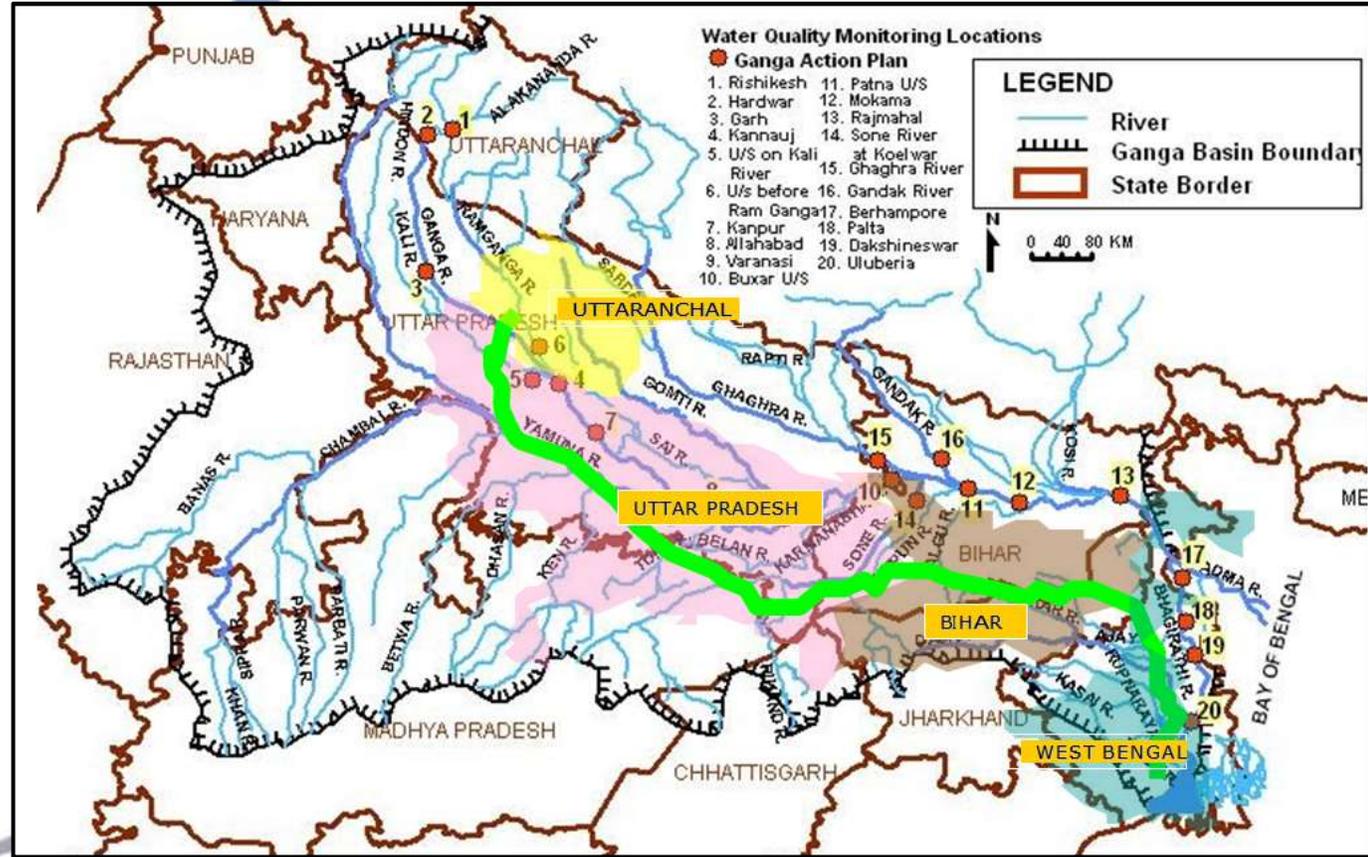


ECOSYSTEM RESTORATION THROUGH SAFEGUARDING TRADITIONAL WATER RESOURCES



Urban Wetland Management Guidelines *A Toolkit for Urban Local Stakeholders*

*Sponsored by National Mission for Clean Ganga
Prepared by
School of Planning and Architecture New Delhi*

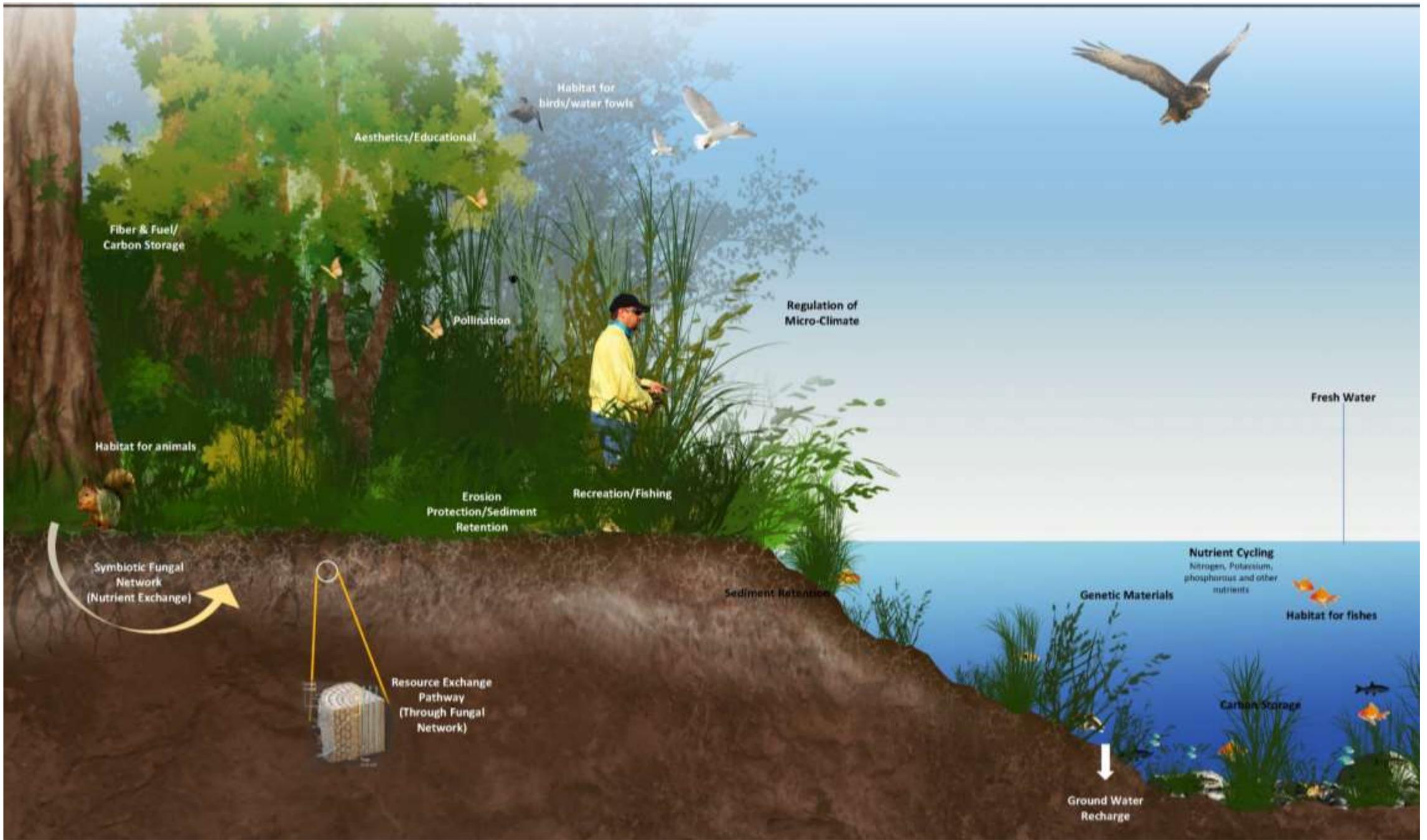


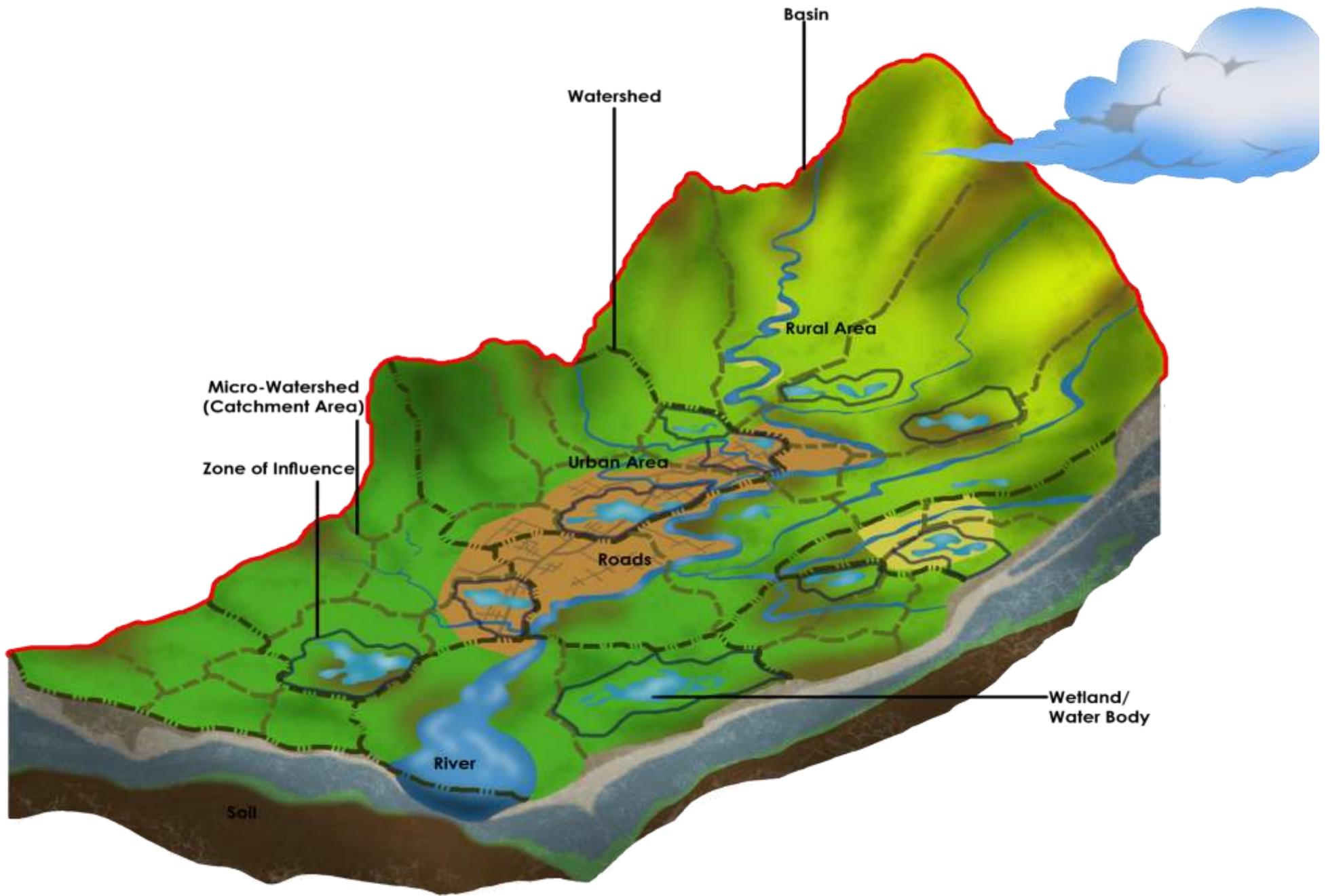
The toolkit is targeted at providing a set of practical and policy-relevant methods for information collection and decision making which can be used by those involved in wetland conservation and development planning.

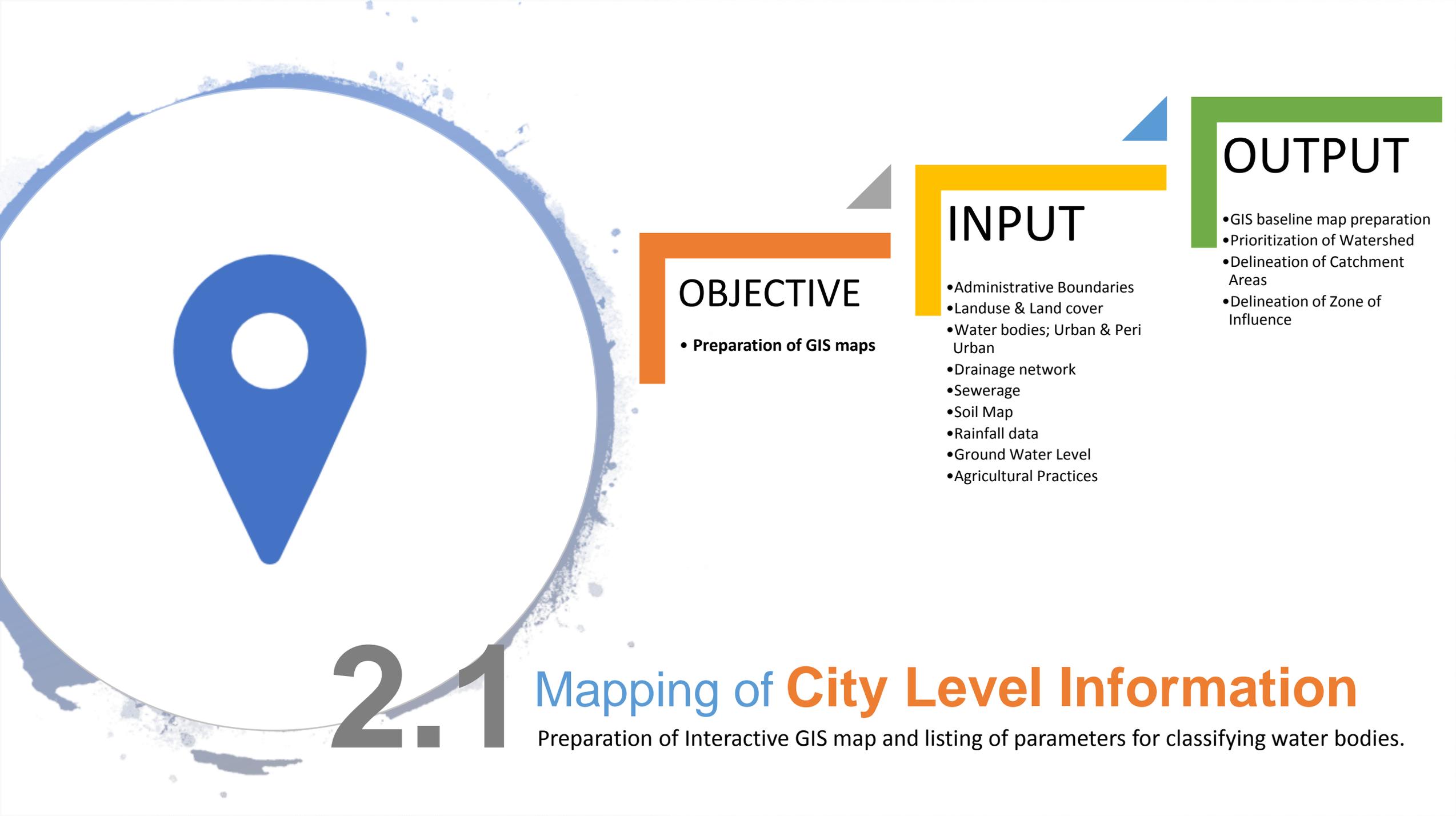
Introduction 1



Methodology 2







OBJECTIVE

- Preparation of GIS maps

INPUT

- Administrative Boundaries
- Landuse & Land cover
- Water bodies; Urban & Peri Urban
- Drainage network
- Sewerage
- Soil Map
- Rainfall data
- Ground Water Level
- Agricultural Practices

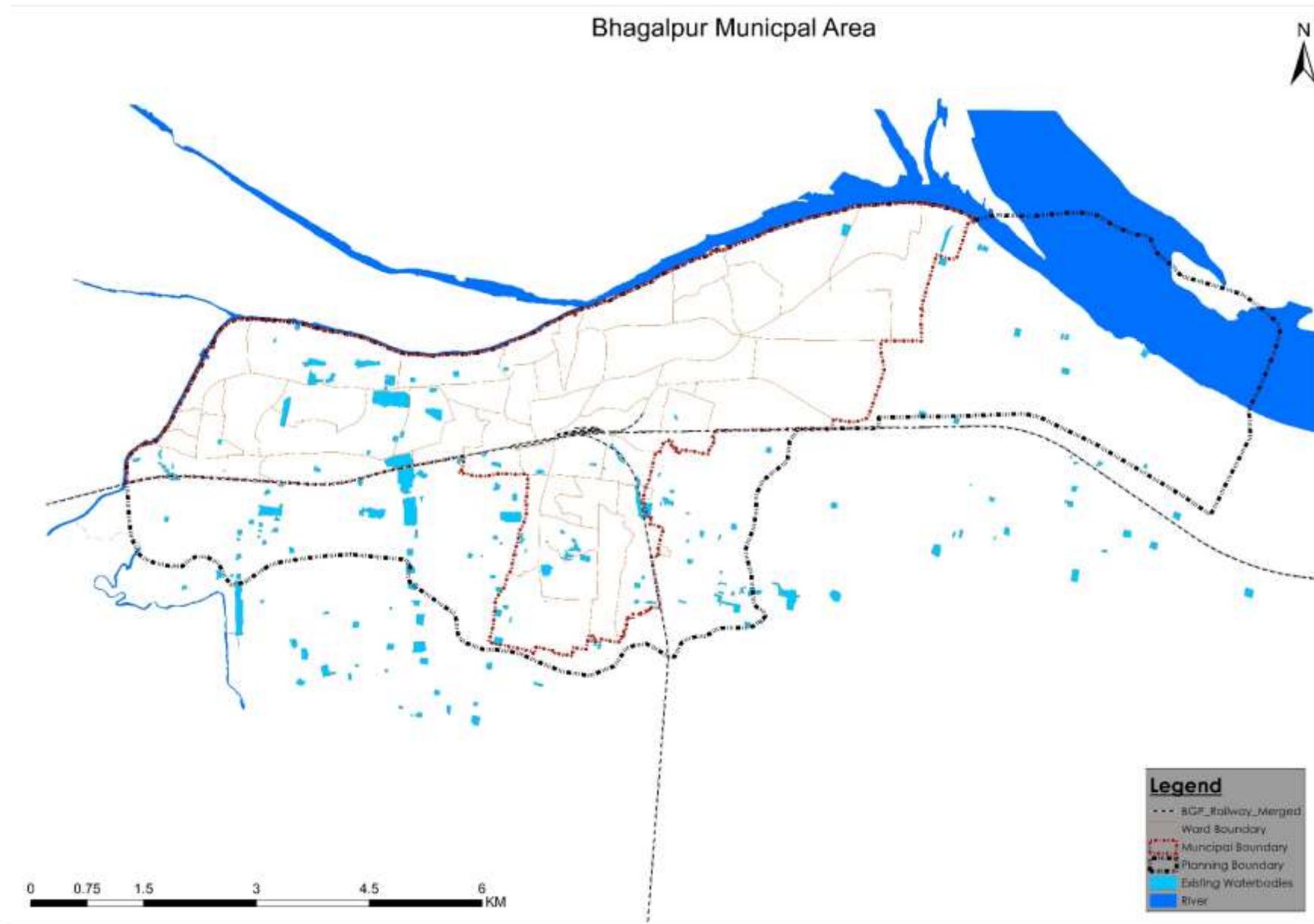
OUTPUT

- GIS baseline map preparation
- Prioritization of Watershed
- Delineation of Catchment Areas
- Delineation of Zone of Influence

2.1

Mapping of City Level Information

Preparation of Interactive GIS map and listing of parameters for classifying water bodies.

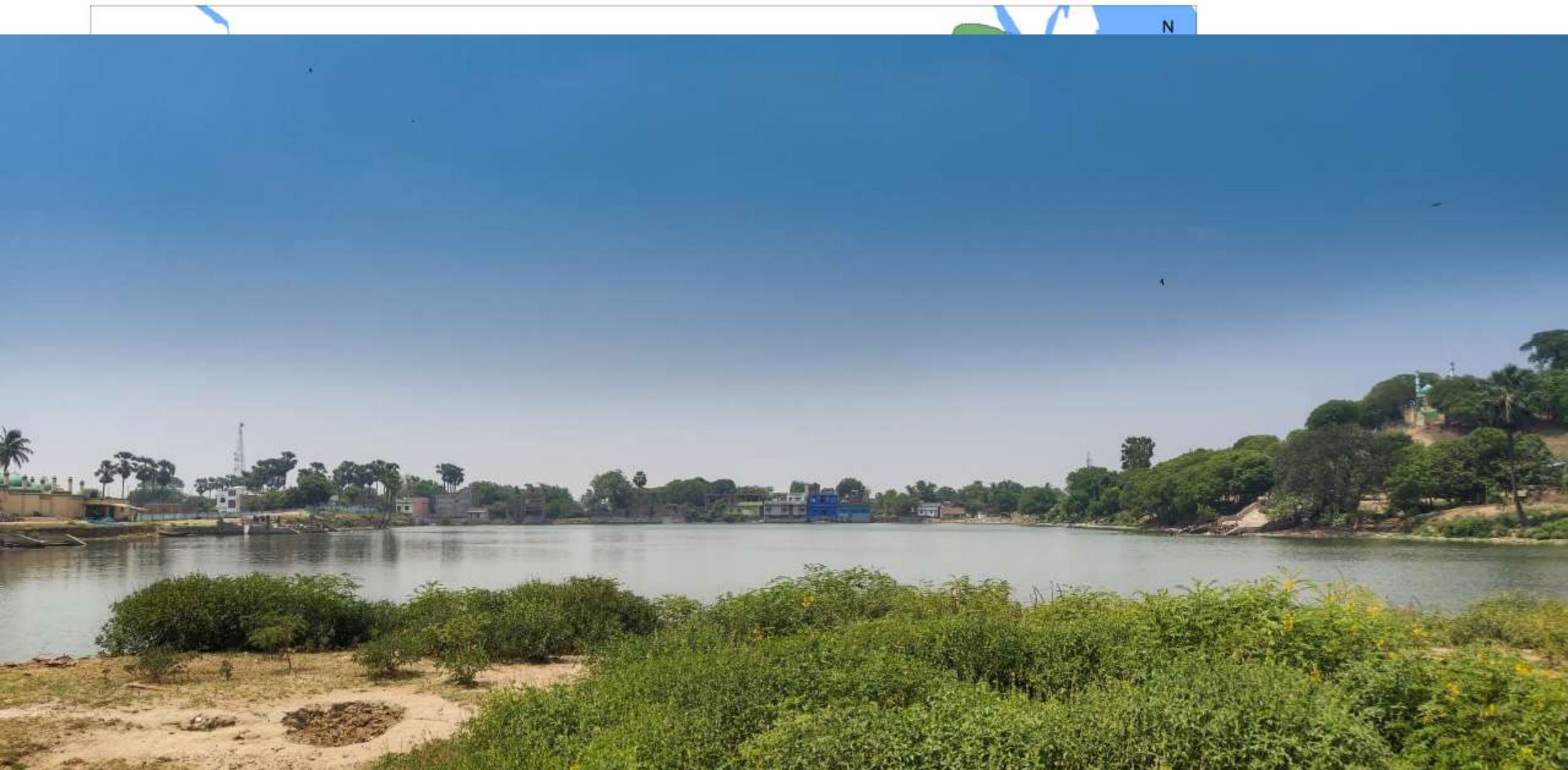


- **Administrative Boundaries**
- Land use & Land cover
- **Water bodies; Urban & Peri Urban**
- Drainage network
- Sewerage
- Soil Map
- Rainfall data
- Ground Water Level
- Agricultural Practices

INPUT

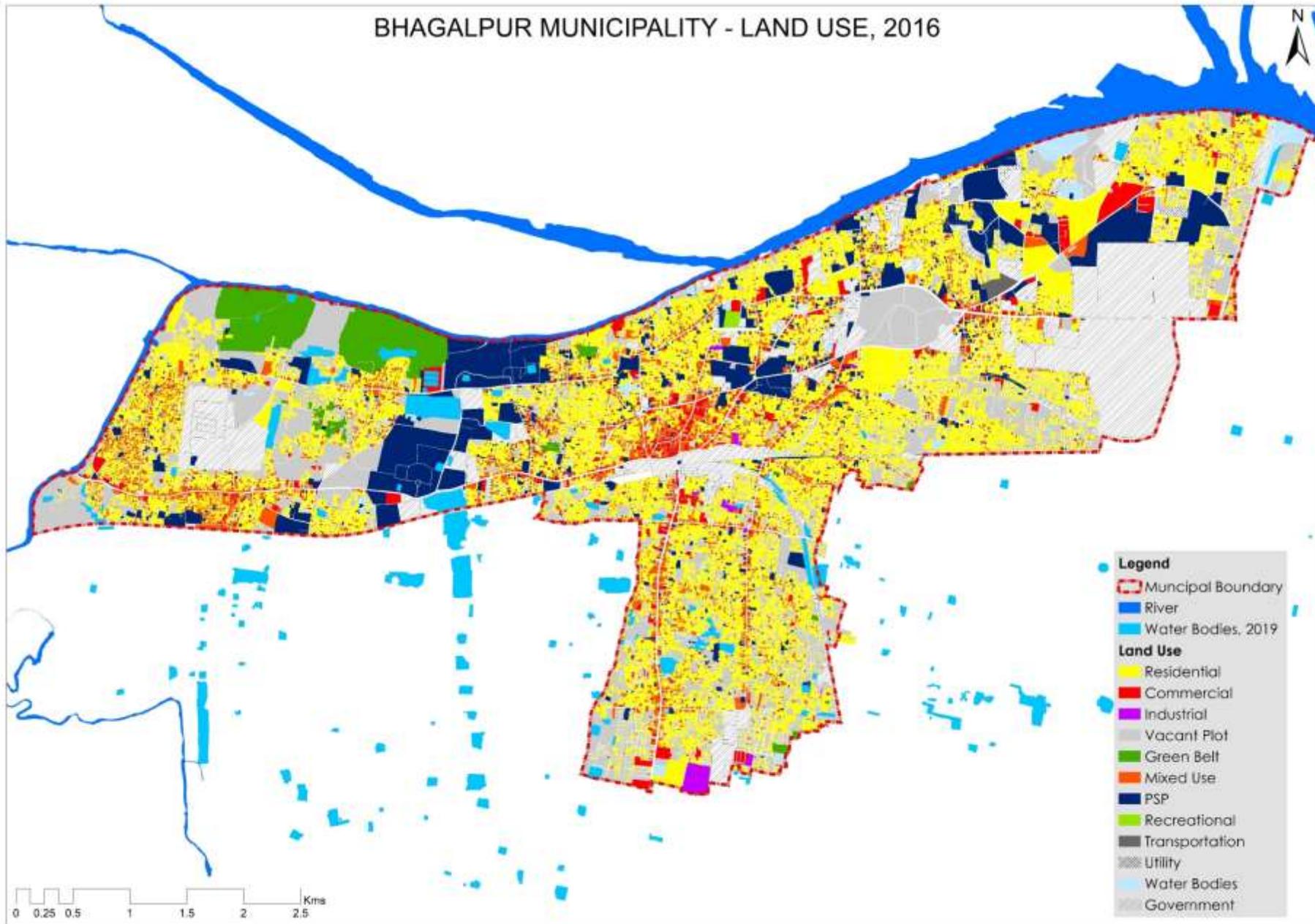
Bhagalpur - City Level Information





Bhagalpur - **City Level Information**

BHAGALPUR MUNICIPALITY - LAND USE, 2016

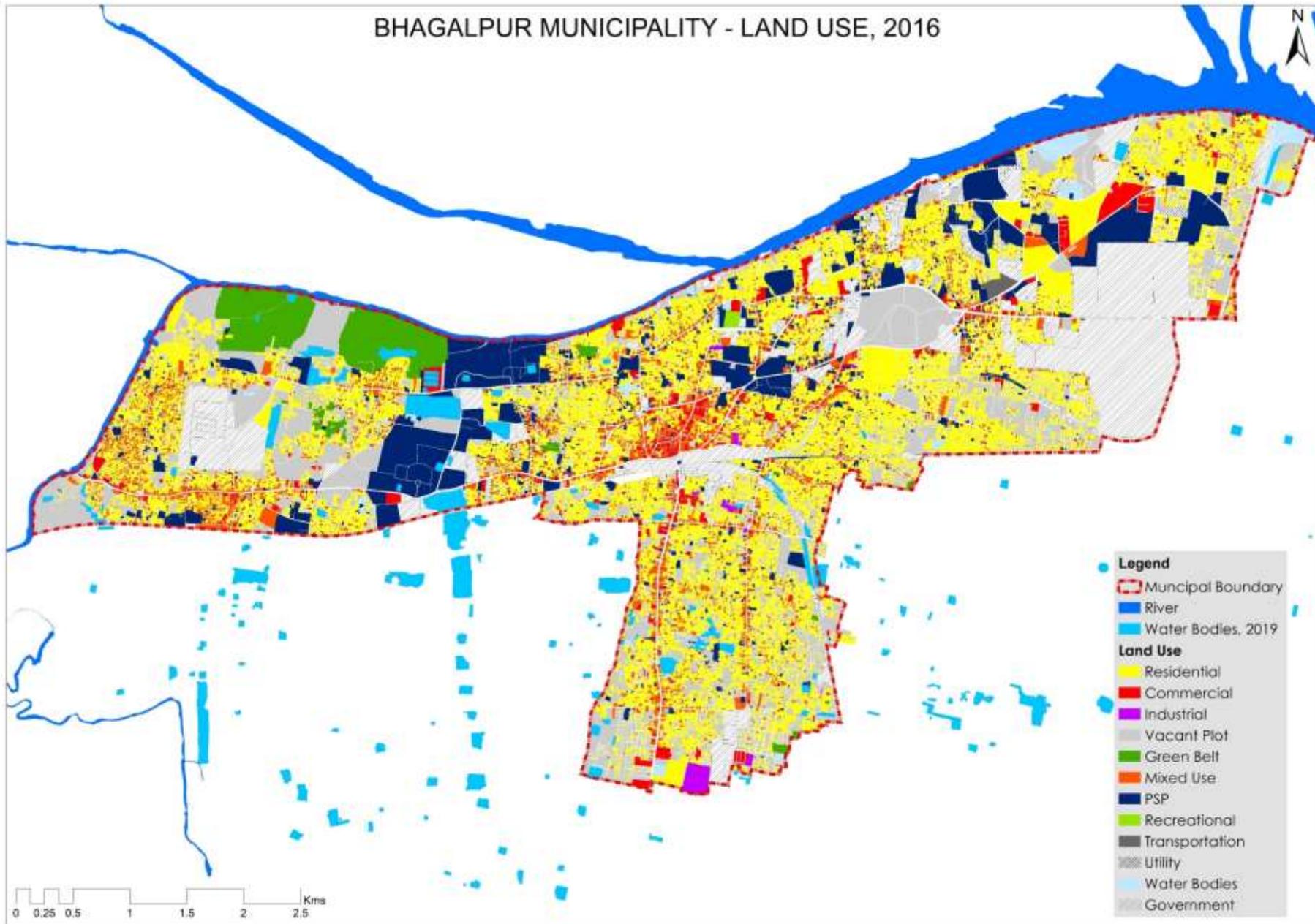


- Administrative Boundaries
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- Drainage network
- Sewerage
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- Rainfall data
- Ground Water Level
- Agricultural Practices

INPUT

Bhagalpur - City Level Information

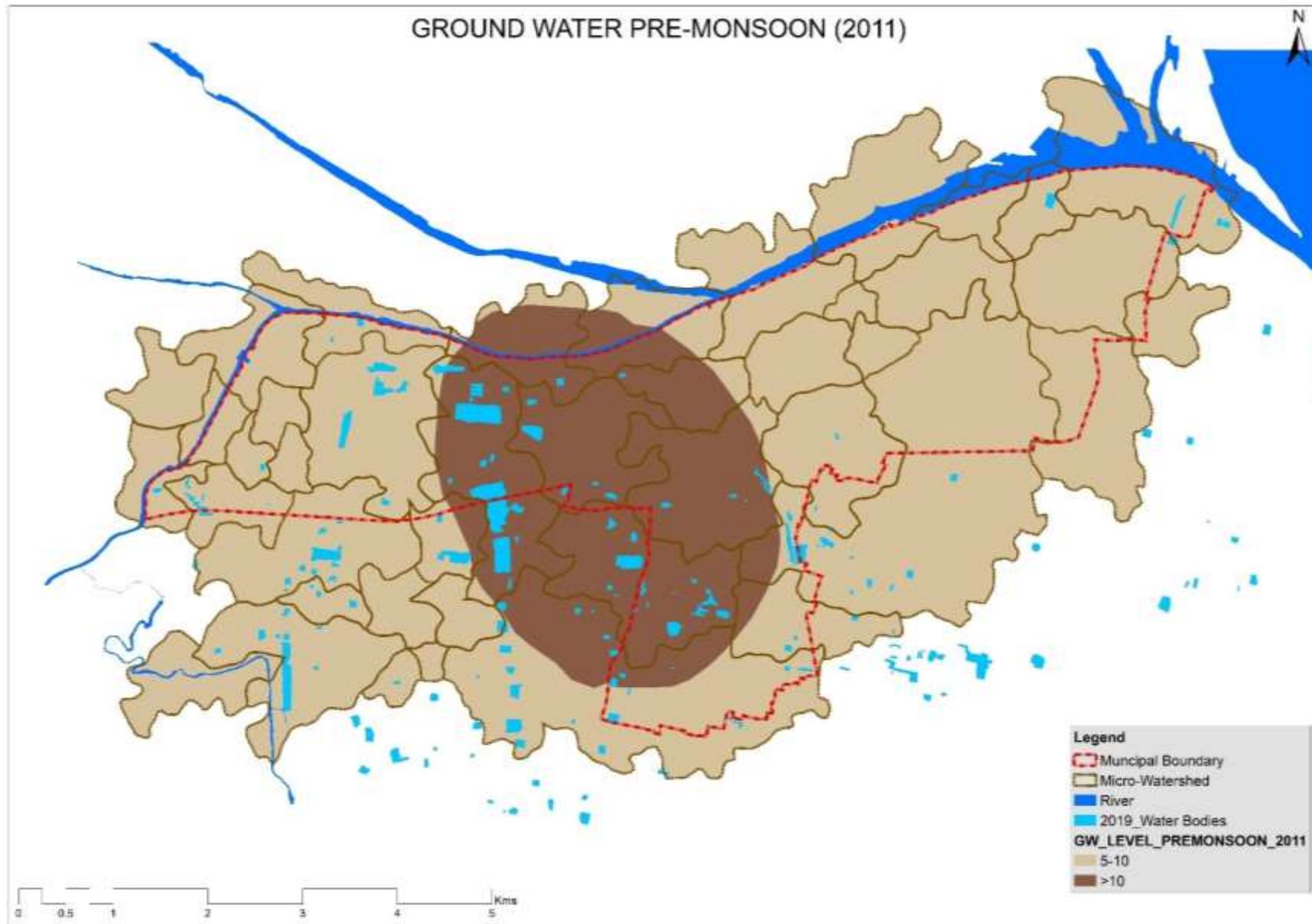
BHAGALPUR MUNICIPALITY - LAND USE, 2016



- Administrative Boundaries
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- Sewerage
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- Agricultural Practices

INPUT

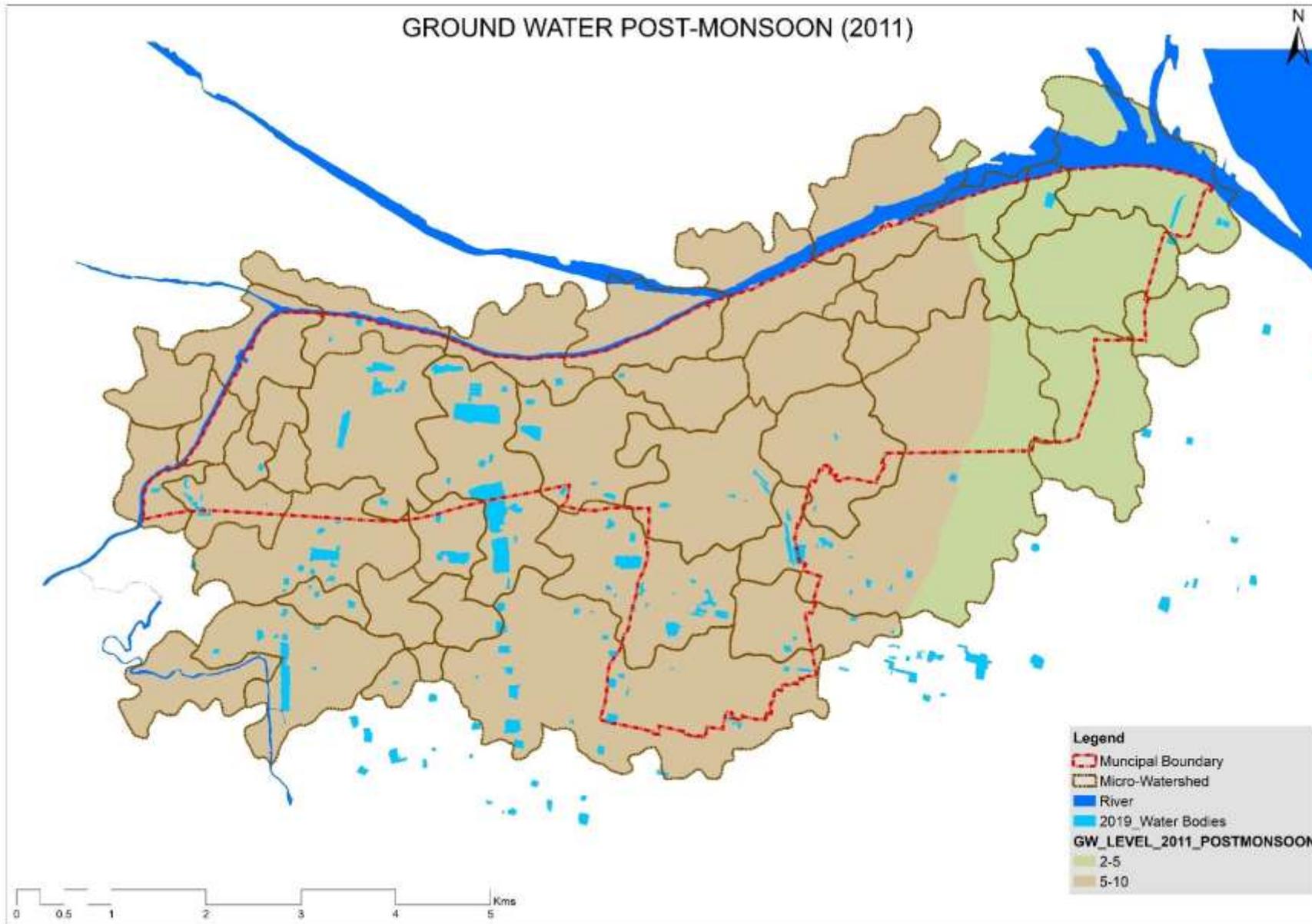
Bhagalpur - **City Level Information**



- Administrative Boundaries
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- Drainage network
- Sewerage
- Soil Map
- Rainfall data
- **Ground Water Level**
- Agricultural Practices

INPUT

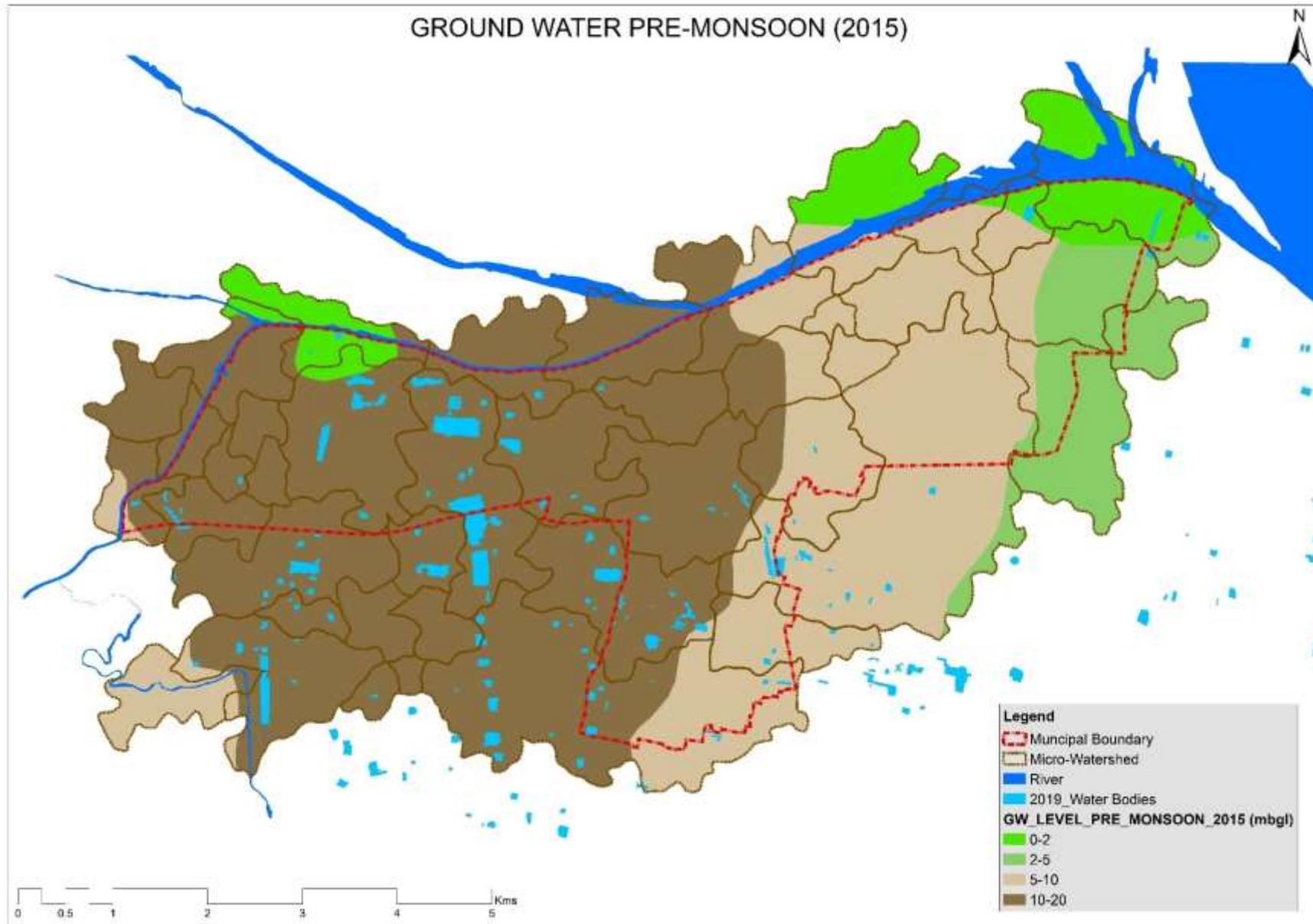
Bhagalpur - **City Level Information**



- Administrative Boundaries
- Land use & Land cover
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- Drainage network
- Sewerage
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- **Ground Water Level**
- Agricultural Practices

INPUT

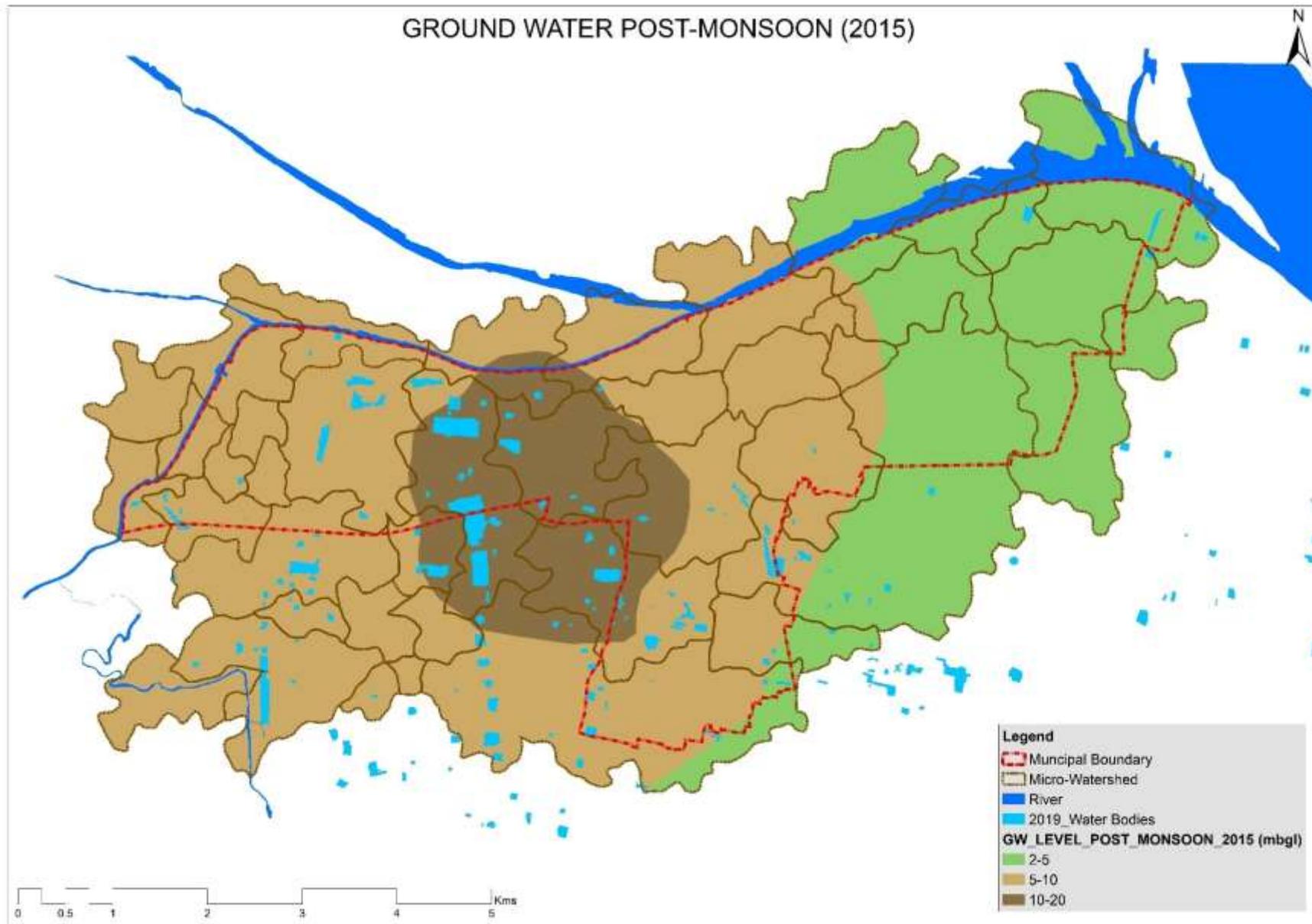
Bhagalpur - City Level Information



- Administrative Boundaries
- Land use & Land cover
- Water bodies; Urban & Peri Urban
- Drainage network
- Sewerage
- Soil Map
- Rainfall data
- **Ground Water Level**
- Agricultural Practices

INPUT

Bhagalpur - **City Level Information**



- GIS baseline map preparation
- Prioritization of Watershed
- Delineation of Catchment Areas
- Delineation of Zone of Influence

OUTPUT

Bhagalpur - City Level Information

Morphometric Analysis of Sub-Watershed

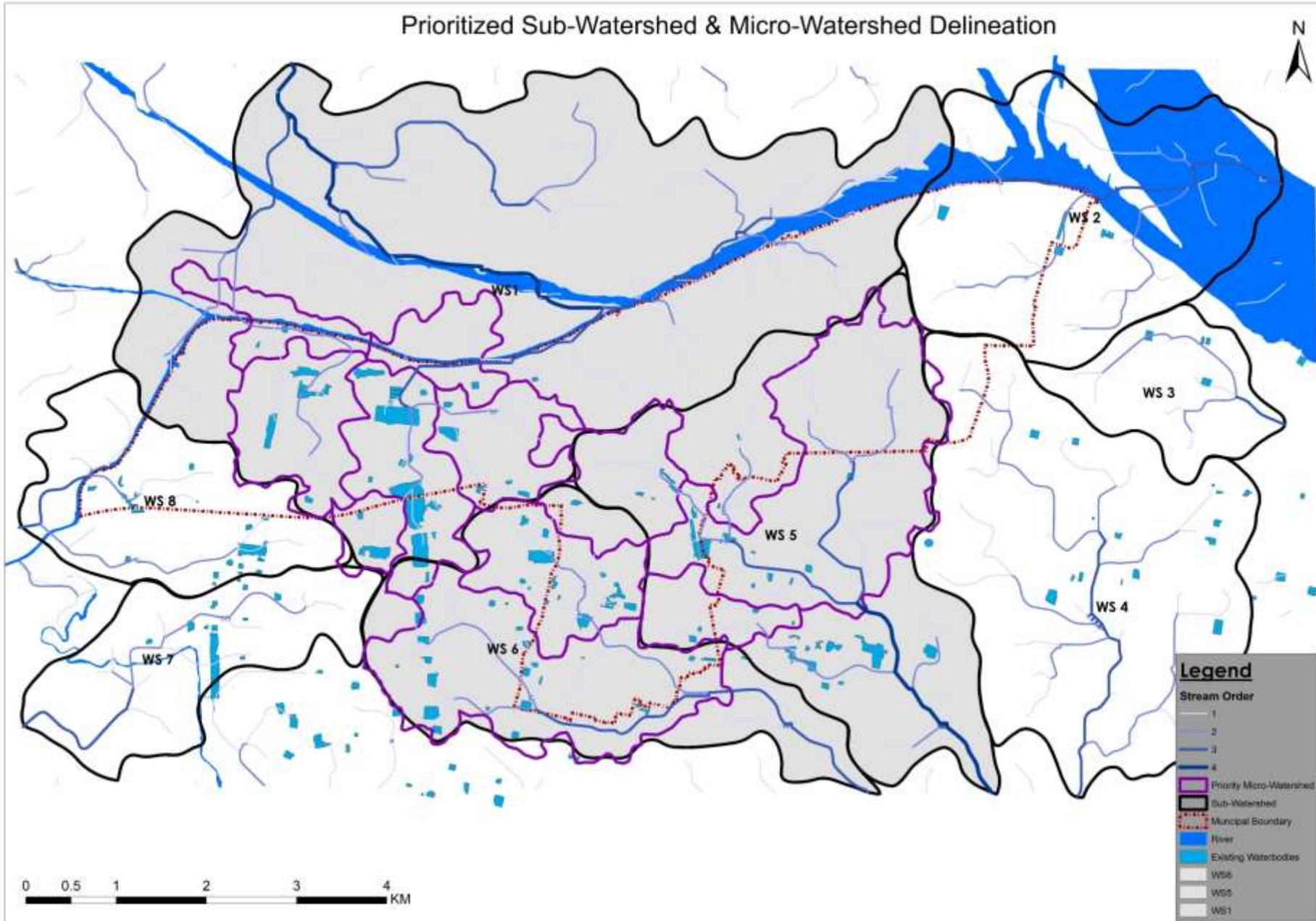


- GIS baseline map preparation
- Prioritization of Watershed
- Delineation of Catchment Areas
- Delineation of Zone of Influence

OUTPUT

Bhagalpur - City Level Information

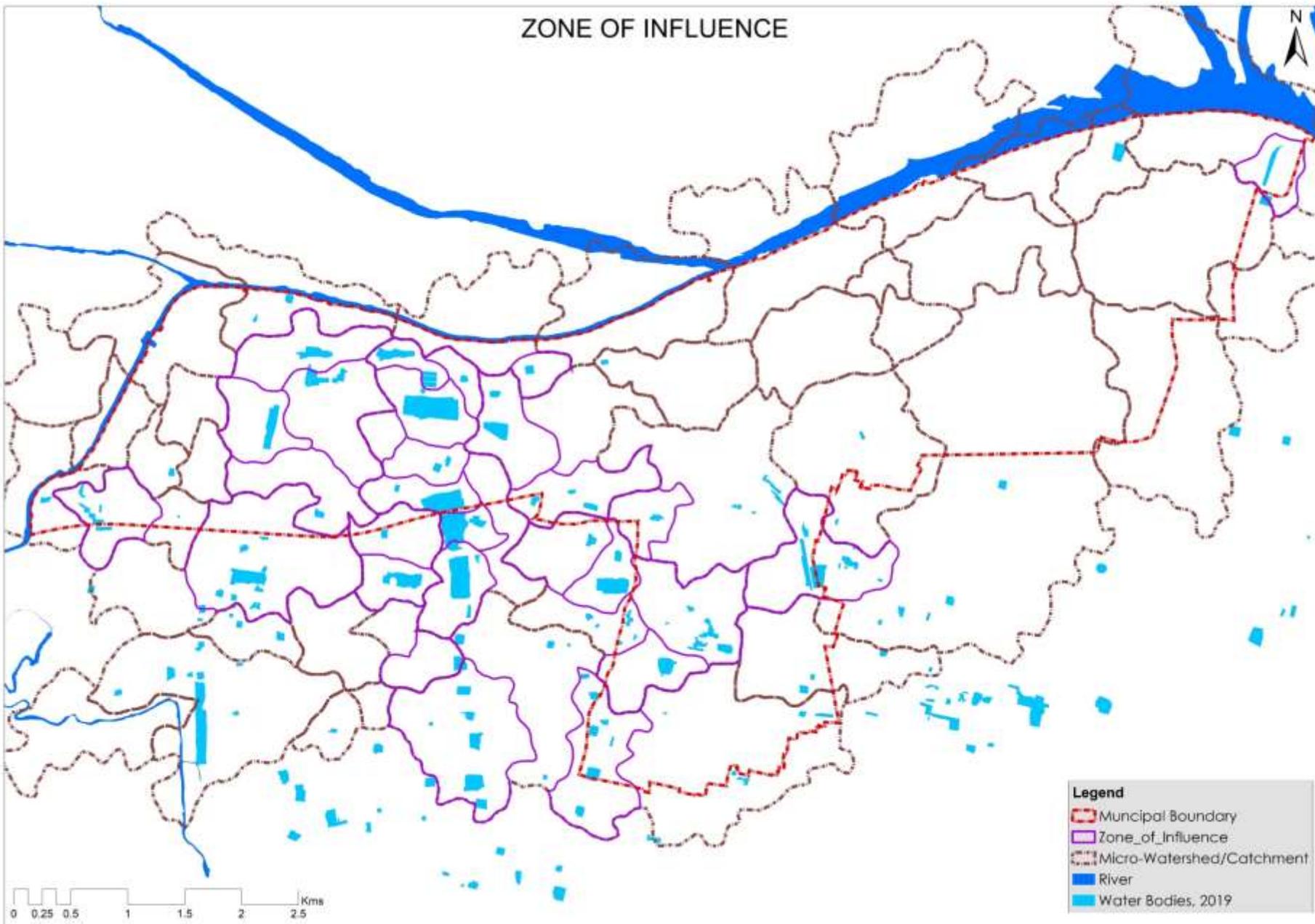
Prioritized Sub-Watershed & Micro-Watershed Delineation



- GIS baseline map preparation
- **Delineation of Catchment Areas**
- **Prioritization of Watershed**
- Delineation of Zone of Influence

OUTPUT

Bhagalpur - City Level Information



- GIS baseline map preparation
 - Delineation of Catchment Areas
 - Prioritization of Watershed
 - **Delineation of Zone of Influence**
- OUTPUT**

Bhagalpur - City Level Information



OBJECTIVE

- Preparation of GIS maps



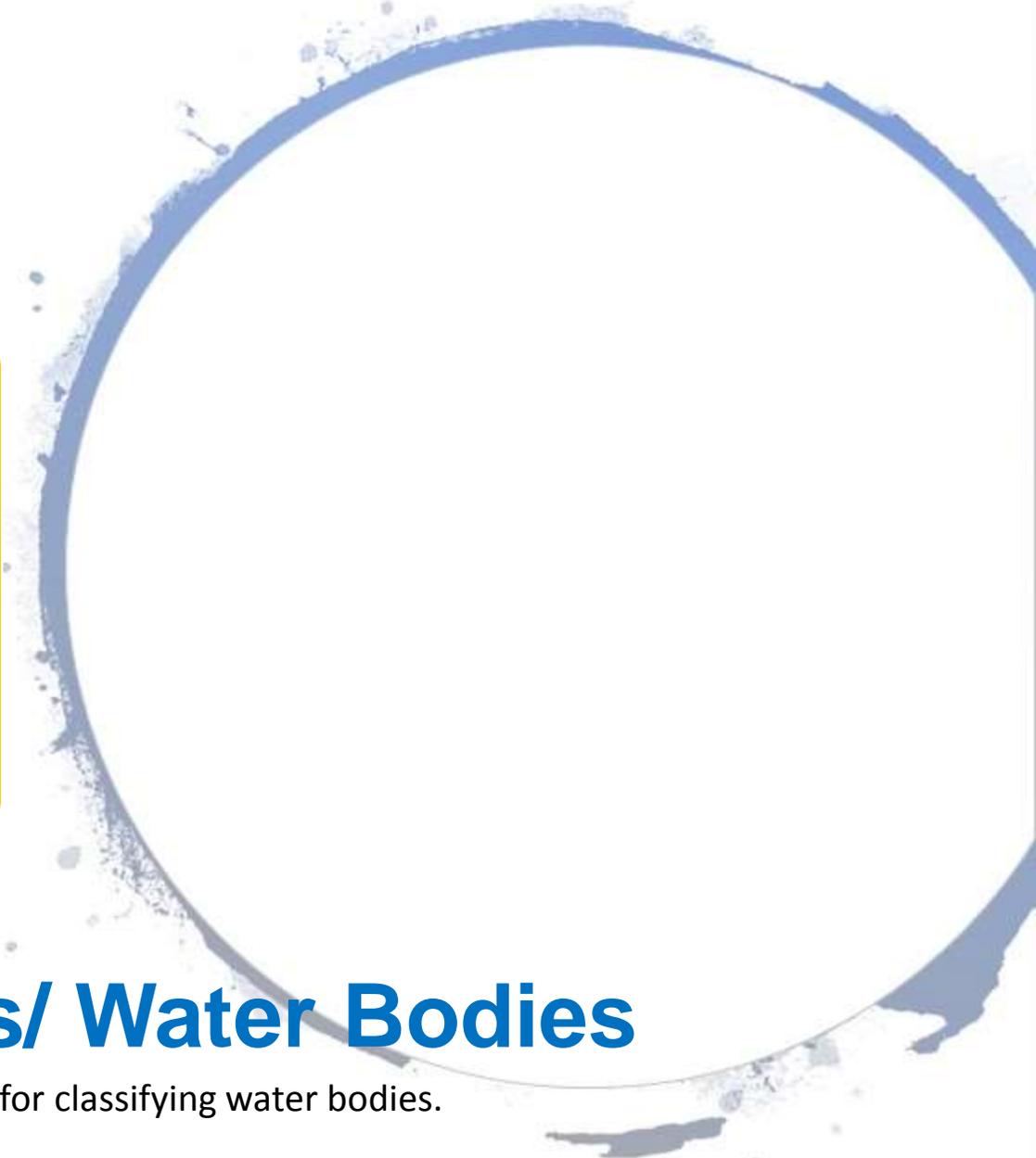
INPUT

- Historical dataset of Satellite maps (10 Years)
- Location, Size, Characteristics, Ownership and Physical and chemical properties of Water Bodies/ Wetlands



OUTPUT

- Classification of Wetlands/Water Bodies based on size and existing condition
- Prioritization of Wetlands/Water Bodies for management



2.1

Mapping **Urban Wetlands/ Water Bodies**

Preparation of Interactive GIS map and listing of parameters for classifying water bodies.

Attributes For Mapping Water Bodies

The following parameters are defined for each water body (to be established within catchment area & zone of influence):

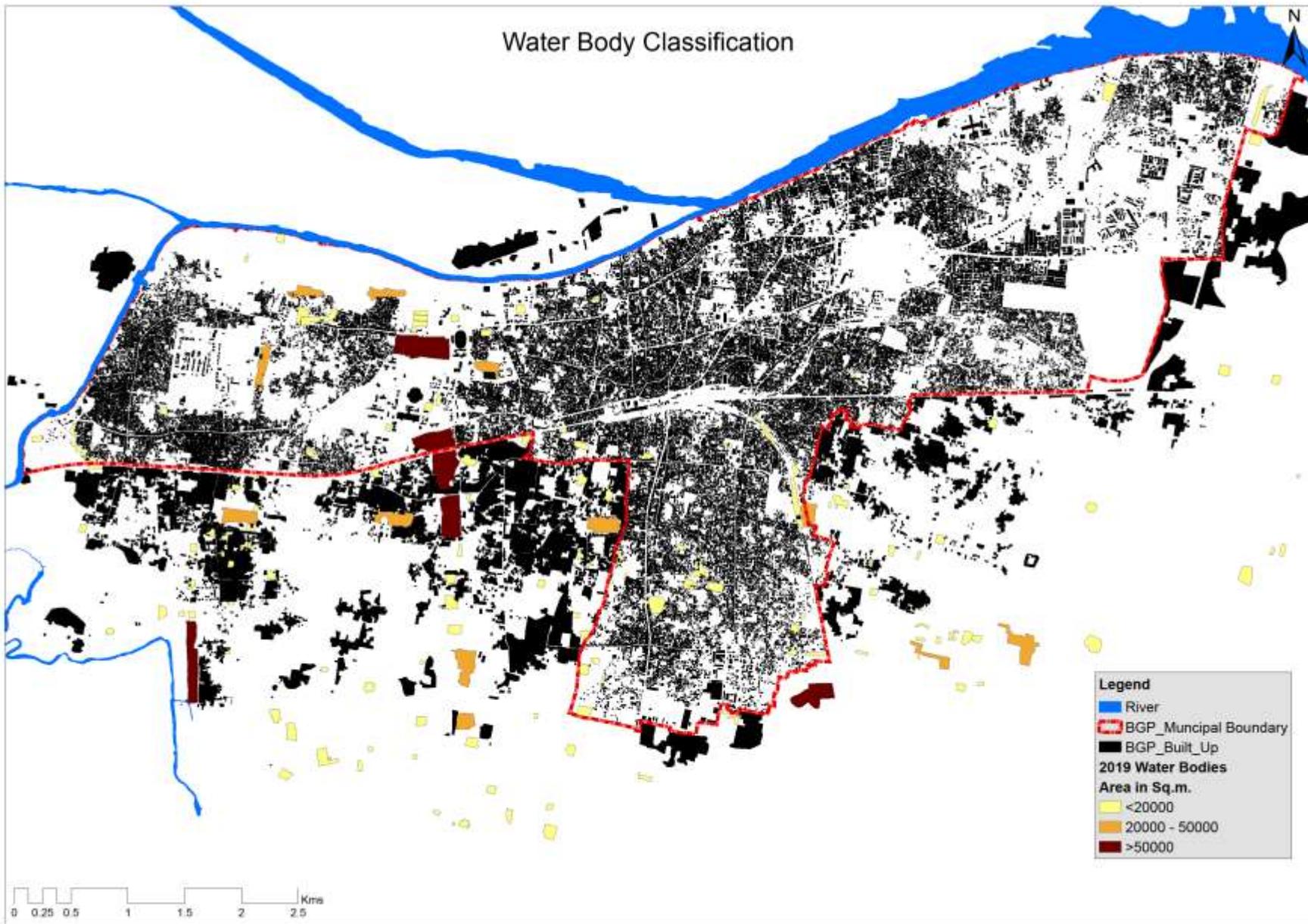
- Catchment Area
- Population
- Population density (pph)
- Land Use and Land Cover
- Built/Open Space Ratio
- Area & Depth of water body
- Storage Volume of Water Body
- Annual Recharge of water body
- Category (Natural or Manmade)
- Source of Water
- Total water demand
- Total waste water generation
- Total solid waste generation
- Slum settlements within 100 meters
- Built-Up area within 100 meters from water body.

A Matrix is prepared which will be later used for the study of impact of Urban Development on Water Bodies

INPUT

- Historical dataset of Satellite maps (10 Years)
- Location, Size, Characteristics, Ownership and Physical and chemical properties of Water Bodies/ Wetlands

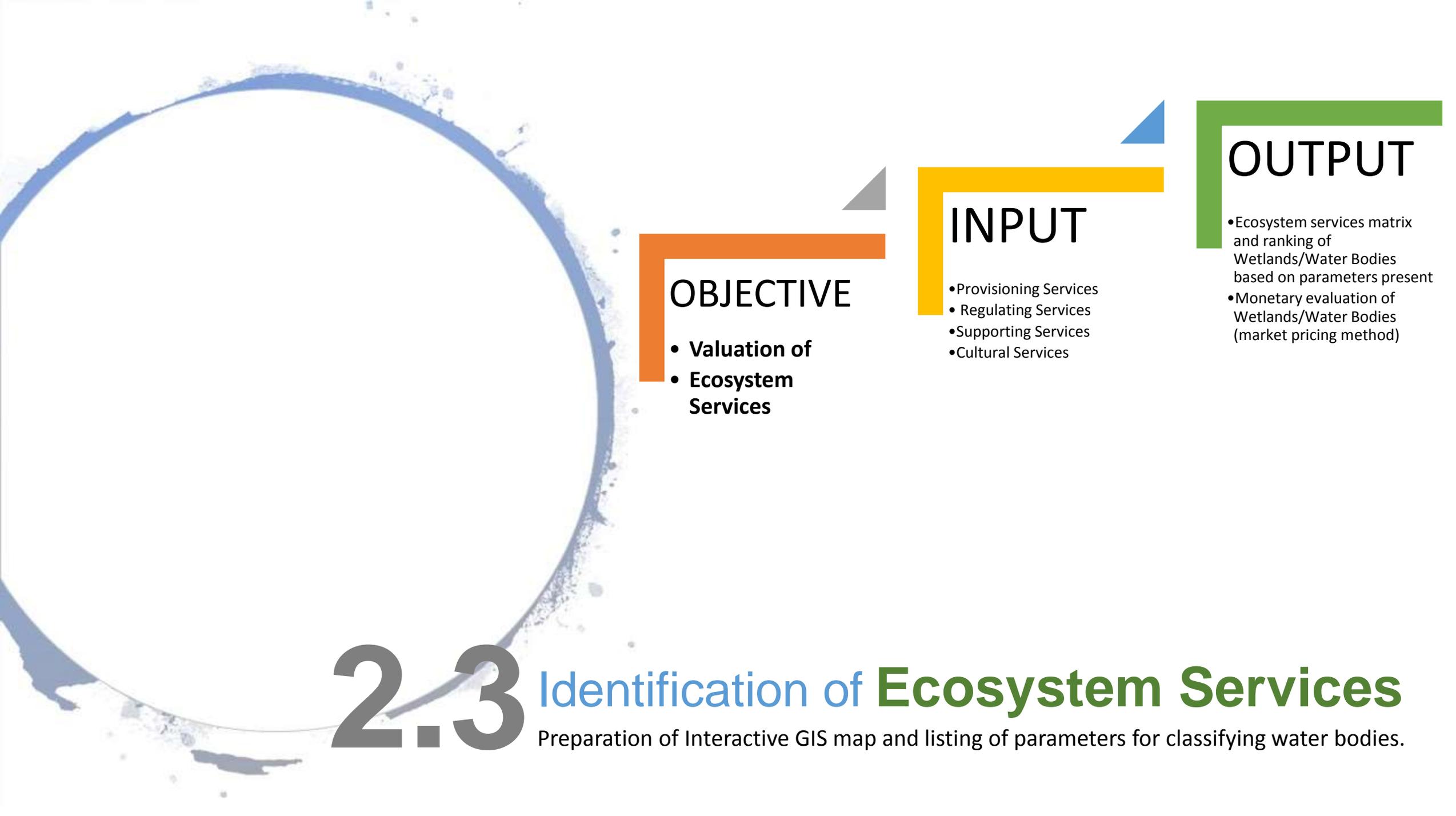
Water Body Classification



INPUT

- Historical dataset of Satellite maps (10 Years)
- Location, Size, Characteristics, Ownership and Physical and chemical properties of Water Bodies/ Wetlands

Bhagalpur – Mapping of Wetlands/Water Bodies



OBJECTIVE

- Valuation of
- Ecosystem Services

INPUT

- Provisioning Services
- Regulating Services
- Supporting Services
- Cultural Services

OUTPUT

- Ecosystem services matrix and ranking of Wetlands/Water Bodies based on parameters present
- Monetary evaluation of Wetlands/Water Bodies (market pricing method)

2.3 Identification of Ecosystem Services

Preparation of Interactive GIS map and listing of parameters for classifying water bodies.

Scale is low ●, medium ●, to high ●; not known = ?; Blank cells indicate that the service is not considered applicable to wetland type.

The information in the table represents expert opinion for a global average pattern of wetlands; there will be local and regional differences in relative magnitude

Services	Comments and Examples	Permanent and Temporary Rivers &	Permanent lakes & Reservoirs	Seasonal lakes, marshes and Swamps including floodplains	Forested wetlands, marshes, and swamps including floodplains	Alpine and tundra wetlands	Springs and oases	Geothermal wetlands	Underground wetlands including caves and groundwater systems
Inland Wetlands									
Provisioning									
Food	Production of fish, wild game, fruits, grains and so on	●	●	●	●	●	●		
Fresh Water	Storage and retention of water; provision of water for irrigation and for drinking	●	●	●	●	●	●		●
Fiber and Fuel	Production of timber, fuelwood, peat, fodder, aggregate	●	●	●	●	●	●		
Biochemical Products	Extraction of materials from biota	●	●	?	?	?	?	?	?
Genetic Material	Medicine; genes for resistance to plant pathogens, ornamental species and so on	●	●	?	●	?	?	?	?

- **Provisioning Services**
- Regulating Services
- Supporting Services
- Cultural Services

INPUT

Bhagalpur - City Level Information

Scale is low ●, medium ●●, to high ●●●; not known = ?; Blank cells indicate that the service is not considered applicable to wetland type.
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Inland Wetlands									
Regulating									
Climate Regulation	Regulation of greenhouse gases, temperature, precipitation, and other climatic processes; chemical composition of atmosphere	●	●●	●	●●	●		●	●
Hydrological Regimes	Groundwater recharge and discharge; storage of water for agriculture or industry	●●	●●	●●	●●	●	●		●
Pollution control and detoxification	Retention, recovery and removal of excess nutrients and pollutants	●●	●	●	●	●	●		●●
Erosion Protection	Retention of soils and prevention of structural change (such as coastal erosion, bank, slumping and so on)	●	●	●	●	?	●		●
Natural Hazards	Flood control; storm protection	●	●●	●●	●	●	●		●

- Provisioning Services
- **Regulating Services**
- Supporting Services
- Cultural Services

INPUT

Bhagalpur - City Level Information

Scale is low ●, medium ●, to high ●; not known = ?; Blank cells indicate that the service is not considered applicable to wetland type.
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Inland Wetlands									
Supporting									
Biodiversity	Habitats for resident or transient species	●	●	●	●	●	●	●	●
Soil Formation	Sediment retention and accumulation of organic matter	●	●	●	●	●	?	?	
Nutrient Cycling	Storage, recycling, processing, and acquisition of nutrients	●	●	●	●	●	●	?	●
Pollination	Support for pollination	●	●	●	●	●	●		

- Provisioning Services
- Regulating Services
- **Supporting Services**
- Cultural Services

INPUT

Bhagalpur - City Level Information

Scale is low ●, medium ●, to high ●; not known = ?; Blank cells indicate that the service is not considered applicable to wetland type.
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Inland Wetlands									
Cultural									
Spiritual and Inspirational	Personal feelings and well-being; religious significance	●	●	●	●	●	●	●	●
Recreational	Opportunities for tourism and recreational activities	●	●	●	●	●	●	●	●
Aesthetics	Appreciation of natural features	●	●	●	●	●	●	●	●
Educational	Opportunities for formal and informal education and training	●	●	●	●	●	●	●	●

- Provisioning Services
- Regulating Services
- Supporting Services
- **Cultural Services**

INPUT

Bhagalpur – Identification of Ecosystem Services

Services			Scope		Ecosystem Service Valuation Determinants (Market Pricing)	Bhairava
Water Bodies/Wetlands			Water Body	Buffer Zone		
Food (1)	Production of fish (0.5)				Quantity of fish production annually	1.5
	Production of fruits and grains (0.5)				Quantity of products produced annually	0
Fresh water (1)	Storage and retention of water (0.33)				Volume of water stored (capacity of ponds/lakes)	1.65
	Provision of water for irrigation (0.33)				Volume of water used for irrigation purpose annually	0
	Provision of water for drinking (0.33)				Volume of water used for drinking purpose annually	0
Fiber and Fuel (1)	Production of timber (0.2)				Quantity of timber produced annually or area under the timber plantation	0
	Production of fuelwood (0.2)				No. of households dependent on fuelwood or area under the tree cover	0
	Production of peat (0.2)				Area under peatland	0
	Production of fodder (0.2)				Area under grazing land	0
	Livestock rearing (0.2)				Number of commodities produced Dairy - Milk, butter, cheese, curd Cattle, Buffaloes, Sheep - Meat Poultry- Meat, eggs Fish(aquaculture)- Meat Pig - Meat Insects and other invertebrates (Vermiculture, Apiculture) - Honey, Silk	0.4
Biochemical Products (1)	Extraction of materials from biota (1)					0
Genetic Material (1)	Medicine (0.33)					0
	Genes for resistance to plant pathogens (0.33)					0
	Ornamental species (0.33)					0
Total Provisioning Services Value						3.55

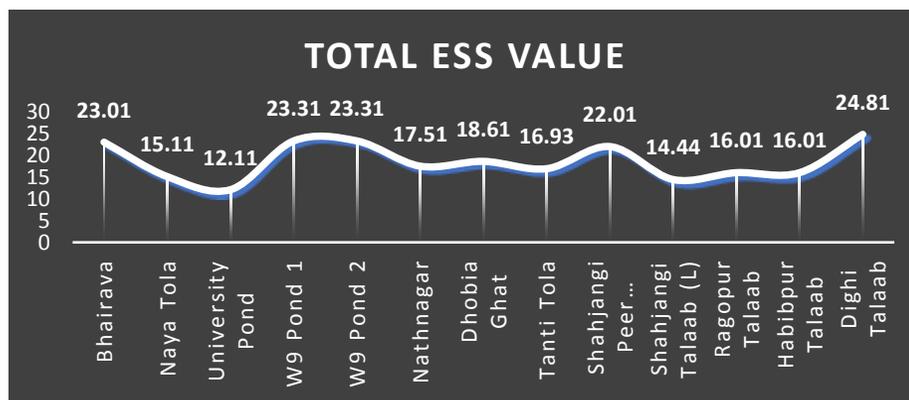
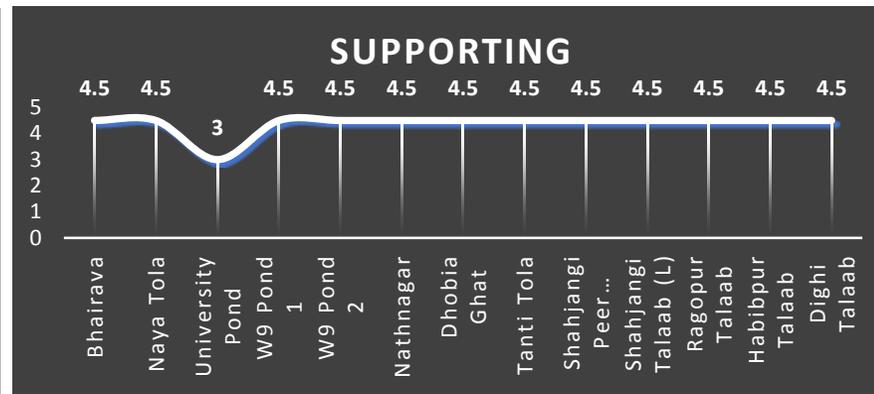
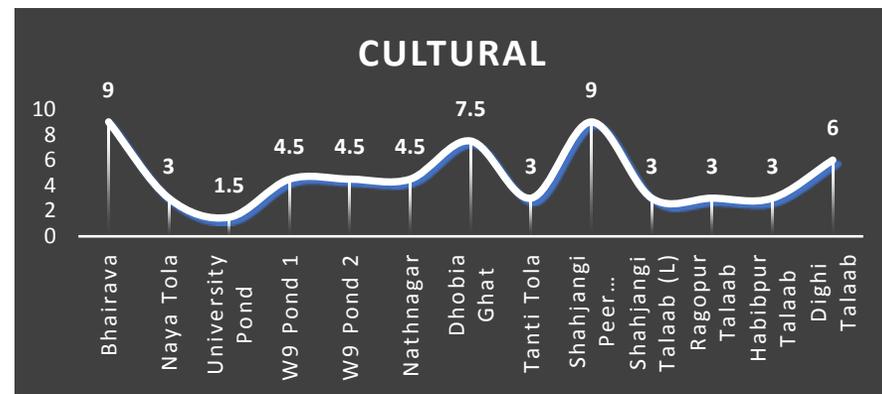
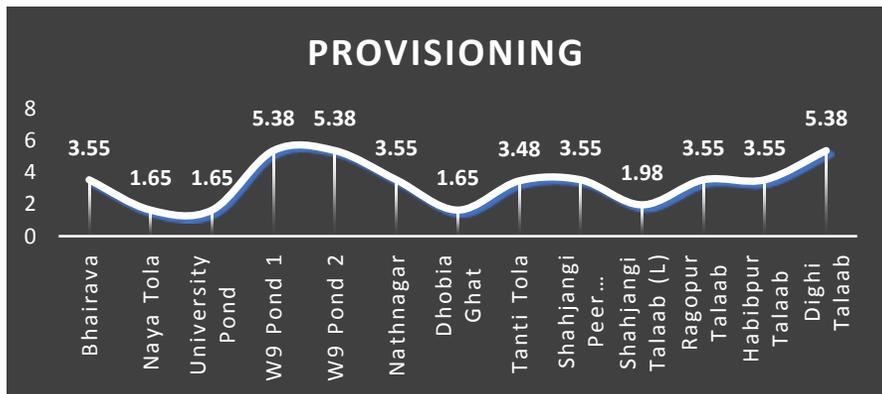
Services			Scope		Ecosystem Service Valuation Determinants (Market Pricing)	Bhairava
Water Bodies/Wetlands			Water Body	Buffer Zone		
Climate Regulation (1)	Regulation of greenhouse gases (0.5)				Amount of Carbon Sequestered by trees in Carbon Equivalent	0
	Regulation of temperature/micro-climate (0.5)				Spatial Variation of temperature around water bodies (Range)	1
Hydrological Regimes (1)	Groundwater recharge and discharge (0.33)				Volume of GW recharged annually in MCM	0.99
	Storage of water for agriculture (0.33)				Area of agricultural lands dependent on the water body	0
	Storage of water for industry (0.33)				Number of industries extracting water from the pond/lakes	0
Pollution control and detoxification (1)	Nutrient Retention (0.33)				Water quality improvement via nutrient retention (nitrogen and phosphorus)	0.99
	Removal of excess nutrients (0.33)				Wetlands have been shown to retain widely variable amounts of nitrogen (30-99%) and phosphorus (0-99%), both of which are harmful to the aquatic environment when present in excessive amounts.	0.99
		Removal of pollutants (0.33)				Removing excessive nitrogen and phosphorus from runoff, etc.
Erosion Protection (1)	Retention of soils and prevention of structural changes (such as erosion, bank slumping and so on) (1)				Area of buffer space present (vegetation)	0
Natural Hazard (1)	Flood control (0.5)				Flood water storage based on hydrological regime and flood events	1
	Storm Protection (0.5)				Based on area of buffer space present	0
Total Regulating Services Value						5.96

- Ecosystem services matrix and ranking of Wetlands/Water Bodies based on parameters present

- Monetary evaluation of Wetlands/Water Bodies (market pricing method)

OUTPUT

Bhagalpur – Ecosystem Services Evaluation



- Ecosystem services matrix and ranking of Wetlands/Water Bodies based on parameters present
- Monetary evaluation of Wetlands/Water Bodies (market pricing method)

OUTPUT

Bhagalpur – Ecosystem Services Evaluation



OBJECTIVE

- Identification of stage of ground water development



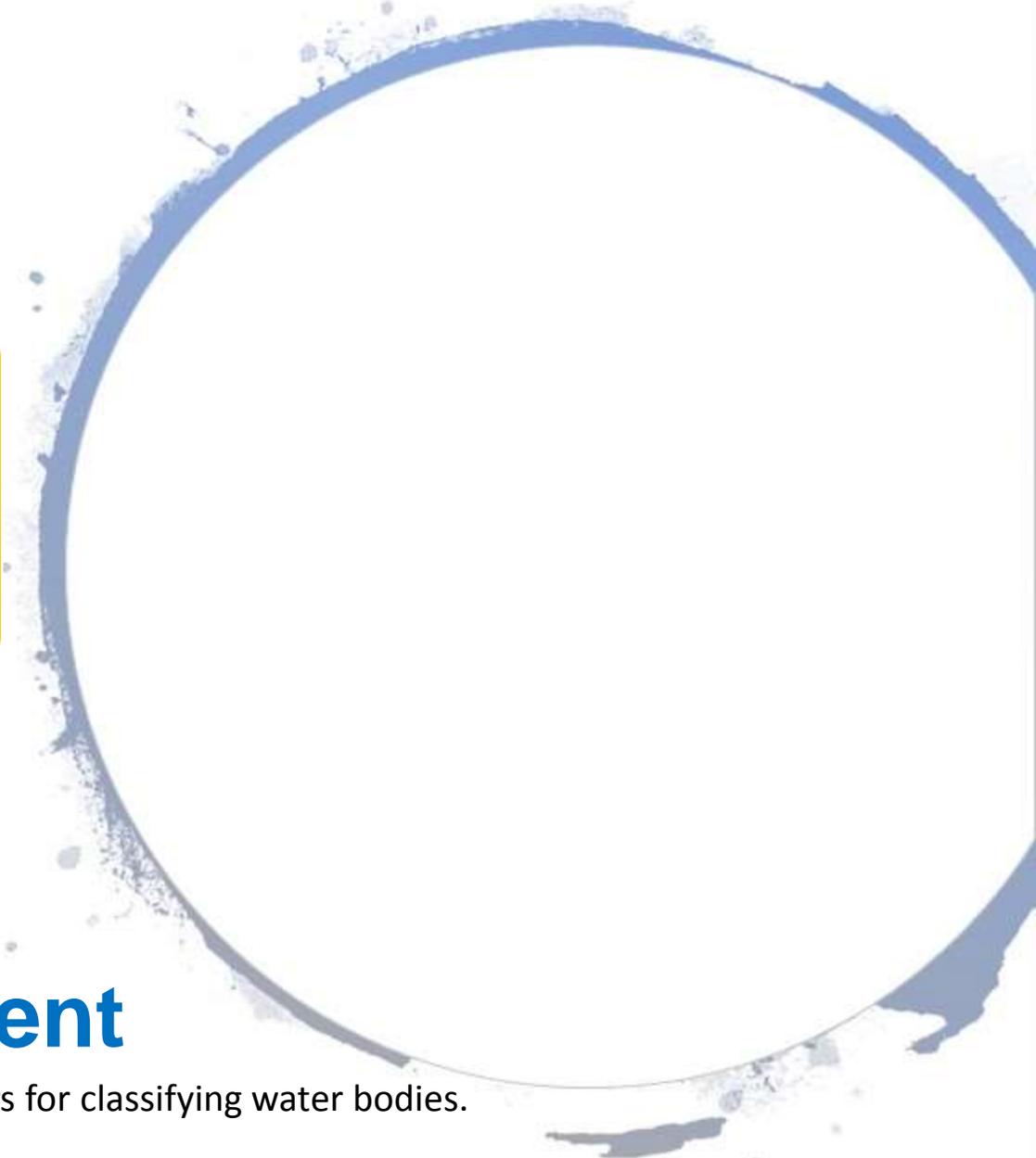
INPUT

- Ground water draft at prioritized watershed level for different purposes
- Seasonal Ground water availability



OUTPUT

- Identification of best use of Wetlands/Water Bodies - ground water recharge, flood control, biodiversity, livelihood, recreational, etc.



2.4

Ground Water Assessment

Preparation of Interactive GIS map and listing of parameters for classifying water bodies.

Assessment of Ground Water

The assessment of ground water is undertaken within the watershed bounding/ containing the area.

The following parameters were identified based on CGWB methods for Ground water assessment:

- **Ground Water Draft for Irrigation in Monsoon & Non Monsoon Season**
- **Ground Water Draft for Domestic & Industrial Use in Monsoon & Non-Monsoon Season**
- **Ground Water recharge from return flow of irrigation, water bodies-ponds, tanks, river, etc., in in Monsoon & Non Monsoon Season**
- **Ground Water recharge from rainfall in Monsoon and Non-Monsoon season**
- **Stage of Ground Water Development is calculated on the basis of Total Gross Ground Water Draft & Net Annual Availability of Ground Water**

INPUT

- Historical dataset of Satellite maps (10 Years)
- Location, Size, Characteristics, Ownership and Physical and chemical properties of Water Bodies/ Wetlands

Bhagalpur – Mapping of Wetlands/Water Bodies

Assessment of Ground Water for Bhagalpur City

Parameters	Values in MCM
Total Ground Water Availability	30.156
Unaccounted Natural Discharges in Non-Monsoon Season	1.508
Existing GW withdrawal for various uses and potential for future development (Net Annual GW Availability)	28.647
Annual water requirement for domestic and industrial use, 2011	19.71
Annual water requirement for domestic and industrial use, 2018	22.37
Net annual GW availability for irrigation, 2018	6.276
Existing Gross Ground Water Draft for Domestic and Industrial Water Supply	4.046
Stage of GW Development (%)	104.03 (Over – Exploited)

INPUT

- Historical dataset of Satellite maps (10 Years)
- Location, Size, Characteristics, Ownership and Physical and chemical properties of Water Bodies/ Wetlands

Bhagalpur – Mapping of Wetlands/Water Bodies



OBJECTIVE

- Identification of potential areas for
- ground water
- recharge

INPUT

- Seasonal Ground water Table
- Drainage density (areas well drained)
- Open areas/ agricultural land/ scrub land

OUTPUT

- Suitable sites for ground water recharge and rain water harvesting

2.5 Land Suitability for GW Recharge

Preparation of Interactive GIS map and listing of parameters for classifying water bodies.

Assessment of land suitability & ground water recharge based on:

1 Present status

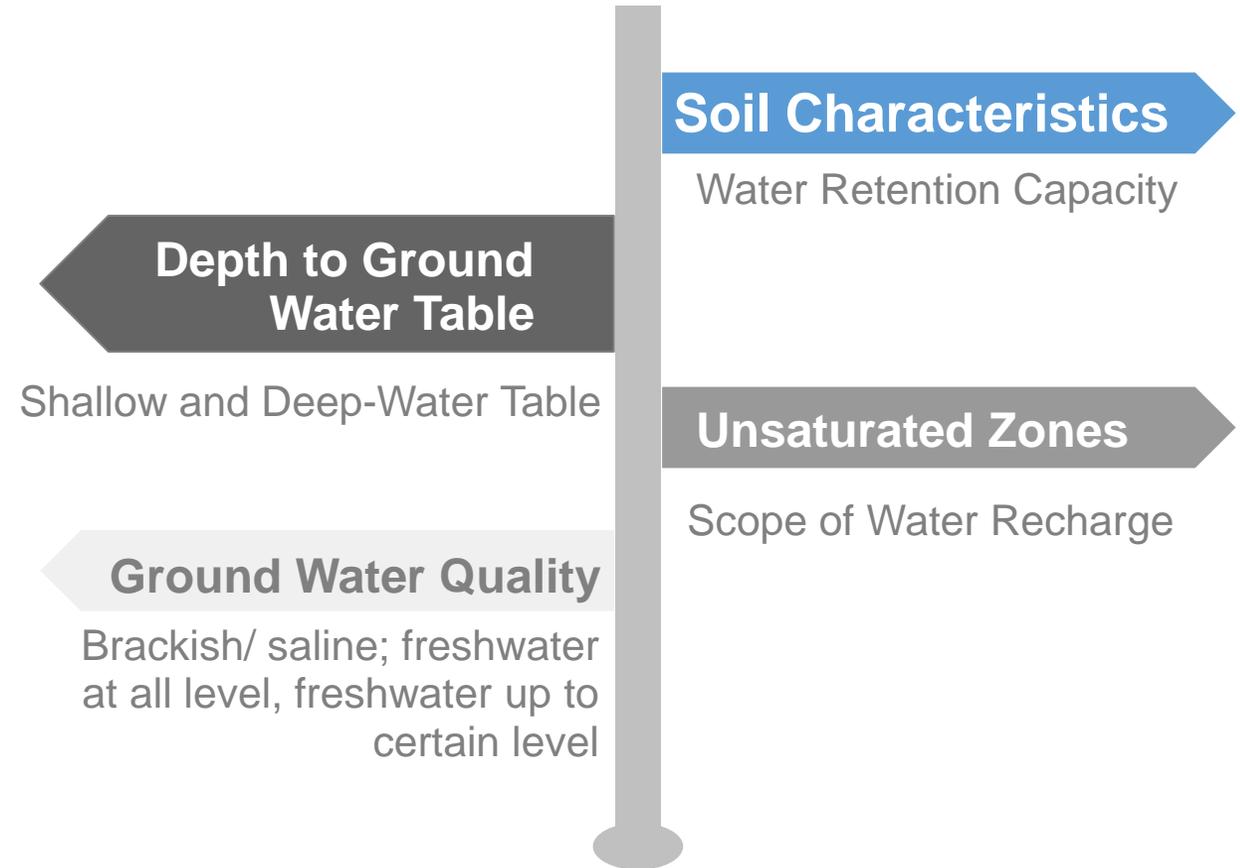
2 Availability of excess water

3 Seasonal Variation in Ground water Table

4 Drainage density

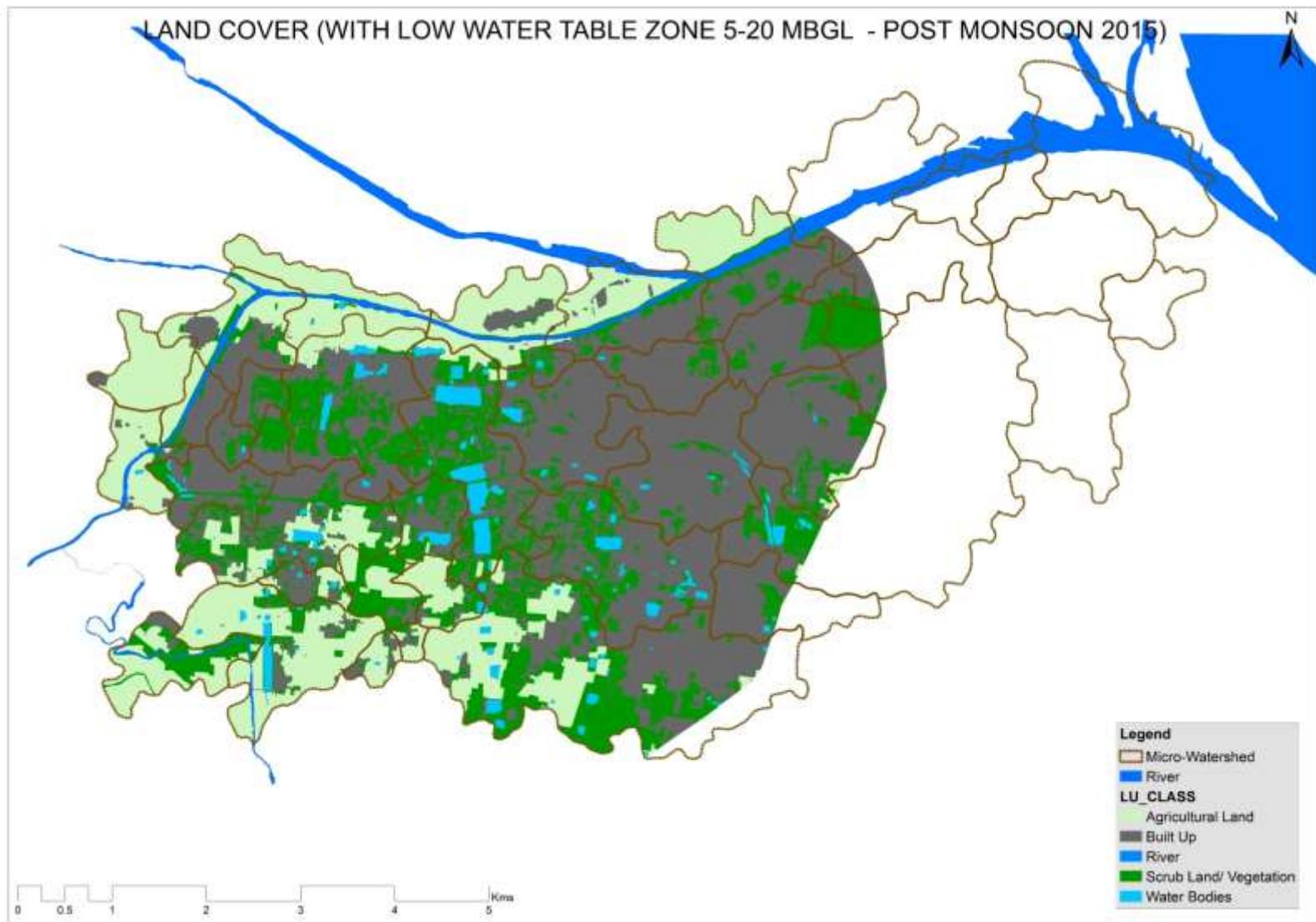
5 Open areas, agricultural areas & scrub land

Parameters Considered



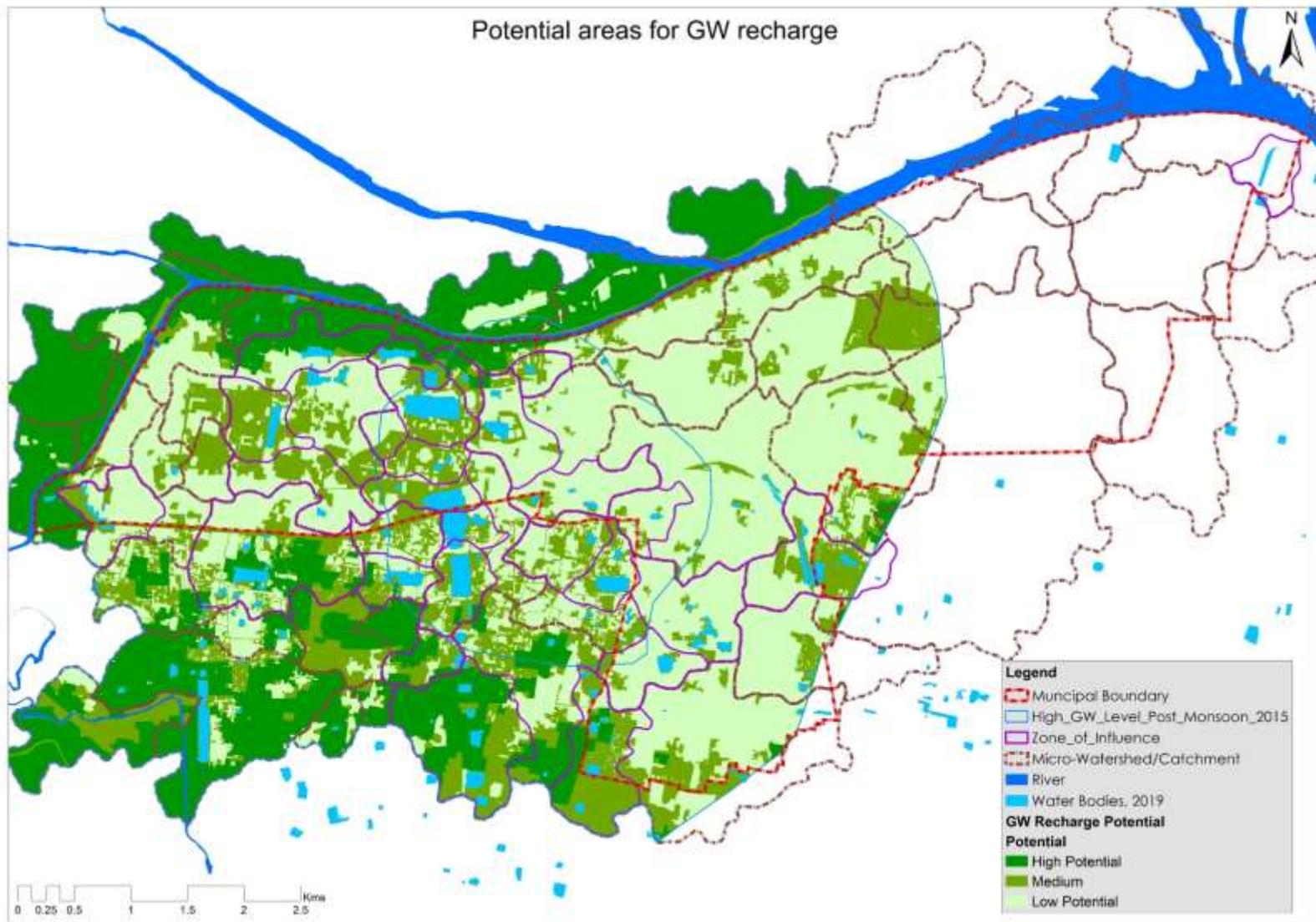
2.5 Land Suitability for GW Recharge

Land Suitable for GW Recharge

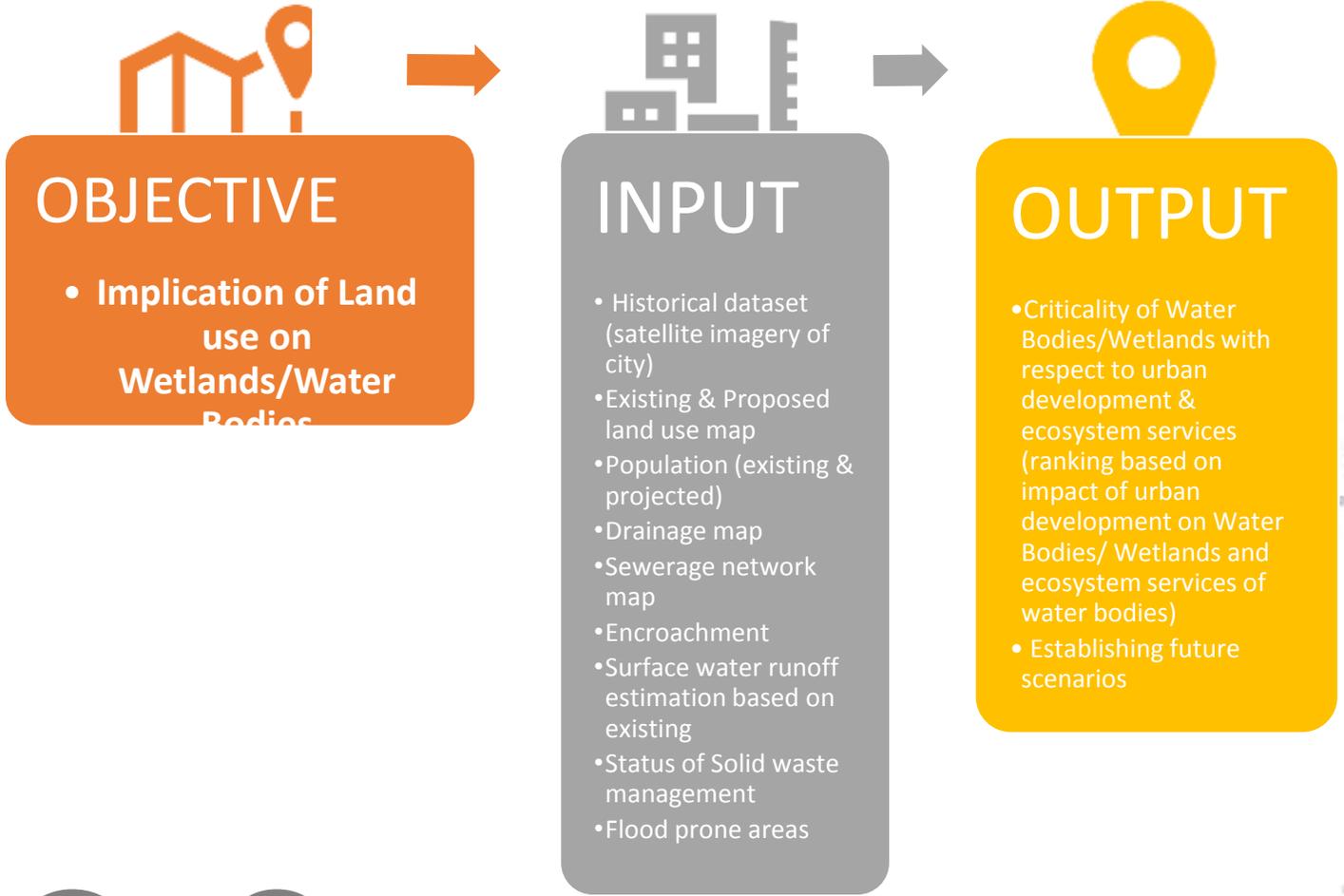


2.5 Land Suitability for GW Recharge

Land Suitable for GW Recharge



2.5 Land Suitability for GW Recharge



2.6 Impact of Urban Development on **Wetlands/Water bodies**

Preparation of Interactive GIS map and listing of parameters for classifying water bodies.

For determining the impact of urban development, the following parameters are identified (Within Catchment Area and Zone of Influence):

- Population Density
- Built-Open Space Ratio
- Water Demand
- Waste Water Generation
- Solid Waste Generation
- Built-Up within 100m buffer area
- Presence of Slum Settlements

Assessment of potential, need and scope of development is formulated for the following five parameters.

- Ground water recharge
- Storing runoff
- Recreational Use
- Fishing
- Revenue Generation

Identification of areas of intervention i.e., treatment on site, at zone of influence or at catchment level

The values are normalized to bring them to same scale and the impact is ranked.

2.5 Impact of Urban Development Wetlands/Water bodies

Impact of urban development on water bodies in Bhagalpur city

Scope	Catchment	Zone of Influence
Bhairava	Yellow	Green
Naya Tola	Yellow	Yellow
University Pond	Red	Red
W9 Pond 1	Red	Yellow
W9 Pond 2	Yellow	Yellow
Nathnagar	Yellow	Yellow
Dhobia Ghat	Yellow	Yellow
Tanti Tola	Red	Red
Shahjangi Peer Masjid	Yellow	Yellow
Shahjangi Talaab (L)	Yellow	Yellow
Ragopur Talaab	Yellow	Red
Habibpur Talaab	Red	Yellow
Dighi Talaab	Green	Yellow

Ranking	Normalization Value
High	> 3.5
Medium	1.5-3.4
Low	<1.5

Scope	Ecosystem Service Score
Bhairava	24.51
Naya Tola	12.11
University Pond	12.11
W9 Pond 1	18.81
W9 Pond 2	18.81
Nathnagar	14.51
Dhobia Ghat	18.61
Tanti Tola	12.43
Shahjangi Peer Masjid	23.51
Shahjangi Talaab (L)	11.44
Ragopur Talaab	14.51
Habibpur Talaab	11.11
Dighi Talaab	21.81

Impact on water bodies and ecosystem services of water bodies

2.5 Impact of Urban Development Wetlands/Water bodies

Assessment of Potentials, Need and Scope of Development of water bodies in Bhagalpur city

Water Body	GW Recharge		Storing Runoff		Recreational Use		Fishing		Revenue Generation		Scope of Development
	P	N	P	N	P	N	P	N	P	N	
Bhairava	Y	Y	Y	Y	Y	Y	Y	Y	Y	-	Ground Water Recharge, Runoff Storage, Recreational Use, Fishing and Revenue Generation

2.5 Impact of Urban Development Wetlands/Water bodies



OBJECTIVE

- Identification of activities/strategies

INPUT

- Critical Wetlands/Water Bodies based on urban development and ecosystem services.

OUTPUT

- Indicative actions to be undertaken for conservation of Wetlands /Water Bodies
- Interventions within catchment area, zone of influence and on site

2.7 Action Plan for Wetland/Water Body Conservation

The indicative actions will target interventions at site, zone of influence and within catchment area

Component	Activities		At Site	Zone of Influence	Catchment Area
	Core	Non-Core			
Wetland Boundary Delineation					
Water Management					
Biodiversity Conservation & Habitat Management					
Sustainable Resource Development					

Source: Adapted from National Plan for Conservation of Aquatic ecosystems (NPCA) Guidelines

2.7 Action Plan for Wetland/Water Body Conservation

Formulation of Action Plan for Bhairava Talaab

Component	Activities		At Site	Zone of Influence	Catchment Area
	Core	Non-Core			
Wetland Boundary Delineation	<ul style="list-style-type: none"> a. Wetland Survey & Mapping b. Identifying activities within its zone of influence 	<ul style="list-style-type: none"> Delineation of buffer space Removal of encroachments 	<ul style="list-style-type: none"> a. Identification of maximum extent of water body to delineate the wetland/water body boundary 	<ul style="list-style-type: none"> a. Identification of activities around water bodies b. Removal of encroachments 	
Water Management	<ul style="list-style-type: none"> a. Assessment of water requirements b. Dredging to increase storage capacity for GW recharge c. Constructed wetlands to treat pollution from diffuse sources. d. Construction of STP e. Assessment of water quality quarterly. 	<ul style="list-style-type: none"> a. Procurement of machinery b. Capacity building 	<ul style="list-style-type: none"> a. Dredging of water body. b. Provision of solid waste segregation chamber from drains 	<ul style="list-style-type: none"> a. Provision of door to door solid waste management facility. b. Provision of sanitation facilities for slum dwellers c. Plantation within identified buffer space 	<ul style="list-style-type: none"> a. Waste water and sewerage network should be linked to STP b. Control of GW extraction through private borewell. c. Rainwater harvesting mechanism for buildings.

Formulation of Action Plan for Bhairava Talaab

Component	Activities		At Site	Zone of Influence	Catchment Area
	Core	Non-Core			
Biodiversity Conservation & Habitat Management	a. Population assessment of wetlands dependent species b. Regulating species invasion by biological and habitat manipulation c. Economic use of harvested biomass of invasive species	Mechanical removal of invasive species biomass	a. Identification of aquatic species – flora and fauna. b. Assessment of nutrients and chemical parameters for suitability of aquatic habitats.	a. Regulating disposal of effluents or chemicals. b. Buffer space management to provide suitable environment for faunal species.	a. Waste water and sewerage network should be linked to STP
Sustainable Resource Development					

2.7 Action Plan for Wetland/Water Body Conservation

Formulation of Action Plan for Bhairava Talaab

Component	Activities		At Site	Zone of Influence	Catchment Area
	Core	Non-Core			
Sustainable Resource Development	<ul style="list-style-type: none"> a. Sustainable capture fisheries within carrying capacity of the wetland b. Community based eco-tourism linked with wetlands c. Conservation of cultural heritage linked with wetlands d. Micro-enterprise development for wetlands dependent communities to diversify livelihoods 	<ul style="list-style-type: none"> a. Aquaculture b. Promotion of organic agriculture in wetlands catchments c. Promotion of water efficient agriculture systems in wetlands catchments d. Promotion of ornamental fisheries-based culture e. Development of fish nurseries f. Development of tourism related infrastructure g. Micro-enterprise development for communities not-directly dependent on wetlands 	<ul style="list-style-type: none"> a. Development of tourism related infrastructure b. Development of eco-tourism facilities and interpretation center. 	Micro-enterprise development for communities not-directly dependent on wetlands	Micro-enterprise development for communities not-directly dependent on wetlands

AMRUT

Enhancing amenity value of cities by upgrading recreation infra

Smart Cities Mission

Area-based development for improvement, renewal and greenfield development.

HRIDAY

Holistic development of services

National Afforestation Programme

Enhancing amenity value of cities by upgrading recreation infra

Green India Mission

Catchment conservation

National Action Programme to Combat Desertification

Assessment and mapping of land degradation, Drought Preparedness and Mitigation

National Afforestation & Eco-Development Board

Ecological restoration and Eco development activities

National Coastal Management Programme

Conserve and protect coastal stretches & promote Sustainable development

National Mission on Himalayan Studies

Conservation of Himalayan Ecosystem & sustainable development

Repair, Renovation & Restoration of Water Bodies

Restoration of aquatic ecosystems used as sources of drinking water

Natural Resources Management, Rain-fed Farming

Sustainable agriculture

Welfare of Fishermen” and “Development of Inland Fisheries”

Sustainable fisheries development

Swachh Bharat Mission

Development of sanitation infrastructure to improve water quality of Urban & Rural Ecosystems.

NPCA

Conservation of wetlands above 5 Ha.

Pilgrimage Rejuvenation and Spiritual Augmentation Drive (PRASAD)

Beautify and improve amenities and infrastructure at major pilgrimage sites in the country

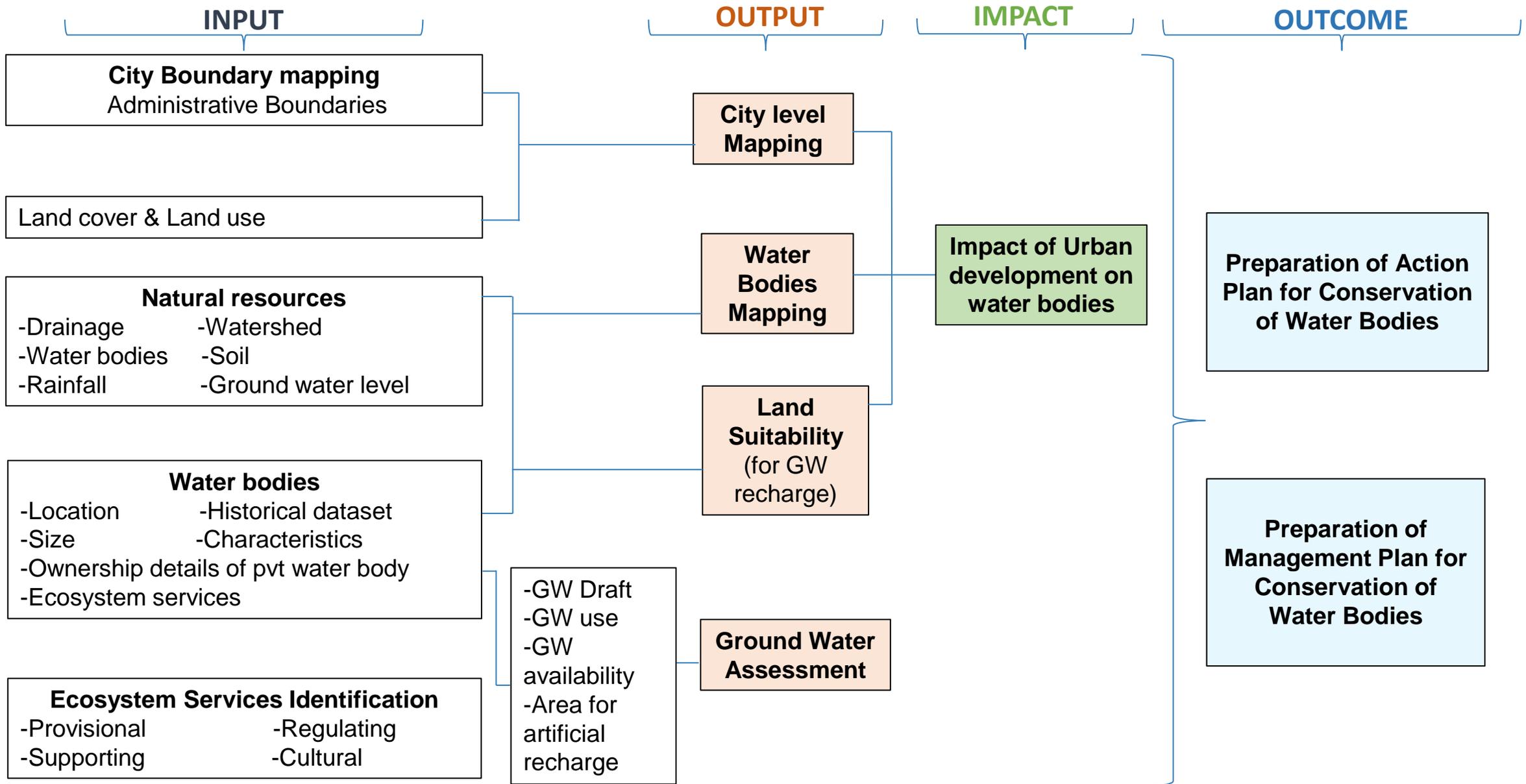
State Government schemes on fisheries, agriculture, forestry, wildlife protection, irrigation development etc.

Various components of DPR

Convergence of Schemes

This Step deals with mainstreaming wetlands in State level policy and decision making by building convergence with ongoing developmental sector investments. It will help to address the anthropogenic threats on wetlands. This will help in cross-sectoral involvement towards the management of urban wetlands/water Bodies.

3



Convergence of Schemes

4 Institutional Arrangements for Wetland Management

Defining An Institutional Arrangement For Wetland Management

- 1 Enlisting of government departments having programmes which impact (or have the potential to impact) wetlands features or threats on these features
- 2 An analysis of laws and regulation related to wetland, access and use of wetland resources, biodiversity or any dimension
- 3 Ownership, rights and privileges pertaining to wetlands
- 4 Analysis of the role of Civil Society Organizations (CSOs) and communities in wetlands management, with particular reference to their views, rights and capacities
- 5 Gaps and challenges

Conservation & Management Plan

To identify the objectives of wetland management, identify the factors that influence the wetlands, resolve conflicts between various stakeholders having an interest in the wetland/water Bodies, identify convergence of schemes to pool financial resources for managing the wetlands, enable communication between various other stakeholders, ensure compliance with laws and regulation and demonstrate the management effectiveness and efficiency.

5

1. Introduction

1.1 Rationale for management planning

Describe importance of wetland, wetlands conservation & wise use
Development goals and alignment with state & central government policies, directives and planning frameworks

1.2 Terms of reference

Enlist the overall terms of reference for the management plan

1.3 Approach and Method

Provide an overview of approach (ways in which the recommended steps have been used)
Describe the data sources and research carried out for management planning if any

2. Description of wetlands feature

2.1 Description of wetland features

Describe importance of wetland, wetlands conservation & wise use
Development goals and alignment with state & central government policies, directives and planning frameworks

3. Evaluation of wetlands feature

3.1 Evaluation

Provide an overview of the current institutional arrangements in the context of

Priority wetland, features that need to wetlands management
be maintained and thresholds thereof,
threats

Guidelines for Preparation of **Management Plans**

3.2 Gaps

Discuss why current institutional arrangements are insufficient in ensuring wetlands conservation and wise use.

3.3 Proposed arrangements for wetland management

Provide an overview of the current institutional arrangements in the context of wetlands management

4. Setting Management Objectives

4.1 Goal and purpose

Provide a statement of overall goal that the management plan seeks to achieve .

Summarize the ecological and economic benefits that are expected from management plan implementation

4.2 Benefits (ecological as well as societal)

4.3 Management objectives

Enlist the specific objectives

4.4 Strategies

Describe strategy(ies) for achieving each of the management objectives

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5. Monitoring and evaluation plan

5.1 Monitoring strategy

Present an overview of monitoring the wetland, and management plan implementation

5.2 Monitoring parameters, frequency & responsibility

Describe the monitoring parameters, the frequency of monitoring and the agency that will be responsible for monitoring

5.3 Institutional design

Describe how coordination between different monitoring agencies will be achieved

5.4 Infrastructure & human resources design

Discuss the infrastructure & human resource requirement for implementing the management plan. Involvement of local universities, research organizations and NGOs in wetlands monitoring

5.5 Reporting

Discuss the frequency in which reporting shall be done and the responsible agency.

5.6 Review and adaptation

Discuss how the monitoring outcomes will be used to

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6. Developing an Action Plan

6.1 Component wise activities linked with management objectives

Generic listing of activities indicating:

- What will be done?
- Where will the activity be done?
- What is the priority for the activity?

7. Budget and activity phasing

7.1 Activity linked budget

Present a summary budget

Provide details of funding available from convergence sources

7.2 Time planning

Present a monthly Gantt Chart for management plan implementation

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