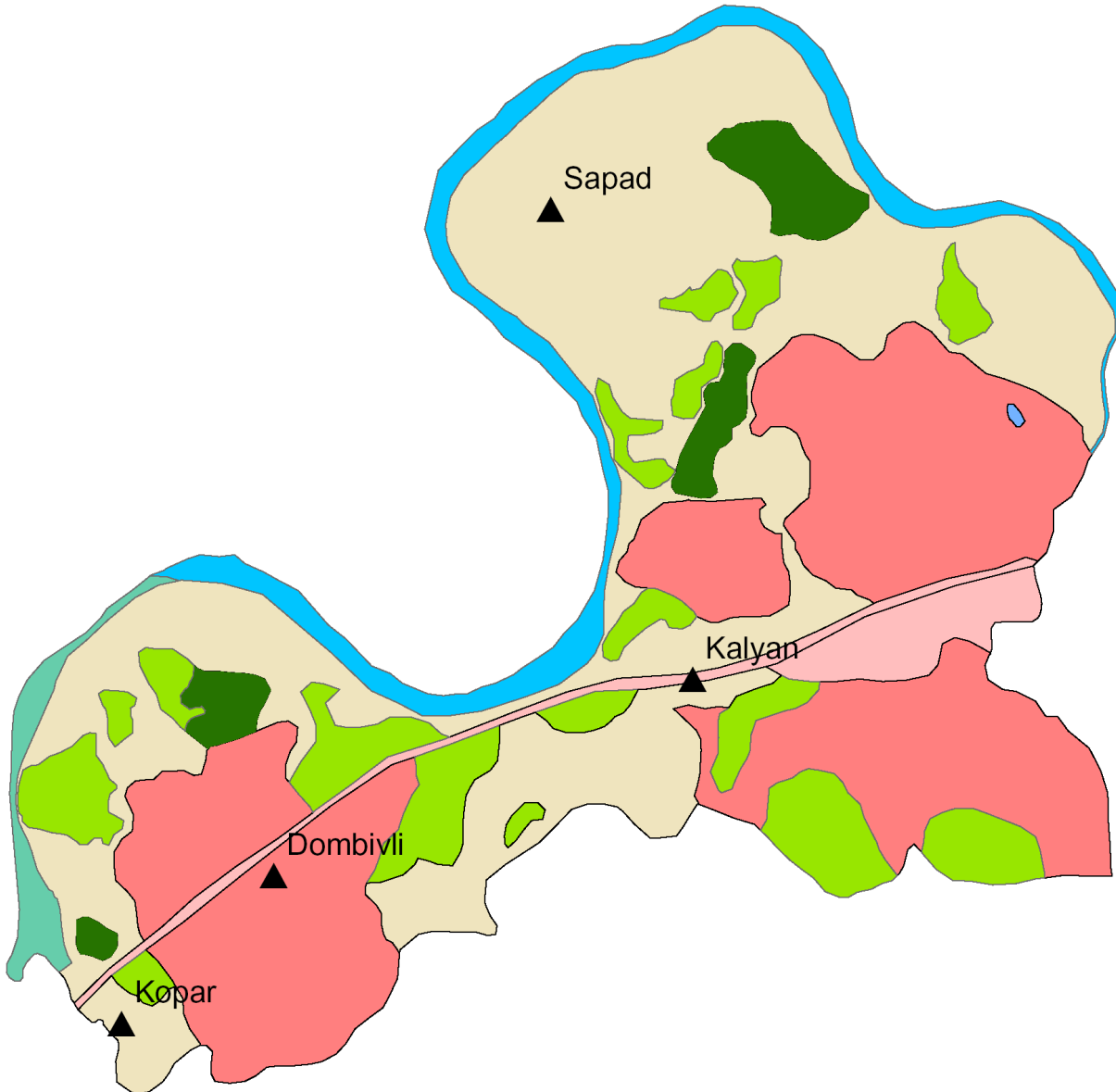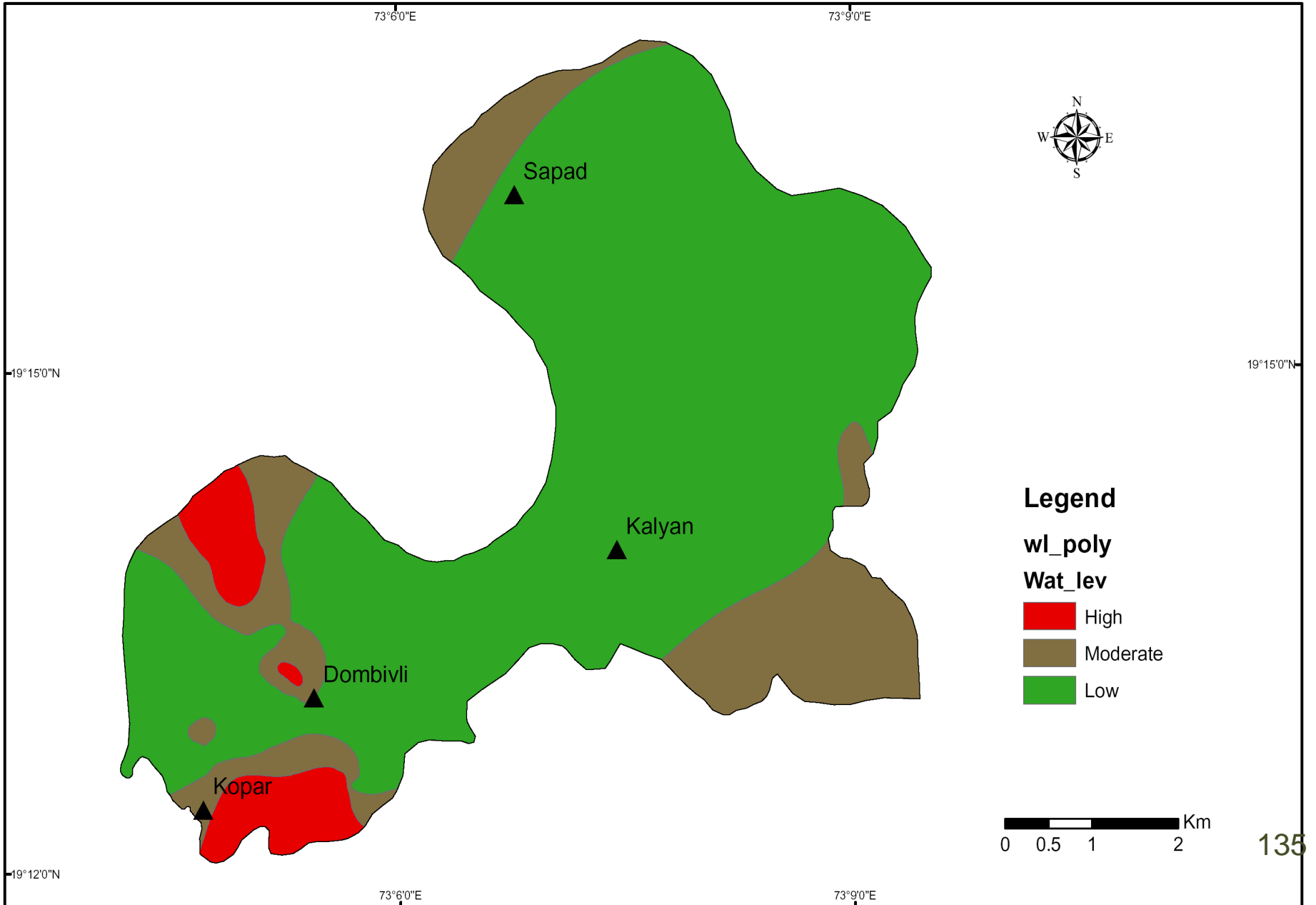
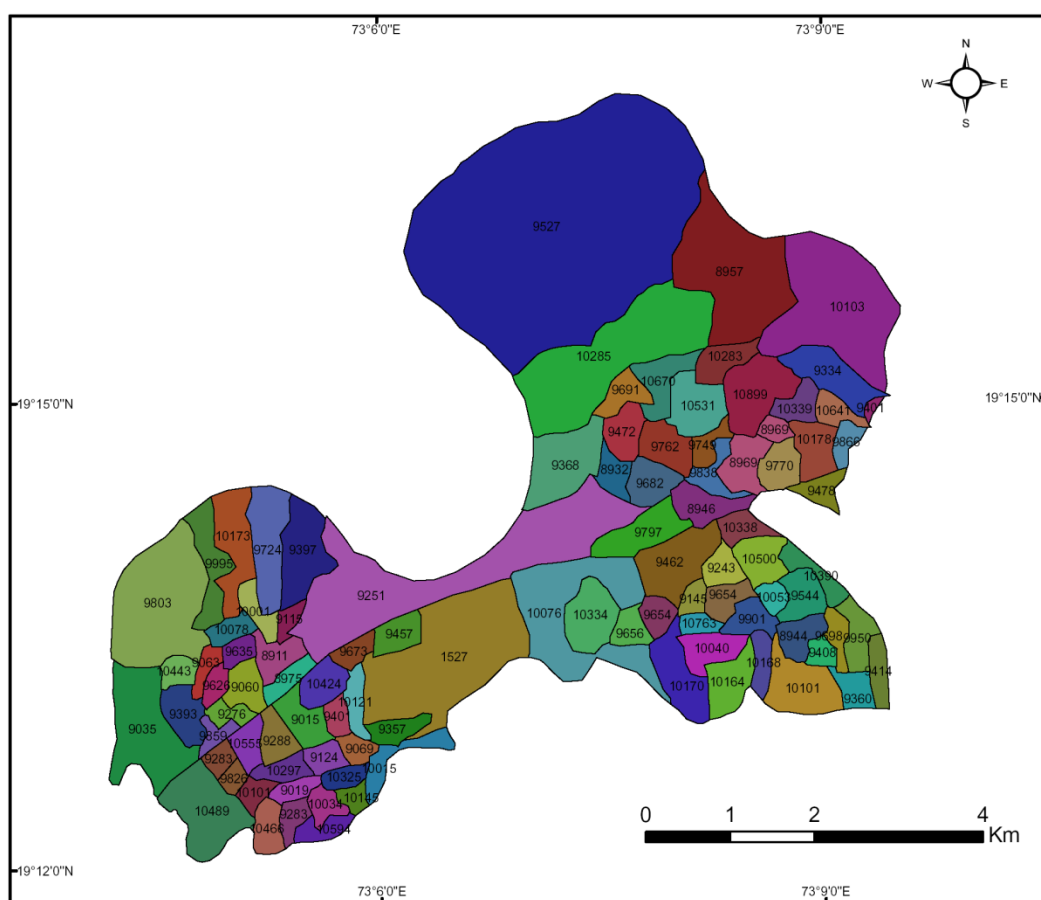■ 4.5 Land without Scrub

■ 5.1 River

■ 5.2 Reservoir

Km
0 0.5 1 2

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Water level map of KDMC

Legend

wl_poly

Wat_lev

- High
- Moderate
- Low

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73°6'0"E   73°9'0"E

19°15'0"N   19°15'0"N

19°12'0"N

73°6'0"E   73°9'0"E

N
W   E
S

0   1   2   4 Km

Legend

popu_boun

ward_names

Adharwadi	Devicha Pada	Joshi Bagh	Navapada	Sapad Umbharde Wadeghar
Ahilyabai Chowk	Devlekar Wadi	Kachore	Nehru Maidan	Saraswat Colony
Ambika nagar	Dombivli Gymkhana	Kala Talau	Nehru Nagar	Sarvodaya Vidyalaya
Ananad nagar	Dr Ambedkar Road	Kanhoji Jedhe Maidan	Netivali Tekdi	Savarkar Road
Anandwadi	Dudh naka	Karnik Road	Old Dombivli	Shani Nagar
Ashok Nagar	Durga Nagar	Karpewadi	Pandurang Wadi	Shastri Nagar
Ayre Gaon	Everest society	Khadakpada	Par naka	Shiv Market
Bail Bazar	Fatak Wadi	Khade Golwali	Patarli gaothan	Shivaji nagar
Barave Gauripada	Gandhi Chawk	Khambal Pada	Pendse Nagar	Shriram Colony
Bavan Chawl	Gandhi Nagar	Kokan Grih Nirman Mandal Vasahat	Prasad Society	Subhash Chawk
Beturkar Pada	Ganesh Mandir	Kolivli Gandhare	Raghuvir Nagar	Sunil nagar
Bhagwan Nagar	Ganesh wadi	Kolshewadi	Rajaji Nagar	Thakurwadi
Bhawani Nagar	Gaondevi Society	Kopar Gaon	Raju Nagar	Thankar Pada
Birla college	Garibacha pada	Kopar Road	Rambagh Khadak	Tilak Nagar
	Gogras wadi	Laxmi Baugh	Ramdas wadi	Tisgaon Gaothan
	Indira Nagar	Maharshtra Nagar	Ramnagar	Tisgaon Shastri Nagar Kalyan

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DATA ANALYSIS

- Physical Indicators
  - Residential areas
  - Commercial areas
  - Industrial
  - Transport
  - Mixed Urban

- Socio-economic Indicators
  - Education and Employment
  - Flood impacts

- Hazard Indicators
  - Rainfall data
  - Water level
  - Flood duration
- GIS Data Analysis
  - Urban
  - Rural
  - Land without scrub
  - Marshy Areas/Swampy Areas
  - Rivers
  - Reservoirs
  - Stone quarry

KEY FINDINGS

- Increase in urban areas–LU/LC maps
- Risk areas–low, moderate and high.
- Irregular drainage systems
- Industrial waste lead into major nullahs.
- Decay of river systems.
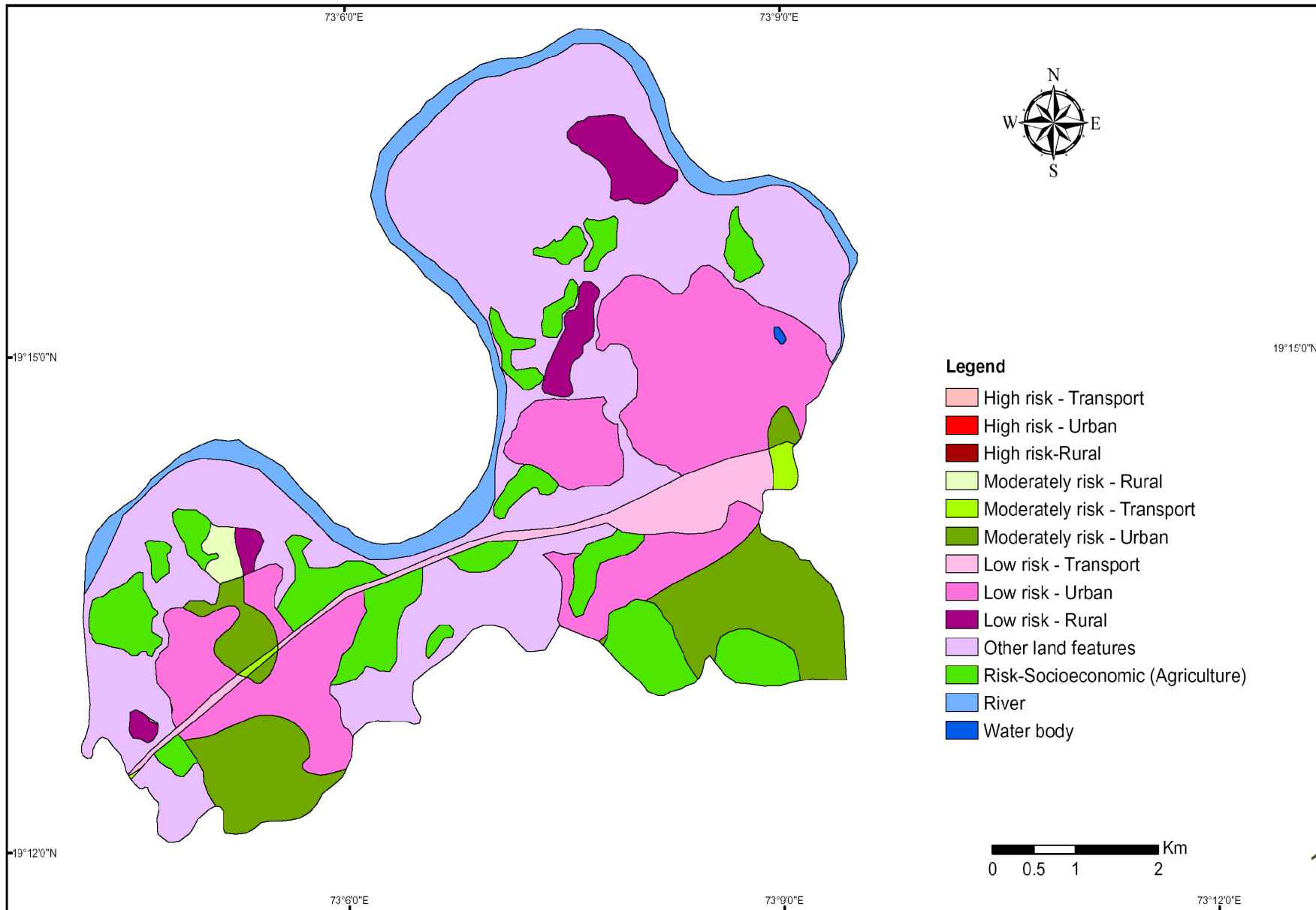- Clogged drainages and improper sewage disposal systems.

Flood Risk Mapping

- **Risk=Vulnerability *Hazard**

- V=E*S/C (White et. al. 2005)

Where V-Vulnerability

E-Exposure

S-Susceptibility

C-Coping capacity

73°6'0"E	73°9'0"E

19°15'0"N

19°15'0"N

Legend

	High risk - Transport
	High risk - Urban
	High risk-Rural
	Moderately risk - Rural
	Moderately risk - Transport
	Moderately risk - Urban
	Low risk - Transport
	Low risk - Urban
	Low risk - Rural
	Other land features
	Risk-Socioeconomic (Agriculture)
	River
	Water body

19°12'0"N

Km

0   0.5   1   2

73°6'0"E

73°9'0"E

73°12'0"E

Legend

■ Population - Very high risk prone area

■ Population - High risk prone area

■ Population - Moderate risk prone area

■ Population - Low risk prone area

RESULTS

1. Concentration of population due to increase in the income opportunities in the suburban regions.
2. Changes in land use/ land cover patterns.
3. Unsafe housing practices which are vulnerable to floods.
4. Improper drainage networks.
5. Increased value of infrastructure and property.
6. Relocation and Rehabilitation.
7. Hygienic and sanitation issues.
8. Regional growth

DISCUSSIONS

- Mainstreaming Disaster Risk Reduction strategies into development concerns
- Remote sensing applications
- Socio-economic aspects of flood management
- GIS Database management
- Economic and population growth scenarios
- Environmental consideration
- Technological support and using them for database management
- Regulatory activities and promotion of flood-resistant structures and
- Comprehensive land use planning.