



सत्यमेव जयते

KACHHUA WILDLIFE SANCTUARY

Uttar Pradesh

Draft Management Plan
(2021-22 to 2031-32)



भारतीय वन्यजीव संस्थान
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CONTENT

Acknowledgements

Executive summary

Management planning process at Kachhua Wildlife Sanctuary

PART I: INTRODUCTION AND EVALUATION

CHAPTER 1: INTRODUCTION TO KACHHUA WILDLIFE SANCTUARY AREA

1.1 Name, Location, Constitution and Extent

1.2 Approach and Access

1.3 Statement of Significance

- 1.3.1 Global significance
- 1.3.2 National and Regional significance
- 1.3.3 Local significance

1.4 Biodiversity value

1.5 Biomass production

1.6 Recreational value

1.7 Cultural value

CHAPTER 2: BACKGROUND INFORMATION AND ATTRIBUTES

2.1 Biogeographic zone

2.2 Boundaries

2.3 Altitude/Terrain type

2.4 Geology, rock and soil

2.5 Catchment characteristics

2.6 Climate, temperature and rainfall

2.7 Hydrological features

- 2.7.1 Drainage and source of water
 - 2.7.2 Channel morphology and bathymetry
 - 2.7.3 Hydrology
 - 2.7.4 Physio-chemical characteristics of water
- 2.8 General ecological features including flora and fauna

- 2.8.1 Vegetation
 - 2.8.2 Fauna
 - ◆ 2.8.2.1 Ichthyofauna
 - ◆ 2.8.2.2 Birds
 - 2.8.2.2.1 Terrestrial birds
 - 2.8.2.2.2 Water birds
 - 2.8.2.2.3 Feeding guilds of the birds
 - 2.8.3 Mammals, reptiles and other obligate species
- 2.9 Species and communities of conservation importance
- 2.10 Major functions and values
- 2.10.1 Direct use value
 - 2.10.2 Indirect use value

CHAPTER 3: HISTORY OF MANAGEMENT AND PRESENT PRACTICES

- 3.1 General site status
- 3.2 Legal status and land tenure in the surrounding area
- 3.3 Dependence on KWS River stretch
- 3.3.1 Water harvesting
 - 3.3.2 Biomass extraction
 - 3.3.3 Fuel
 - 3.3.4 Fodder
 - 3.3.5 Fishing
 - 3.3.6 Religious dependence
- 3.4 Status of protection
- 3.4.1 Encroachment and other forms of river reclamation
 - 3.4.2 Entanglement/Accidental death of aquatic species
 - 3.4.3 Livestock grazing on the river banks and surrounding areas
 - 3.4.4 Sewage, effluent and solid waste disposal
 - 3.4.5 Wildlife Health
 - 3.4.6 Human activities in the surrounding areas
- 3.5 Tourism
- 3.5.1 Scope
 - 3.5.2 Visitor statistics
 - 3.5.3 Interpretation programme
 - 3.5.4 Facilities
- 3.6 Research, monitoring and training
- 3.6.1 Research and monitoring
 - 3.6.2 Trainings
 - 3.6.3 Wildlife conservation strategies and their evaluation

CHAPTER 4: THE SANCTUARY AREA AND THE INTERFACE LAND USE SITUATION

4.1 The Zone of Influence: Current Scenario

- 4.1.1 Landuse/Landcover of the Kachhua Wildlife Sanctuary and surrounding areas
- 4.1.2 Human settlement in and around the Kacchua Wildlife Sanctuary
- 4.1.3 Ethnic identities, traditions, customs
- 4.1.4 The state of people's economy
- 4.1.5 Vocations and use of river stretch and its products
- 4.1.6 Implications of the land use and resource dependency
- 4.1.7 KWS management practices and their implications for people

4.2 Attitude and perception of the local people

4.3 The development programmes and conservation issues

4.4 Stakeholders

- 4.4.1 Analysis of interest data
 - ◆ 4.4.1.1 Advantages of KWS to various stakeholder groups
 - ◆ 4.4.1.2 Disadvantages of KWS to various stakeholder groups
- 4.4.2 Stakeholder mapping for KWS

CHAPTER 5: PROBLEMS, ISSUES AND RISK ANALYSIS

5.1 Loss of Species

- 5.1.1 Use of fertilizers and Pesticides in Agriculture
 - ◆ 5.1.1.1 Lack of Awareness
 - ◆ 5.1.1.2 Lack of Green Options
- 5.1.2 Entanglement /Accidental Killing
 - 5.1.2.1 Lack of awareness
 - 5.1.2.2 Unscientific fishing
 - 5.1.2.3 Lack of Rescue and rehabilitation facilities

5.2 Loss of habitat

5.2.1 Unsustainable resource Use

5.2.1.1 Sand mining

5.2.1.2 Bio-mass extraction

5.2.2 River bank agriculture

5.2.2.1 Traditional practice of the local community

5.2.2.2 Lack of alternate employable skill

5.3 Improper waste management

- 5.3.1 Lack of Awareness

- 5.3.2 Lack of proper waste management facilities
- 5.3.3 Lack of co-ordination between departments

5.4 Risk Analysis

PART II: APPROACHES AND RECOMMENDATIONS

CHAPTER 6: VISION, OBJECTIVES AND PROBLEMS

- 6.1 Conservation Values of Kachhua Wildlife Sanctuary
- 6.2 Vision
- 6.3 Goal
- 6.4 Objectives
- 6.5 Problems
- 6.6 Strengths-Weaknesses-Opportunities-Threats (SWOT) Analysis

CHAPTER 7: MANAGEMENT STRATEGIES

- 7.1 Management Philosophy
 - 7.1.1. Degree of intervention
 - 7.1.2. Statues, rules and guidelines followed
 - 7.1.3. Wider geographic scope of Management Plan
 - 7.1.4. Balancing development with conservation
 - 7.1.5. Building ownership of communities and empowering them for participatory decision making
- 7.2 Strategies
 - 7.2.1 Constitution of Advisory Committee
- 7.3 Zone Plan
 - 7.3.1. Minimum intervention Zone
 - 7.3.2. Restoration Zone
 - 7.3.3. Tourism Zone
 - 7.3.4. Sustainable-use Zone
- 7.4 Theme Plans
 - 7.4.1. Secure the ecological integrity of the Sanctuary
 - ◆ 7.4.1.1. Boundary Demarcation and expansion of Kachhua Wildlife Sanctuary
 - 7.4.2. Monitor impacts of Climate Change
 - 7.4.3. Monitoring vegetation composition and productivity
- 7.5 Habitat Management Plan
 - 7.5.1. Strengthening the existing population of Turtles
 - ◆ 7.5.1.1. Management of habitat for wildlife
 - ◆ 7.5.1.2. Management of water level and quality

- ◆ 7.5.1.3. Management of fishery
- ◆ 7.5.1.4. Regulation of sand mining activity
- ◆ 7.5.1.5. Control of grazing
- ◆ 7.5.1.6. Management of invasive species

7.6 Species Management planning

- 7.6.1. Establishment of rescue and rehabilitation center
- 7.6.2. Undertaking, aiding, promoting and coordinating research
 - ◆ 7.6.2.1. Monitoring population trend of turtles and other aquatic vertebrates

7.7 Protection Strategies

- 7.7.1 Establishment of protection camps
- 7.7.2 Infrastructure for patrolling
- 7.7.3 Watch tower for protection

7.8 Management of surrounding landscape

CHAPTER 8: ECOTOURISM, NATURE INTERPRETATION AND CONSERVATION EDUCATION

8.1 General

8.2 Stakeholders in Ecotourism

- 8.2.1 Local Communities
- 8.2.2 Tourism industry
- 8.2.3 Government officials
- 8.2.4 Non-governmental organizations
- 8.2.5 Academicians
- 8.2.6 Travelers

8.3 Objectives

8.4 Problems and Issues

8.5 Strategies

- 8.5.1 Zonation
 - ◆ 8.5.1.1 Zoning in space
 - ◆ 8.5.1.2 Zoning in time

8.6 Planning and Mapping

- 8.6.1 Infrastructure
- 8.6.2 Visitor facilities

8.7 Involvement of the local community

8.8 Development of facilities

- 8.8.1 Facilities inside the protected area
- 8.8.2 Facilities to be constructed outside the site

8.9 Nature Interpretation and Conservation Education

- 8.9.1 Interpretation Zone
- 8.9.2 Infrastructure Requirement
- 8.9.3 Dolphin Ganga Restaurant
- 8.9.4 Ganga Vatika
- 8.9.5 Dolphin Sighting Point
- 8.9.6 Interpretation Techniques and Exhibits

8.10 Sign and visitor circulation

- 8.10.1 Advertisement Hoardings
- 8.10.2 Signage at the Main Gate
- 8.10.3 Pathway Directional Signs
- 8.10.4 Interpretive Signage
- 8.10.5 Temporary Signs
- 8.10.6 Trail Signs

8.11 Publications

8.12 Nature guides

8.13 Marketing Plan

8.14 Capacity Building

8.15 Monitoring and Evaluation

8.16 Financial Plan

CHAPTER 9: COMMUNITY ENGAGEMENT AND ECODEVELOPMENT PLANNING

9.1 Rationale

9.2 Problems and Issues

9.3 Goal

9.4 Objectives

9.5 Broad Strategies

- 9.5.1 Reduce Dependency of Local Communities on the Sanctuary
- 9.5.2 Involve Local Communities in Conservation (Institutional Arrangements)
 - ◆ 9.5.2.1 Formation and strengthening of Self Help Groups (SHGs)
 - ◆ 9.5.2.2 Establishment of Ecodevelopment Committees (EDCs)
 - ◆ 9.5.2.3 Kachhua Wildlife Sanctuary Management Trust (KWST)
 - ◆ 9.5.2.4 Formation of spearhead teams
- 9.5.3 Capacity building
- 9.5.4 Linkages with other line agencies
- 9.5.5 Policy and administrative framework
- 9.5.6 Monitoring and evaluation

9.6 Village level strategies

- 9.6.1. Participatory Microplanning and Implementation
- 9.6.2 Proposed Ecodevelopment Activities
 - ◆ 9.6.2.1 Entry point activities
 - ◆ 9.6.2.2 Agricultural development works
 - ◆ 9.6.2.3 Off-farm Income Generation Activities
 - ◆ 9.6.2.4 Skill Development/ Training
 - ◆ 9.6.2.5 Alternatives for biomass Resource

9.7 The process of microplanning

- 9.7.1 Sustainable resource use
- 9.7.2 Sustainable tourism
- 9.7.3 Sustainable fishing
- 9.7.4 Sustainable farming
- 9.7.5 Improved protection

9.8 Plan Flexibility

CHAPTER 10: RESEARCH, MONITORING AND TRAINING

10.1 Introduction

10.2 Research

10.3 Monitoring

- 10.3.1 Main consideration in design of monitoring programme

10.4 Landuse/ Landcover

10.5 Biodiversity monitoring

- 10.5.1 Monitoring of Phytoplankton
- 10.5.2 Monitoring of Aquatic Vegetation
- 10.5.3 Monitoring of Invertebrates
- 10.5.4 Monitoring of Fish population and catch
- 10.5.5 Monitoring of Invasive species
- 10.5.6 Monitoring of Reptiles (Gharial, Mugger and Turtle)
- 10.5.7 Monitoring of Waterbirds
- 10.5.8 Monitoring of Aquatic mammals
- 10.5.9 Wildlife health monitoring
- 10.5.10 Habitat monitoring
- 10.5.11 Monitoring of hydrological regime
- 10.5.12 Social monitoring
- 10.5.13 Institutional monitoring

10.6 Training and Capacity building

PART III: BUDGET AND ADMINISTRATION

CHAPTER 11: Budget

CHAPTER 12: ORGANIZATION AND ADMINISTRATION

12.1 Structure and Function

- 12.1.1 Organizational structure

12.2 Infrastructure and amenities

- 12.2.1 Staff amenities

12.2.1.2 Quarters

12.3 Incentive for staff

REFERENCES

PART IV: ANNEXURES

Annexure 1 - Notification

Annexure 2 - Ecosystem services provided by KWS

Annexure 3 - Format for Microplan for Ecodevelopment around Protected Areas

Annexure 4 - Logical Framework Analysis of problems and issues in the Kachhua Wildlife Sanctuary

LIST OF FIGURES

S. No.	Title
2.1	Catchment of the sanctuary area
2.2	Land use pattern of the Kachhua wildlife sanctuary area
2.3	Drainage and water sources of the sanctuary area
2.4	Bathymetry profile of the Sanctuary during pre- and post- monsoon seasons ²
2.5	Hydrology of the Sanctuary area
2.6	Seasonal variations in volumetric flow of the Sanctuary
2.7	Occurrence of major aquatic species in KWS
2.8	Community structure of the wetland and riparian vegetation in the Sanctuary
2.9	Habit wise classification of wetland and riparian vegetation in the Sanctuary
2.10	Percentage of water bird species observed in various families in the Kachhua Sanctuary
2.11	Number of resident and migratory water birds species of Kachhua Sanctuary
2.12	Feeding guilds of water birds recorded in the Kachhua Sanctuary
3.1	Location map of Kachhua Wildlife Sanctuary showing District boundary
3.2	Villages around the Sanctuary area
4.1	Land Use Land Cover, 2005-2006
4.2	Land Use Land Cover, 2015-2016
4.3	Land Use Land Cover in KWS Area
4.4	Stakeholders mapping (based on stakeholders analysis conducted in the middle stretch of the Ganga river)
6.1	Analysis of problems of KWS
7.1	Analysis of solutions for the biodiversity conservation of KWS area
8.1	Process of livelihood interventions
8.2	Stakeholders in tourism (Source: Adapted from Gutierrez et al., 2005)

8.3	Indicative picture of nature interpretation center
8.4	Major action points for Eco-tourist , nature interpretation and conservation education
9.1	Ensuring participation in Sanctuary Management through Ecocodevelopment planning
9.2	Process of village Micro planning for KWS management and Gangabiodiversity conservation (WII-GACMAC, 2020)
9.3	Purposed activities in the Sanctuary area

LIST OF TABLES

S. NO.	Title
2.1	Rainfall in Sanctuary area in year 2018
2.2	Drainage system with description of main rivers
2.3	Designated best uses of water and the quality criteria
2.4	Biodiversity profile of the Kachhua Sanctuary
2.5	Checklist of plant species in the sanctuary
2.6	Fish diversity in the Kachhua Sanctuary
2.7	Occurrence of terrestrial birds in the Kachhua Sanctuary
2.8	Relative abundance of water birds in the Kachhua Sanctuary
2.9	Diversity of higher vertebrate fauna in the Kachhua Sanctuary
3.1	Tourist inflow in district falling under Sanctuary area
4.1	Villages within 500 m. area on both side of the Sanctuary area
4.2	Land use/cover and land feature change from 2006-2016
4.3	Major occupation of the people living in and around the Kachhua Wildlife Sanctuary
7.1	Area under various purposed zones in Kachhua Wildlife Sanctuary
8.1	Interpretation center of KWS
8.2	Topics and themes that could be exhibited in the conservation interpretation

	and education center of KWS
10.1	Summary table for purposed monitoring activities in Turtle Wildlife Sanctuary
12.1	Purposed staff strength in KWS

LIST OF PLATES

S.NO.	TITLE
3.1	Water extraction from Sanctuary area
3.2	Riverbank farming in the KWS area
3.3	Cattle grazing in the KWS area
3.4	Human activities in the KWS area
3.5	Some places of tourist attraction in close proximity of KWS
8.1	“JALAJ” the mobile livelihood center at Rajghat, Varanasi
8.2	Agri tourism can add to the income of the village communities
8.3	Indicative interpretative signage

LIST OF APPENDICES

S.NO.	TITLE	PAGE NO.
1	Notification	
2	Ecosystem services provided by KWS	
3	Format for Microplan for Ecodevelopment around Protected Areas	
4	Logical Framework Analysis of problems and issues in the Kachhua Wildlife Sanctuary	

EXECUTIVE SUMMARY

Kachhua Wildlife Sanctuary (KWS) is located in the densely populated area of middle Gangetic plain with adequate ecological, geomorphological, hydrological values along with diverse socio-economic linkages and resource use. The stretch harbours wide array of biota including 355 species of phytoplankton, 114 species of periphyton, 58 species of zooplankton, 51 families of Insects, 8 families of Molluscs, assorted group of Annelids as zoobenthos and 126 species of fishes (EMP & Basin, 2012). Middle stretch embodies terrestrial species like chital (*Axis axis*) and Sambhar (*Rusa unicolor*). Some of the noteworthy and indicator species of the middle Ganga River fund in this stretch are Gangetic Dolphin (*Platanista gangetica*), gharial (*Gavialis gangeticus*), mugger (*Crocodylus palustris*) and Indian softshell turtle (*Nilssonia gangetica*).

The KWS is a 30 km protected area stretch covering Prayagraj, Bhadoi and Mirzapur districts of Uttar Pradesh. The stretch has significant conservation values as it supports a vast array of flora and fauna which forms important trophic components in ecological pyramids. This sanctuary is notified by the Paryawaran, Van Evam Jalvayu Parivartan Anubhag – 4 of Uttar Pradesh Government vide notification no. 346/81-4-2020-823/2008 TC dated 17/03/2020 under sub section (l) of the section 18 of Wildlife (Protection) Act of 1972. The primary objective for creating the sanctuary was protection and conservation of aquatic wildlife in their natural habitat, especially to create a safe habitat and breeding space for the turtles of the Ganga River. The KWS Being located in the most populated area and having high dependence of the communities residing along the river stretch the sanctuary area is a high pressure zone. According to Niti Aayog Report (2016), KWS stretch supports about 10 million (total population of Prayagraj, Bhadohi and Mirzapur districts) (Uttar Pradesh Population, 2020) people by providing different ecosystem services like fish, water and minerals and regulating services which in turn becomes source of livelihood for the people residing along its banks.

The preparation of KWS Conservation Management Plan has been a dynamic process involving field data collection and stakeholder consultations aiming to preserve and enhance the ecological integrity and improve the social-economic conditions of the local communities residing in and around the KWS. This management plan will contribute in making sustainable management decision and informed policy making for future management of the sanctuary.

Vision

To develop the KWS and adjoining landscapes as an outstanding example of well managed protected area, safeguarding its ecological integrity, management of ecosystem services, and providing economic benefits to the local communities based on an integrative and strategic framework for ensuring sustainable relationships between ecosystems and human wellbeing.

Goal

To develop the KWS as a well-managed protected area by optimizing ecosystem processes and functions of the KWS considering the hydrological (flow, depth profile and lateral connectivity), ecological (species assemblages and interacting factors) and social indicators (ethical and cultural norms and attitude towards sustainability).

Objectives of management

The proposed objectives outlined below aims to strengthen the overall management regime and biodiversity values of the KWS:

1. To secure the ecological integrity for biodiversity conservation and ensure sustained flow of ecosystem services in KWS.
2. To develop and strengthen alternate livelihood opportunities for local communities.
3. To develop KWS as a site for recreation and conservation education for visitors through participation of local communities.
4. Promote sustainable use of natural resources through the development of institutional mechanism and eco development.
5. To strengthen the forest department through capacity building of the staff deployed for protection of the sanctuary.
6. To foster a system of participatory conservation through engagement of key stakeholder for effective management of KWS and adjoining landscape.

The KWS Conservation Management Plan is outlined into four parts.

Part I: Introduction and Evaluation is divided into five chapters. These chapters provide information on the current scenario of KWS area and its attributes such as terrain type, catchment, physio- chemical and hydrological features, ecological diversity including faunal and floral diversity, community structure, livelihood dependence of local communities on natural resources, land use and land cover, management practices for various aspects of the sanctuary area, integrated conservation and development programmes, stakeholder mapping and analysis, and problem and risk analysis of the KWS area.

Part II: Approaches and Recommendations comprises of seven chapters. These chapters delineate vision, objectives and recommendations for the management of KWS, elucidate strategies for habitat management for diverse terrestrial and aquatic species, establishing nature interpretation and conservation education centres for awareness generation and information dissemination, enhancing ecotourism activities in and around the KWS area. Another very significant aspect for management of any protected area is community

engagement and ecodevelopment planning. Under this chapter broad strategies have been developed for reinforcing local institutions and community participation in conservation and protection of the sanctuary area through capacity building and strengthening need based alternate livelihood options and formation of Self Help Groups (SHGs), Ecodevelopment Committees (EDCs) and Spearhead Teams for management of the sanctuary area. The following chapter explains research and biodiversity monitoring techniques for faunal, floral diversity, institutional and social diversity.

Part III: Budget and Administration comprises of two chapters outlining the budget outlay and organizational structure and function, infrastructure amenities, capacity building of staff for implementing the management plan and monitoring of KWS area.

Part IV: Appendix provides all appendices mentioned in this document.

A comprehensive and all-inclusive approach which includes efficient protection strategies, and species management through habitat restoration with legal framework and policy support, institutional mechanism, capacity building, and community participation is necessitated.

MANAGEMENT PLANNING PROCESS AT KACHHUA WILDLIFE SANCTUARY

A model management plan for Kachhua Wildlife Sanctuary has been prepared in collaboration with Uttar Pradesh Forest Department and Wildlife Institute of India (WII). Ecological and socio-economic surveys were conducted along the Ganga River by the WII team comprising of research personnels and Ganga Praharis (a cadre of volunteers established under the WII- NMCG Project titled 'Biodiversity Conservation and Ganga Rejuvenation').

During the surveys, consultations with local communities and other stakeholders were carried out in villages (n= 38) covering all three districts that is Prayagraj, Mirzapur and Bhadoi to understand the resource use patterns, dependency and livelihood issues, conservation attitude. Site level consultative meetings with stakeholders were conducted by WII in July- August 2020 regarding management of the Sanctuary, their willingness to engage in management activities of the Sanctuary.

WII deputed research personnels and Ganga Praharis to collect data on ecological and socioeconomic aspects of the Ganga River. Primary data on water availability, water quality, and water depth; and floral and faunal composition of the Sanctuary area were collected covering 3 districts. Subsequently, site level stakeholder meetings were conducted by WII in which community members and stakeholders from various departments were consulted and their suggestions regarding the management of the Sanctuary; their role and willingness to join in the management activities of the Sanctuary were noted. The senior officers from the Forest Department, Block development office, NRLM, Agriculture department, Animal Husbandry and Fisheries Department, and local communities and their representatives had participated in the consultation. During these meetings, draft strategies were developed and presented and further refined taking the suggestions from stakeholders into consideration.

The Management plan is structured into three parts which comprises of 12 Chapters. Part I of the plan lays out the existing situation of the sanctuary, Part II explains the proposed management for KWS, Part III provides budget and Administration for management of KWS and Part IV provides appendices mentioned in the plan. This management plan is proposed for a period of 10 years (2021-22 to 2031-32) with a mid-term review after five years (2026). Dr. Ruchi Badola, Scientist G, WII, and Dr. S. A. Hussain, Project Manager, NMCG-WII Ganga Project WII, Dehra Dun, coordinated the management planning process. The management planning officer was Divisional Forest Officer, Prayagraj, Forest Department, Uttar Pradesh.

Chapter 1

Introduction to Kachhua Wildlife Sanctuary area

1.1 Name, Location, Constitution and Extent

In 1989, the Government of Uttar Pradesh notified a 7 km stretch of Ganga River lying between Rajghat to Ramnagar Fort in Varanasi, as the Kachhua Vanyajeev Abhyaranya (Turtle Wildlife Sanctuary) under the provisions of Section 18 of the Indian Wild Life (Protection) Act, 1972 (vide notification no. 4170/04-3-62/89 dated 21-12-1989) in order to conserve the representative ecosystem and biodiversity of the Ganga River.

A biodiversity assessment of entire Ganga River was conducted by Wildlife Institute of India (WII) in April to June 2018. Data on habitat defining variables such as water depth, presence of meanders and islands were also collected. The results of biodiversity assessment were integrated with habitat variables to identify the high biodiversity stretches. A total of three high biodiversity areas were identified in the entire stretch of the Ganga River (WII, 2018). Bringing these high biodiversity areas under protected area network will secure the long-term survival of these fragile riverine ecosystems and the species thriving in it. Therefore, a stretch of 140 km from Newada in District Prayagraj to Adalpur in Mirzapur was recommended by WII to Uttar Pradesh Forest Department (UPFD) to designate as a protected area and subsequently UPFD agreed to notify a 30 km river stretch between Prayagraj and Mirzapur.

The stretch of 30 Km stretch bounded by both banks of the Ganga River from Meja Village, District Prayagraj (25.215000 N and 82.194814 E) to Baripur Uparwar, District Bhadohi (25.273769 N and 82.87486 E) was notified as Kachhua Wildlife Sanctuary (KWS) by Government of Uttar Pradesh under vide notification no. 346/81-4-2020-823/2008 TC dated 17/03/2020 under sub section (I) of the section 18 of Wildlife (Protection) Act of 1972 (Appendix I). The Sanctuary was notified with an objective to provide a safe and least disturbed natural habitat for aquatic biodiversity of the Ganga River, especially freshwater turtles.

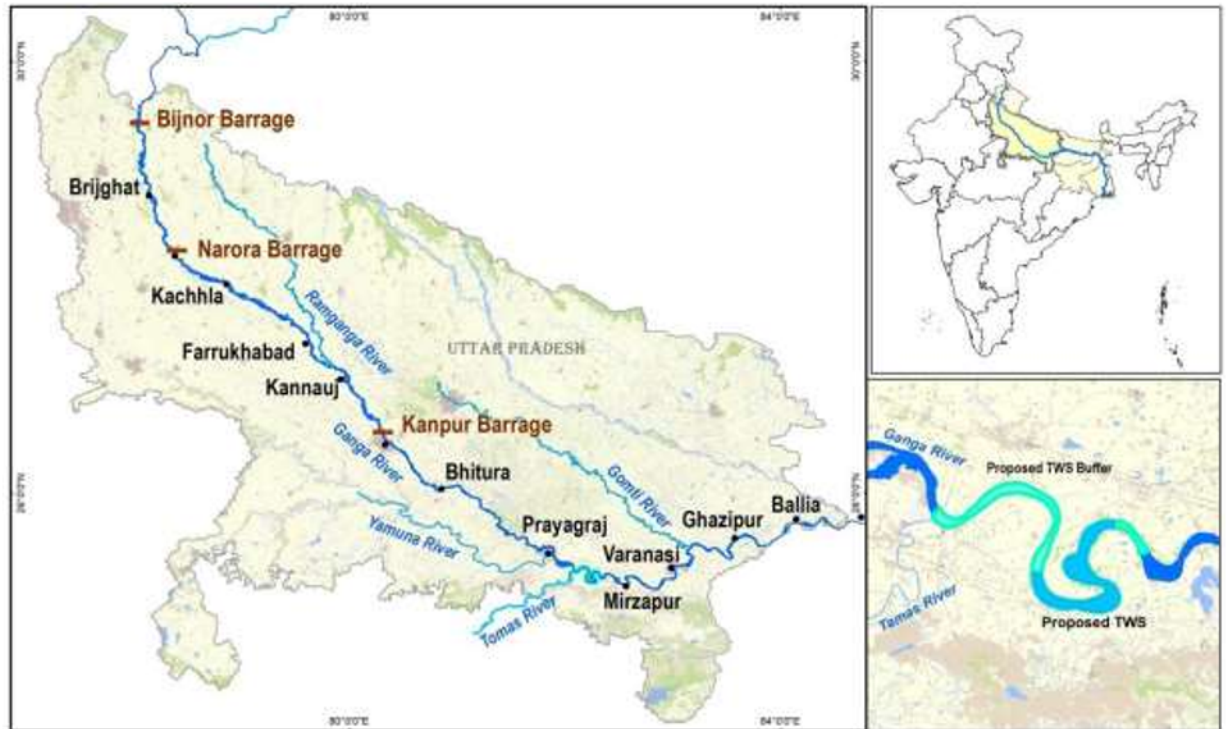


Figure 1.1 Location map of the Kachhua wildlife sanctuary area

1.2 Approach and Access

The sanctuary area is easily accessible from Prayagraj (62 km), Bhadohi (25 km) and Mirzapur (30 km). Bamrauli Airport, Allahabad and Babatpur International Airport, Varanasi are the nearest airports. The nearest railway station is Meja Road (MJA) under North Central Railway division. The area is connected with nearest towns by National Highway 35 (NH 35).

1.3 Statement of Significance

The Ganga River is considered one of the most sacred river in the world and is a repository of the India's natural and wildlife heritage. The sanctuary falls within the Upper Gangetic Plain biogeographic province (7A) and the habitat mosaic of fertile alluvial floodplain (Rodgers and Pawar, 1988). Its meanders, deep water pool and sand bars support a unique assemblage of flora and fauna. Owing to its high biodiversity values and ecosystem services that it provides, the Ganga River is declared the National River of India in the year 2008. The river channel and surrounding upland provides several ecosystem services to the local communities such as water for agriculture, drinking and other domestic purposes, provision of fish, fodder and other biomass along with, cultural, religious and aesthetic values.

1.3.1 Global significance

The Ganga River is among the largest rivers in Asia with unique geo-morphology and assemblage of diverse flora and fauna. It has been a cradle of human civilization since time immemorial (Trivedi, 2010; Kumar, 2017a). It flows through the most fertile and populated regions during its course. The river is intricately connected with a network of tributaries and the floodplain wetlands and provides breeding grounds and shelter for many aquatic species. The KWS falls within the middle Ganga Stretch which is biologically very productive due to the presence of higher concentration of nutrients, warm water and meandering river, flood plains and reduced flow velocities. The stretch harbours wide array of biota including 355 species of phytoplankton, 114 species of periphyton, 58 species of zooplankton, 51 families of Insects, 8 families of Molluscs, assorted group of Annelids as zoobenthos and 126 species of fishes (EMP & Basin, 2012). Middle stretch embodies terrestrial species like chital (*Axis axis*) and Sambhar (*Rusa unicorn*). Some of the noteworthy and indicator species of the middle Ganga River found in the stretch are Gangetic Dolphin (*Platanista gangetica*), gharial (*Gavialis gangeticus*), mugger (*Crocodylus palustris*) and Indian softshell turtle (*Nilssonina gangetica*).

1.3.2 National and Regional significance

Located in the densely populated area of middle Gangetic plain this area is an important repository of biodiversity. The stretch has significant conservation values as it supports a vast array of flora and fauna which forms important trophic components in ecological

pyramids. Apart from being livelihood source for millions, it regulates the climate of the surrounding area and recharges the groundwater aquifers of the area. As per Niti Aayog 2016 report, this stretch supports about 10 million (total population of Prayagraj, Bhadohi and Mirzapur districts) (Uttar Pradesh Population, 2020) people by providing different ecosystem services like fish, water and minerals and regulating services which in turn becomes source of livelihood for the people residing along its banks.

1.3.3 Local significance

The river stretch provides number of benefits to the local communities residing at its banks. It provides various ecosystem services, which are important for human wellbeing. It serves as a source of livelihood for these communities through fishing, boating, sand mining, religious and cultural activities on the banks. The river also provides water for irrigation as well as for domestic and industrial use. It enhances the water quality, regulates the local climate, recharges groundwater and contributes to a more aesthetic environment.

This stretch has importance for local people as they are dependent on it for water for drinking and irrigation, livelihood and riparian vegetation for multiple uses. The local people value this stretch for its aesthetic and religious importance. There are number of temples and ghats where people gather for Pooja and holy bath.

1.4 Biodiversity value

From water-saturated soil of the shoreline to the fertile alluvium in the surrounding upland of the river stretch, the vegetation differs from typical wetland species such as Kans (*Saccharum spontaneum*) to terrestrial shrubs such as wild indigo (*Tephrosia purpurea*). This riparian forest and the wetlands harbours terrestrial species such as chital (*Axis axis*) and Sambar (*Rusa unicolor*). The rich aquatic wildlife is represented by Gangetic Dolphin, the National Aquatic Animal, Smooth coated otter, Sarus crane (*Antigone Antigone*), Indian skimmer (*Rynchops albicollis*) gharial, mugger, and Indian softshell turtle (Sundar et.al. 2000; Sundar, 2004).

The ecological survey of the Wildlife Institute of India (WII) in the Ganga River, carried out during 2017-2019, recorded 36 species belonging to 33 genera and 17 families (WII-GACMC, 2018).

1.5 Biomass production

The river stretch has significant fish diversity, especially that of commercial importance. The riverside communities depend upon fish resources of the river for food and livelihood. Phasa (*Settipinna phasa*), rohu (*Labeo rohita*), bata (*Labeo bata*), mrigel (*Cirrihinus mrigala*), wallago (*Wallago attu*) and exotic species such as *Cyprinus carpio* contributes significantly to the income of the local communities. Apart from fishes, several species of submerged, emergent and floating vegetation are used for different purposes. The *sarpat* (*Saccharum munja*) grass, which grows on the banks of the river, is used for making temporary settlements (Huts), roofs and thatch, mats for pooja and ropes.

1.6 Recreational value

Ganga River has high recreational value in terms of boating, wildlife watching and religious activities. However, the Sanctuary area is located in a rural and lesser-known landscape, and therefore the area does not attract many tourists. The area has potential for eco-tourism, Farm tourism and wildlife-centric tourism. Mirzapur has several ghats on the river with historical importance. The Pakka Ghat here is a very beautiful ghat with magnificent sandstone structure and fine engravings. It has elaborate structure with wide stairway leading down to the waterway. Another ghat named Narghat was used as a jetty for the cargo barges earlier. Its pillars still contain old inscription and prices in English, Hindi and Persian. Boat safari can be introduced from this place to the KWS area.

1.7 Cultural value

The Ganga River is revered as mother and its water is considered sacred. Religious rites and ceremonies are performed on the banks of the river on regular basis. Famous Sitamarhi temple is located in this area. This is considered as the Samadhi sthal of Sita, wife of Ram, the God incarnated. It is believed that Sita was absorbed into the earth at this place. This place attracts lots of tourists throughout the year.

Confluence of the river Ganga, Yamuna and Saraswati at Prayagraj has high religious value. People consider this confluence or Sangam (the Triveni) as one of the holiest places according to Hindu mythology, where a dip in the water absolves all sin. The Magh mela is celebrated here annually during winter months. Maha Kumbh Mela, celebrated in every 12 years, is the largest human congregation in the world. Millions of pilgrims take holy dip during Kumbh mela, Magh mela and other important days. On the day of Deep Mahotsav or Diwali locals adorn the ghats of Ganges with beautiful diyas or lamps.

Chapter 2

Background Information and Attributes

2.1 Biogeographic zone

The Kachhua sanctuary area is a part of the Upper Gangetic plain biogeographic province (7A). This biogeographic zone is considered one of the most fertile areas in the world, and is densely populated. Due to population growth and increasing food demand most of the original vegetation has been converted into croplands.

2.2 Boundaries

The sanctuary is a 30 km stretch of the main stem Ganga River, bordered by village Kothri, Meja of Prayagraj district and Baripur Uparwar village in Bhadohi district. There are 31 villages in 500 m buffer from the sanctuary boundary (river bank) and 42 inhabited villages in the 1 km buffer area.

2.3 Altitude/Terrain type

Located in the southern part of Uttar Pradesh this area has a gentle elevation of 81 - 98m above sea level. This area represents alluvial as well as hard rocks. It is a part of alluvial plains with a slope from north-west to south-east. The Trans Ganga tract has poor sandy soil with stretches of sodic lands. Trans Ganga has its master slope towards east or south east, and the altitude ranges from 89.30 mamsl-93.57 masl. (District Survey report, Allahabad) Meja forest division has rocky, undulating and arid terrain.

2.4 Geology, rock and soil

The sanctuary consists of piedmont, craton margin and valley interfluvial geomorphic features; a partly confined floodplain; and braided and sinuous channels (Sinha et al., 2017). The sanctuary area falls in the Mid plain (Prayagraj), Eastern plain (Sant Ravidas Nagar and Bindhyani (Mirzapur) agro-climatic zones of Uttar Pradesh. The most common soil type is the alluvial soil which covers 52.44% of the area, range from sandy to clayey loam with very high erodibility. Mixed red and black or red-to-

yellow are other soil types. The alluvial soil is characterized by neutral to slightly alkaline pH and medium organic content.

2.5 Catchment characteristics

The catchment of the Sanctuary is alluvial plain of middle part of the Gangetic alluvial fan. The elevation of the north bank Inferred Fan ranges from 69 – 119 m and elevation of the south bank Piedmont fan ranges from 69 – 117 m (fig.2.1). The alluvial fan gently slope (0° – 24.5°) towards the south-eastern direction which conforms to the direction of the flow of river (fig. 2.1).

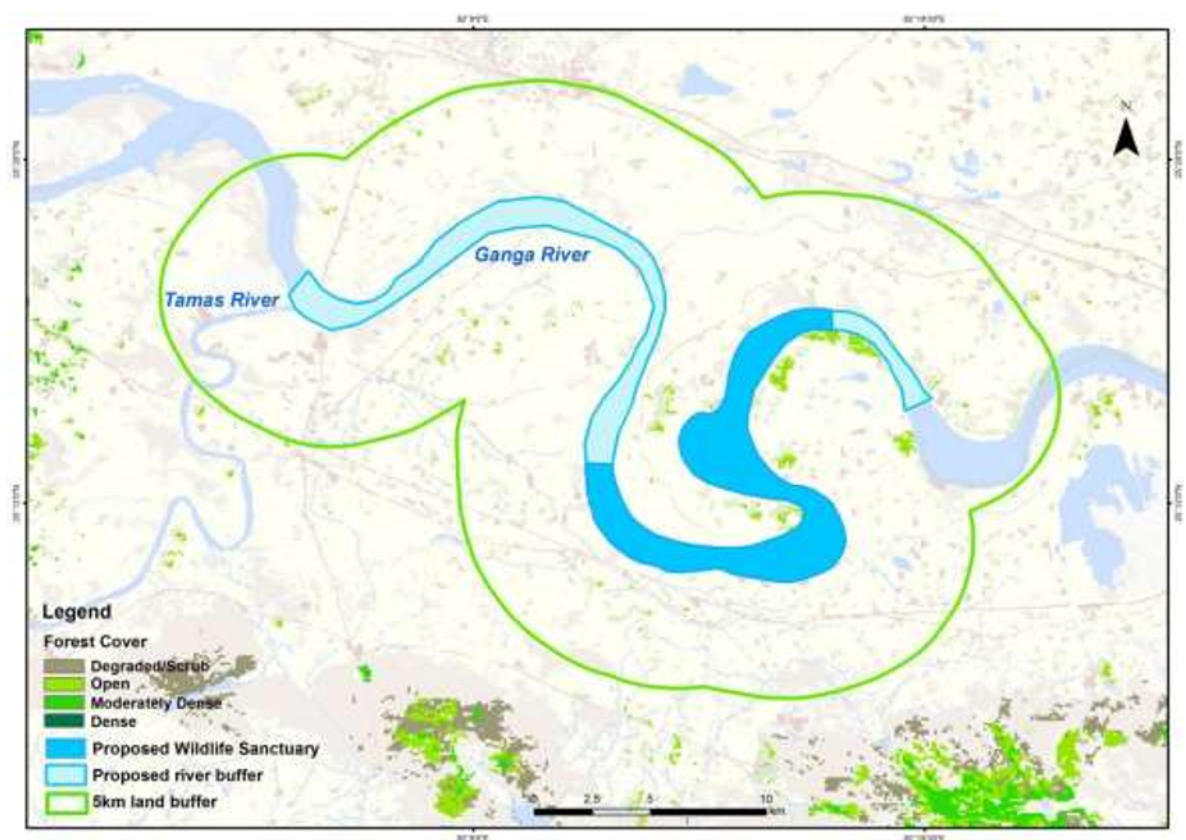


Figure 2.1 Catchment of the sanctuary area

The catchment area in a 5 km buffer zone from both sides of the high flood zone, is predominated by agriculture area (85%) mainly under paddy and wheat cultivation. Bajra, arhar, urad, moong, mustard, potato, brinjal, tomato, ladies finger and pea were among the common cultivated crops. The forest area, consisting of deciduous forest,

covered 3.9% of the catchment, followed by built-up area of 2.9% (Fig. 2.2). The effective catchment area has been reduced due to agricultural activities.

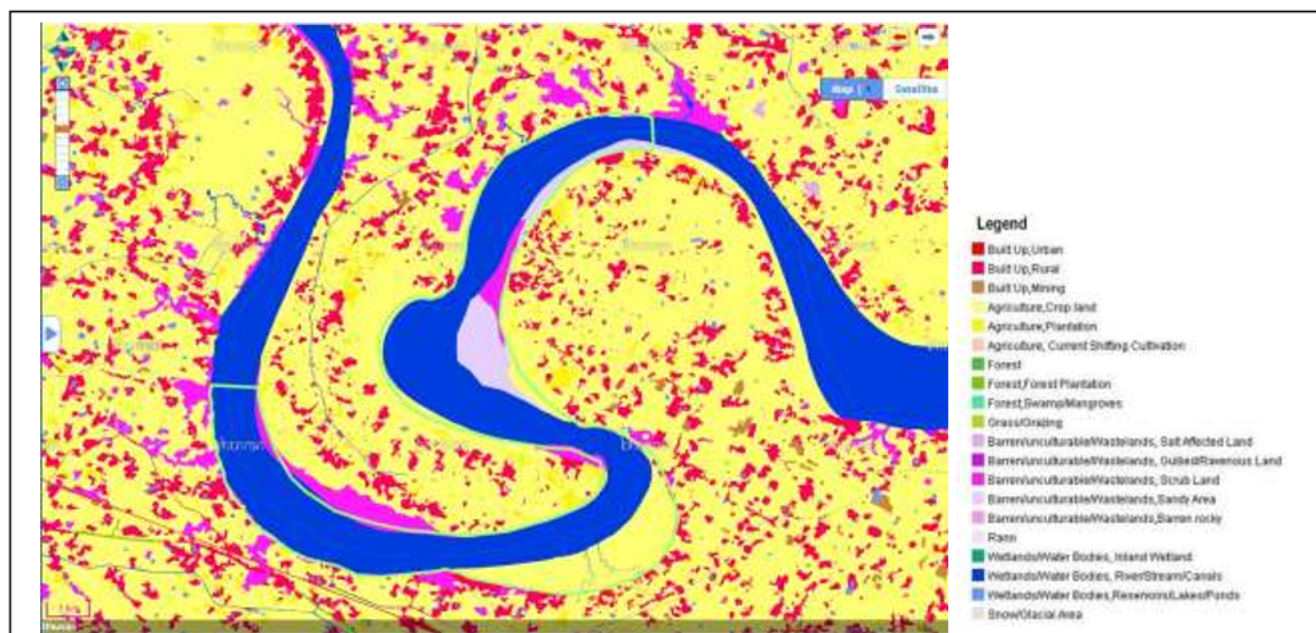


Figure 2.2 Land use pattern of the Kachhua wildlife sanctuary area

2.6 Climate, temperature and rainfall

The climate of Uttar Pradesh state is predominantly subtropical, but weather conditions change significantly with location and seasons. The average temperature in the three agro-climatic zones of the area ranges from 5.0 degree Celsius to 5.7°C in winters and in summers it goes up to 41.4°C to 45.2°C. Average annual rainfall ranges from 803 to 1134 mm in the area.

Table -2.1 Rainfall in sanctuary area in year 2018

Sl.no.	District	Rainfall (mm.) Calendar Year 2018	
		Normal	Actual
1.	Sant Ravidas Nagar (Bhadohi)	-	929
2.	Mirzapur	590	1414
3.	Prayagraj	1181	679

Source- Statistical diary, UPDES, 2018

2.7 Hydrological features

The sanctuary is a part of the mainstem Ganga River. The Sanctuary is also rejuvenated by Yamuna and Tamas rivers from the south bank at Prayagraj and Sirsa, respectively.

2.7.1 Drainage and source of water

The sanctuary has a total drainage area of 230.2 sq. km, which consists of perennial channel of the mainstem Ganga and tributaries such as Yamuna, Tamas and Belan rivers (a tributary of Tamas) (Fig. 2.3). The gentle slope of the young alluvial also allows surface runoff, overland runoff and sub-surface exchange which add to the base flow of the sanctuary.

Table: 2.2 Drainage System with description of main rivers

Name of River	Area Covered (sqkm)	% Area Covered
1. Ganga	105.3 sq km	1.9 %
2. Yamuna	63.75 sq km	1.17 %
3. Tons	55.3 sq km	1.01%
4. Belan	5.85 sq km	0.11%

Source: District Survey report for minor minerals excavation, Allahabad

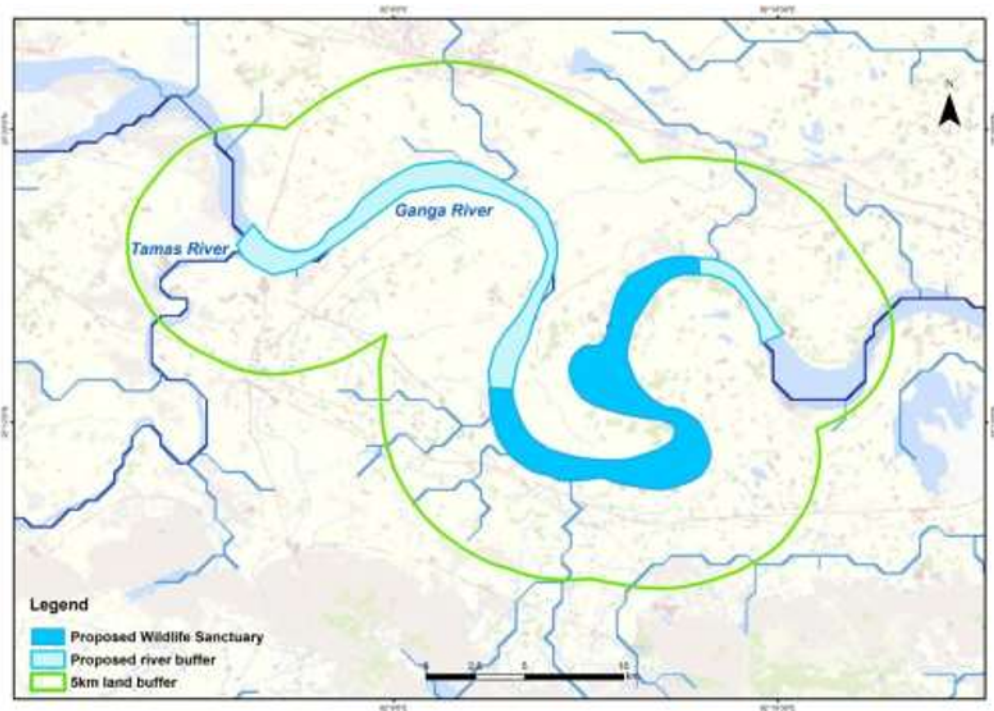


Figure 2.3 Drainage and water sources of the sanctuary area

2.7.2 Channel morphology and bathymetry

The Sanctuary exhibits fluvio-geomorphological landforms such as meandering and anastomosing patterns. Helical flow maintains the channel profile and creates depositing toe and undercut banks. The depositing ends of the banks are sandy, whereas, the scouring ends are characterized by clayey banks.

The bathymetry profile of the Sanctuary altered between pre- and post-monsoon seasons. The depth ranged from 2.0 – 10.3 m with a mean of 5.4 ± 0.7 m during pre-monsoon (March- April), whereas, the depth ranged from 1.8 – 14.0 m with a mean of 6.1 ± 0.9 m during post- monsoon season (November-December) (Fig. 2.4).

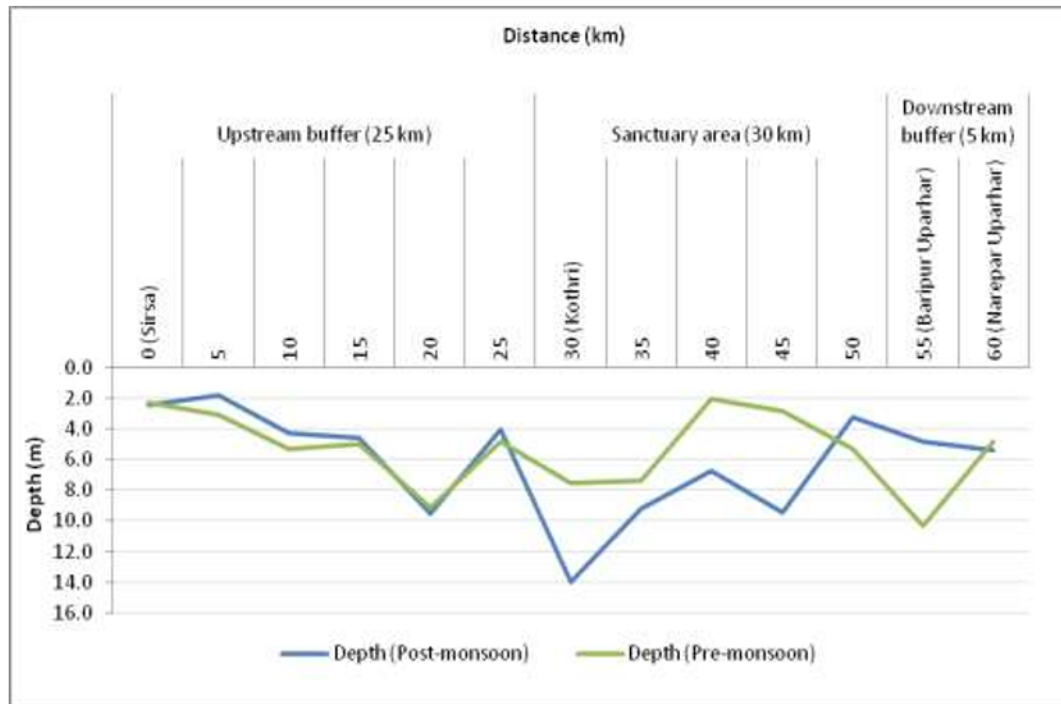


Figure 2.4 Bathymetry profile of the Sanctuary during pre- and post-monsoon seasons

2.7.3 Hydrology

The hydrology of the Sanctuary is regulated by discharges from Ganga, Yamuna and Tamas rivers. The mean volumetric flow of the main stem Ganga before confluence with Yamuna River was 194.9 ± 48.2 m³/s. The Yamuna River contributes a mean flow of 184.8 ± 43.0 m³/s and thereafter, Tamas River contribute a mean flow of 96.8 ± 41.4 m³/s to the main stem. After confluence, the mean flow of the river was 477.8 ± 132.8 m³/s before entering the Sanctuary and 485.1 ± 135.6 m³/s as it flows downstream of the Sanctuary boundary (Fig. 2.5).

During pre-monsoon (March-April), the volumetric flow of the main stem river was 347.1 m³/s before entering the Sanctuary and 349.5 m³/s when it leaves the Sanctuary. The flow ranged from 289.6 - 350.0 m³/s with a mean of 343.3 ± 4.5 m³/s. During post-monsoon (November-December), the flow of the mainstem river was 615.4 m³/s before entering the Sanctuary and 620.8 m³/s at the downstream boundary of the Sanctuary. The flow ranged from 472.4 – 622.2 m³/s with a mean flow of $6.5.8 \pm 11.2$ m³/s (Fig. 2.6).

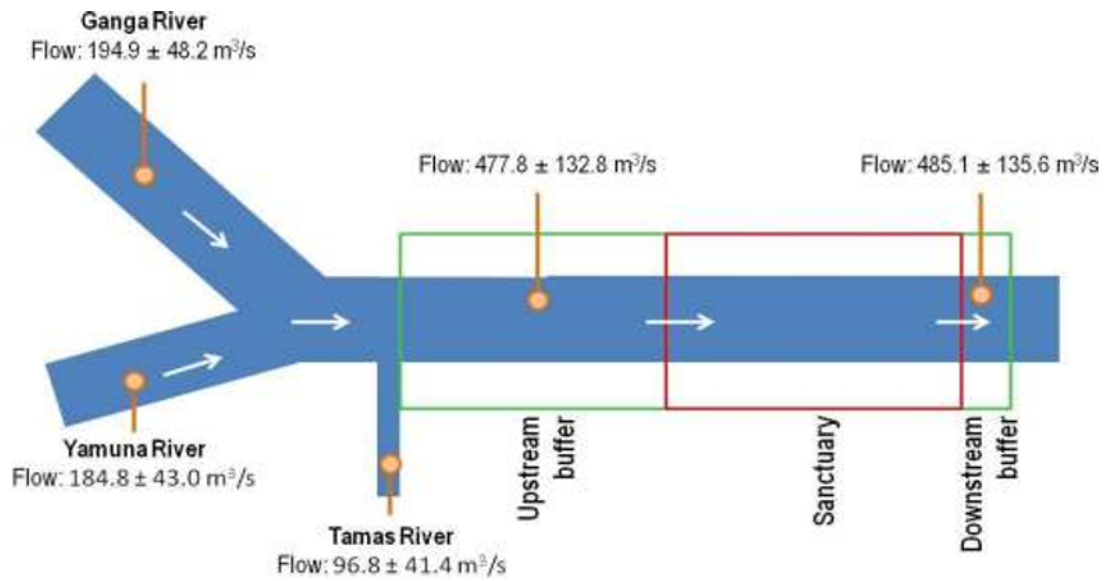


Figure 2.5 Hydrology of the Sanctuary Area

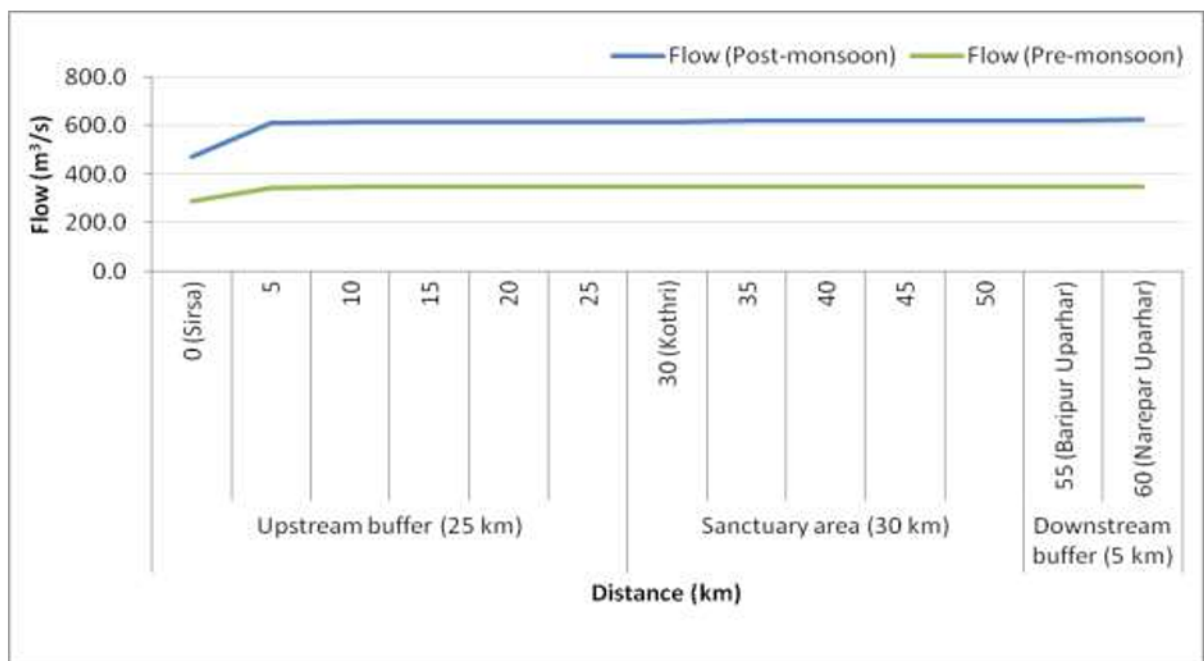


Figure 2.6 Seasonal variations in volumetric flow of the Sanctuary

2.7.4 Physio-chemical characteristics of water

The physio-chemical characteristics of the river stretch were assessed on field with the help of membrane-based digital meter. Readings were recorded at every 5 km interval. The

primary water quality assessment parameters, such as Conductivity, pH, Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Nitrate and Total Coliforms (TC), as designated in the Environment (Protection) Act, 1986, were assessed. Conductivity of water represents the presence of inorganic salts that are dissolved in the water. The mean conductivity was $573.0 \pm 7.5 \mu\text{S/cm}$ (Table 2.2). The TDS in river are the result of natural geo-genic processes and surface runoffs from the catchment area. TDS is an indicator of the source of soluble organic and inorganic materials in water. The mean TDS in the water was $320.8 \pm 7.2 \text{ mg/L}$. Salinity is an indicator of tidal influence as well as sewage inflow. The mean salinity was low and $0.2 \pm 0.002 \text{ mg/L}$. pH, which indicates the acidic/alkaline condition of water, ranged from 8.5 – 8.8 describing alkaline condition in the Sanctuary. Oxygen dissolved in water determines occurrence and distribution of species in aquatic systems. It is also a surrogate indicator of level of organic pollution in the water. The mean DO concentration in the Sanctuary was $7.7 \pm 0.3 \text{ mg/L}$. BOD represents the organic load in the water and indicates the source of organic pollutants. The mean BOD of the river stretch in the Sanctuary was $2.1 \pm 0.03 \text{ mg/L}$. The nitrate is also an indicator of organic load caused due to runoff from agricultural area and sewage inflow. The mean concentration of nitrate was $0.9 \pm 0.1 \text{ mg/L}$ in the Sanctuary. The microbial parameter TC indicates septic condition of water due to inflow of untreated sewage. The mean count of TC was $2785 \pm 398 \text{ MPN/100 mL}$ (Table 2.3).

The alkaline range of pH, higher conductivity, and high TDS was a result of silt load from fallow lands in the floodplain and dissolution of inorganic water soluble substances. Lower nitrate concentration and BOD were the result of low input of organic matter and less microbial degeneration of organic matter, which conforms to higher level of DO.

The range of pH, DO and BOD conforms to the Class B (Outdoor bathing (Organized)) of the Designated-Best-Use of Central Pollution Control Board (CPCB) (Table 2.3). However, the count of TC conforms to Class C (Drinking water source after conventional treatment and disinfection).

Table 2.3 Designated best uses of water and the quality criteria

Designated Best Use	Class	Criteria
Drinking water source without conventional treatment but after disinfection	A	Total Coliforms Organism MPN/100ml shall be 50 or less pH between 6.5 and 8.5 DO 6 mg/l or more BOD (5 days, 20°C) 2 mg/l or less
Outdoor bathing (Organized)	B	Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 DO 5 mg/l or more. BOD (5 days, 20°C) 3 mg/l or less
Drinking water source after conventional treatment and disinfection	C	Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 and 9 DO 4 mg/l or more. BOD (5 days, 20°C) 3 mg/l or less
Propagation of wildlife and Fisheries	D	pH between 6.5 and 8.5 DO 4 mg/l or more Free Ammonia (as N) BOD (5 days, 20°C) 2 mg/l or less.
Irrigation, Industrial Cooling, Controlled waste disposal	E	pH between 6.0 to 8.5 Electrical conductivity at 25°C micro mhos/cm, maximum 2250 Sodium absorption Ration Maz.26 Borax Max. 2 mg/l
	Below-E	Not meeting any of the A,B,C,D and E criteria

2.8 General ecological features including flora and fauna

A 30 km stretch of the Ganga River between Meja, Prayagraj and Baripur Uparwar, Gyanpur, Bhadohi has been notified as Kachhua sanctuary. The Ganga River in this stretch is characterized with intermittent shallow habitats with braided channels, sand bars and exposed islands. The combined flow of the Yamuna and the Ganga River has immensely influenced the depth profile of the stretch. Surveys carried out by Wildlife Institute of India between 2018 and 2020 revealed that was ranging between 1.1 m to 21.1 m with an average channel depth of 8.91 ± 7.49 m and channel width ranging between 190 m to 550 m with an average width of 365.79 ± 119.54 m.

Table 2.4: Biodiversity profile of the Kachhua Sanctuary

Biodiversity profile (species occurrence)							
Mammals	Birds	Reptiles	Amphibians	Fish	Vegetation	Average Depth	Average Width
1	16	5	2	36	36	8.91 ± 7.49	365.79 ± 119.54

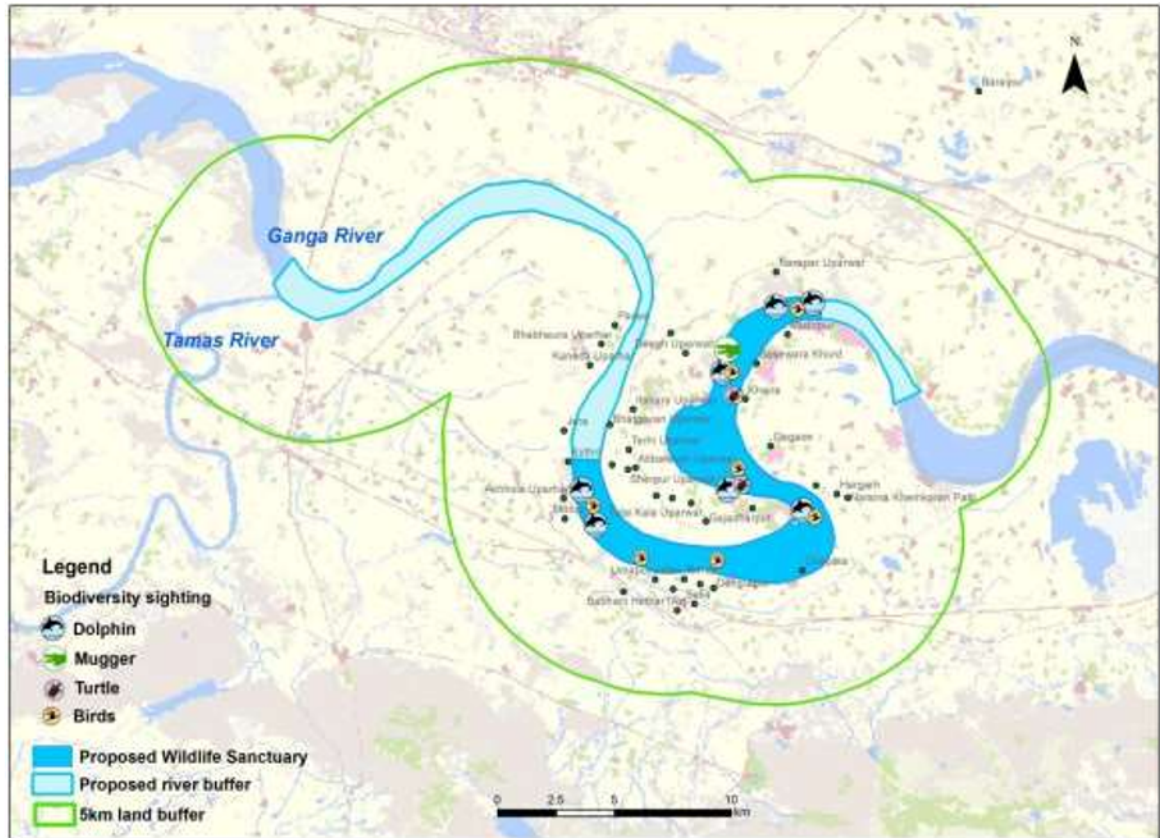


Figure 2.7 Occurrence of major aquatic species in KWS

2.8.1 Vegetation

The aquatic and riparian shrub land vegetation was represented by 36 species belonging to 33 genera and 17 families (WII-GACMC, 2018) (Fig. 1). Among 17 families, Asteraceae (7 species) was dominant followed by Poaceae (5), Solanaceae and Malvaceae (4 species each), Verbenaceae, Lamiaceae, Convolvulaceae (2 species each). 10 families were represented by single species (Fig. 2.8). Habit wise classification showed 61.11% plants were herbaceous, followed by 13.89% grasses and sedges, 11.11% aquatic, 8.33% shrubs and 2.78% of each of the reeds and climbers (Fig 2.9).

Five species belong to threatened category and listed in the IUCN Red List (Table 2.5). The *Calotropis procera* (Ait.) R.Br. *Eclipta prostrata* (L.) L., *Eclipta alba* (L.) Hassk., *Ocimum tenuiflorum* L., and *Datura wrightii* Regel have medicinal properties. Some exotic weed species were also encountered such as *Phragmites karka* (Retz.) Trin. ex Steud., *Eichhornia crassipes* (Mart.) Solms, *Saccharum spontaneum* L. The wetland and riparian vegetation

were critical as wildlife habitat, providing bank stability, and controlling soil erosion,siltation and runoffs.

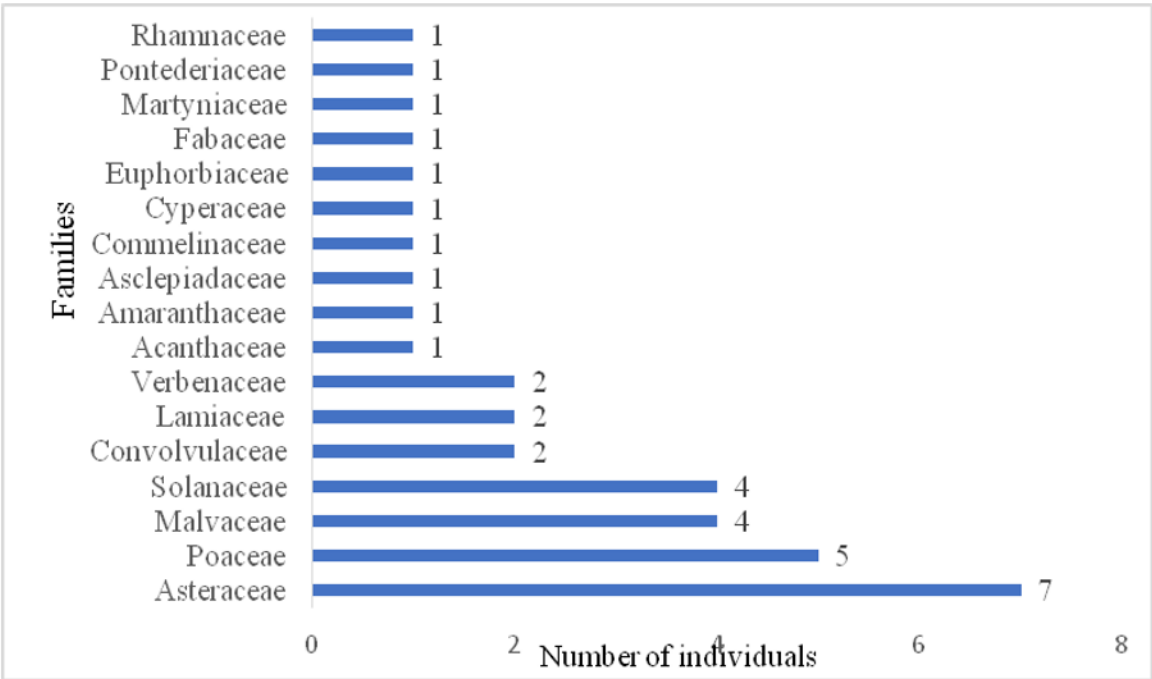


Figure 2.8 Community structures of the wetland and riparian vegetation in thesanctuary

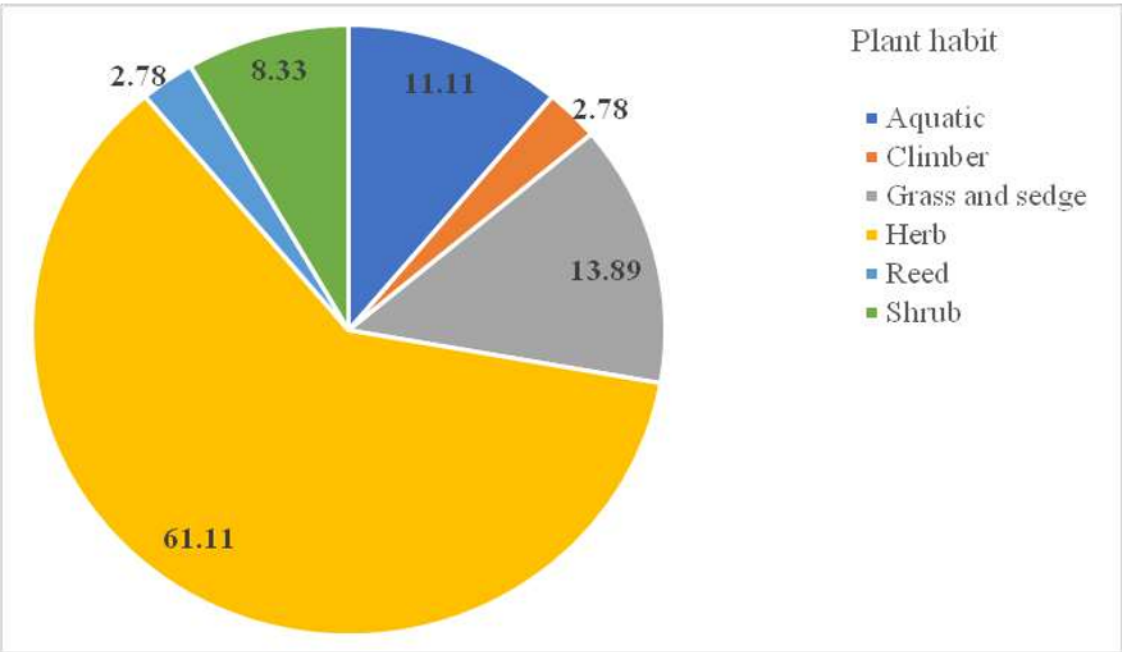


Figure 2.9 Habit wise classifications of wetland and riparian vegetation in the sanctuary

Table 2.5 Checklist of plant species in the sanctuary

Family	Species name	Habit	Common Name
Acanthaceae	<i>Rungia pectinata</i> (L.) Nees	Herb	Comb Rungia
Amaranthaceae	<i>Achyranthes aspera</i> L.	Herb	Prickly chaff flower
Asclepiadaceae	<i>Calotropis procera</i> (Ait.) R.Br.	Herb	Rubber bush
Asteraceae	<i>Eclipta prostrata</i> (L.) L.	Aquatic	Bhringraj
	<i>Launaea procumbens</i> (Roxb.) Ramayya & Rajagopal	Herb	Jungli Muli
	<i>Parthenium hysterophorus</i> L.	Herb	Gajar ghaas
	<i>Xanthium strumarium</i> L.	Herb	Chota dhatura
	<i>Taraxacum campylodes</i> G.E.Haglund	Herb	Dudhi
	<i>Eclipta alba</i> (L.) Hassk.	Aquatic	False daisy
	<i>Grangea maderaspatana</i> (L.) Poir.	Herb	Madras Carpet
Commelinaceae	<i>Cyanotis axillaris</i> (L.) D.Don ex Sweet	Aquatic	Kana
Convolvulaceae	<i>Ipomoea carnea</i> Jacq.	Shrub	Besharam/Be haya
	<i>Operculina turpethum</i> (L.) Silva Manso	Climber	Transparent Wood Rose
Cyperaceae	<i>Cyperus</i> sp.	Grass and sedge	
Euphorbiaceae	<i>Croton bonplandianus</i> Baill.	Herb	Ban tulsi
Fabaceae	<i>Tephrosia purpurea</i> (L.) Pers.	Herb	Wild indigo
Lamiaceae	<i>Ocimum tenuiflorum</i> L.	Herb	Tulsi
	<i>Ocimum americanum</i> L.	Herb	Hoary Basil

Malvaceae	<i>Sida cordifolia</i> L.	Herb	Heart-leaf sida
	<i>Sida acuta</i> Burm.f.	Shrub	Common wireweed
	<i>Sida rhombifolia</i> L.	Herb	Sahadeva
	<i>Urena lobata</i> L.	Herb	Caesarweed
Martyniaceae	<i>Martynia annua</i> L.	Herb	Devils claws
Poaceae	<i>Cynodon dactylon</i> (L.) Pers.	Grass and sedge	Doob
	<i>Saccharum spontaneum</i> L.	Grass and sedge	Kans
	<i>Phragmites karka</i> (Retz.) Trin. ex Steud.	Reed	Narkul
	<i>Eleusine indica</i> (L.) Gaertn.	Grass and sedge	Malankuri
	<i>Eragrostis cilianensis</i> (All.) Janch.	Grass and sedge	Candy Grass
Pontederiaceae	<i>Eichhornia crassipes</i> (Mart.) Solms	Aquatic	Jal kumbhi
Rhamnaceae	<i>Ziziphus nummularia</i> (Burm.f.) Wight & Arn.	Shrub	Jhar beri
Solanaceae	<i>Nicotiana plumbaginifolia</i> Viv.	Herb	Jungli tambaku
	<i>Physalis minima</i> L.	Herb	Rasbhari
	<i>Datura wrightii</i> Regel	Herb	Sacred Datura
	<i>Solanum surattense</i> Burm. f.	Herb	Thorny Nightshade
Verbenaceae	<i>Lippia alba</i> (Mill.) N.E.Br. ex Britton & P.Wilson	Herb	Bushy Lippia
	<i>Phyla nodiflora</i> (L.) Greene	Herb	Jal buti

2.8.2 Fauna

The strategic location of the Sanctuary bordering northern most limits of the Vindyanchal range and Gangetic plain with habitat mosaics offers unique faunal assemblages, especially with regards to conservation dependent species. The proposed sanctuary also serves as an ideal breeding and wintering ground for numerous resident and migratory birds. Biodiversity surveys conducted in the sanctuary area revealed a total of 36 fish (13 families), 2 amphibian (2 families) 5 reptile (5 families), 60 bird (30 families) and 1 mammal (1 family) species, including one Endangered, 4 Vulnerable and 5 Near Threatened species, as categorised by the IUCN Red List of Threatened Species. This demonstrates an inventory of species assemblages for the Sanctuary and provides immense scope to undertake conservation action in this area.

2.8.2.1 Ichthyofauna

36 species of fish belonging to 13 families were recorded from the Kachhua sanctuary area (Table 2.6). Major fish Species found in this area are *Notopterus notopterus*, *Settipinna brevifilis*, *Settipinna phasa*, *Labeo rohita*, *Labeo bata*, *Gibelion catla*, *Cirrihinus mrigala*, *Cirrhinus reba*, *Puntius sophore*, *Puntius ticto*, *Pethia conchonius*, *Sperata aor*, *Sperata Seenghala*, *Wallago attu*, *Clupisoma garua*, *Channa punctatus*, *Rita rita*, *Macrongothrus pancalus*, *Mastacembalus armatus*.

Table 2.6: Fish diversity in the Kachhua Sanctuary

Family	Common Name	Scientific Name	IUCN Status
Bagridae	Long-whiskered catfish	<i>Sperata aor</i>	LC
	Giant river-catfish	<i>Sperata seenghala</i>	LC
	Gangetic mystus	<i>Mystus cavasius</i>	LC
	Rita	<i>Rita rita</i>	LC
Belonidae	Freshwater garfish	<i>Xenentodon cancila</i>	LC
Channidae	Spotted snakehead	<i>Channa punctata</i>	LC
Cichlidae	Tilapia	<i>Oreochromis niloticus</i>	NL
Clupeidae	Indian river shad	<i>Gudusia chapra</i>	LC

	Ganges river gizzard shad	<i>Gonialosa manmina</i>	LC
Cyprinidae	Rohu	<i>Labeo rohita</i>	LC
	Orange-fin labeo	<i>Labeo calbasu</i>	LC
	Minor carp	<i>Labeo bata</i>	LC
	Catla	<i>Gibelion catla</i>	LC
	Mrigal	<i>Cirrhinus mrigala</i>	LC
	Reba carp	<i>Cirrhinus reba</i>	LC
	Common carp	<i>Cyprinus carpio</i>	NL
	Silver carp	<i>Hypothalmichthys molitrix</i>	NT
	Bighead carp	<i>Hypothalmichthys nobilis</i>	DD
	Grass carp	<i>Ctenopharyngodon Idella</i>	NL
	Olive barb	<i>Systomus sarana</i>	LC
	Spotfin swamp barb	<i>Puntius sophore</i>	LC
	Chola barb	<i>Puntius Chola</i>	LC
	Ticto barb	<i>Pethia ticto</i>	LC
	Rosy barb	<i>Pethia conchonius</i>	LC
	Gila khani	<i>Osteobrama cotio</i>	LC
	Large razorbelly minnow	<i>Salmophasia bacaila</i>	LC
	Molacarplet	<i>Amblypharyngodon mola</i>	LC
	Gangetic latia	<i>Crossocheilus latius</i>	LC
Engraulidae	Short-hairfin anchovy	<i>Settipinna brevifilis</i>	NL
	Gangetic anchovy	<i>Settipinna phasa</i>	LC
Gobiidae	Bareye Goby	<i>Glossoglobius giuris</i>	LC
Mastacembelidae	Barred spiny eel	<i>Macrognathus pancalus</i>	LC
Mugilidae	Yellowtail mullet	<i>Sicamugil cascacia</i>	LC
Notopteridae	Bronze featherback	<i>Notopterus notopterus</i>	LC
Schilbeidae	Garua bachcha	<i>Clupisoma garua</i>	LC
Siluridae	Parhin	<i>Wallago attu</i>	NT

Labeo rohita, *Labeo calbasu*, *Labeo bata*, *Cirrhinus mrigala*, *Gibelion catla*, *Sperata seenghala*, *Clupisoma garua*, *Channa punctatus*, *Salmophasia bacaila*, *Settipinna phasa*, *Rita rita*, *Wallago attu*, are the species caught for commercial use.

Hypothalmichthys molitrix and *Wallago attu* are listed as ‘Near Threatened’ category in IUCN Red List book. *Cyprinus carpio* is an exotic species found in the area but it is used for consumption by the local community.

2.8.2.2 Birds

Sixty species of birds belonging to 30 families were recorded from the Kachhua Sanctuary (**Table 2.7 & 2.8**). The frequently occurred species recorded in the area are Asian Openbill, Barn Swallow, Indian Grey Hornbill, Black Drongo, Jungle Babbler, Indian Peafowl, Grey Heron, Indian Pond Heron, Little Cormorant, Little Egret, Pied Kingfisher, Red-naped Ibis, Ruddy Shelduck, and White-breasted Kingfisher.

2.8.2.2.1 Terrestrial birds

Thirty species of terrestrial bird belonging to 19 families were recorded during field observations in the Sanctuary area. Columbidae was the dominant family with maximum number of species (4), followed by Muscicapidae (3), 2 species represented each by Corvidae, Cuculidae, Estrildidae, Leiotrichidae, Phasianidae and Sturnidae Family. Accipitridae along with Bucerotidae, Charadriidae, Cisticolidae, Dicruridae, Meropidae, Motacillidae, Passeridae, Phylloscopidae, Psittacidae and Pycnonotidae comprised of one species each (**Table 2.8**).

Table 2.7: Occurrence of terrestrial birds in the Kachhua Sanctuary

Family	Common Name	Scientific Name	IUCN Status
Accipitridae	Black winged Kite	<i>Elanus caeruleus</i>	LC
Bucerotidae	Indian Grey Hornbill	<i>Ocyrceros birostris</i>	LC
Charadriidae	Grey-headed Lapwing	<i>Vanellus cinereus</i>	LC
Cisticolidae	Plain Prinia	<i>Prinia inornata</i>	LC
Columbidae	Eurasian Collared-Dove	<i>Streptopelia decaocto</i>	LC

	Laughing Dove	<i>Spilopelia senegalensis</i>	LC
	Rock Dove	<i>Columba livia</i>	LC
	Yellow-footed Green-pigeon	<i>Treron phoenicopterus</i>	LC
Corvidae	Indian jungle Crow	<i>Corvus culminatus</i>	LC
	Rufous Treepie	<i>Dendrocitta vagabunda</i>	LC
Cuculidae	Asian Koel	<i>Eudynamys scolopaceus</i>	LC
	Greater Coucal	<i>Centropus sinensis</i>	LC
Dicruridae	Black Drongo	<i>Dicrurus macrocercus</i>	LC
Estrildidae	Indian Silverbill	<i>Euodice malabarica</i>	LC
	Scaly-breasted Munia	<i>Lonchura punctulata</i>	LC
Leiotrichidae	Jungle Babbler	<i>Turdoides striata</i>	LC
	Large Grey Babbler	<i>Argya malcolmi</i>	LC
Meropidae	Asian Green Bee-eater	<i>Merops orientalis</i>	LC
Motacillidae	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	LC
Muscicapidae	Grey Bushchat	<i>Saxicola ferreus</i>	LC
	Indian Robin	<i>Saxicoloides fulicatus</i>	LC
	Oriental Magpie-robin	<i>Copsychus saularis</i>	LC
Passeridae	House Sparrow	<i>Passer domesticus</i>	LC
Phasianidae	Grey Francolin	<i>Francolinus pondicerianus</i>	LC
	Indian Peafowl	<i>Pavo cristatus</i>	LC
Phylloscopidae	Hume's Leaf-warbler	<i>Phylloscopus humei</i>	LC
Psittacidae	Rose-ringed Parakeet	<i>Psittacula krameri</i>	LC
Pycnonotidae	Red-vented Bulbul	<i>Pycnonotus cafer</i>	LC
Sturnidae	Common Myna	<i>Acridotheres tristis</i>	LC
	Pied Myna	<i>Gracupica contra</i>	NE

2.8.2.2.2 Water birds

During the survey of Kachhua sanctuary, 30 species of birds belonging to 11 families were recorded. Ardeidae was the dominant family with maximum percentage of species (23%), followed by Laridae (13%), 10% species represented each by Anatidae, Charadriidae and

Ciconiidae. Family Alcedinidae along with Phalacrocoracidae, Podicipedidae and Recurvirostridae comprises 7% of species each. Hirundinidae and Threskiornithidae family were represented only 3% of recorded species (Fig. 2.10). An analysis of the residential status of recorded bird species revealed that most species were resident with local movements (16 species,) followed by resident and winter migrant (5 species), resident (4 species), winter migrant (2 species) and 1 species each represented by resident with altitudinal movements, winter migrant as well as passage migrant as well as resident with winter influx as well as passage movement (Fig. 2.11).

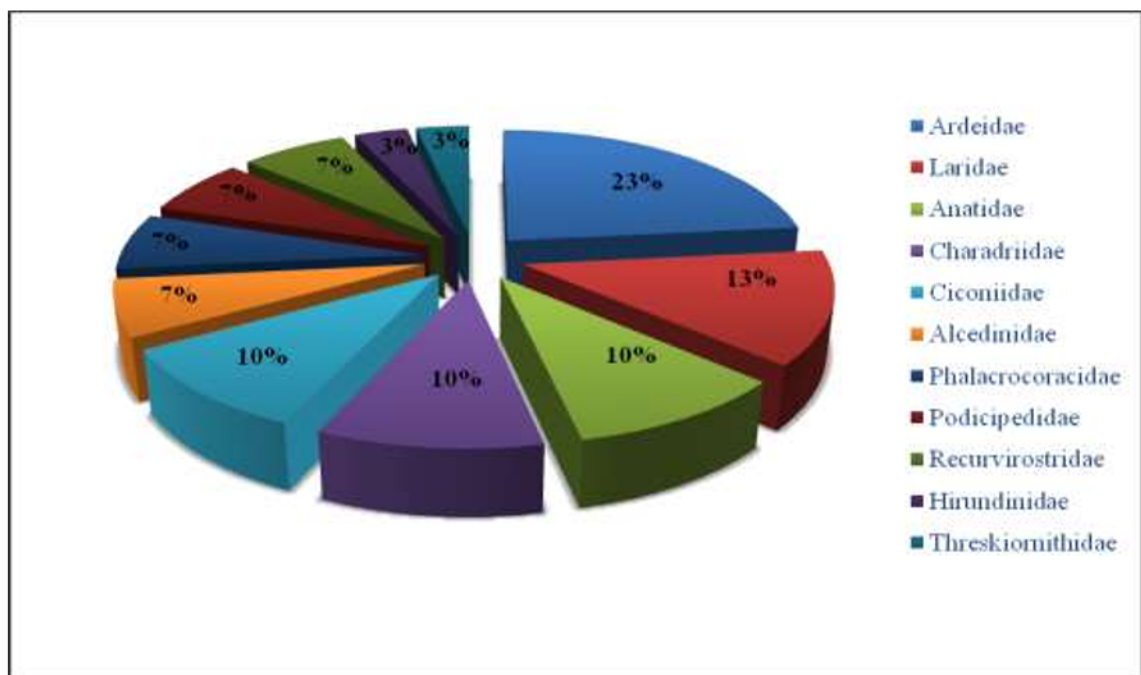


Figure 2.10. Percentage of waterbird species observed in various families in the Kachhua Sanctuary

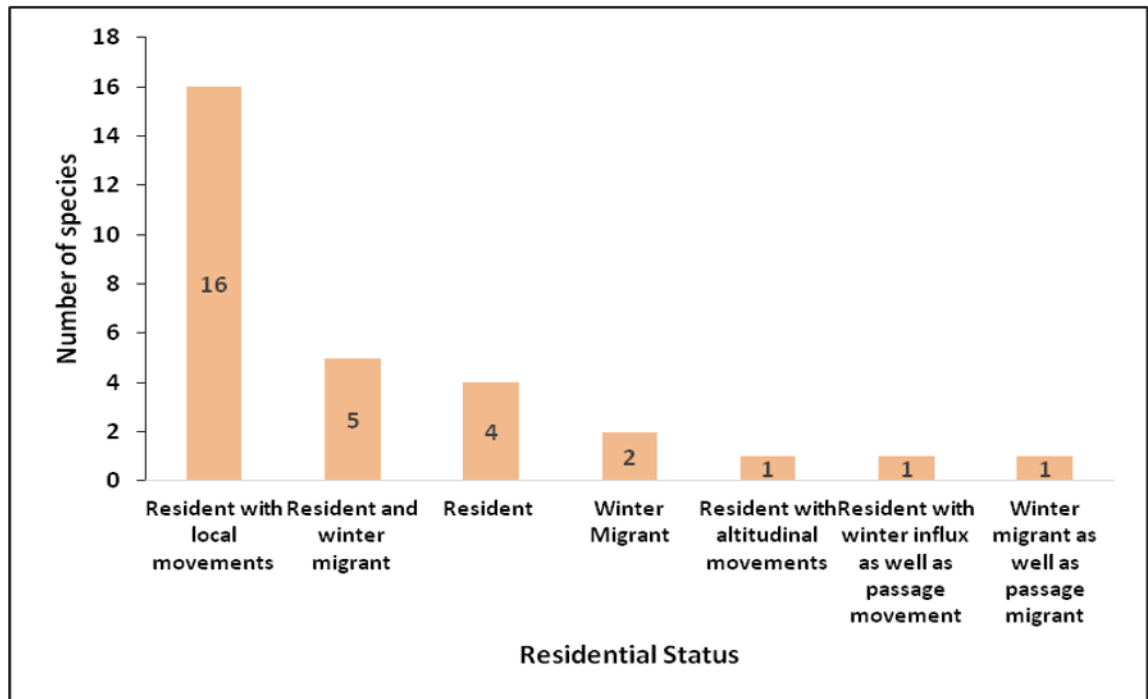


Figure 2.11 Number of resident and migratory waterbirds species of the Kachhua Sanctuary

Table 2.8: Relative abundance of water birds in the Kachhua Sanctuary

Species	Scientific Name	IUCN Status	IWPA Status	Pre monsoon_RA	Post monsoon_RA	Overall RA
Asian Openbill	<i>Anastomus oscitans</i>	LC	Schedule IV	0.2930	0.0172	0.3102
Asian Wollyneck	<i>Cicinia episcopus</i>	VU	Schedule IV	0.0009	0.0000	0.0009
Barn Swallow	<i>Hirundo rustica</i>	LC	Not listed	0.0000	0.4135	0.4135
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	LC	Schedule IV	0.0141	0.0000	0.0141
Black-headed Gull	<i>Larus ridibundus</i>	LC	Schedule IV	0.0000	0.0607	0.0607
Black-winged Stilt	<i>Himantopus himantopus</i>	LC	Schedule IV	0.0000	0.0275	0.0275
Cattle Egret	<i>Bubulcus ibis</i>	LC	Schedule IV	0.0724	0.0000	0.0724
Gadwall	<i>Mareca strepera</i>	LC	Schedule IV	0.0000	0.0080	0.0080
Great Crested Grebe	<i>Podiceps cristatus</i>	LC	Schedule IV	0.0000	0.0057	0.0057
Great White Egret	<i>Ardea alba</i>	LC	Schedule IV	0.0106	0.0092	0.0198
Grey Heron	<i>Ardea cinerea</i>	LC	Schedule IV	0.0097	0.0424	0.0521
Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	LC	Schedule IV	0.2860	0.0000	0.2860
Indian Pond Heron	<i>Ardeola grayii</i>	LC	Schedule IV	0.0124	0.0183	0.0307
Indian Skimmer	<i>Rynchops albicollis</i>	VU	Not listed	0.0018	0.0000	0.0018
Intermediate Egret	<i>Ardea intermedia</i>	LC	Schedule IV	0.0035	0.0000	0.0035
Lesser Whistling-Duck	<i>Dendrocygna javanica</i>	LC	Schedule IV	0.0530	0.0000	0.0530

Little Cormorant	<i>Microcarbo niger</i>	LC	Schedule IV	0.0177	0.2119	0.2296
Little Egret	<i>Egretta garzetta</i>	LC	Schedule IV	0.0971	0.1546	0.2517
Little Grebe	<i>Tachybaptus ruficollis</i>	LC	Schedule IV	0.0371	0.0000	0.0371
Little Ringed Plover	<i>Charadrius dubius</i>	LC	Schedule IV	0.0035	0.0000	0.0035
Little Tern	<i>Sternula albifrons</i>	LC	Schedule IV	0.0159	0.0000	0.0159
Painted Stork	<i>Mycteria leucocephala</i>	NT	Schedule IV	0.0053	0.0000	0.0053
Pallas's Gull	<i>Larus ichthyaetus</i>	LC	Schedule IV	0.0000	0.0034	0.0034
Pied Avocet	<i>Recurvirostra avosetta</i>	LC	Schedule IV	0.0009	0.0000	0.0009
Pied Kingfisher	<i>Ceryle rudis</i>	LC	Schedule IV	0.0026	0.0046	0.0072
Red-naped Ibis	<i>Pseudibis papillosa</i>	LC	Schedule IV	0.0132	0.0023	0.0155
Red-wattled Lapwing	<i>Vanellus indicus</i>	LC	Schedule IV	0.0062	0.0000	0.0062
River Lapwing	<i>Vanellus duvaucelii</i>	NT	Schedule IV	0.0000	0.0000	0.0000
Ruddy Shelduck	<i>Tadorna ferruginea</i>	LC	Schedule IV	0.0415	0.0137	0.0552
White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	LC	Schedule IV	0.0018	0.0069	0.0086

Note (RA= Relative abundance)

IUCN Status: NE- Not Evaluated; LC - Least Concern; NT - Near Threatened; VU - Vulnerable; EN - Endangered; CR -Critically Endangered.

2.8.2.2.3 Feeding guilds of the birds

All the recorded waterbird species were grouped broadly under six feeding guilds, types of feeding guilds were identified in the proposed Kachhua Sanctuary. Out of all recorded species (47%) represents carnivore guild followed by (20%) piscivore/insectivore, (13%) piscivore/carnivore, herbivore and insectivore represent (7%) of species each, whereas 3 % of species represented by omnivore and piscivore guilds respectively (**Fig. 2.12**).

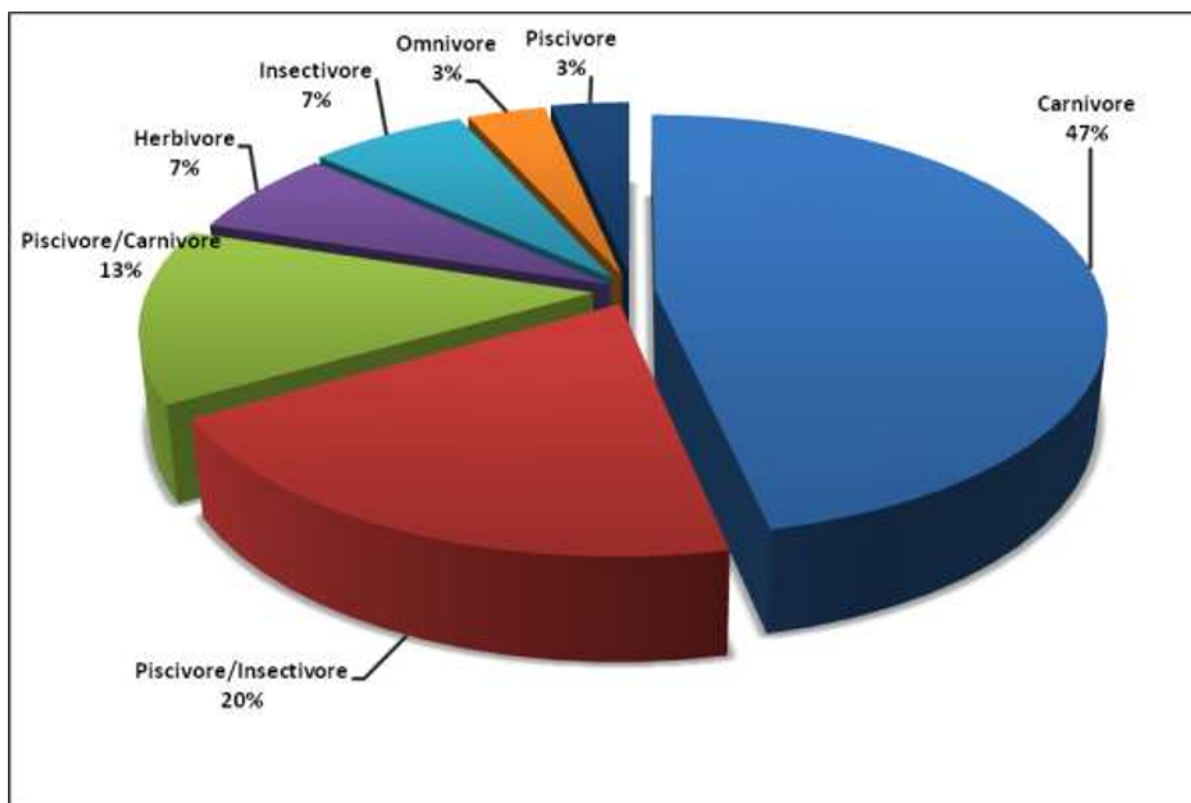


Figure 2.12 Feeding guilds of waterbird recorded in the Kachhua Sanctuary

2.8.3 Mammals, reptiles and other obligate species

The sanctuary harbours some of the key conservation dependent higher vertebrate fauna such as Gangetic Dolphin (*Platanista gangetica*), Mugger crocodile (*Crocodylus palustris*), Indian Ganges softshell turtle (*Nilssonina gangetica*) and Brown Roofed turtle (*Pangshura smithii*). Besides the stretch also provides shelter to few snakes and amphibian species such as Indian rat snake (*Ptyas mucosa*), Indian Rock python (*Python molurus*), Common Asian Toad (*Duttaphrynus melanostictus*) and Skittering Frog (*Euphluctis cyanophlyctis*). A total of 106 sightings of Gangetic dolphin (*Platanista gangetica*) were obtained with a mean encounter rate

of 1.77 sightings/ Km. Besides, 5 species of reptiles including one mugger (*Crocodylus palustris*), 2 species of turtles (*Pangshura spp* and *Nilssonia gangetica*), 2 species of snakes (*Ptyas mucosa* and *Python molurus*), and 2 species of amphibians (*Duttaphrynus melanostictus* and *Euphluctis cyanophlyctis*)) were recorded in the Sanctuary area (Table 2.9).

Table 2.9: Diversity of higher vertebrate fauna in the Kachhua Sanctuary

Sl No	Group	Family	Scientific Name	Common Name	IUCN Status	IWPA Status
1	Mammals	Platanistidae	<i>Platanista gangetica</i>	Gangetic Dolphin	EN	Schedule I
2	Reptiles	Crocodylidae	<i>Crocodylus palustris</i>	Mugger	VU	Schedule I
3		Geoemydidae	<i>Pangshura smithii</i>	Brown Roofed Turtle	NT	Not listed
4		Trionychidae	<i>Nilssonia gangetica</i>	Ganges softshell turtle	VU	Schedule I
5		Colubridae	<i>Ptyas mucosa</i>	Indian Rat snake	NE	Schedule II
6		Pythonidae	<i>Python molurus</i>	Indian Rock Python	NE	Schedule I
7	Amphibians	Bufo	<i>Duttaphrynus melanostictus</i>	Common Asian Toad	LC	Not listed
8		Dicroglossidae	<i>Euphluctis cyanophlyctis</i>	Skittering Frog	LC	Schedule IV

2.9 Species and communities of conservation importance

The only aquatic mammal inhabits the sanctuary is Gangetic River dolphin (*Platanista gangetica*). It is one of the world's most endangered dolphins and due to continuous population decline and habitat destruction the species is listed as 'Endangered' in the IUCN Red list status. Similarly, the population of Mugger crocodile (*Crocodylus palustris*) is on a declining trend due to habitat fragmentation and over exploitation of riverine resources and is being listed under 'Vulnerable' category of IUCN red list status. Ganges softshell turtle (*Nilssonia gangetica*) is listed as 'Vulnerable' in the IUCN Red list status and often regarded as water purifiers and biomass transformers as the species scavenge upon dead organic matters and contribute in maintaining health of the ecosystem. All the species are habitat indicators and have been accorded highest protection status in India by including in Schedule-I of the Wildlife (Protection) Act, 1972. These species for their survival requires micro-habitats such as deep water pools,

shallow riffle areas, sand peninsulas, muddy banks, exposed sand banks (steep and flat sand banks), rocky banks, steep river-side cliffs, xerophytes vegetation on the banks. These conservation dependent species are known to occur in areas with maximum fish diversity and minimum human interventions thereby indicating the quality of the habitat.

2.10 Major functions and values

2.10.1 Direct use value

The direct benefit from the Kachhua Sanctuary area is the income generated from the sale of fish, ferryboat for carrying goods and people and other resources extracted from the river bank including water for irrigation. Thus, the Ganga stretch under the sanctuary area serves as a source of livelihood for the local communities which are dependent on it. Other than provisioning services in terms of fish and other resources, it also provides cultural, educational, recreational, and spiritual services (Annexure -2).

2.10.2 Indirect use value

The river stretch provides significant ecosystem services in terms of regulating services such as flood control, groundwater recharge, maintaining population and habitat, regulation of micro climate, soil fertility and soil formation, water purification and waste management, and ground water recharge.

The river is the only source of water for irrigation, industrial, domestic and other uses. There is a need to economically evaluate the ecosystem services provided by such a dynamic and fragile ecosystem that is exposed to tremendous anthropogenic pressure.

Chapter 3

History of Management and Present Practices

3.1 General site status

In India the Wildlife (Protection) Act, 1972 is implemented to conserve the wildlife including birds and plants. Under the act State Governments can notify an area of ecological, faunal, floral and geomorphologic, natural and zoological significance as a sanctuary in order to protect, propagate and develop wildlife and its environment. After declaration of an area as sanctuary, outside the protected area, provision of section 27 to 33 A of the act come into effect. The state government has to make alternate arrangements to ensure availability of fuel, fodder and other produces to affected persons, till the affected persons are finally settled under section 19 to 24 of the act. The government will take necessary steps to ensure that the wild animals and sanctuary area are secure and preserved.

The National Environment policy, 2006, comprises, among others, formulation of a regulatory framework, linkage with poverty alleviation, and programmes for employment generation (MoEFCC 2007). The NEP states that while conservation of environmental resources is necessary to secure livelihoods and human wellbeing, the most secure basis for conservation is to ensure that people dependent on a particular resource obtain better livelihood from the conservation of the resource rather than its degradation. Keeping in view the religious and economic importance of Ganga River, it is declared as National River by the Prime Minister of India.

3.2 Legal status and land tenure in the surrounding area

India has the strictest legislations to protect wildlife and their habitats. The wildlife (Protection) Act, 1972 provides a legal framework for wildlife protection. This provides protection to all the mammal, bird, amphibian, reptile, fish, crustacean, insects, or coelenterates listed in four Schedules of the act. Beside this The Environment (Protection) Act (1986), The Biological Diversity Act (2002), and most recently the National Wildlife Action Plan (2002-2016) which has special focus on strengthening and enhancing the protected area network, conservation of endangered wildlife and their habitats, and controlling trade of wildlife products and research,

education, and training. These acts form the basis of wildlife conservation in India. Besides, India is also a signatory to the Ramsar Convention, Convention on Migratory Species (CMS) and Convention on Biological Diversity (CBD), which makes it mandatory for India to safeguard its natural resources such as wetlands and its obligate species.

An area of 30 km. of Ganga river bordered by both banks of the Ganga River falling in Prayagraj, Bhadohi and Mirzapur districts of Uttar Pradesh state is declared as Kachhua Wildlife Sanctuary vide notification no. 346/81-4-2020-823/2008 TC dated 17/03/2020 under sub section

(1) of the section 18 of Wildlife (Protection) Act of 1972 by the Paryawaran, Van Evam Jalvayu Parivartan Anubhag of Uttar Pradesh Government. Geographically this area lies between 25.273769 Latitude and 82.87486 longitude East (Downstream) falling in the revenue boundary of village Baripur Uparwar, in district Bhadohi and 25.215000 Latitude and 82.194814 Longitude (Upstream) falling in revenue boundary of village Kothari, Meja of district Prayagraj.



Figure 3.1- Location map of Kachhua wildlife sanctuary showing District boundaries

As per the notification, upstream and downstream boundaries of the Sanctuary are defined on map, but boundaries along the left and right bank are not mentioned, resulting in ambiguity with respect to the extent of the area of interest. The shoreline in the sanctuary area is very thin and the surrounding land interspersed between government lands is revenue land. Consolidation of these government land patches is not possible unless the private land adjacent to it is acquired by the Government. While creating the Sanctuary the right and concession of the local villages werenot settled.

3.3 Dependence on KWS River stretch

The sanctuary is located in densely populated area of middle Gangetic plains. There are total 31 inhabited villages within 500 mts. and 42 inhabited villages in 1 km. stretch on both sides of the river stretch designated as Kachhua sanctuary. The community residing around the river stretch is dependent on the river for fishing, sand mining, riverbed and riverbank agriculture, irrigation and domestic water use. Being a part of the fertile plains of the Ganga basin, this area has a high population density. The community residing along the banks is highly dependent on agriculture for their sustenance. Fishing is another major activity prevalent in the area.

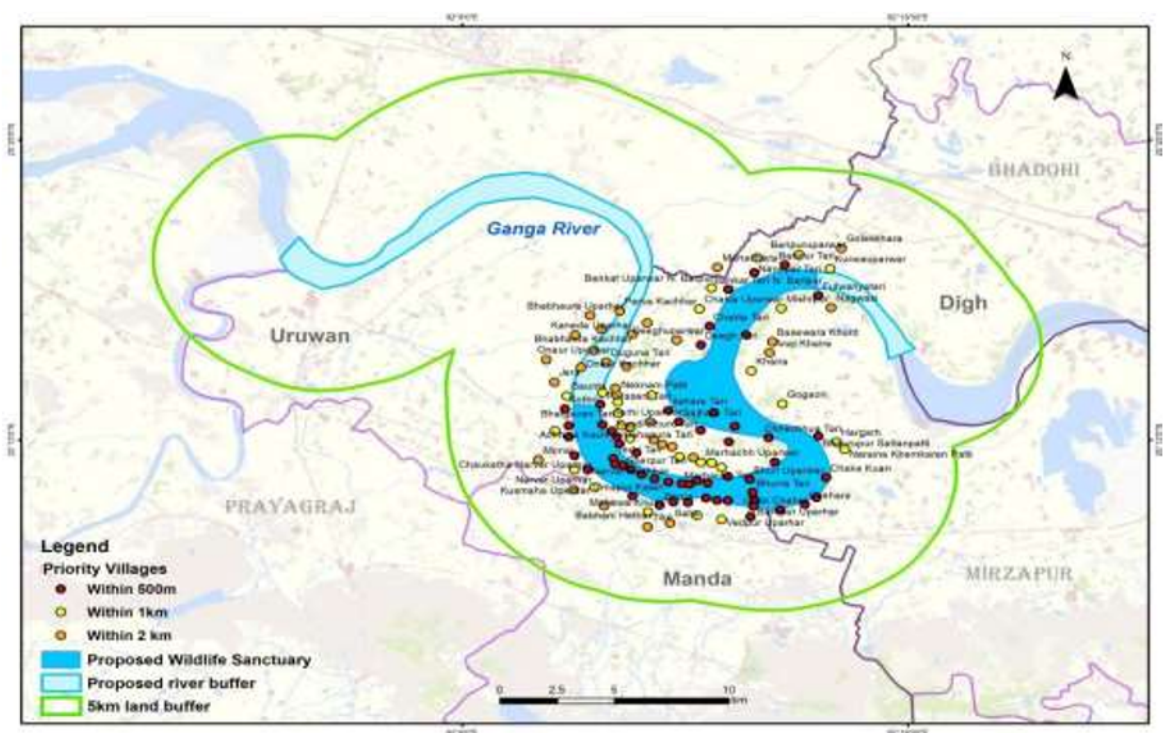


Figure 3.2 Villages around the sanctuary are

3.3.1 Water harvesting

Water from the river is utilized mainly for irrigation. Hand pumps were observed in almost every household and were used for domestic purposes including drinking water.



Plate 3.1 Water extraction from sanctuary area

3.3.2 Biomass extraction

A major use value of the river stretch is extraction of vegetation such as Sarpat grass (*saccharum munja*), Kans (*Saccharum spontaneum*), and Sarai (*Vetiveria Zizanioibes*) etc. from the riverbanks for making temporary settlements (Huts), roofs and thatches, mats for *pooja*, ropes, *Dalia*, *Soop* (used for cleaning rice and during festivals like chatt puja), etc.

3.3.3 Fuel

A total of 22% households in the 38 villages surveyed use wood and dung cake as fuel. They collect it from the bank and surrounding area. Plant species such as Mango (*magnifera indica*), Peepal (*Ficus religiosa*), Banyan (*Ficus benghalensis*), Neem (*azadirachta indica*), anwala (*phyllanthus emblica*), Jamun (*Syzygium cumini*), Gular (*ficus racemosa*), Sahtoot (*Morus*) are commonly used as fuel by the local people.

3.3.4 Fodder

A large number of livestock, mainly goats, buffaloes, cows, and donkeys, etc. are owned by the community living along the sanctuary area. They depend on the bank vegetation for fodder. A total of 46839 animals are reported in surveyed villages. Main vegetation used as fodder is Sahtoot (*Morus*), Babool (*vachellia nilotica*), Amla(*phyllanthus emblica*), Mahua (*madhucalongifolia*), Sarpat grass (*saccharum munja*), kans (*Saccharum spontaneum*), etc.

3.3.5 Fishing

Fishing, an important source of income in this area, is practiced mainly by the Mallah community which constitute 13.7% of the total population. The major fish species extracted from the sanctuary area are *Cyprinus carpio* (China), *Xenentodon Cancila* (kawi), *Labeo rohita* (Rohu), *Mystus tengara* (Tangra), *Gibelion catla* (Bakhur), *Channa marulius* (Gaingra), *Salmophasia bacaila* (Chailva), and *labeo bata* (Bata).

3.3.6 Religious dependence

Ganga River holds a high religious and spiritual value. She is considered 'Mother Goddess' and a river on earth who reduces the suffering of people and grants them Moksha i.e. salvation. Every year, several festivals and days are dedicated to celebrate the holiness of the river and its contribution to humankind. The most common festivals are Kanwad Mela, Durga pooja, Dussehra, Ganesh chaturthi, etc., which are celebrated every year. People take holy dip in Ganga during these festivals. The waste generated during cultural and religious ceremonies or puja is discharged into the river, which is a major source of water pollution. Apart from this many crematoria' are situated on the banks of Ganga, people also come on Ganga Ghats for pind dan (to perform last rites) etc.

3.4 Status of protection

The Kachhua wildlife sanctuary is a notified sanctuary under sub section (l) of the section 18 of Wildlife (Protection) Act of 1972, by the Paryawaran, Van Evam Jalvayu Parivartan, anubhag-4 of Uttar Pradesh government vide notification no. 346/81-4-2020-823/2008 TC dated 17/03/2020.. An area of 30 km. is notified as Kachhua wildlife sanctuary. This area lies between 25.273769 Latitude and 82.87486 longitude East (Downstream) falling in the revenue boundary of village Baripur Uparwar, in district Bhadohi and 25.215000 Latitude and 82.194814 Longitude (Upstream) falling in revenue boundary of village Kothari, Meja of district Prayagraj. The primary objective of creating this Sanctuary is the protection, propagation and restoration of wildlife, especially aquatic species of the middle Gangetic plains and their habitat.

3.4.1 Encroachment and other forms of River reclamation

The majority of the land around the sanctuary area is privately owned. There is a lack of clarity about boundaries on the left and right banks of the Sanctuary River stretch. The riverbed is used for agriculture crop production by the community for 8 months of a year.





Plate 3.2 Riverbank farming in the KWS area

3.4.2 Entanglement/Accidental death of aquatic species

Entanglement and accidental death cause loss of species. Unscientific and unsustainable fishing is the main reason for the accidental death of the species. Moreover, people have little knowledge about the importance of the species for the river ecosystem.

3.4.3 Livestock grazing on the river banks and surrounding areas

Grazing causes erosion on the river bank, destroys the vegetation, alters the soil composition and reduces plant species richness (Dorrough et al., 2004). It brings negative change in the habitat conditions of the aquatic species and also affects the breeding behaviour of the riparian birds.. In the survey conducted in 38 villages located around the sanctuary area, more than 18% (n=7) villages reported grazing near river bank.



Plate 3.3 Cattle grazing in the KWS area

3.4.4 Sewage, effluent and solid waste disposal

Most of the households living around the sanctuary area use twin pit toilets. Disposal of Sewage was not observed on the banks and ghats of the river stretch, however, there is no facility for solid waste management in and around the villages. Agricultural practices such as excessive use of fertilizers and pesticides, mixes with the river water through agricultural runoffs has a detrimental effect on the river ecosystem.

3.4.5 Wildlife Health

Facilities to monitor wildlife health, especially health of aquatic animals, is lacking in the area.

3.4.6 Human activities in the surrounding areas

Agriculture, sand mining, bank grass extraction and livestock grazing are common practices in the areas surrounding the sanctuary area. Solid waste and runoff from the agricultural fields is a major source of water pollution. Activities like sand mining, bank agriculture and grass extraction adversely affect the habitat of turtles, water birds and other animals. Fishing, resource extraction, religious rites and ceremonies, religious tourism are other human related activities around the sanctuary area that are detrimental to its health.



Plate 3.4 Human activities in the KWS area

3.5 Tourism

This area has a high religious tourism value. Famous Sitamarhi temple is situated in this area, which is considered as the Samadhi sthal of Maa Sita. It is believed that Sita was absorbed into the earth at this place. This place attracts lots of tourists throughout the year.

Confluence of river Ganga, Yamuna and Saraswati at Prayagraj has huge religious value. People consider this triveni as a holy place as three most important and sacred river meet here. Every year Magh mela is celebrated here. Maha Kumbh Mela, which is celebrated in every 12 year, is the largest religious congregation. Millions of pilgrims take holy dip during this mela. Vindhyachal Dham, in Mirzapur is one of the main Hindu pilgrimage sites of India. It is considered as the abode of Bhagwati Vindhyawasini and a shaktipeeth. Chunar fort, located on the banks of Ganga River, is also a tourist attraction nearby.

Religious tourism is flourishing in this area, however interpretation and environment education are at its infancy. Tourism infrastructures including even the most basic amenities are lacking.

Bhadohi and Mirzapur district are also well known for carpet weaving and are known as “Townsof export excellence”.



Triveni Sangam at Prayagraj (Jagran.com)



Birds eye view of Prayagraj city
(Up.pujabkesari.in)



Sita samadhi sthal (Bhadohi.nic.in)



Khusro bagh Prayagraj



Hariharnath Temple, Gyanpur Bhadohi



Vindhyanchal dham, Mirzapur

Plate 3.5 Some places of tourist attraction in close proximity of KWS

3.5.1 Scope

The Kachhua Sanctuary area is situated on Ganga River in Prayagraj, Mirzapur and Bhadohi District. Prayagraj, located at a distance of 45 km. from this area, is rich in cultural heritage. Places of cultural and historical importance like Triveni Sangam, Allahabad fort, Khusro Bagh and Allahabad museum which are located in Prayagraj. Kumbh Mela and Magh Mela are the famous festivals/occasions, when millions of people come here to take a holy dip in Ganga. Apart from this Sita Marhi in Bhadohi and Vindhyachal Mandir attracts large no. of tourists round the year. Vindhyachal ghat also receives large number of migratory birds in winters. People living in nearby areas also celebrate different festivals on the Ganga ghats.

The proximity to these historical places mainly sangam, having large number of resident and migratory birds, makes this area a potential tourist hotspot, provided its proper management. Proper management and restoration of wildlife habitat will in definitely increase the flocks of migratory and residential water birds, which will attract a large number of tourists.

3.5.2 Visitor statistics

Since the sanctuary is recently notified (17/03/2020), there is no official data available on visitors to this place. However, the annual tourist visit data of district Prayagraj, Mirzapur and Bhadohi shows significant tourist inflow in the area.

Table 3.1 Tourist inflow in district falling under sanctuary area

Sl. No.	TOURIST PLACE	2015			2016			2017			2018		
		Indian	Foreign	Total	Indian	Foreign	Total	Indian	Foreign	Total	Indian	Foreign	Total
1	Prayagraj	40001670	109281	40110951	41146674	109571	41256245	41764987	109675	41874662	44668662	146805	44814767
2	Mirzapur	807012	386	807398	831310	386	831696	915957	604	916561	928968	678	935746
3	Bhadohi	22721	197	22918	35800	201	36001	36251	212	36463	39191	220	39411

NOTE: THE TOURIST VISITS IN KUMBH MELA/ SNAN, PRAYAGRAJ IN YEAR-2019 OF 15.01.2019 TO 01.01.2020, 23,94,70,000 AND FOREIGN TOURIST 10,30,000 (TOTAL TOURIST- 24,05,00,000) IS INCLUDED IN ABOVE YEAR 2019.

Source – UP Tourism Department

3.5.3 Interpretation programme

There is no organizational setup for interpretation programme. This is a recently notified sanctuary hence, before the initiation of such, training of local people and forest department staff is a prerequisite.

3.5.4 Facilities

Sanctuary area does not have any tourism infrastructure. As mentioned above, there is no interpretation centre. Other facilities are also lacking. This area needs to properly develop both its infrastructure and human resource base before it can become a tourism spot.

3.6 Research, monitoring and training

3.6.1 Research and monitoring

The current study is the preliminary study in Kachhua Wildlife Sanctuary area covering various aspects of the sanctuary. Prior to this, very few studies had been conducted in the area. WII conducted a study of the middle stretch of Ganga in 2018 “ASSESSMENT OF THE WILDLIFE VALUES OF THE GANGA RIVER FROM BIJNOR TO BALLIA INCLUDING TURTLE WILDLIFE SANCTUARY, UTTAR PRADESH” to assess the different attribute of the river, aquatic flora and fauna and habitat assessment of the middle stretch of the Ganga River.

3.6.2 Trainings

To manage the sanctuary area and to maintain its ecological integrity the local community and the forest department official needs to be trained in different aspects of sanctuary management and biodiversity conservation. Local communities can be trained in Organic and Sustainable agriculture, Sustainable fishing, Importance of biodiversity, Alternative livelihoods, etc.

3.6.3 Wildlife conservation strategies and their evaluation

This is the first management plan for the Kachhua Wildlife Sanctuary therefore, prior to this no conservation strategies were developed for the protection of this Sanctuary.

Chapter 4

The Sanctuary Area and the Interface Land use Situation

4.1 The Zone of Influence: Current Scenario

The zone of influence is defined as any area, often peripheral to a protected area, inside or outside, in which activities are implemented or the area is managed with the aim of enhancing the positive and reducing the negative impacts of conservation on neighboring communities and vice-versa. The zone of influence is roughly 2 km. on both banks of the Kachhua Wildlife Sanctuary area and is studded with human habitation interspersed with agricultural fields. A total 61 revenue villages are situated within 500 m. area on both side of the sanctuary, out of which 31 villages are inhabited.

Table – 4.1 Villages within 500 m. area on both side of the Sanctuary area

Sl.no	District	Block	Village
1.	Allahabad (Prayagraj)	Manda	Bampur Kachhar
2.	Allahabad (Prayagraj)	Manda	Bampur Uparhar
3.	Allahabad (Prayagraj)	Manda	Berua
4.	Allahabad (Prayagraj)	Manda	Dengurpur
5.	Allahabad (Prayagraj)	Manda	Kewtahi Uparhar
6.	Allahabad (Prayagraj)	Manda	Kushmaha Kachhar
7.	Allahabad (Prayagraj)	Manda	Mahewa Kala Uparhar
8.	Allahabad (Prayagraj)	Manda	Mahewa Kalan Kachhar
9.	Allahabad (Prayagraj)	Manda	Umapur Kalan
10.	Allahabad (Prayagraj)	Manda	Umapur Khurd
11.	Allahabad (Prayagraj)	Manda	Vedpur Kachhar
12.	Allahabad (Prayagraj)	Manda	Vedpur Uparhar
13.	Allahabad (Prayagraj)	Uruwan	Achhola Uparhar
14.	Allahabad (Prayagraj)	Uruwan	Chaukatha Narvar Uparhar
15.	Allahabad (Prayagraj)	Uruwan	Kothri
16.	Mirzapur	Chhionway	Basewara Kalan

17.	Mirzapur	Chhionway	Bhaurupur Sattanpatti
18.	Mirzapur	Chhionway	Chehara
19.	Mirzapur	Chhionway	Dewari Mu. Gaura
20.	Sant Ravidas Nagar (Bhadohi)	Digh	Atibalshah Uparwar
21.	Sant Ravidas Nagar (Bhadohi)	Digh	Bahupura Uperwar
22.	Sant Ravidas Nagar (Bhadohi)	Digh	Bankat Uparwar N. Barpur
23.	Sant Ravidas Nagar (Bhadohi)	Digh	Bhabhauri Uparwar
24.	Sant Ravidas Nagar (Bhadohi)	Digh	Bhuri Uparwar
25.	Sant Ravidas Nagar (Bhadohi)	Digh	Chhechhua Uparwar
26.	Sant Ravidas Nagar (Bhadohi)	Digh	Gajadharpur Uparwar
27.	Sant Ravidas Nagar (Bhadohi)	Digh	Kalik Mavaiya Uparwar
28.	Sant Ravidas Nagar (Bhadohi)	Digh	Mavaiya Than Singh Tari
29.	Sant Ravidas Nagar (Bhadohi)	Digh	Mavaiya Vara Goti Uparwar
30.	Sant Ravidas Nagar (Bhadohi)	Digh	Poore Purwa Uparwar
31.	Sant Ravidas Nagar (Bhadohi)	Digh	Sherpur Uparwar

The above mentioned villages have the maximum impact on the sanctuary area as local communities are traditionally dependent on the river resources for their livelihood. 42 inhabited villages are situated within 1 km. distance from the river on both side of the sanctuary area. This area also has some impact on the area as the community is dependent on the resources of the river.

4.1.1 Landuse/Landcover of the Kachhua Wildlife Sanctuary and surrounding areas

LULC data obtained for a 5 km buffer on both banks of the sanctuary area, from National Remote Sensing Centre, ISRO prepared from AWIFS data, shows an overall increase of 1.5% in the Agricultural. 0.04 % reduction was observed in the forest class comprising of plantation and scrub forest. There was a 2.45% reduction in wasteland from 2006 to 2016. The water spreadarea also reduced by 0.05% in the 10 years.

Table 4.2 Land use/cover and land feature change from 2006 to 2016

Sl. No.	LULC features	2005-06		2015-16	
		Area (sqkm)	Percentage	Area (sqkm)	Percentage
1.	Built up area	10.37	1.94	14.44	2.51
2.	Agriculture	386.43	72.12	423.66	73.67
3.	Forest	18.31	3.42	19.79	3.44
4.	Fallow land	49.93	9.32	40.23	6.99
5.	Water	70.77	13.21	76.99	13.39

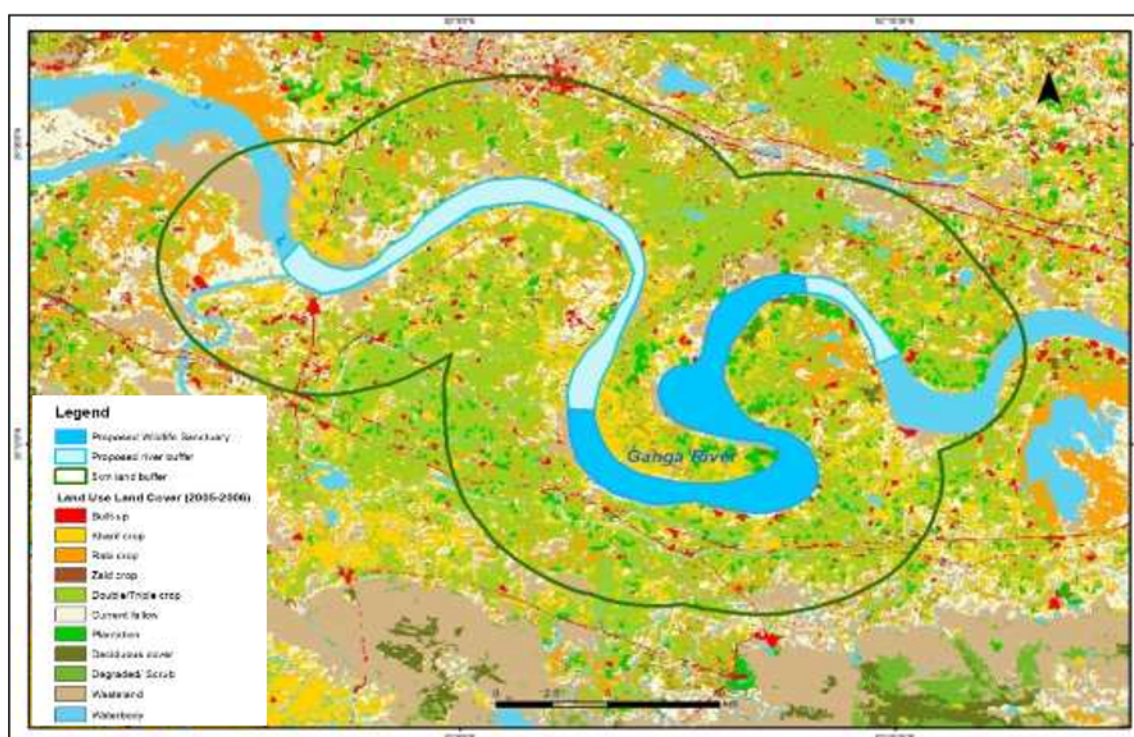


Fig: 4.1 Land Use Land Cover, 2005-2006

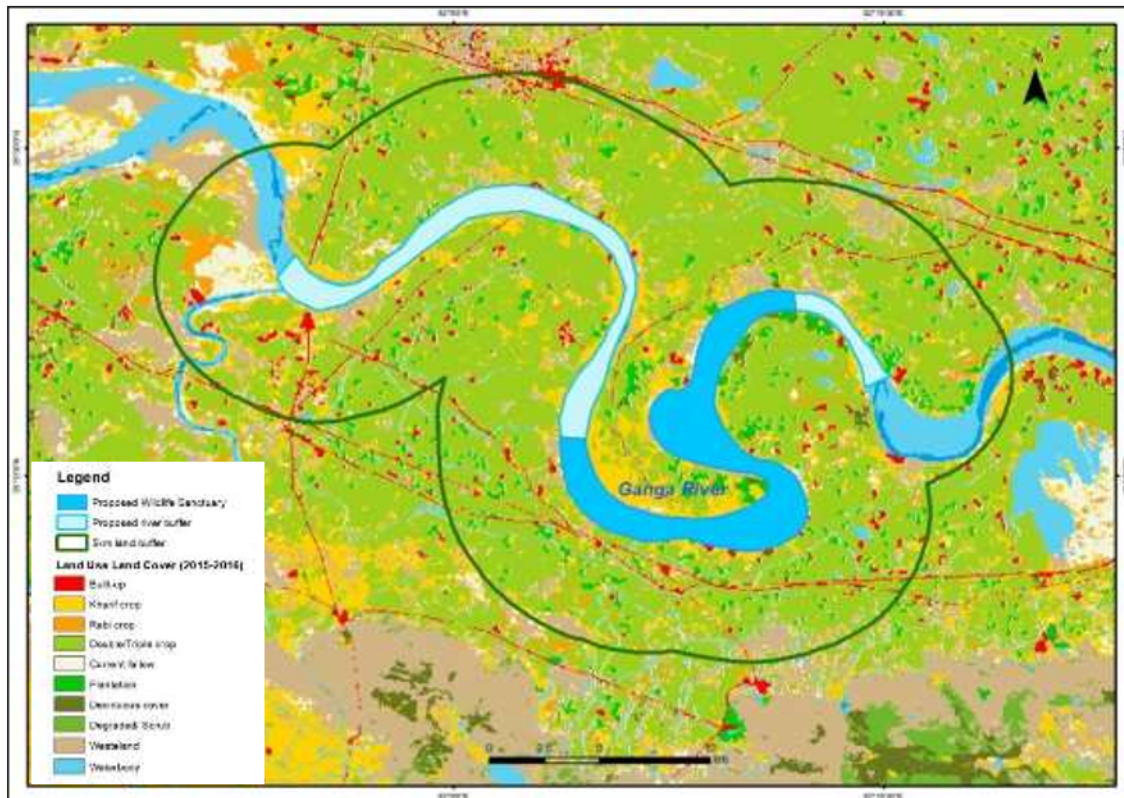


Fig: 4.2 Land Use Land Cover, 2015-2016

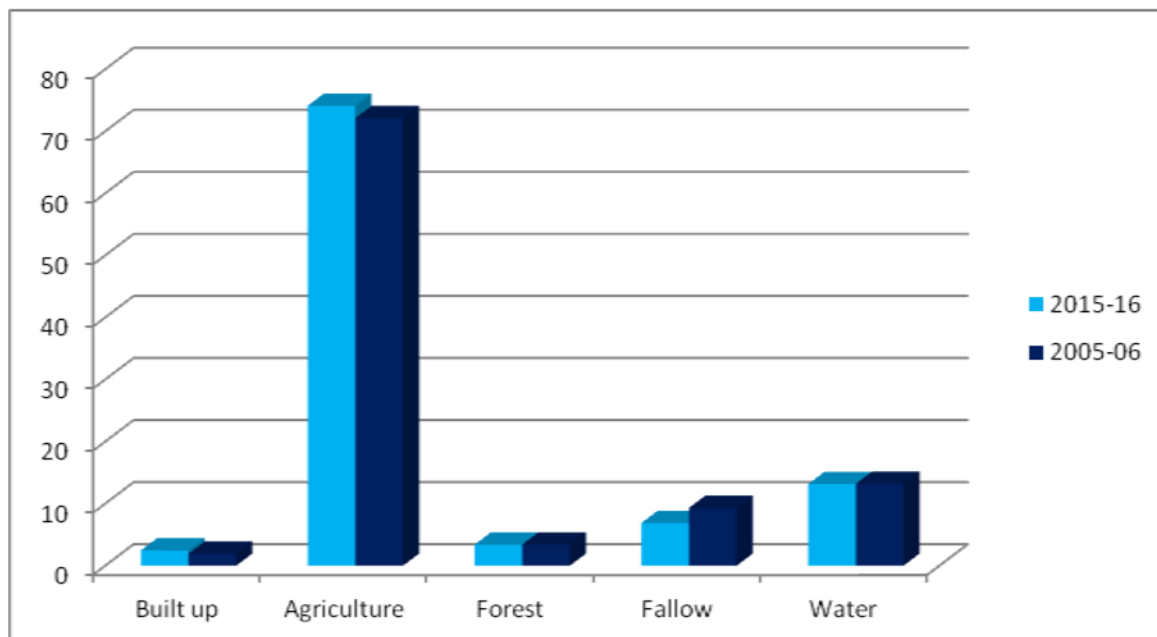


Fig: 4.3 Land use Land cover in KWS area

4.1.2 Human settlements in and around the Kachhua Wildlife Sanctuary

The KWS is situated in Prayagraj, Bhadohi and Mirzapur district of the middle Gangetic plains. Being a very fertile area, it is densely populated and the community is dependent on the river resources for their livelihood and domestic needs (water, fuel, fodder etc.). Numbers of villages are situated on both side of the river stretch. A total of 61 revenue villages are located within 500 m., 52 villages within 1 km. and around 800 villages are situated in the buffer area (25 Km. upstream and 5 km. downstream) of the sanctuary.

The resources of the river stretch falling in the sanctuary area are being utilized by the local communities for various purposes such as fishing (for commercial and self-consumption), water extraction (for irrigation and domestic purposes), and riverbed and bank farming. One or the other households in almost all these settlements are river resource users.

4.1.3 Ethnic identities, traditions, customs

The various social groups present in the area are Brahmin, Thakur, Mallah, Gupta, Yadav, Kannoja, Lohar, Pal, Prajapati, Koli, Bind and Kahar. The Mallah are fisherman communities who are solely dependent on fishing as a source of income. Caste system is highly prevalent as economic and working classes are divided exclusively on the basis of caste.

The area is rich in culture and traditions, which play an important role in the life of people. Many festivals are celebrated during the year. Every festival is celebrated with passion and enthusiasm.

4.1.4 The state of people's economy

Most of the families living around the Kachhua wildlife sanctuary are in the low to medium income groups. Agriculture and wage labour is their main occupation. A major portion of the local people is earning their livelihood through labour based activities and these are categorized as low income group. Private jobs and Fishing is also a significant source of livelihood of the villagers. Livestock rearing for dairy products is another major occupation. A total of 2739 households, in the 38 surveyed villages, rear cattles.

4.1.5 Vocations and use of river stretch and its products

People are engaged in vocations such as agriculture, wage laborers, jobs in government/public sector and private sector jobs, livestock rearing for dairy, fishing, boating, businesses, handicraft making, pottery, etc. Many households are involved in more than one occupation for subsidiary income.

Table 4.1 Major occupation of the people living in and around the Kachhua Wildlife Sanctuary area

S.N.	Occupation	No. of HHs Involved	Percentage (%)
1	Agriculture	16381	91.59
2	Wage Labour	9148	34.40
3	Fishing	3510	13.19
4	Boating	182	0.68
5	Govt. Service	887	3.33
6	Private Service	4790	18.01
7	Dairy/Animal Husbandry	2739	10.29
8	Floriculture	13	0.05
9	Orchard	306	1.15
10	Business	621	2.33
11	Handicraft	100	0.37
12	Pottery	90	0.33

4.1.5 Implications of the land use and resource dependency

Major land use practice around the Kachhua wildlife sanctuary is agriculture. Out of the total households owning land in the Kachhua Wildlife Sanctuary stretch and surrounding areas, around 92% are engaged in agriculture, 14 % are doing fishing and 0.7% are boatmen. Other than that 10% are engaged in livestock rearing for dairy purposes.

4.1.6 KWS management practices and their implications for people

As the dependence of the local people on the river stretch is very high, the direct implication of sanctuary management on them is immense. The direct uses of the sanctuary resources include Fishing and extraction of fuel, fodder, river bank grasses and sand. Since the dependent communities are mostly from the economically backward classes and have no alternative livelihood options, their dependence on the river cannot be restricted without social implications. It is a challenge for the management authorities to curtail these pressures without antagonizing the local people. Therefore, management strategies need to address these social issues through the involvement of local communities and formation of Ecodevelopment Committees (EDCs) for providing employment and enhancing the livelihood of these people.

4.2 Attitude and perception of the local people

The attitude of the local people towards the conservation of the Kachhua wildlife sanctuary area was mostly positive. As the sanctuary area is recently notified the local community is not aware about it. However, the local communities are willing to support and cooperate with the government in eco-development programmes and are also ready to take up optional work in favour of these eco-development programmes. The local communities supported ecotourism as an alternative livelihood option.

4.3 The Development Programmes and Conservation issues

For holistic development of an area, it is essential that development programme should work in consonance with each other. Same is applicable with the conservation programme. To seek participation of local communities in conservation it is important to work for their social and economic development. There is a need that development agencies, whether Government or non-government should dovetail their programme to the requirement of the conservation of the sanctuary area, and bring in positive impact to the management of the sanctuary. In the government sector other than Forest department, Rural development department, Agriculture department, horticulture department, Fisheries department, Tourism department etc. are important agencies involved in the development of the area. These departments can contribute to the development of the communities living around the sanctuary area. Different schemes e.g., MNREGA, SBM, NRLM and other agriculture and horticulture development schemes can contribute in social development and spearhead an effective conservation measures on ground.

Recently, the Ministry of Jal Shakti has developed a comprehensive strategy to restore the biodiversity value of the Ganga River. In its endeavour, the NMCG is working in collaboration with the Wildlife Institute of India (WII), Dehra Dun as a lead knowledge partner institution for aquatic species restoration in Ganga River. The WII with its sole aim to improve the environmental flow, restoration of biodiversity value and address the water scarcity issues in the Ganga River has been conducting ecological surveys since the year 2017. Consultative meetings have also been organised in some villages but a lot has to be done yet.

Agricultural practices in and around the sanctuary stretch are a major concern due to the detrimental effect it has on the river and species habitat. The water required for cultivating is extracted from the river. Moreover agricultural runoff that falls directly into the river is harmful for the species and human health.

Another major conservation issue in the area is the excessive dependency of the local communities on the resources of the river. The lack of alternative sources of income combined with the lack of awareness among the local people poses a huge threat to the integrity of the sanctuary.

Sand mining is another issue in this area. Excessive mining from the riverbed is destroying the habitat and egg laying ground of the species found in the area.

4.4 Stakeholders

Stakeholder analysis represents one of the most crucial and initial steps in water resource management which allows identification of the key stakeholders and their roles, interests, behaviour, power and the position. Stakeholder analysis also helps to identify current/future opportunities and threats to the river/sanctuary and thus, help find compatibility between management objectives and stakeholder aspirations, and assist managers in balancing conflicting objectives such as conservation, development, equity and peace.

The objectives of SA were as follows:

- To identify the stakeholders of KWS and record their key characteristics and attributes,

- To determine the interests and influences of the key stakeholders and the management activities they want to participate in; and also to set the groundwork for stakeholder participation in the management of KWS, and
- To identify the conflicting interests of stakeholders, if any, and find ways to resolve the same.

4.4.1 Analysis of interest data

Stakeholders were grouped according to their stated interest in KWS (i.e. People dependent on it and the managers & other stakeholders). The analysis revealed shared interests of the stakeholders and depicted the gains and losses from KWS.

4.4.1.1 Advantages of KWS to various stakeholder groups

Most of the community members were not aware about the notification of the area as Kachua sanctuary. When informed and asked about the advantages of that area they felt that the various ecosystem services provided by KWS are an advantage for the community residing along the river as well as for others. The main stakeholders i.e the community members said that the river will become clean but they insisted upon the need to engage the community in the management of the sanctuary for better results. Officials of the line agencies i.e Divisional forest officer, Block development officer, Block manager NRLM, Assistant development officer (Panchayat) etc. said that as there will be minimum human interference in the river stretch the river ecosystem will be restored which will be beneficial for humans as well as the animal species. Community members were also interested in the civic development of area such as construction of roads, development of the area as tourist destination, jobs, and other prospects of livelihoods.

4.4.1.2 Disadvantages of KWS to various stakeholder groups

The respondents were encouraged to speak freely regarding the disadvantage to them because of the existence of the sanctuary. The main concern for the local communities was access rights to resources and livelihood issues. They said that their livelihoods will be affected as there will be restriction in using the river resources such as fishes and sand, river bank agriculture, river side vegetation etc. Especially the Mallah community will be affected the most. Sand prices will go on rise and affect the common people.

4.4.2 Stakeholder mapping for KWS

The sanctuary area is situated in a human dominated landscape. The local communities residing at the periphery of the river stretch are heavily dependent on it for biomass resources which are used for food and livelihood generation. The success of management largely depends on well- coordinated collaboration between the various stakeholders and swift conflict solving by the management plan implementing agency.

Local communities residing along the Ganga river depend on its resources for their social, cultural and livelihood needs. WII under its NMCG-WII project “Biodiversity and Ganga Conservation” conducted stakeholders analysis of sanctuary area. During the conversations and meetings, it was realized that there is a lack of awareness among the stakeholders not only at the grassroots level but also at the district level. Most of the people are not aware that the area has been notified as turtle sanctuary. In this area stakeholders identified are local communities, religious groups, forest department, District administration, Local Ngo’s, District Ganga committee, Ganga Task Force, Village Panchayat, Fishries department, Agriculture department, Animal husbandry, Mining department, Water and Sanitation department, Tourism department, State Program Management Group, Irrigation department, Nehru Yuva Kendra Sangathan, State Rural Livelihood Mission, State renewable energy department etc.

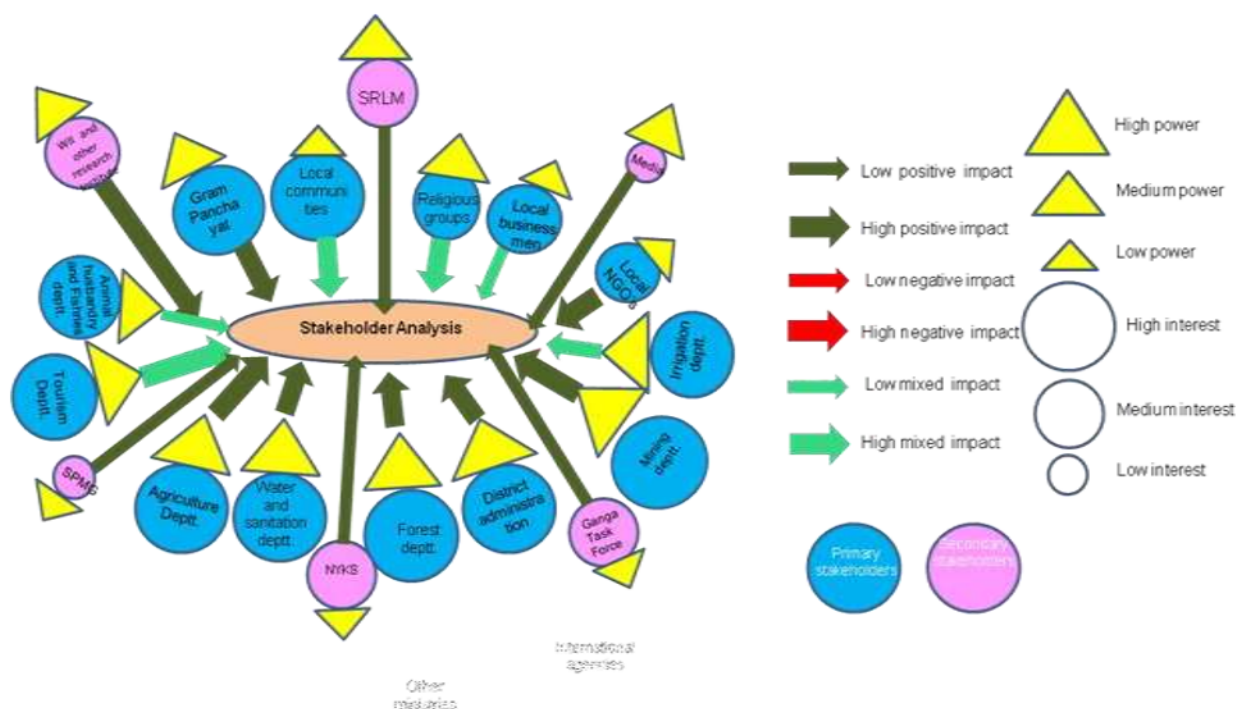


Fig: 4.4 Stakeholders mapping (based on stakeholders analysis conducted in the middle stretch of the Ganga River

Chapter 5

Problem, Issues and Risk Analysis

5.1 Loss of Species

5.1.1 Use of fertilizers and Pesticides in Agriculture

To obtain maximum production and to secure their crops from pests, the farmers use different types of pesticides, insecticides and chemical fertilizers. This gets mixed with the river water during monsoons. As a large area around the sanctuary is being used for agriculture cultivation, hence the amount of chemical fertilizers and pesticides is also huge. The heavy use of chemical fertilizers and pesticides by the farmers, although beneficial for high productivity of their crops, will cause more damage. Besides being a threat to human health, it is also harmful to the species. This will, therefore, lead to heavy consequences considering conservation of the biodiversity.

5.1.1.1 Lack of Awareness

People living along the sanctuary are not aware about the harmful impact of chemical fertilizers and pesticides on human and animal health. They find it beneficial for increasing the productivity of the land and obtain good crop production.

5.1.1.2 Lack of Green Options

The sanctuary is located in a densely populated area. Agriculture is the main occupation of the community living around the stretch. They have to take good production to have enough food for the whole year, for which they use chemical fertilizers. They do not have knowledge and access to other green options like bio fertilizers and they are not aware about the importance of organic agriculture.

5.1.2 Entanglement /Accidental Killing

Entanglement in nets during fishing is another reason for loss of species in the entire river stretch. People do fishing for their livelihood or for their everyday sustenance. In most of the places fishermen are using mosquito nets to catch fish. The animals are getting stuck in these nets and are losing their lives. Although this is not done intentionally, but is a threat to the lives of the species present in the water.

5.1.2.1 Lack of awareness

Lack of awareness among the community about the importance of biodiversity for a healthy ecosystem is causing threat to the species. The community residing along the sanctuary area is extracting the river resources as they have free and easy access to them. They do not have knowledge about the sustainable use of these resources and their role in maintaining the ecosystem, which can benefit them for a long time while conserving the nature.

5.1.2.2 Unscientific fishing

Unscientific and excessive fishing is causing loss of prey base for the aquatic species. Overfishing creates imbalance and disrupts the food web and leads to loss of aquatic species like Dolphin, Gharial and Turtles.

5.1.2.3 Lack of Rescue and rehabilitation facilities

Entanglement of dolphin and other species is a general phenomenon throughout the river stretch, as intensive fishing is done in the middle and lower stretch of the Ganga River, but facility to save the species from mortality due to entanglement are lacking. Sanctuary area is also not an exception, there is lack of people trained to rescue these injured animals. Lack of rescue and rehabilitation facility leads to loss of many aquatic animals.

5.2 Loss of habitat

Habitat provides food, shelter and protection to the animals. It is also site for reproduction of the species living in and around the sanctuary area. The species habitat in the sanctuary area is degrading due to sand mining and unsustainable biomass extraction.

5.2.1 Unsustainable resource Use

People living in and around the sanctuary area are dependent on the river resources for their sustenance. They use river resources like fish, sand, river bank vegetation to accomplish their needs. Over and unsustainable extraction of these resources is causing degradation of the habitat of river species.

5.2.1.1 Sand mining

Sand is an easily available resource to the people living around the sanctuary area. People extract it to earn their livelihood. As the area is under extensive sand bar cultivation, it does not have islands for breeding of aquatic species or perching spots for the birds. Biomass extraction from the banks has also ruined the habitat of the bird species.

License for sand mining is generally allotted by the mining department of the area to selected persons. Apart from commercial mining for which license is allotted, local people also extract sand in small amount for their household use or they sell it for their daily sustenance. This practice damages the breeding grounds of the species. Although there are rules to extract the sand mineral and only people having license can extract it but the rules are not being followed. There is laxity in enforcement of the rules on the part of the department.

5.2.1.2 Bio-mass extraction

Extraction of river bank vegetation for fuel, fodder and other uses is also causing threat to the habitat of the river species. The riverside communities use the bank vegetation for fuel and fodder. Apart from this river bank grasses like Sarpat (*Saccharum Munja*), Kaans (*Saccharum spontaneum*), and Sarai (*Vetiveria Zizanioides*) are used for making *Dalia*, *Soop* (used for cleaning rice and during festivals like chatt puja), mats, ropes and temporary huts. Apart from this the river bank vegetation is also used for fuel and fodder.

5.2.2 River bank agriculture

Agriculture is the main occupation of the people living around the sanctuary area. People are heavily dependent on the farm products for sustenance. People own the land at the river banks and do extensive agriculture. The shoreline area is very less in villages around the sanctuary. Moreover, with the increasing population, agriculture is expanding day by day, leaving small space for breeding and resting of the species.

5.2.2.1 Traditional practice of the local community

The KWS area is situated in a highly populated and fertile area. People residing in the area do agriculture and allied works traditionally, for their livelihood. Being located in a fertile landscape a large area of land is under cultivation. This area is expanding day by day with the increase in population and the needs of people.

5.2.2.2 Lack of alternate employable skill

Another major conservation issue in the area is the excessive dependency of the local communities on the river resources. The lack of alternative sources of income combined with the lack of awareness among the local people poses a huge threat to the integrity of the sanctuary. People living in and around the sanctuary area are extracting the river and river bank resources for their livelihood because i. they have easy access to them and ii. They do not have any skill to develop alternative livelihoods. Consequently, they are dependent on the resources which are around them.

People's dependency on the river resources is basically due to the lack of employable skills in the community. Due to lack of skill development related training and schemes, people tend to adopt their traditional occupations and they are comfortable with this. An increase in population is creating pressure on the resources.

5.3 Improper waste management

5.3.1 Lack of Awareness

Solid waste generated in the area is causing problems to environment and human health. People are not aware about the impacts of improper waste management on their health, on agriculture, water and other natural resources. Due to lack of awareness they ignore the proper management of the waste produced from their houses and throw it in open places, which mixes with the river water through rain, wind etc. causing threat to the biodiversity.

5.3.2 Lack of proper waste management facilities

There is no provision of solid waste management in the villages located around the sanctuary. Due to lack of dustbins, waste collection facilities, proper dumping or collection ground, and waste treatment facilities the garbage is dumped at unoccupied places, on river banks, near the road or wherever they find it easy to dump. This scattered waste mixes in the water bodies through run off and also makes the soil unfertile leading to less productivity. Non-biodegradable solid waste like plastic is hazardous for the health of aquatic animals, causing death due to eating and entanglement of the animal.

5.3.3 Lack of co-ordination between departments

Many departments/ organizations are working for the development of the rural areas. Alignment of conservation and development initiatives in the area is necessary to solve issues of conservation. For proper waste management in the area there is a need to have good co-ordination between Gram Panchayat, Block and district level officials, Forest department and other line departments.

5.4 Risk analysis

The ecological risks to the sanctuary area can be grouped into four major categories viz., (i) alteration in the hydrological regimes, (ii) water pollution, (iii) disruption of lateral connectivity due to physical modification, and (iv) exploitation of riverine resources.

In the case of KWS this can be explained as follows:

- (i) Alteration in the flow regime due to abstraction of water for irrigation and other domestic purposes.
- (ii) Degradation of water quality due to excessive nutrient loads and runoffs from agricultural field.
- (iii) Habitat degradation due to loss of connectivity
- (iv) Excessive extraction of biomass resources leading to decrease in biodiversity value and ecosystem services coupled with lack of adequate resources for the conservation and management of the KWS.

Table: 5.1 Risk Analysis

Risk Factor	Harmful Potential impacts
Change in the Flow regime due to extraction of water by the villagers for agricultural and other purposes.	Reduction in channel depth, reduced flushing and hence decreased purification. Loss of biodiversity.
Degradation of water quality due to excessive nutrient loads and runoffs from agricultural field.	Prolific growth of invasive species, decreased species richness, diversity and overall production.
Habitat degradation due to loss of connectivity	Loss of genetic diversity as it limits species dispersal

Extraction of biomass resources, and lack of adequate resources for the conservation and management of the sanctuary.

Decrease in biodiversity value and ecosystem services coupled with an increased erosion potential, reduced interception, threat to the diversity of important migratory birds and other fauna and flora, weed infestation.



PART II



Chapter 6

Vision, Objectives and Problems

6.1 Conservation Values of Kachhua Wildlife Sanctuary

The Kachhua Wildlife Sanctuary is recently notified under sub section (1) of the section 18 of the Wildlife (Protection) Act, (Act no. 53 of 1972), vide notification no.-346/8 1-4-2020 823/2008TC, dated 17-03-2020 by the Paryawaran Van Evam Jalvayu Parivartan Anubhag- 4 of the Uttar Pradesh government. Before the notification of the Ganga River stretch between Kothari and Baripur Uparwar as Kachhua Wildlife Sanctuary a rapid biodiversity assessment study was carried out by the Wildlife Institute of India, Dehradun in 2018 and 2019. Based on the ecological findings and social surveys for the current Management Planning, the conservation values for the sanctuary are formulated as follows:

1. The KWS has adequate ecological, geomorphological and hydrological values for the protection and propagation of aquatic biodiversity of the Ganga River and its habitats.
2. Agriculture being the primary occupation of the community in this area, the KWS provides water for irrigation to the local farmers.
3. The local people are dependent on the sanctuary area for their livelihood; it has diverse socio- economic linkages with the people in terms of resource use.
4. The area has rich religious, aesthetic and cultural values. It is located on the Ganga River which has high religious value. The Prayagraj confluence, (famous for Kumbh Mela) and Sitamarhi temple is also located near the sanctuary area, both the places have high tourism value.
5. The proposed Sanctuary is home to numerous aquatic wildlife especially Gangetic River dolphin, Ganges softshell turtle and breeding birds such as Indian skimmer, River lapwing, Rivertern and Small Indian Pratincole and hence, KWS has a good potential to be developed as a site for sustainable tourism and nature education.

6.2 Vision

The vision for this Management Plan is to develop KWS and adjoining landscapes as an outstanding example of well managed protected area, ensuring its ecological integrity, providing economic benefits to the local communities, facilitate improve decision making on services provided by the KWS to the adjoining rural and urban areas and to develop an integrative and strategic framework considering multiple stakeholder prospective towards achievement of sustainable relationships between ecosystems and human wellbeing.

6.3 Goal

Being located in the most populated area and having high dependence of the communities residing along the river stretch the sanctuary area is a high pressure zone. Keeping in view its

importance for aquatic wildlife and the local communities the goals of this management plan are as follows;

1. The immediate goal of the management plan is to develop the KWS as a well-managed protected area through optimizing ecosystem processes and functions of the KWS considering hydrological (flow, depth profile and lateral connectivity), ecological (species assemblages and interacting factors) and social indicators (ethical and cultural norms and attitude towards sustainability).
2. Given the landscape of practical concern and increasing legislative consideration the long-term goal of the plan is to understand the extent of human-nature interactions and underlying drivers for sustainable development and as a means to protect the biodiversity of the KWS.

6.4 Objectives

For successful implementation of riverine ecosystem management and planning it is imperative to have integrative approach for stakeholder involvement along with proper consideration of all social indicators such as ethical and cultural norms, and institutional attitude towards sustainability (Srinivas et al. 2018). The specific objectives of this Plan are as follows:

1. To secure the ecological integrity for biodiversity conservation and ensure sustained flow of ecosystem services in KWS.
2. To develop and strengthen alternate livelihood opportunities for local communities.
3. To develop KWS as a site for recreation and conservation education for visitors through participation of local communities.
4. Promote sustainable use of natural resources through the development of institutional mechanism and Ecodevelopment.
5. To strengthen the forest department through capacity building of the staff deployed for protection of the sanctuary.
6. To foster a system of participatory conservation through engagement of key stakeholder for effective management of KWS and adjoining landscape.

6.5 Problems

To achieve the set objectives, a number of challenges are visualized. Brief accounts of various problems against each objective are documented as follows:

Objective 1: To secure the ecological integrity for biodiversity conservation and ensure sustained flow of ecosystem services in KWS.

Problems:

- a. Ecological degradation due to alteration in flow regimes
- b. Population decline due to accidental killing and entanglement in fishing gear
- c. Unsustainable resource use by local communities such as fishing, biomass extraction, sand mining and riverbank agriculture.
- d. Absence of proper framework for linking different stakeholders for biodiversity conservation.
- e. Improper waste management and pollution due to use of pesticides and insecticides.
- f. Inadequate scientific basis to understand the fundamentals of ecosystem dynamics and its processes.

Objective 2: To develop and strengthen alternate livelihood opportunities for local communities.

Problems:

- a. Lack of socio-economic incentives for local communities towards sustainable relationship between human wellbeing and conservation.
- b. Lack of skill development training facilities/schemes to address local vulnerability and ecosystem resilience.
- c. Lack of interdepartmental departmental co-ordination for improving strategies for Sanctuary management.
- d. Lack of market availability for enhancing local livelihoods.

Objective 3: To develop KWS as a site for recreation, nature interpretation and conservation education for visitors through participation of local communities.

Problems:

- a. No infrastructure facility and lack of other resources for establishing nature interpretation centre.
- b. Inadequate trained human resource to facilitate environmental awareness through nature interpretation and conservation education.
- c. Lack of integrated programmes for local communities to support their livelihood and strengthen biodiversity

Objective 4: Promote sustainable use of natural resources through the development of institutional mechanism and Ecodevelopment

Problems:

- a. Poor community engagement towards biodiversity conservation
- b. Lack of awareness about role of communities in sanctuary management
- c. Lack of capacity building programmes for local communities and forest department
- d. Lack of alternative livelihood options for local communities

Objective 5: To strengthen the forest department for protection of the sanctuary.

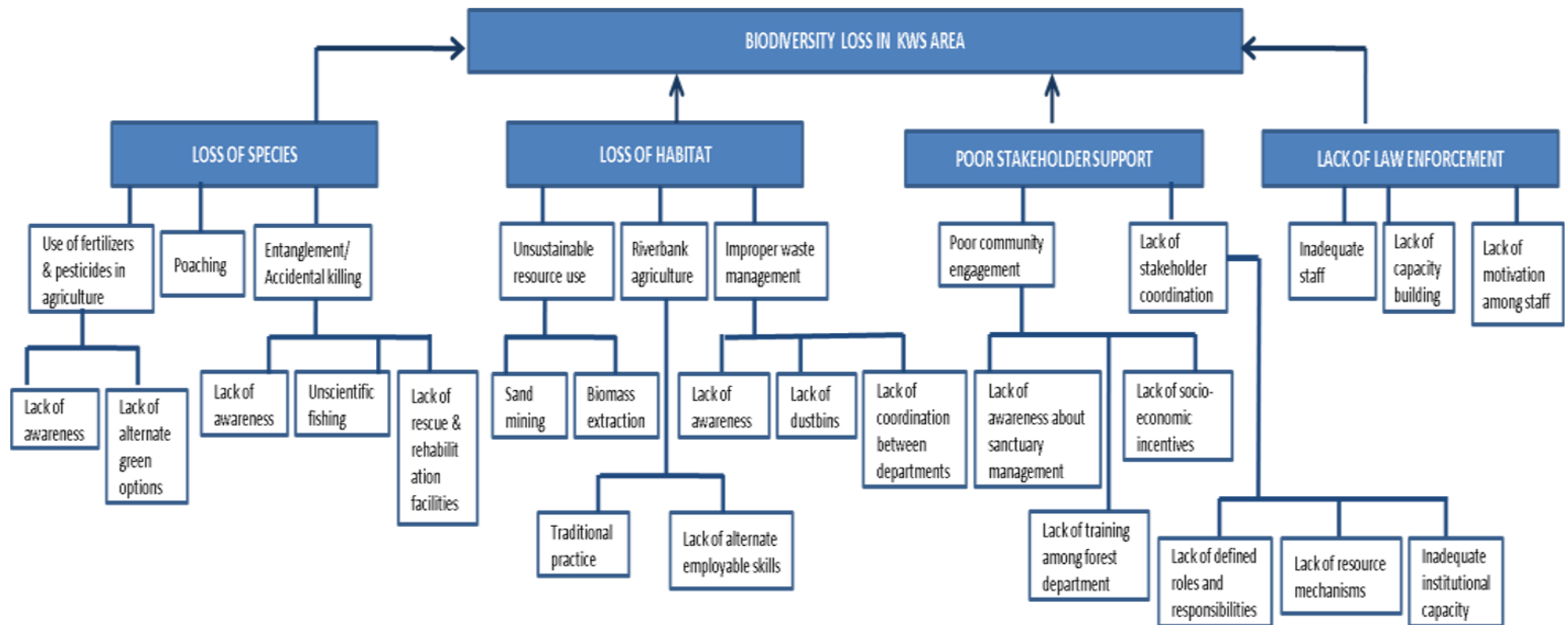
Problems:

- a. Lack of adequate capacity building trainings for forest officials and staff
- b. Lack of resource mechanisms for sanctuary management
- c. Lack conflict management strategies to mitigate challenges between forest department and local communities.

Objective 6: To foster a system of participatory conservation through multiple stakeholder engagement for effective management of KWS and adjoining landscape.

Problems:

- a. Lack of awareness about rules and regulation of protected area
- b. Lack of integrative strategies for proper sanctuary management in coordination with multiple stakeholders.
- c. Lack of integrated vision and plan for participatory management of the sanctuary.
- d. Inadequate skill to collate baseline information for the adjoining landscape



Problem Analysis for KWS area

6.6 Strengths-Weaknesses-Opportunities-Threats (SWOT) Analysis

In order to manage the sanctuary area, the management will have to make use of strengths while minimizing the problems. Similarly, they will have to keep in mind, both the threats and opportunities of the area. Accordingly, the SWOT Analysis of KWS area is detailed below:

STRENGTHS

- 6.6.1 Biological diversity and substantial breeding population of endangered Ganges Softshell turtle (*Nilsonia gangetica*), Gangetic Dolphin (*Platanista gangetica*) and other breeding water birds.
- 6.6.2 Heterogeneous habitat in terms of sandbars, meanders, intermittent shallow water with deep pools that offers diverse micro habitat to wide range of species.
- 6.6.3 Hydrological complexity favoring species richness and assemblages.
- 6.6.4 Greater hydraulic refuge and less contamination enhance wildlife propagation.
- 6.6.5 Enrich local livelihood through multiple services such as fish, water and other biotic resources.
- 6.6.6 Located in tri junction of Prayagraj, Mirzapur, Bhadohi district that are connected to major towns and tourism sites may provides ample opportunity to support local livelihood.

WEAKNESSES

- 1. Less forest covers in the catchment area.
- 2. Land use dominated by agriculture area.
- 3. Lack of scientific rigour to assess the impact of increasing human pressure on the hydrological regimes and functional attributes of the riverine ecosystem.
- 4. Lack of conservation awareness among communities.
- 5. Poor governance and lack of coordination among regional stakeholders.
- 6. Lack of in depth planning and improper implementation of existing policies

OPPORTUNITIES

- 1. Declaration of sanctuary will ensure protection status of the KWS and thereby enhance protection of wildlife and their habitat.

2. Implementation of existing policies to enhance biodiversity as well as community wellbeing.
3. Significant tourist inflow from adjoining area such as Prayagraj, Mirzapur and Bhadohi.
4. Presence of scientific and educational institutions which can provide their inputs in conservation.
5. Possibilities of recreational activities and conservation education.
6. Livelihood opportunities such as carpet making etc.
7. Facilitate improved decision making on understanding complexities of human-nature interface for sustainable development.

THREATS

1. Unsustainable resource extraction such as fishing, sand mining and riverbed agriculture.
2. Alteration in flow regime due to abstraction of water for irrigation and domestic use.
3. Non point sources of pollution from adjoining agricultural areas.
4. Mechanism for waste management not in place.

Chapter 7

Management

Strategies

7.1 Management Philosophy

For the strategies to be effective on ground, it is important that they are led by a certain philosophy. The management philosophy for Kachhua Wildlife Sanctuary (KWS) is guided by the following principles:

7.1.1 Degree of intervention

In general, a policy of minimal intervention in natural ecosystem level processes has been followed in this management plan considering the fragility of the riverine ecosystem. The floral and faunal assemblages of the selected stretch have resulted from years of change and adaptation to a natural set of conditions. The chain of interdependence, however, is too complex to be understood in totality. Tampering with this natural ecosystem with limited understanding may create a chain of events that we may not understand and can have long-term undesirable effects. Management prescriptions, therefore, are mostly directed towards reducing excessive activities and developments that may create undesirable impact on the flora and fauna and at the same time promoting sustainable use of the riverine resources to ensure human well-being.

In situations where the cause and effect relationship is well understood, it may be justifiable to carry out interventions that helps mitigate an altered natural feature of the ecosystem or for achieving specific management objectives. This implies a good understanding of the ecology of the river at the habitat level, species level, hydrology and other disciplines.

7.1.2 Statues, rules and guidelines followed

The strategies suggested in this plan follow the extant statutes, rules, directives and guidelines prevalent in India. The primary ones in this regard are the National Environmental Policy, 2006, Wild Life (Protection) Act, 1972, Biological Diversity Act, 2002, Environmental (Protection) Act, 1986, especially Water (Prevention and Control of Pollution) Act, 1974. In addition, suggestions from officials and local communities having wide experience with the Sanctuary

management have also been considered while framing the strategies for the management of Kachhua Wildlife Sanctuary.

7.1.3 Wider geographic scope of Management Plan

The notified area of the KWS is not ecologically adequate for long ranging higher aquatic vertebrate species such as Gangetic dolphin, gharial and turtles. In order to provide substantial habitat to achieve viable population of large aquatic vertebrates it is very much essential to have a buffer zone. It will also help in reducing human disturbance on the sanctuary. Hence, apart from the 30 km stretch which will be protected as wildlife sanctuary, a stretch of 25 km upstream and 5 km downstream is proposed as an eco-sensitive zone which will come under buffer zone of the KWS.

However, KWS as a lotic linear system with longitudinal connectivity, it is essential to have strategies that go beyond the legal boundaries of protected area. Herein, it is proposed that a 1 km perpendicular distance from shoreline of both the banks which will effectively help in managing human dimensions and their interactions with KWS. This will require large support of the local communities and other important stakeholders, which in turn will ensure long term conservation of this human-dominated riverine landscape. Eco-development programs and extension activities are the key to gain the trust of local communities and garner their support for conservation and management of KWS. Lessons learnt from the implementation of this plan in KWS will help to expand the boundaries of the sanctuary and to effectively manage the Ganga Riverscape.

7.1.4 Balancing development with conservation

KWS is lying within the Gangetic plain which is a part of the middle stretch of the Ganga River. This stretch of the river experiences huge anthropogenic pressures evident from dense population on both sides of the river, intensive agriculture on riverbanks, rampant illegal sand mining and fishing activities. These human stressors have led to an unsustainable use of resources from the riverine ecosystem and its degradation, which in turn, has impacted the ecological integrity of the river and its aquatic biodiversity. The major reason for shifting KWS from Varanasi to the present location was the intense human disturbance itself which had left the stretch “no longer

suitable for adequate ecological, floral, geomorphological, natural and zoological significance for the purpose of protecting, propagating Wildlife and its environment.”

Other than the tangible benefits, KWS contributes to people's quality of life through various intangible benefits like groundwater recharge, providing fertile lands for agriculture, water supply, climate and water regulation etc. Hence, it is of utmost importance to balance the needs of the local communities and various beneficiaries dependent on KWS for their livelihood and the ecological integrity of the protected area to achieve the ultimate goal for which this stretch has been declared as wildlife sanctuary. Hence, this management plan attempts at reducing or shifting the dependency of local communities on the resources of KWS through alternative livelihoods as part of its ecodevelopment and ecotourism programme to compensate for the economic losses from foregoing their dependency on the stretch.

7.1.5 Building ownership of communities and empowering them for participatory decision making

The local communities living on the banks of KWS are dependent on the river mainly for fishing and agriculture. With legal protection to the stretch, their free access to the area and its resources might get restricted. This in turn, might affect the ownership and interest of the local communities in the conservation of the stretch. Hence, it is crucial to maintain the linkage between the river stretch as protected area and the local communities and simultaneously, empower the communities so they can actively participate in decisions related to management and conservation of the protected area. Though legally Wildlife Sanctuaries have no provision to involve local communities in the management of the protected area, it is desirable that local communities also represented in decision-making and given a chance to voice their opinions and traditional knowledge regarding the area. Through various capacity and trust-building exercises, they can be trained to participate better. The state forest department has a major role to play as facilitator and reach out to them to ensure sustainable and inclusive conservation and management. Ensuring alternative livelihoods and sustainable substitute of resources for which the communities are dependent on the river is also crucial to ensure long-term support of the communities.

7.2 Strategies

Through extensive village-level meetings and focus group discussions, problems were identified and suitable broad strategies to tackle them were formulated (Figure xx and xx).

7.2.1 Constitution of Advisory Committee

As per the provisions under section 33B (1) of Wild Life (Protection) Act, 1972 “the State Government shall constitute an Advisory Committee consisting of the Chief Wildlife Warden or his nominee not below the rank of Conservator of Forests as its head and shall include a member of the State Legislature within whose constituency the sanctuary is situated, three representatives of Panchayati Raj Institutions, two representatives of non-governmental organizations and three individuals active in the field of wildlife conservation, one representative each from departments dealing with Home and Veterinary matters. Honorary Wildlife Warden, if any, and the officer-in-charge of the sanctuary as Member- Secretary”.

7.3 Zone Plan

To reconcile conservation with communities, the protected area is suggested to be divided into two zones: Minimum disturbance zone and Sustainable-use zone (Table 7.1). With the purpose of the two zones being different, the set of prescriptions will also differ. Minimum disturbance zone will be subjected to complete protection and no resource use. However most of the habitat management interventions will be applied in sustainable use zone. Many interventions related to eco-tourism, interpretation, eco-development, research and monitoring etc., cannot be associated with a particular zone and hence would be discussed as theme plans. Protection as an integral part of management is also being discussed separately as theme plan as it will spread across all the zones.

7.3.1 Minimum intervention Zone

This zone is the entire 30 km stretch of Ganga river notified as wildlife sanctuary as per the notification number- 346181-4-2020-823120081-C, dated 17-03-2020. It is proposed to have minimum human intervention and maximum protection so as to maintain its ecological integrity and aquatic biodiversity assemblage.

7.3.2 Restoration Zone

A part of the sustainable use zone will be delineated as the ecological restoration zone. Here habitat management activities will be carried out with the aim to restore the habitat.

7.3.3 Tourism Zone

In the buffer area, a separate zone dedicated for tourism is proposed. 25 km area upstream the sanctuary area is to be delineated as tourism zone. Here, infrastructure for tourism based activities such as interpretation center, nature trails, boat routes, bird watching and camping sites etc., should be properly facilitated.

7.3.4 Sustainable-use Zone

The 25 km upstream and 5 km downstream stretch of sanctuary area is proposed under sustainable-use zone. This area is delineated so as to regulate the extraction of resources for that are difficult to regenerate. In this zone, sustainable and wise use of resources will be encouraged whilst ensuring the ecological integrity of the whole stretch. This zone will, therefore, be accessible by the dependent communities. Hence, strategies should be formulated such that this zone receives appropriate protection and restoration. Activities like weed removal, plantation of tree species for the purpose of nesting and perching of fish eating waterbirds and other habitat improvement strategies if required can be carried out in this zone, especially in the upstream stretch of 25 km. Also, to ensure smooth transition from open access to regulated access to resources, the rights and the concessions of the local communities needs to be settled on priority.

Table 7.1 Area under various proposed zones in Kachhua Wildlife Sanctuary

Zones	Length (km)	Area (%)	Comment
Minimum Intervention Zone	30		Entire stretch under wildlife sanctuary
Restoration Zone	TBD		Restoration activities will be carried out
Sustainable Use Zone	30		Stretch under buffer area meant for local communities to sustainably meet their needs
Tourism Zone	TBD		Part of Sustainable-use zone meant for establishing ecotourism facilities

7.4 Theme Plans

The following theme plans are proposed for KWS management:

7.4.1 Secure the ecological integrity of the Sanctuary

7.4.1.1 Boundary Demarcation and expansion of Kachhua Wildlife Sanctuary (Buffer)

From the rapid biodiversity assessment survey it was evident that the KWS is rich in biodiversity. The home range of higher vertebrates such as Gangetic dolphin, gharial and turtles extends beyond the area demarcated for the KWS. Only 30km of the stretch is notified as Wildlife Sanctuary, which is not ecologically sufficient for the survival of long ranging species. Hence, this management plan proposes 25 km upstream and 5 km downstream as buffer area of the Sanctuary. There is a need to demarcate Eco sensitive zone on both side of the river stretch, so as to check human interference in this area. Hence, this management plan proposes to declare the high flood zone as Eco Sensitive Zone and convey the exact location of boundaries to the surrounding local communities as a part of the outreach initiatives of forest department to familiarize the local communities with the protected area.

7.4.2 Monitor impacts of Climate Change

The fragile ecosystem of the KWS makes it vulnerable to climate change impacts such as change in flow and depth due to erratic precipitation, which in turn can be detrimental for its biodiversity and the local communities residing nearby. Hence, it is necessary to have a well-planned management strategy for flood risk management in the sanctuary.

7.4.3 Monitoring vegetation composition and productivity

The degradation of the habitat has resulted change in plant species composition and biomass productivity. The following strategies need to be adapted to enhance the ecosystem function and services of the sanctuary:

1. Study the change in vegetation composition and productivity of the Park through quadrat sampling on a line transect (Muller-Dumbois & Ellenberg 1974).

2. Map the vegetation structure and composition in a periodic manner to see any unwanted changes

7.5 Habitat Management Plan

Habitat management is based on protecting the area from the degradation, improving the habitat for wildlife, regenerating the area and to conserve the biodiversity. For KWS, management of aquatic weeds, fishery, and management of habitat for wildlife are crucial.

With the purpose of improving the habitat and achieving the goal of aquatic biodiversity conservation, this theme is being proposed.

7.5.1 Strengthening the existing population of Turtles

7.5.1.1 Management of habitat for Wildlife

To ensure the long-term survival of the present population of its flagship species of Turtles and other species of conservation significance like Gangetic dolphin, Gharial etc. restoration of original habitat is important.

1. River bed agriculture should be regulate/stopped during breeding season so as to provide adequate space for the aquatic species viz. turtles and water birds to lay nests.
2. Natural vegetation along the banks serves as foraging, basking and breeding habitat of amphibians and reptiles, which needs to be protected.
3. Incidentally caught Gangetic dolphin, Gharial, Turtle, other reptiles and amphibians, during fishing, should be released back to the water.
4. Use of pesticides and chemical fertilizers are harmful to aquatic fauna, therefore, farmers of nearby agricultural fields should be made aware and encouraged to practice organic farming.
5. Livestock, feral dogs and human interventions along the Sanctuary needs to be checked and monitored in a regular basis so as to minimize threats on aquatic species of the KWS.

7.5.1.2 Management of Water level and quality

The use of pesticides and fertilizers in the surrounding agricultural fields needs to be discouraged. During religious rites and ceremonies, specific sites should be identified and demarcated where religious rites and ceremonies can be conducted, while keeping the rest of the Sanctuary area free from the polluting activities. Local people should be encouraged to use products made from biodegradable materials for the religious activities. Ecodevelopment committees (EDCs) along with the temple authorities should be involved in cleaning the waste generated during religious rites and ceremonies.

Maintaining the minimum required e-flow is an important prerequisite for strengthening the ecological character for improving the habitat quality and sustained flow of ecosystem services.

7.5.1.3 Management of Fishery

For sustainable fishing in the Sanctuary, Fishermen Ecodevelopment Committee should be established. Fishermen EDC will provide fishing contracts to the fishermen community on a rotational basis, so that most people are able to get benefit from this. Fishing in the Sanctuary should be allowed only in Sustainable use zone, with the following condition:

7.5.1.3.1 Fishing activities should be kept at a minimum level between November and March.

7.5.1.3.2 Forest Department along with Fishery Department and Fishermen's EDC will regulate fishing activities in the Sanctuary.

7.5.1.3.3 Accidentally captured fauna such as Gangetic dolphin, gharial, turtles, snakes, should be released back to the open water immediately.

7.5.1.3.4 Make fishermen aware about the ecological functions of the river so that they are more careful not to contribute to its degradation.

7.5.1.3.5 Fishermen need to be advised not to disturb birds during winter.

7.5.1.4 Regulation of sand mining activity

Sand resources are excessively used for many purposes, such as land reclamation (e.g., for building/extension of ports), industry, protection and restoration of wetlands, and nourishment of river banks that are susceptible to erosion. However, the most serious physical and biological impacts of sand extraction are inevitable and are related to substratum removal; alteration of the

bottom topography and sediment composition; changes in depth and alteration of hydrologic conditions that causes an initial reduction in abundance, species diversity, and biomass of the benthic community in the extraction area and finally leads to direct removal of species. With prior consideration of the areas of ecological and landscape interest and the rational use of natural resources of the KWS, it is imperative to promote integrated regulatory guidelines which are as follows:

- 7.5.1.4.1 Adopt measures to ensure the protection and conservation through legislation, planning, and management of KWS, in particular of those hosting habitats and species of high conservation value.
- 7.5.1.4.2 Prohibition of commercial extraction of sand including river bed sediments where it is likely to have an irreversible and adverse impact on the functions and processes of the riverine system of the KWS.
- 7.5.1.4.3 Ensure institutional coordination, establish and maintain mechanisms in vulnerable areas through local support and stakeholder participation.
- 7.5.1.4.4 Strengthening existing mechanism and create new legislative framework if necessary for observation and monitoring of illegal sand extraction as means to protect the natural heritage of the sanctuary.

7.5.1.5 Control of Grazing

Alternate fodder management plan such as agricultural waste, annual fodder plantation in available wasteland, agroforestry subsidies for fodder procurement etc. needs to be initiated. A physical boundary should be established through fencing wherever possible on areas adjoining the villages especially where grazing is most prevalent. In addition, constant vigilance for any grazing activity and stringent penalty on owners of livestock that graze near the sanctuary should be enforced. The following are some measures that could help in tackling grazing issues. Cattle grazing at the peripheral areas during lean season need to be stopped urgently.

- A survey for livestock population in the peripheral area should be initiated to formulate a scheme for immunization of livestock.
- In most vulnerable locations, cattle proof fencing should be raised. Temporary cattle watchers should be engaged at these locations.

- Create social fencing through local institutions
- Agroforestry should be encouraged and the community should be made aware to adopt it.

7.5.1.6 Management of Invasive Species

In human dominated landscape intensive agricultural activities caused infestation of aquatic weed like *Eichhornia crassipes*. The area is mainly dominated by aquatic species like reeds, grasses and sedges, some exotic weed plants viz. *Phragmites karka* (Retz.) Trin. ex Steud., *Eichhornia crassipes* (Mart.) Solms, *Saccharum spontaneum* L., *Parthenium hysterophorus* L., *Ipomoea carnea* Jacq. Although these species play a major role to protect and conserve soil and river bank ecosystem; simultaneously excessive and prolific growth decrease species richness, diversity and overall production. These invasive species can be removed manually by deploying labour and boats. Weed removal activities can be done by involving villagers from the surrounding areas. Involvement of local communities in these activities will generate seasonal employment and invoke sense of ownership among them.

Invasive species management is much more effective when consistent funding and effort can be applied to a given site across multiple years. Training and educating local people, citizen scientists, and different stakeholders can help conservation organizations to spot threats before they become a larger problem. Seasonal and controlled burn of dry reeds like *Phragmites karka* (Retz.) Trin. ex Steud., *Saccharum spontaneum* L. should be done.

For managing or controlling the spread of invasive species a set of guidelines based on tested methods should address invasive species across their geographical area and across jurisdictional boundaries by Government, Non-Government Organizations, and Regional collaborative organizations for more effective invasive species management.

For management of invasive fish species we need to identify and target the invasive species whose population needs to be controlled in the given habitat. The following steps can be adopted to monitor spread of invasive species in freshwater streams:

- 7.5.1.6.1 Prior knowledge about the ecology, morphology, phenology, reproductive biology and physiology is essential in monitoring exotic or invasive fish species monitoring.

7.5.1.6.2 Proper quarantine norms formulated by the state government departments and quarantine measures should be adopted consulting NBFGR, ICAR, etc.

7.5.1.6.3 Introduction of genetically engineered species in natural streams should be done with extreme care.

7.5.1.6.4 Strengthening awareness among the locals by easy to identify pictorial diagrams can be used, depicting the uncontrolled spread of invasive species and encouraging the concerned departments to identify and target those species in culturing them in nearby streams and waterbodies.

7.5.1.6.5 Avoid releasing exotic aquarium fish species directly in natural streams and waters

7.6 Species Management planning

7.6.1 Establishment of rescue and rehabilitation centre

The rescue cum rehabilitation centre for rescued animals and conservation breeding should be maintained properly as per the IUCN and Central Zoo Authority (CZA) standards. At the centre area, there is a need to have an aversive conditioning facility for the rescued animals.

7.6.2 Undertaking, aiding, promoting and coordinating research

7.6.2.1 Monitoring population trend of Turtles and other aquatic vertebrates

The existing population of Turtles in KWS needs to be assessed to know whether it is stable or not. The deteriorating habitat condition and anthropogenic pressure is affecting the population growth, distribution and habitat use. A complete scientific management for population monitoring and habitat use should be in place. This monitoring should be carried out periodically. Monitoring protocol should be developed and implemented together by forest department and a competent organization or research institute.

7.7 Protection Strategies

7.7.1 Establishment of Protection Camps

Protection camps are required to check the unregulated extraction of resources since the villages in these blocks are highly dependent on river resources. One Guard station, one camp office for Management Committee of KWS needs to be established. It is important to deploy watchers during the winter to control poaching and illegal fishing.

7.7.2 Infrastructure for patrolling

One four-wheeled vehicle for the Range Officer is a must for the protection of the Sanctuary. Two motor-cycles and few bicycles for the rest of the staff are also a necessary requirement for better and efficient protection. In addition, three rowing boats are required to check the ingress of fishermen and others in the Sanctuary. There would be a requirement of boat men for these boats as well, who can be engaged on a contractual basis. Weapons, wireless phone and uniform should be provided for patrolling to each forest guard and also to members of the EDC involved in protection work.

7.7.3 Watch tower for protection

In order to check illegal trespassing in the various zones of the Sanctuary, watch towers of 50 ft height are proposed to be constructed near the protection camp. These towers can be made of iron or locally available materials, which could be used for bird watching by the tourist.

7.8 Management of surrounding landscape

For effective management, there is a need to expand the conservation initiatives to the landscape level. The conservation planning should be initiated through baseline information, creating awareness in surrounding villages, trust building activities and building resources for the proposed Trust. Additionally, networking with major institutions and department will be required for this expansion.

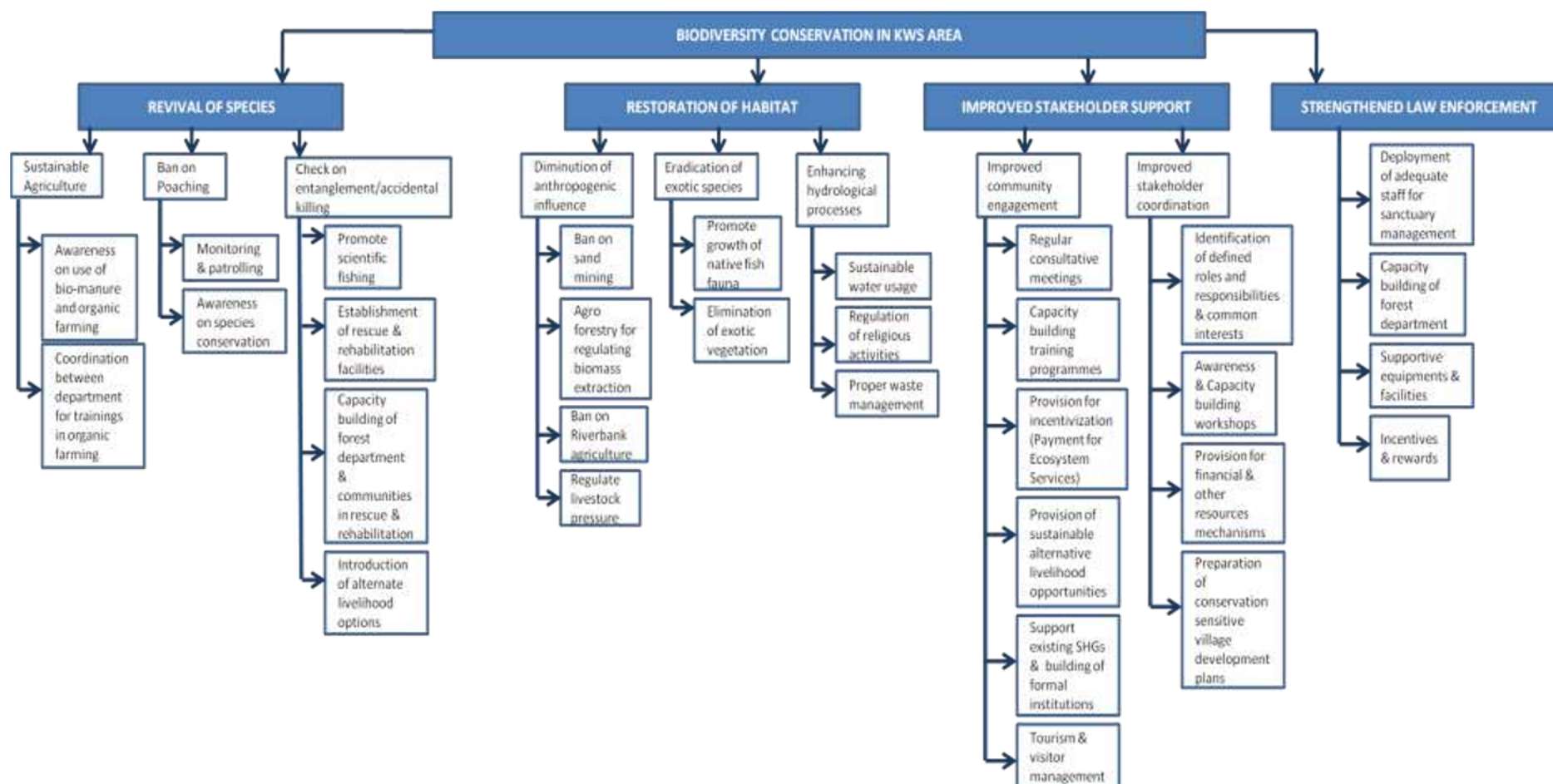


Figure 7.1 Analysis of solutions for biodiversity conservation of KWS area

Chapter 8

Ecotourism, Nature Interpretation and Conservation Education

8.1 General

The term ecotourism was first introduced in the 1980s. It is defined as *responsible travel to natural areas that conserves the environment and improves the well-being of local people* was established (International Ecotourism Society, 1990). According to World Conservation Union (1996), ecotourism is described as *environmentally responsible travel and visitation to natural areas, in order to enjoy and appreciate nature (and any accompanying cultural features, both past and present) that promotes conservation, have a low visitor impact and provide for beneficially active socio-economic involvement of local peoples*. The concept and practice of ecotourism involves participation from various stakeholders thereby ensuring management of natural resources and sustainable development.

Relation among conservationists, communities and tourism practitioners has not always been smooth and collaborative. For years, for biodiversity conservation were managed through minimal collaboration with the people living in or near these areas. Ecotourism has emerged as a platform to establish partnerships and to jointly guide the path of tourists seeking to experience and learn about natural areas.

Kachhua Wildlife Sanctuary (KWS) has high potential to support ecotourism and become an ideal centre for nature interpretation and freshwater conservation education. As the KWS has frequent sightings of Gangetic River Dolphin and different species of water birds, an interpretation centre can be developed to make visitors and local communities aware of the high biodiversity value of the area and various conservation issues. The area surrounding KWS holds religious importance due to the presence of Sitamarhi temple. The local communities residing in the vicinity of the sanctuary can be empowered to partake in the Ganga biodiversity conservation by generating sustainable local livelihood alternatives and providing them with subsequent capacity building and skill enhancement trainings. The concept and practice of ecotourism brings different stakeholders together, therefore, there is a need for proper channelizing and mobilization of the resources and potential the place holds.

Ecotourism can be strengthened by replicating the Jalaj model viz. a mobile livelihood and awareness centre at Varanasi, Uttar Pradesh established under WII-NMCG Biodiversity Conservation and Ganga Rejuvenation Project. The Jalaj boat will act as one stop centre for disseminating information and spreading awareness about the cultural and ecological heritage of the Ganga River and KWS thereby making it a holistic and valuable experience for the visitors. The Jalaj can also be the centre for promoting local handicrafts, and value added food products made using locally available resources by local communities. This will not only provide alternative livelihood options to the local communities who will be trained in various skill development and livelihood options such as health and wellness, value addition of the local products, eco-tourist guide but will also ensure and strengthen community participation in biodiversity conservation and sanctuary management in the long term (Figure 8.1).



Plate 8.1 “JALAJ” the mobile livelihood center at Rajghat Varanasi.

To strengthen local livelihoods of local communities, homestays can be established in surrounding areas of KWS. The concept of homestays symbolizes collaborative consumption and shared economy and is environmentally sustainable having lower carbon footprints as compared to other types of lodging facilities. This will provide an opportunity to the visitors to experience

and understand local culture and local cuisines. The hospitality and lodging facilities will give an exposure to the daily routine and lifestyle of the local communities and the shared relationship with the nature symbolizing co-existence. For e.g. farmstays can be introduced wherein the visitors will get an overall experience of the lifestyle and dependence of local communities residing along the Ganga River. Various activities can be introduced such as farm visits wherein there are demonstration sites for organic farming, groundwater recharge, livelihood centres, horticulture, agro forestry, use of sustainable rural technologies etc. The local communities will be thoroughly trained in hospitality management for ensuring a meaningful, valuable, hygienic and safe experience for the visitors. The concept of homestays if implemented in a right manner will significantly contribute in improving the local livelihoods as well as strengthen and ensure the role of communities in conservation in the long run (Figure 8.2).

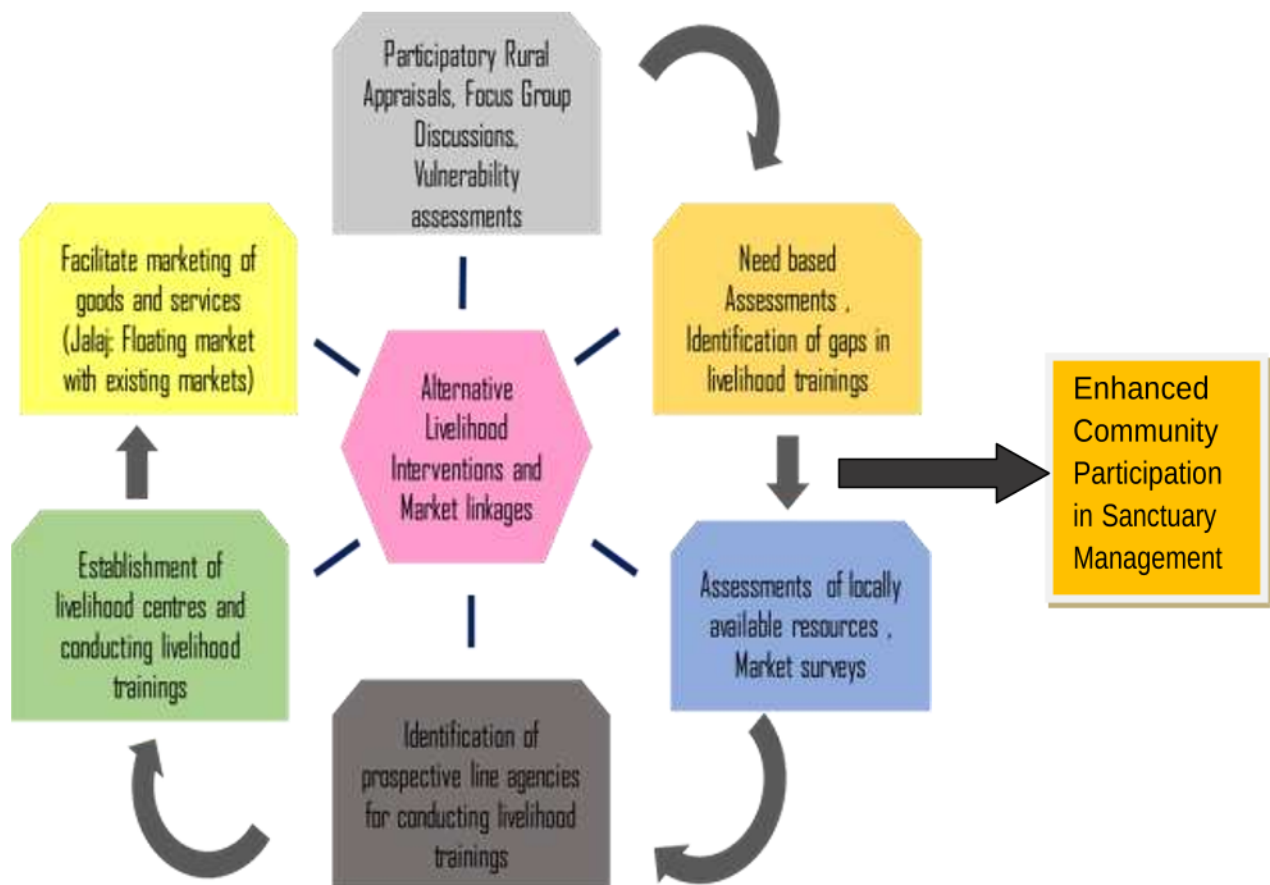


Figure 8.1 Process of livelihood interventions

Our villages are part of India's rich culture and heritage. Each village is different as it has its own story and uniqueness. Agritourism or Farm tourism, is another form of tourism which can be promoted in this area. This is an emerging sector with huge potential to tap. As sanctuary area is an agriculture dominated area, Farm or agri tourism can be an option to engage people and reduce their dependence on the river stretch. Villages situated along the Ganga River can become a tourist attraction for people who want to get away from the hustle bustle of the urban life. Here the tourist can experience the village life and culture. They can have bullock or tractor rides. They can work in the fields and also have the traditional village food (Figure 8.3).



Plate 8.2 Agri tourism can add to the income of the village communities

The revenues generated from tourism will help reduce the direct dependency of local communities on the Ganga River, as well as strengthen sustainable livelihood opportunities, thereby, ensuring their support in biodiversity conservation and protected area management.

8.2 Stakeholders in Ecotourism

To fulfill the multiple goals of conservation and equitable development, it is crucial to strengthen partnerships between multiple stakeholders for effective implementation of ecotourism activities (Figure 8.1). Partnership may be difficult because of the number of players involved and their varying interests, but forging relationship is essential. Protected area managers and staff play crucial role in ecotourism as they are on the frontlines for management and are the first to notice natural resource changes such as impact from tourism. Some may play more prominent roles than others, but almost all will be represented at different levels in the development and management of ecotourism activities. Effective ecotourism enquire that the protected area personnel be able to work closely and knowledgeably in collaboration with local people and community leaders as well as with a wide variety of tourism industry representatives, including tourism operators, travel agents, guides, government tourism agencies and others. Protected area personnel must be able to guide the sometimes conflicting interests of all the ecotourism participants so that they come together for the benefit of the protected area and achieve its conservation goals.

For different ecotourism activities in KWS the lead role will be played by the forest department with support and active participation from local communities and Ecodevelopment Committee. Eventually, the KWS can partner with other outside groups such as tour operators, hoteliers, education institutions in and around the area, research organizations, etc. in order to cater to the interest of different stakeholders in a sustainable manner. From community participation to conservation education and skill development to infrastructure, there is a lot of effort needed by the government to implement ecotourism. Thus, proper policies are to be formulated for an inclusive ecotourism approach in KWS, one which is socio-economically effective, culturally advanced, conservation sensitive and environmentally sustainable.



Figure 8.2: Stakeholders in tourism (Source: Adapted from Gutierrez et al., 2005)

Target Groups for Ecotourism in KWS

8.2.1 Local Communities

Local communities play a key role in ecotourism. Their relationship to natural resources and their utilization of it determine the success of conservation strategies for protected areas. In addition, local or traditional knowledge is often a key component of visitors' experience and education.

People who live in or near protected areas are not a homogeneous group. Even within a small community there is diversity of people with a varying range of needs and habits. The interests and concern of the local residents need special attention. Tourism touches all groups of people involved directly or indirectly with it, in mostly an economic sense. For the local villagers, it touches their personal lives affecting their lifestyle, tradition and culture along with enhancing their livelihood. With time, other players enter into tourism voluntarily. The villagers must deal with the impacts of tourism whether they choose to or not.

8.2.2 Tourism industry

First, the local community involved in tourism should understand travel trends. They should know how consumers act and what they want. This plays a key role in promoting tourism. They should know how to attract travelers through publications, social media and other means of promotion thus providing crucial link between ecotourism in KWS as well as bearing in mind conservation of the natural resources.

8.2.3 Government officials

Officials from various concerned Government Departments should participate in ecotourism planning, development and management. These departments include Irrigation department, Soil and Water Conservation, State Tourism departments. Officials from the regional and local level departments should also contribute to the planning.

8.2.4 Non-governmental organizations

NGO's are valuable players because they provide a forum for discussion and influence. They offer a means of communication with a large number of interested individuals. Organizations can serve as facilitators between protected areas, communities and all the other players in ecotourism.

8.2.5 Academicians

Academicians are another group that plays a valuable role in ecotourism. Researchers and academicians contribute to the existing knowledge base. Colleges in Prayagraj can conduct extensive research on various aspects of protected areas. The research findings can be used for educating the visitors. The schools and colleges in Prayagraj can use the area for conservation education trips.

8.2.6 Travelers

It is crucial to ensure responsible traveling by travelers for effective implementation of ecotourism activities. The choices they make when they select a destination have a tremendous impact upon the eventual success or failure of an ecotourism project.

8.3 Objectives

The main objective of ecotourism at KWS is to ensure ecologically responsible tourism, which is responsive to the economically profitable for the local communities. The objectives can be listed as follows:

1. To promote conservation awareness regarding freshwater conservation amongst local people and tourists through conservation education and nature interpretation.
2. To generate alternate livelihood opportunities for local communities in order to reduce the existing dependence on the natural resources in KWS.
3. To develop a harmonious relationship among the sanctuary, the visitor and the host community.

8.4 Problems and Issues

KWS supports unique river ecosystem inhabiting diverse freshwater/aquatic biodiversity, making it a potential site for developing regulated and sustainable ecotourism centre. The Sanctuary has frequent sightings of Gangetic dolphin and is a unique habitat for residential and migratory waterbirds and turtles. The surrounding area of the sanctuary is also known for its cultural and aesthetic value, due to the presence of Sitamarhi temple in Bhadoi district and sacred Triveni Sangam in Prayagraj district, which is 25 km and 62 km away from KWS resulting in high tourist footfall. The tourists are mostly nationals and locals who visit these two places regularly due to religious significance of the Ganga River.

As KWS has been recently notified and declared as a Protected Area vide Government Notification No.1485/14-4-2008-823/2008 dated 21-05-2009 issued under Section-26A of the Wild Life (Protection) Act, 1972 (Act No. 53 of 1972) therefore, there is lack of proper infrastructure, inadequate trained staff and lack of participation from local communities to initiate and implement ecotourism activities. Also, there is no comprehensive plan for promoting sustainable and regulated ecotourism activities in the area.

There is lack of basic infrastructure facilities such as nature interpretation centre for conservation education, ticketing counter, tourist and visitor management, parking facility, toilets and cafeteria which need to be developed. At present, there are no nature trails and watchtowers in

the Sanctuary for monitoring and patrolling. Banners and signage are inadequate within and outside the Park for directing people in and around the Sanctuary.

There is no provision for incentivization that will be generated through tourism activities for benefit sharing with local people and ensuring their participation in biodiversity conservation and Sanctuary management. Also, there is a need to establish and strengthen the relationship between Forest Department and local communities in order to minimize the negative impacts on tourism and Sanctuary management. There are no advertisements of the aquatic faunal and floral species of KWS. There is limited or no media attention from the locals, state as well as national to attract tourists. With respect to establishing nature interpretation centre for conservation education following are some of the issues that needs to be addressed:

- Lack of interpretation centre to provide information on biology and ecology of freshwater aquatic species and other important species of the Sanctuary.
- Lack of trained interpreter and local tourist guides to educate the visitors about the information displayed in the interpretation centre and nature trails.
- Lack of capacity building and awareness workshops to involve the local communities in managing tourism in the Sanctuary.
- Lack of functional Self-Help Groups and eco-development communities to promote local products.
- Shortage of home stay facility in the surrounding villages to promote ecotourism industry in KWS.
- Proper demarcation of tourism zone in the Sanctuary to restrict the tourism activities in and avoid any human disturbances and in the Sanctuary.
- Lack of zonation in time to balance the inflow of visitors during sensitive periods of animal activity.

Capacity building of forest department and local community members needs to be carried out for developing a cadre of trained staff for the management of the Sanctuary as well as regulation of ecotourism activities in and around the Sanctuary area especially during peak tourist seasons. In order to promote ecotourism activities in KWS there is a need to design and implement a

conservation sensitive ecotourism plan protecting the ecological integrity of the Sanctuary as well as catering to the needs and interests of the tourists and promoting responsible tourism.

8.5 Strategies

8.5.1 Zonation

8.5.1.1 Zoning in space

Zonation in space will be used to determine how to disperse visitors when they enter the Wildlife Sanctuary. This way a whole range of visitor densities in different parts of the area maybe created. Visitors may be separated by providing different opportunities for recreation in different parts of the area, without imposing limitations on access. However, sensitive parts of the Park should be closed to the general public.

Tourism zone area is limited therefore; demarcation inside the Sanctuary for visitors is required. These places however would not suffice the number of tourists likely to start visiting once the plan is implemented. At the same time the Sanctuary being eco-sensitive, creating new areas will certainly be challenging and careful prior planning will be required. A part of sustainable use zone will be converted into tourism zone inside the Sanctuary for tourism activities.

8.5.1.2 Zoning in time

With the change of seasons, wildlife inside the Sanctuary use different areas. At the same time, there are the seasons when number of visitors is more, *i.e.*, during the month of May and June. Striking a balance between inflow of visitors and tending to sensitive period for animals is required. For instance, it is necessary to limit the number of visitors during certain times of the year (during the breeding), or to close down certain roads and paths so that sensitive part of the area remains undisturbed. Accessibility could also be restricted according to the time of the day. Visitors could be allowed only during morning (sunrise to 1100 hours) and evening (1600 hours to sunset). According to the season, area and time, visitors may be allowed to access in slow- moving vehicles or on foot. It is also important to determine the type of visitors visiting at different seasons. Most of the visitors during summer and winters are children or young adults visiting the place mostly for recreational purpose. For such type of visitors, a short visit to the periphery of the Sanctuary and the interpretation centre would suffice given that interesting and correct information of the Sanctuary, wildlife and conservation are provided.

8.6 Planning and Mapping

8.6.1 Infrastructure

Interpretation centre should be made an integral part of planning since it would help in educating and guiding the visitors before they enter the Sanctuary to watch wildlife. It is proposed to develop an interpretation centre near the Sanctuary entrance. Short trails can be developed that will act as an extension to the existing road, could be converted into educational nature trail.

There should be purpose in every design made for the route. A trail can:

- Lead visitors to observe and experience special features and spectacular localities
- Point out less obvious characteristics that most visitors would normally fail to notice
- Guide people away from places that managers do not want them to visit
- Confine visitors to specific points

8.6.2 Visitor facilities

- No facilities should be planned in open areas important to terrestrial and aquatic species such as turtles, Gangetic River Dolphin and water birds.
- Permanent watchtowers inside the Park should be used to enable visitors to obtain close views of wildlife without much disturbance. These towers should be maintained regularly.
- Facilities such as wooden sitting places on the nature trails at intermittent distances and area as a means to encourage visitors to stay in those chosen spots should be constructed. It is a way of managing flow of visitors.
- The interpretation centre building needs to be developed and made functional.
- Home stays and small guest houses are recommended instead of big hotels in this ecotourism zone so that visitors get a feel of the village in its natural roots.
- Village walks, farm tourism, boat rides are some activities open for the visitors. This will provide direct employment and income to the local people from ecotourism.

8.7 Involvement of the local community

The objective of community participation should focus on increased employment opportunities, diversification of the local economy and increased markets for local products. A local

Ecodevelopment committee (EDC) should be established to manage the development of ecotourism. The local EDC should manage the development of ecotourism at the site from the very beginning and should have the authority to enforce the rules and regulations.

The ecotourism management committee may consist of the following:

- Ecotourism experts
- Experts on aquatic species, water birds and their wetland habitats
- Park managers
- Local and regional politicians and administrators
- Local farmers
- Tour operators
- Representative of NGO/NGI
- Local vendors
- Other individuals who have an interest in the area

A forum to be created with the local community to discuss local involvement in ecotourism activities:

- An inventory to be made of local 'resources' which are of interest to visitors, e.g. historical sites, sites of architectural or archaeological interest, local crafts, local produce and folklore. This inventory should include not only the site itself but also the surrounding areas.
- Decide on possibilities for home stays in the villages.
- Decide on the types and numbers of shops (souvenirs, local produce) and tours that will be permitted in and around the area.
- Discuss local involvement in guided tours in the area.
- Discuss ways and means so that the benefits from tourism accrue to a large number of people rather than a few.

Visitors require no special luxuries. Facilities should be well positioned and well adapted to the environment, and preferably constructed in the local building style. Basic requirements include clean drinking water, good sanitation and good waste disposal facilities. The local surroundings should be kept as authentic, traditional, attractive and clean as possible.

8.8 Development of facilities

8.8.1 Facilities inside the protected area

Facilities need to be added which include:

- Permanent watchtowers
- Walking paths, nature trails, boat safaris using traditional boats with trained ecotourists guides disseminating information to the visitors about ecological and cultural significance of the Ganga River as well as KWS and other interpretative trails
- Sitting area/ Benches on the river bank
- Interpretative and directional signage

8.8.2 Facilities to be constructed outside the site

Conservation education centre, with information and programmes for:

- Visitors
- Guides
- The local community
- Patrolling camps for staff
- Cafeterias
- Restrooms and drinking water facilities
- Souvenir shops and shops selling local produce
- Parking area
- Rest areas with benches
- Homestays including farm stays for strengthening local livelihoods and providing an exposure to visitors about the local lifestyle, culture, cuisines and co-existence with nature.
- Jalaj: a floating market and awareness centre will act as one stop centre for disseminating information and spreading awareness about the cultural and ecological heritage of the Ganga River and significance of KWS thereby, making it a holistic and valuable experience for the visitors. The Jalaj will also be the centre for promoting local handicrafts, and value added food products made using locally available resources by local communities.

8.9 Nature Interpretation and Conservation Education

Interpretation is an educational activity, which aims to reveal meanings and relationships through the use of original objects, by first-hand experience, and by illustrative media, rather than simply communicating factual information (Tilden, 1977). This is used as a visitor management tool to affect visitor's behaviour and in order to do this, motivate through an appeal to human needs and emotions. Therefore, interpretation becomes a very important instrument for educating tourists while simultaneously enhancing their visitor experience.

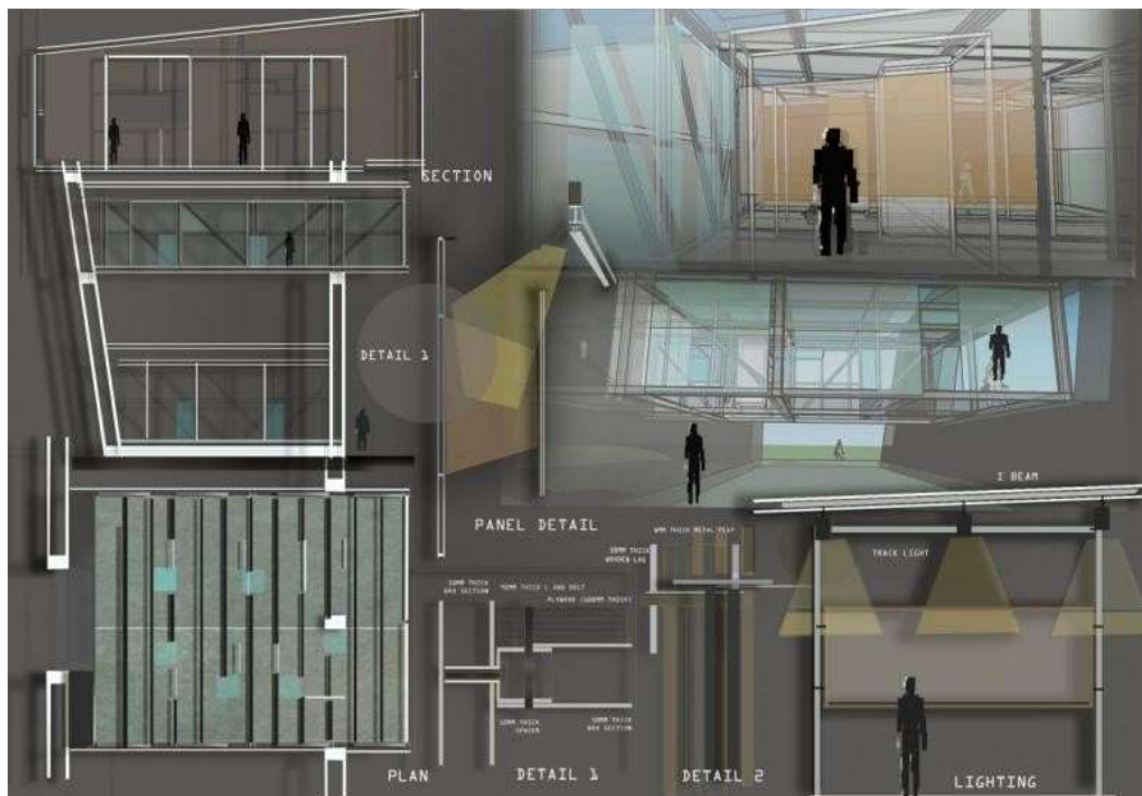
The visitors will know about the resources, activities which are permitted or forbidden and about safety and security. As their understanding grows, visitors show more curiosity about natural environment and its conservation. The result of well-planned interpretation should be a more fulfilling visitor experience.

The first and foremost information which needs to be disseminated once the visitor reaches the Sanctuary are resources and facilities available, permitted activities, guidelines for safety and security. Curiosity about the surrounding natural environment would grow as they start to grasp an understanding of the area. Interpretation centre should be such where all the answers and doubts are cleared. Result of a well-planned interpretation should be a more fulfilling visitor experience (Figure 8.2). Interpretation and education of the centre should go beyond simply informing, but also towards developing an understanding and appreciation. There are three fundamental objectives of interpretation viz., i) to educate the visitors and other stakeholders about the importance of KWS, forest department's management initiatives, and management goals, ii) to provide educational and good visitor experience, iii) to enhance livelihood opportunities for SHGs and EDCs.

The goal of nature interpretation and conservation education centre is a safe, visually coherent, appropriately sequenced and enjoyable experience with a focus on conservation education centre, exhibits and self-guided activities. Signs and exhibits when designed, fabricated and installed will welcome, orient and educate visitors about the facilities and

the resources of the Sanctuary (Figure 8.6) Through the signs, exhibits and brochures, visitors are informed about how to enjoy their visit. A clear list of Do's and Don'ts is an important part of the visitor education.

Nature Interpretation and Conservation Education Centre should be developed as formal (school and college) and informal (general visitation) learning programmes that convey messages about the importance of Protected Areas, freshwater biodiversity, wetlands, rivers and KWS biodiversity. In addition, they may also provide information on threats to KWS as well as conservation solution with special highlights on freshwater biodiversity with emphasis on turtles and Gangetic River dolphin.



Source -<https://images.app.goo.gl/m3788edEpWUDtX6c6>

Figure 8.3 Indicative picture of nature interpretation center

8.9.1 Interpretation Zone

The interpretation zone will comprise of an interpretation centre. It is proposed that the interpretation center should be established near the Sitamarhi Temple which is about 1 Km from the main sanctuary area. The interpretation centre will be established with an aim to

communicate information and disseminate knowledge about freshwater ecosystem with regard to the Ganga River, geographical distribution, ecological diversity, social- cultural diversity, conservation threats and challenges, about establishment of KWS, its management practices, role of different stakeholders in conservation.

This centre will help disseminate information, generate awareness and enhance visitor experience. The interpretation centre will provide written and audio-visual information on freshwater ecosystem, the array of ecological, social and cultural values of the large landscape and Ganga riverscape as well as historical background of Kachhua Wildlife Sanctuary. While constructing the centre, it will be essential to ensure that the structure does not impinge the natural beauty of the reserve and gels well with the surrounds.

8.9.2 Infrastructure requirements

- Accommodation facilities
- Conference hall/Meeting space for lectures and interactive sessions
- Audio-visual equipment
- Reference materials
- Binoculars
- Spotting-scopes
- Handheld lenses
- Laptop
- CDs of wildlife films / Educational documentaries
- Transport facilities
- Brochures, pamphlets
- White board/Marker pens
- Printer/Copier/Scanner
- Power Back up

A self-guided trail marked with signages and other interpretative materials will help the person to learn and enjoy. This will also have access to the edge of the water body. This will ensure

visibility of biodiversity and contribute to the interpretation centre. The centre will also cater to academicians and students to understand the ecology of freshwater aquatic biodiversity.

A cafeteria ‘Dolphin Restaurant’ is proposed adjacent to the interpretation zone to cater to the visitors. In addition to the Dolphin Restaurant, a Ganga Vatika is also proposed in this zone:

8.9.3 Dolphin Ganga Restaurant

The theme of the restaurant can be based on rich aquatic and terrestrial biodiversity of KWS. The cafeteria will be a plastic free eating outlet where only biodegradable and reusable material will be used. All trash must be removed by the visitors themselves. It will serve local delicacies prepared by the SHG groups using local produce. It will provide an experience to visitors about local food and cultural diversity of the place. It is proposed that a section in the restaurant can be dedicated as a souvenir shop. This shop will showcase and sell souvenirs and gift items prepared by local SHG groups. This will help in unveiling the cultural, historical and sacred side of the place.

8.9.4 Ganga Vatika

It is proposed that an area should be dedicated for plantation activities. This area will be used to plant native species such as Peepal, Bargad, Neem, Mango, Amla, Shatoot, Babbon. Information boards describing the plant’s common name and botanical name will be put on the trees. Along with this, a section of the Ganga Vatika will be dedicated to grow medicinal plants and herbs. Plants have been used for medicinal purposes long before prehistoric period. Evidence exist that Unani Hakims, Indian Vaid and European and Mediterranean cultures were using herbs for over 4000 years as medicine. A medicinal plant area is designed to create awareness among public about the importance of the area in conserving rich tradition of India in ayurvedic life style. The medicinal plants in the reserve, which are not visible in the trails and otherwise, will be planted here with signages explaining their use. Ganga Vatika will be established and maintained by Uttar Pradesh Forest Department with the active support from local communities.

8.9.5 Dolphin Sighting Point

The KWS area has frequent sightings of Gangetic Dolphin in the Ganga River. The area known as Tela can be explored for developing as a Gangetic Dolphin sighting site. Apart from various activities, dolphin sighting will not only add on to the surreal experiences for the visitors but will also contribute in imparting knowledge and spreading awareness about the Gangetic Dolphins, its ecological significance and the need for its conservation.

8.9.6 Interpretation techniques and exhibits

Broad interpretation techniques and exhibits for KWS are being provided as Table 8.1 and 8.2.

Table 8.1 Interpretation Centre of KWS

Technique	Components	Comments
Personal services	• Information desk at the entry • A kiosk at the Interpretation centre • Guided tours • Lectures and demonstrations	Provide information directly to visitors by nature guides and staff
Non-personal services	• Interpretation centre • Signages (Directional & Interpretive) • Publications • Audio Visuals and films	Non-personal services can make information widely available at a relatively low expense per visitor contact.

Table 8.2 Topics and themes that could be exhibited in the Conservation Interpretation and Education Centre at KWS

Topics	Contents
Genesis of Kachhua Wildlife	Brief historical facts and figures

Sanctuary (KWS)	
The Ganga River	History and mythology of the Ganga River
	Ecological significance of the Ganga River
	Socio-Cultural significance of the Ganga River
	Ecosystem services provided the Ganga River
Biodiversity of KWS	Terrestrial faunal species
	Freshwater aquatic species
	Adaptation
	Evolution
Gangetic River Dolphin	Quick facts
	Distribution and habitat
	General ecology
	Conservation trend and status
Turtles of Ganga River	Quick facts
	Distribution and habitat
	General ecology
	Conservation trend and status
Resident and Migratory bird species	Quick facts
	Distribution and habitat
	General ecology
	Conservation trend and status
Sustainable River Conservation	I. Anthropogenic pressures
	Habitat loss and degradation
	Invasive species
	Pollution
	Population
	Over-exploitation of natural resources / non sustainable use
	II. Managing sustainability
	Conservation – ethics, definitions, the need for

	conservation
	Scientific, aesthetic, economic and moral imperatives.
	Wise use of freshwater resources
	III. Conservation tools
	Policy, legislation and planning
	Species and habitat management
	Creative conservation
	Personal action and participation
The People	Different communities along the Ganga River
	Dependence on KWS
	Role of communities in river conservation

8.10 Sign and visitor circulation

A minimum number of signs are needed to welcome, direct or control visitors at Kachhua Wildlife Sanctuary. These signs are described below:

8.10.1 Advertisement hoarding

Prayagraj, Mirzapur and Bhadoi districts have significant numbers of frequently visited tourist spots due to the religious and cultural significance of the Ganga River and presence of Triveni Sangam and Sitamarhi Temple at Prayagraj and Bhadoi districts respectively. Therefore, it is proposed to place advertisement hoarding in these places. Transit places like the airport, railway station and bus station are other significant places. The hoardings should highlight the aesthetic value, ecological and cultural significance of KWS, how one can contribute to conservation and take home messages.

8.10.2 Signages at the main gate

- Welcome
- Timings

- Do's and Don'ts

8.10.3 Pathway directional signs

In the tourism zone, directional signs should be placed at regular intervals to ensure that the visitors have a pleasant and easy walk around. The signs should lead them to all the major facilities that are available for them such as cafeterias, toilets, drinking waters and conservation interpretation and education centre. Signage declaring the presence of the turtles and Gangetic River Dolphin, migratory and resident birds and KWS along with its significance should be placed on sides. Steel reinforced concrete footing with granite sign panel is recommended for the roadsides. However, inside the Park wooden or bamboo structures that give a naturalistic look are recommended.

8.10.4 Interpretive signage

Interpretation signage should give valuable and interesting snapshots of KWS with special reference to the turtles and Gangetic River Dolphin. Different types of signage can be placed around the Sanctuary and on those areas where visitors gather – resting area, cafeteria, view points and so forth. It should be low lying and non-obtrusive.



Plate 8.3 Indicative interpretative signage

8.10.5 Temporary signs

With the change in the season and the visitor influx pattern, temporary signs would be required. For instance, during the migratory birds' arrival period, signs in certain areas need to be put up to avoid disturbing them.

8.10.6 Trail signs

Trail signs providing information about the key plant species, birds and other relevant information should be placed along the nature trail. Also, information on littering, no plastic zone needs to be included.

8.11 Publications

All publications should have a masthead so that the viewer can know about the associated departments. This would also act as a means of publicity for the area and the department. Following publications for the area are proposed:

- KWS Brochure
- Checklist of wild animals, birds and aquatic fauna such as Gangetic River dolphin, crocodiles, turtles
- Plant identification guide
- Posters
- Outreach Material
- Website development

Publications can be priced and the money generated can be ploughed back for improvement of the interpretation facility. The revenue can be used for replenishing the stock of publications and maintaining the conservation education centre.

- **KWS Brochure**

The brochure would consist of all the information that would be required by a visitor for planning the visit and what one can expect to see in the area. The brochure would also have the 'Things to remember' i.e. what one is allowed to do on the trip within the sanctuary area and what is prohibited. It would also give information on the timings and the period when the sanctuary would be open for visitation.

- **Checklist of animals and birds**

KWS has important freshwater aquatic species. There is large number of birds also recorded in the area. The area can be promoted as a birding site for bird lovers and students. In order to assist the students, a checklist of birds needs to be prepared. This checklist can be regularly updated with the help of birdwatchers and new records mentioned.

The checklist can be produced both in Hindi and English so that the students from the neighboring schools and colleges can also be benefited. Services of some retired officers of the department or other experts can be taken to design these materials.

- **Plant Identification Guide**

Since most of the facilities in the KWS would be self-guided, it is important that the visitors have some aid to assist them in knowing about the area. The plant identification guide would be a source of information for local flora. Visitors can use the guide to know about the plants in the reserve wetland and on the islands.

The guide would be pictorial with line drawing depiction of the plants. It will have the Botanical name, common name, flowering and fruiting period, importance to the habitat and to the fauna, and economic importance to human being.

- **Posters**

A series of 5 pictorial posters is recommended namely:

- Fishes, Amphibians and Reptiles
- Mammals,
- Flowering Plants
- Avifauna
- Importance of KWS, including role of community and their socio-cultural history

These posters can be sold as souvenirs for the visitors and can also be used as outreach material for the visitors, including school children. The posters can be produced in two languages i.e. Hindi and English.

- **Audio Visual**

Documentaries and educational films are an important media of mass communication and it works well in rural settings. A series of 20 minutes audio-visual films on KWS, terrestrial and aquatic biodiversity, Ganga River, its ecological & socio-cultural importance, threats and conservation initiatives taken up in the sanctuary area can be prepared. The commentary can be

in Hindi for use in the villages but English commentary can be superscripted for use in the Nature Interpretation Centre. The film should be professionally done.

- **Outreach Material**

Since students, local public and youth will also be potential visitors to the area, it will be important to reach out to them through publications and other means. These materials can be used during special events day such as World Environment Day (05th June), Wildlife Week (02- 08th October) and Wetland Day (02nd February). Such events increase public awareness on environmental issue and motivate people to participate by focusing their attention on a particular environmental issue. The materials can be activity booklets like draw and color, sheets or cards. The material produced has to be in easy to understand language. The activity booklets can be used by school children and on successful completion of the activity they can be given a Certificate which would motivate the children to learn more about their surrounds. Environment clubs too can be formed in schools and colleges located around KWS and environmental awareness activities can be undertaken in these clubs.

- **Website**

Gradually a website for KWS should also be developed with the help of professionals.

8.12 Nature guides

With increase in the visitors' influx, there would be requirement for nature guides to show around the Sanctuary. For this purpose, the local educated youth may be trained. This way it would create job opportunity at the same time help with the effort to involve the community in tourism initiatives. The Wildlife Institute of India along with Uttar Pradesh Forest Department can train Nature guides in various aspects of nature tourism in the Sanctuary including birds, butterflies, wetland culture, etc. These youths can take groups of students/visitors around the Park and some of them can be in charge of the Nature Interpretation and Conservation Education Centre.

Local educated youths from adjoining villages should be trained as nature and eco-tourist guides. This will be an important effort to involve the community in tourism initiatives. Such capacity

building initiatives need to be continued periodically to encourage local youth to pursue their career as nature and eco-tourist guides.

Once the facilities are developed and visitors start flowing then there would be an opportunity for the youth. The youth can take groups of students/visitors on the journey around the reserve and other areas of the landscape. They can also be deployed to manage the entry kiosk and the conservation education area. Training of guides and staff should be a routine process. During non-visitation period, the guides can undergo refresher course training at the site. This would update their knowledge and sharpen their skills required for guiding visitors.

All the capacity building trainings in ecotourism and nature guide may be organized by the forest department in collaboration with various institutions and organizations. These capacity building programmes may also include trainings in personality development, learning of various languages to cater tourists from all over the world. During the refresher course, the performance of the guides their knowledge and communication skill may be evaluated. Accordingly, their fee for one trip with the visitor can be fixed. The group size should not be more than 10 persons.

The EDC can be involved in managing funds for providing uniform and books for the guides along with financial support in times of need to the guides. The guides can be managed through a Nature guide's eco development committee so that all interested and trained guides get opportunity on a rotational basis. The guides can charge a fee of Rs 100/ per trip (up to 2 hrs) from the visitors. Later, on evaluation, the management committee can decide to enhance the guide fee and categorize them as per knowledge and skills i.e. Grade 'A' guides would be the ones who has good knowledge about the birds and is good at communication in both English and Hindi. His/her fee would be on the higher side as he/she would cater to groups more proficiently.

Once tourism picks up then the guides will have to contribute a small amount of the fee to the staff welfare fund. The other portion would be contributed by the department either from the proceeds of the sale of publications or souvenirs or else from some other funding source like donations etc. This fund would provide financial support to the guides and would provide for uniform and books for the guides. There should be coordination with the trained guides, EDC and the FD for the programme to succeed.

8.13 Marketing Plan

Marketing plan should aim to promote and encourage ecotourism activities highlighting interesting and unique features of KWS (Figure 8.2). Marketing materials should not focus on just the turtles and Gangetic River dolphin and associate wildlife but also on other aspects such as cultural, historical and archaeological feature of the area. This would help in reaching out to a larger group of people with different interest and it will be made clear that a visit to the Sanctuary is worthwhile. Some pointers to be noted for reaching out to the masses are:

- Have a National marketing plan that can be carried out with other sites in the country.
- Experts' advice on the advertising for ecotourism in the best way both National and International could be sorted.
- Use of social media, attractive websites etc. weighing the main attraction facilities of the Sanctuary.
- To develop a strategy for the distribution of information materials that could reach a wider range of people and places
- To develop a plan for the distribution of guidelines for ecotourists and tour operators.

Another significant and impactful way of strengthening marketing and promotional activities for ecotourism in KWS is by establishing Jalaj: a mobile livelihood and awareness centre. The Jalaj boat will provide alternative livelihood to the trained local communities ensuring their participation in conservation as well as contribute in strengthening awareness on various aspects of Ganga River conservation and importance of KWS by reaching out large number of people. The picturesque experience on the Ganga River along with the services provided by the trained local communities in health and wellness, value added food products prepared by them using locally available resources and ecotourist guides disseminating information about the rich biodiversity of the Ganga River and KWS will be one of a kind lifetime experience for the visitors, thereby, strengthening ecotourism activities and making the visit to KWS worthwhile.

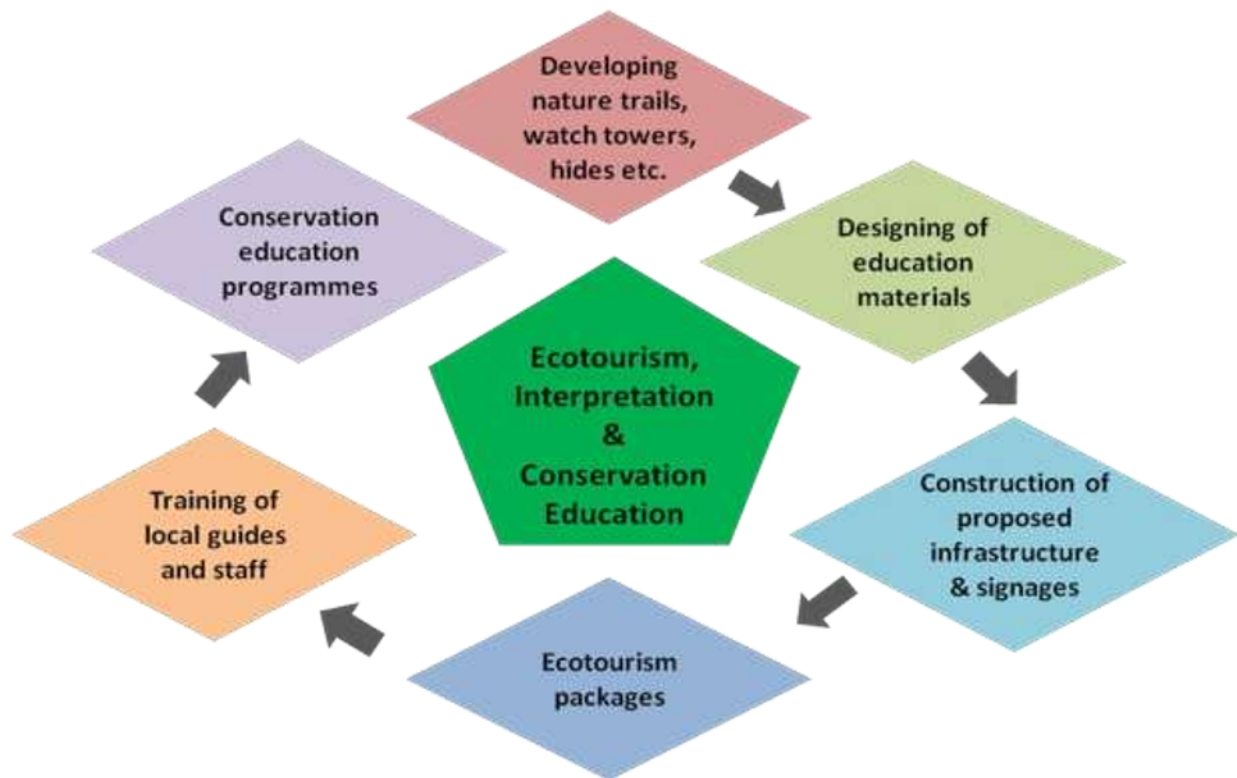


Figure 8.4 Major Action Points for Ecotourism, Nature Interpretation & Conservation Education

8.14 Capacity Building

Capacity building trainings should be arranged at the site with experts brought in for training different courses. Training is required for:

- Park managers and staff
- Guides (staff and local people)
- Personnel for the Nature Interpretation and Conservation Education Centre
- Volunteers from the community
- Tour guides and tour operators

8.15 Monitoring and Evaluation

For a successful and long term management of ecotourism, a regular feedback from all the participants involved is necessary. In this way, shortcomings or conflicts between and/or

amongst different groups could be sorted out. The EDC should meet regularly and whenever required invite experts to attend these meetings.

For a regular monitoring, certain data are required which could be designed in a pre-formatted data sheet to measure:

- The impact of tourists on the Sanctuary.
- Visitor numbers at different times of the year and in different parts of the site, group size, type and duration of visits, interactions between visitors, crowding etc.
- The adequacy of the programmes offered to visitors, employees and the local population.
- Social impacts on local residents.
- Visitors' satisfaction and the extent to which the expectations of visitors have been fulfilled. High visitor satisfaction is very important to promote the Park.
- The financial viability.

Strategies should be designed in advance to manage:

- Environmental impact, the maintenance of hides and screens (if any).
- Tourist numbers and problems of over-crowding.
- Water resources and human waste.
- Law enforcement. A small number of badly behaved visitors can have a huge negative impact on the natural and social environment.

8.16 Financial Plan

-----.....has approved an amount ofand started sanctioning fund for Ten year duration. The funds will be required for:

- Maintenance of facilities
- Capacity building
- Education and interpretation
- Research and monitoring

Chapter - 9

Community Engagement and Ecodevelopment Planning

9.1 Rationale

Freshwater ecosystems, especially riverine systems harbor rich and distinctive species, ecosystem and genetic diversity necessitating its protection and conservation. Being an integral part of the ecosystem, rivers play a key role in maintaining terrestrial biodiversity as well as provide numerous ecosystem services. Many civilizations have flourished along the rivers contributing significantly in shaping human settlements. High human dependency on river resources and lack of appropriate livelihood alternatives has called forth the much attention on community engagement in conservation thereby, making community involvement in river conservation crucial for ensuring sustainable management of the river resources.

The Ganga River is a multifaceted river system flowing across five states (Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal) crossing three biogeographic zones that is the Himalaya, the Gangetic Plain and the Coastal Zone. It harbors varied aquatic species such as Gangetic river dolphin, gharial, otters, turtles, aquatic and terrestrial birds as well as supports high human densities representing diverse religious and cultural backgrounds (WII-GACMC, 2018). Understanding the intricate ecological and social dimensions of the Ganga River an integrated comprehensive approach is requisite for Systematic Conservation Planning (SCP) and implementation.

The interdisciplinary management plan for Kachhua Wildlife Sanctuary (KWS) is envisioned to conserve biological diversity including species, genetic and ecosystem diversity as well as ensure stakeholder participation primarily from the local communities who are residing in the vicinity of the sanctuary having divergent interests and are directly or indirectly dependent on the river resources for their sustenance.

It is crucial to secure the economic and social well-being of people and ascertain involvement of stakeholders with different capacities and interests to ensure effective management of the sanctuary area. Apart from this, it is imperative to base conservation and management of the sanctuary on robust policy and legislative framework. This will further contribute in developing

efficient and effective management strategies, actions as well as clearly define roles and responsibilities of the various stakeholders in management and implementation process.

To secure the support and ensure participation of local communities and other stakeholders for Protected Area (PA) management planning and formation of Eco-development Committees (EDCs) is indispensable. Eco-development is a strategy to overcome unsustainable and incompatible resource use practices by the dependent communities for their livelihood in and around PAs through regulated (sustainable and compatible) use and alternatives through participation of various stakeholders (Wildlife Institute of India, 1998). It is a dynamic process with an attempt to balance linkages between conservation and development as well as to the existing socio-cultural milieu (Badola et al. 2002; Badola, 1995).

9.2 Problems and Issues

The stretch encompassing KWS is characterized by large, fertile floodplains that are extensively used for agricultural activities. The human density is about 820 persons/km² (Block wise total population of all three districts divided by total area). This stretch hosts a significant population of the Gangetic river dolphin, mugger, turtles and island-nesting birds. Based on the ecological and socio-economic surveys and stakeholders meetings conducted in 38 villages under the aegis of NMCG-WII Biodiversity Conservation and Ganga Rejuvenation Project following issues were identified affecting the integrity of the Kachua Wildlife Sanctuary.

1. Unsustainable biological resource extraction using destructive methods (fish and plant biomass).
2. Bank feature alteration due to agriculture, construction and sand mining disrupting lateral connectivity of the river.
3. Extensive sandbar cultivation has rendered the habitat unsuitable for use as nesting sites by turtles and island-nesting birds.
5. Lack of alternative livelihood options for local communities dependent on resources of the sanctuary

6. Lack of awareness among the local people regarding biodiversity conservation
7. Lack of community involvement in sanctuary management
8. Lack of inter-departmental coordination towards sanctuary management

To resolve the above-mentioned ecological challenges and socio-economic issues and, for developing effective conservation measures towards KWS management following objectives are set forth.

9.3 Goal

The main goal of the ecodevelopment plan is to ensure the sustainable use of resources in and around the Sanctuary by participation of local communities and other stakeholders for long term conservation of KWS.

9.4 Objectives

Main objectives of ecodevelopment for KWS will be:

1. To elicit community participation in biodiversity conservation and sanctuary management.
2. To reduce the dependence of local communities on the Sanctuary by strengthening socio-economic incentives and exploring alternative livelihood options.
4. To improve institutional capacity for implementation of ecodevelopment programmes involving other stakeholders.

9.5 Broad Strategies:

To support the local communities dependent on sanctuary resources for livelihood sustenance, it is important to explore and develop site specific alternative livelihood options. Majorly, the local communities are dependent on the Ganga River for fishing, sand mining, and irrigation, therefore, alternative and efficient livelihood interventions are imperative. For protection and conservation of Ganga aqualife and maintenance of ecosystem services provided by the Ganga

River a ban can be imposed or prohibition of anthropogenic pressures such as fishing and sand mining in the sanctuary area under (Fisheries Act, 2018). For activities such as water abstraction for irrigation, ferry/boat services and collection of fuel and fodder can be regulated. For sustainability of conservation measures in KWS it is crucial to identify and introduce site specific and interest specific alternative livelihood interventions for ecological and social security.

9.5.1 Reduce Dependency of Local Communities on the Sanctuary

Alternative sustainable livelihood options need to be explored and developed to support economically and ecologically sustainable livelihood and reduce direct dependence on the Sanctuary resources. Agriculture and fishing were the primary source of income followed by fuelwood collection, fish feed and cattle fodder collection. It is crucial to carry out feasibility analysis of the alternate livelihood options on the basis of five criteria (economic, social and cultural, environmental, technological and political) that will be proposed to the local communities (Ashley and Hussein 2000; Choi and Sirakya 2006). It is also recommended that double cropping, inter cropping with vegetables, improved irrigation facilities, alternate source of fish feed can also be encouraged. Involvement of local people in department works such as patrolling, rescue of aquatic species, boat canal cleaning etc can also be organized.

9.5.2 Involve Local Communities in Conservation (Institutional Arrangements)

9.5.2.1 Formation and strengthening of Self Help Groups (SHGs)

The local communities around the KWS are dependent on the Sanctuary resources for their livelihood. To conduct livelihood and skill development trainings, to reduce the dependency there is a need for form groups of people. Presently there are around 25 existing SHGs in the surveyed villages but most of them are not functioning due to lack of training and monitoring. For strengthening these SHG's training on skills like sewing and stitching, health and wellness, food processing, book keeping can be conducted after need assessment. New SHG's can be formed where required. Proper monitoring of the groups needs to be conducted regularly for proper functioning of the groups. Training on different skills and forming SHGs based on the type of skills will wean people away from their dependence on the Sanctuary resources.

9.5.2.2 Establishment of Ecodevelopment Committees (EDCs)

EDC is a collaborative arrangement between Forest department, local communities representing varied social, economic and cultural backgrounds, local institutions/ interest groups around the PA based on their strengths and weaknesses. It is a multi-stakeholder process revolving around power balance among different stakeholders. It should ensure participation from Gram Panchayats to address conservation and developmental issues. To ensure sustainability of EDC it is crucial to create a strong institutional base. Establishment of new institutions should only be initiated when traditional institutions are not available (Badola et al., 2002). Identification and strengthening of existing institutions should be encouraged and made self-sustaining. For effective and active participation of the communities the EDC programme it is crucial to reinstate the local institutions such as Self Help Groups (SHGs) for natural resource management and environmental entitlements of various sections of the society (Badola, 1997). The evaluation of the institutions is based on the effectiveness of the committees in addressing the conservation issues in a sustainable manner.

Different types of EDCs can be established addressing livelihood issues of target communities and at the same time ensuring their participation in biodiversity conservation of KWS. EDCs such as Fishermen EDC, Farmer's EDC, and Ecotourism Guides. EDC has been recommended for proper management and protection of the KWS. These EDCs will be established at the village level. Fisherman EDC should involve *mallah* communities from all the fringe villages who have a very high dependence on fishing for their livelihood. Farmer's EDC should have equal representation from all the villages who are involved in farming. Farmers' EDC should promote revival of traditional crop varieties and encourage organic farming and organize awareness workshops relating to this issue. Ecotourism EDC should focus on infrastructure and human resource development. As ecotourism is to be limited to the Tourism zone, the focus should be given to the area where there is considerable tourist footfall such as Sitamarhi Temple or near villages where homestays, village walks and farm tourism can be developed. This EDC should also look into the solid waste disposal and cleanliness issues around the KWS. It should also take part in Prime Minister's programmes like *Swachh Bharat Abhiyaan* and *Namami Gange*, to maintain cleanliness of the Ganga River and in the surrounding villages. Funds for

these activities can also be mobilized through the *Swachh Bharat Abhiyaan and Namami Gange* programme.

The process of ecodevelopment planning involves community involvement with representation from all sections of the village including women and marginalized communities. Involvement of the local communities should start right from the stage of planning. The EDCs formed should not work in isolation but also network with the Forest Department. Initially, the seed money to the EDCs should be provided by the Uttar Pradesh Forest Department for its formation and management. Subsequently, the EDCs should generate their own income through soft loans or formation of Self-Help Groups (SHGs) involving local women, contributions from incomegeneration activities etc.

Another important role that can be played by the EDC is in supporting the Biodiversity Managing Committees (BMCs) formed under the National Biodiversity Act, 2002. The members of the EDC can support in the activities of BMC of which one of the main activity is formation of People Biodiversity Registers (PBRs) which is a compilation of the biodiversity found in the area and maintaining the register up to date.

9.5.2.3 Kachhua Wildlife Sanctuary Management Trust (KWST)

Long-term sustainability of EDC will require new institutional arrangements. Therefore, it is proposed that a Sanctuary level trust named 'Kachhua Wildlife Sanctuary Management Trust' may be constituted as a part of institution building process. Example of successful trusts such as the Periyar Foundation can be followed. The trust will have the twin objective of biodiversity conservation and livelihood support to the dependent local communities in KWS and its surrounding area. The trust should have representation of the local communities (EDCs), officials of Uttar Pradesh Forest Department, members of State Board for Wildlife, Uttar Pradesh, District Development Authority, District Administration, the State Government, and other stakeholders at the level of Governing Body and Executive Committee. At Governing Body level, District Collector of one of the district (Prayagraj, Mirzapur and Bhadohi) could be the chairperson and an official of forest department (Related to sanctuary management) could be the member secretary. Assistant Conservator of Forest (Wildlife), Range Officers and Deputy Range Officers will be the permanent member in this body. The objective of this trust will be

two-fold. Firstly, it will support and facilitate conservation related activities of the Sanctuary and secondly, it will support the programmes of EDCs.

In addition to this, the trust will also be responsible for conducting research and monitoring, trainings and conservation awareness programme of the area. The KWST should have its own financial resources for its functioning. There could be different sources of income for this trust. There could be the funding support from government, incomes from revenue generated from ecotourism, donations from different sources (national and international). Government of Uttar Pradesh can introduce an additional cess, called ecodevelopment surcharge on the visitors of the KWS. The income through this surcharge can be pooled in the KWST funds for running its programs. KWST should also have the scope of raising its income from regional, national and international sources in the form of donations and institutional charges undertaking research and capacity building programs. The necessary government orders for establishment of such a trust will have to be pursued by the Uttar Pradesh Forest Department, State Board for Wildlife and District Development Authority. Necessary rules for the functioning of the trust as well as the management of finances will have to be framed by the Forest Department in consultation with State Board for Wildlife and District Development Authority.

9.5.2.4 Formation of spearhead teams

Since, the KWS is recently notified responsibilities to the staff of the sanctuary have not been assigned. The spearhead team for management of KWS should constitute of forest staff and representatives of the EDCs, surrounding communities under the leadership of local range officer is recommended. The responsibility of this spearhead team will be to work in coordination towards management of KWS. The activities will include conservation of the biodiversity, maintenance of the ecosystem services, institution building, capacity building, conflict resolution and facilitating the microplanning process. This team will have to be trained and properly guided so that they can formulate microplans and initiate its process and implementation.

9.5.5 Capacity building

Capacity building of the frontline staff is another important strategy for effective and efficient management of the KWS. The process of capacity building has to begin with the formulation of a spearhead team comprising of the frontline staff of the Forest Department, local villagers (EDC

members) and NGO representatives. This spearhead team will have to be trained in the microplanning process and establish linkages with line agencies. Capacity building programme will have to be decentralized so that the spearhead team could further take up the work of training the village community and other stakeholders. While some of the training programmes could lead to better conservation awareness and empowerment of the communities, others will have to be designed to provide skills related to livelihoods. Skill development programmes should also be conducted for the frontline staff of the Bihar Forest Departments and members of NGOs working in the area. For this, experts from the concerned agencies will have to be involved as and when required. The spearhead team along with the other senior Forest Department officials should be taken to some well-managed PA for exposure visits and confidence development.

9.5.6 Linkages with other line agencies

Linkages will be established to ensure alignment and implementation of conservation and development initiatives in the sanctuary area and to generate employment opportunities for local people of the fringe villages and reduce dependence on the river resources.

9.5.7 Policy and administrative framework

Appropriate administrative framework and necessary orders of the Government/Forest Department will be required for management of KWS area and operationalize the functioning of this decentralized mechanism. This will include the roles and responsibilities of the departmental officers, delegation of powers, roles and responsibilities of the various village EDCs.

9.5.8 Monitoring and evaluation

The EDCs should have in-built monitoring and evaluation mechanism so as to ascertain the progress in the right direction and also to keep the ongoing activities in the right track through timely corrective measures. Monitoring team should be comprised of PA personnel and representatives from EDC and NGOs. Monitoring formats should be prepared regularly and submitted for regular checking. The progress of the activities will be evaluated on the basis of set indicators. Broadly the monitoring indicators could be:

9.5.8.1 **Ecological:** Aquatic species found in the Ganga River, waterbirds and migratory birds, water quantity and quality, water depth, area under invasive species.

9.5.8.2 **Social and economic:** Dependency of people on the Ganga River, access to basic amenities, alternate sources of income.

9.5.8.3 **Institutional:** Working of the EDCs, conflict resolution mechanisms, activities conducted by EDCs, involvement of line agencies, adhering to mutual agreements.

Monitoring of developmental activities should be done in order to keep these activities in check. Concerned authorities and EDC members should ensure the feasibility of the developmental activities, whether it is environmentally viable or not.

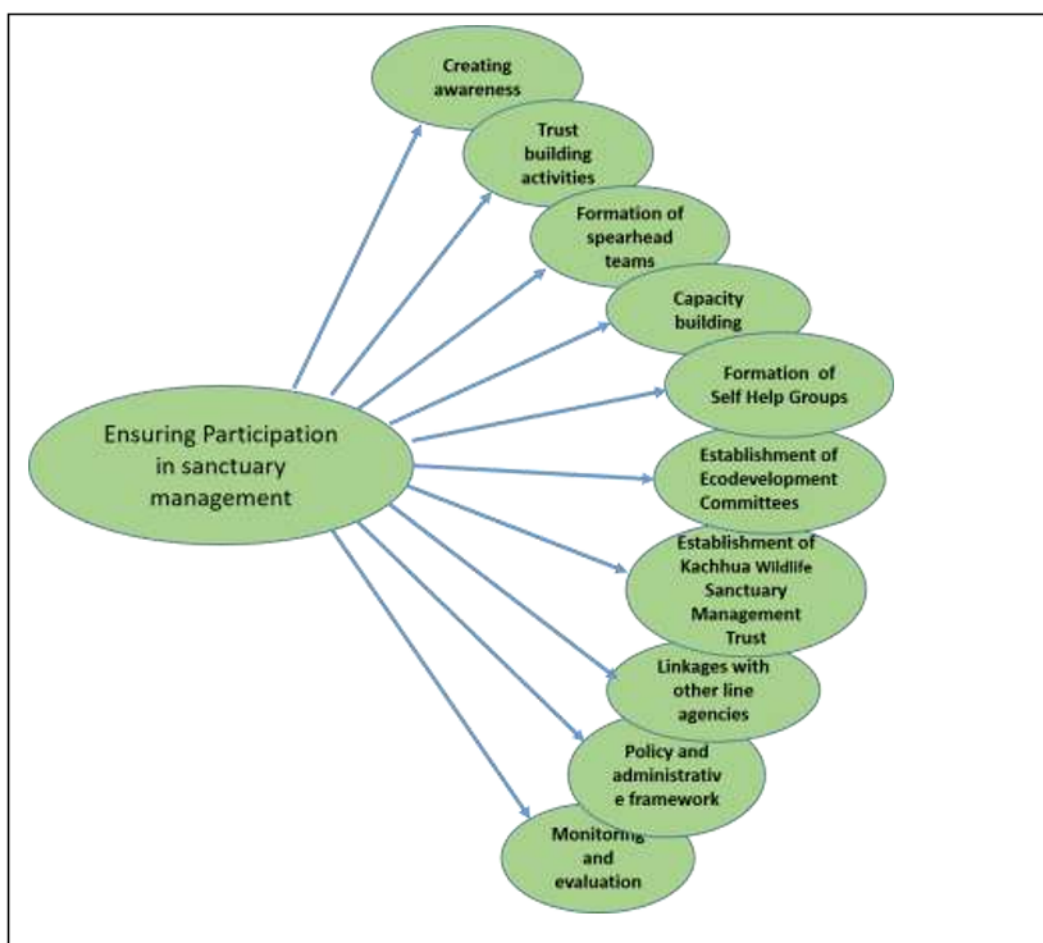


Figure 9.1 Ensuring participation in sanctuary management through ecodevelopment planning

9.6 Village level strategies

The main challenge for the management of the Sanctuary is ensuring conservation and protection of the biological resources, strengthening livelihood opportunities of local people and linking benefits of river conservation to the local communities. To develop and nurture such an arrangement, the process of ecodevelopment needs to spread over a reasonable period of time during which various concurrent actions may be initiated. It is therefore imperative to initiate ecodevelopment programmes by establishing EDCs. These EDCs will be local level institutions that will be in charge of the overall conservation- development programmes in the area. This will also include ecotourism and human resource development for livelihood enhancement of the local communities. EDCs will also encourage equitable participation and representation of all sections of the community in river conservation. They will be the local institutional base for implementation of ecodevelopment and would ensure the interests of the marginalized and dependent sections of community. Some of the proposed initiatives are described in the following sections. The immediate ecodevelopment strategies/ activities will comprise of the following:

- 1) Formation of Ecodevelopment Committees.
- 2) Initiate the microplanning process in the fringe villages.
- 3) Implementation of entry point and support programme activities.
- 4) Provide alternative livelihoods to the local people including promotion of ecotourism.

9.6.1. Participatory Microplanning and Implementation

The EDCs should have representation from every section of the community including women, tribal, scheduled castes, other backward classes, youth, Panchayat members and NGOs. Every member should be encouraged to contribute in the formulation of the microplan, planning and decision making process. This will enhance the probability of the success of EDCs in the long run. Microplanning support teams should comprise of PA personnel, NGOs and spearhead teams who will assist the village communities in the development and implementation of issue specific microplans on a continuing basis. Microplan should accommodate all issues such as guidelines, investment criteria, training programme, schedule, and commitments etc. so as to ensure

achieving the set objectives. It is also important to identify various schemes of the associated lineagencies/ institutions involved in the area.

9.6.2 Proposed Ecodevelopment Activities

9.6.2.1 Entry point activities

The following developmental activities have been proposed in consultation with the local stakeholders:

1. Establishment of Checkpost/Gates at the entry point.
2. Tourism infrastructure development.
3. Approach road for hamlets.
4. Community hall and EDC office.
5. Renovation of school building.
6. Single point electricity connection for all the villages.
7. Health unit buildings.

Some of these activities could be initiated by the line agencies with persuasion from the ForestDepartment.

9.6.2.2 Agricultural development works

1. Promoting organic farming through EDCs.
2. Horticulture (plantation of fruit bearing species).
3. Value addition to agricultural produce. Provision for training women and members of marginalized communities in making value added products such as jam, pickle and develop their green entrepreneurial skills and strengthen market linkages for the products.
4. Agroforestry to cater the fodder needs of the villages.

9.6.2.3 Off-farm Income Generation Activities

1. Pisciculture can be initiated in villages along the Ganga where there is high dependence of the local communities on the Ganga River for fish.
2. Provision of recommended fishing net to the mallah communities at the subsidised rate.
3. Development of two Fish Landing Stations at select locations.
4. Poultry development, dairy production
5. Promotion of local handicrafts and souvenirs
6. Motor vehicle repair training.
7. General store/shop in all the fringe villages.
8. Training in sewing and stitching and Supply of tailoring machines to the SHGs of all the fringe villages.
9. Ecotourism (JALAJ.)
10. Agri/ Farm tourism

9.6.2.4 Skill Development/ Training

1. Ganga aquatic biodiversity, birds and major plant identification for unemployed youth from the surrounding villages.
2. Training for inter-personnel skill development such as communication, green entrepreneurship.
3. Training for generating awareness.
4. Exposure visits as proposed.

9.6.2.5 Alternatives for biomass Resource

The following activities should be incorporated in the microplans:

1. Install alternate fuel sources such as bio-gas plants and fuel efficient *chullahs* in highly dependent villages.
2. Provision of LPG at subsidized rates in these villages and moderately dependent.
3. Plantation of fuel and fodder trees and fodder grasses on field bunds in all the villages.

9.7 The process of micro planning

The format for preparation of village micro plan is provided at Annexure 3. The process of micro planning has to focus particularly on initiating alternative livelihood options compatible with the conservation initiative and resource dependence of particular villages thereby leading to conservation sensitive village development plans (Badola et al., 2019). The micro plans will have to be prepared by the EDCs with assistance from spearhead teams and forest department staff. Micro planning process should provide flexibility and space to the dynamic needs and issues of the area. Therefore, it is suggested that the micro plans should be revisited periodically, in a participatory manner, so as to modify the existing activities or incorporate the designed ones, keeping in mind dual benefit of the community and protection of the Sanctuary. This exercise of re-looking the micro plans may have to be done at an interval of every two years. Sustainability of the livelihoods will have to be addressed by not only providing benefits of income but also strengthening institutions (EDCs, SHGs, Nature Clubs, etc.), building physical assets as well as generation of social capital. Management of community development fund for EDCs will be an important aspect of the programme. The EDCs and spearhead team members should formulate micro plans following guidelines provided in annexure 3, for each village after careful surveillance of the same.

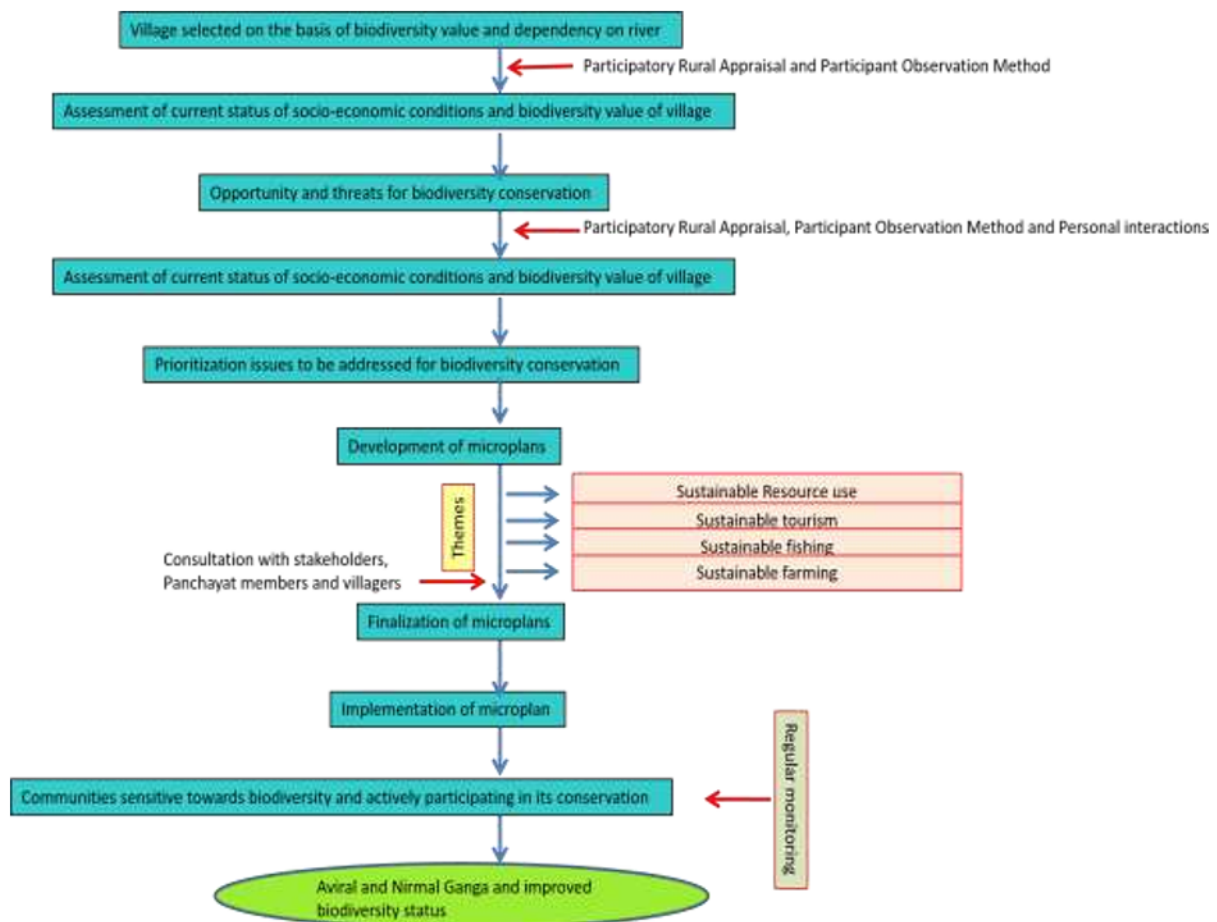


Figure 9.2 Process of Village Microplanning for KWS management and Ganga biodiversity conservation (WII-GACMAC, 2020)

In view of the existing issues in the KWS and surrounding villages, the following microplan components are suggested:

9.7.1 Sustainable resource use

In order to ensure conservation of the biological resources provided by the Ganga River, a sustainable approach to resource use is the need of the hour. Forest department and EDCs should keenly monitor the amount of resource extracted by dependent communities. Extraction should be limited to the sustainable use zone to avoid habitat degradation.

9.7.2 Sustainable tourism

In spite of being a major livelihood enhancing option, unlimited and uncontrolled tourism activities tend to be detrimental to the environment. Therefore, limitation of tourism to the tourism zone is a requisite. Homestays, village walks, farm tourism, nature tourism, boat rides, bird watching etc. are suggested instead of mass tourism activities.

9.7.3 Sustainable fishing

Fishing, a major livelihood source in the area, if not regulated will lead severe decline of the river biodiversity. Hence, sustainable fishing practice needs to be adopted in order to ensure continued production. Fishing activities should also be limited to the sustainable use zone. Fisher communities and their corporations should formulate and enforce a strict set of laws for sustainable fishing activities. Pisciculture/ fish farming, suggested as an alternate livelihood option, could be explored to regulate fishing activities.

9.7.4 Sustainable farming

Farming is one of the primary occupations in the area. Understanding the considerable dependence of local communities on farming and use of insecticides and pesticides may pose threats to the biodiversity of the sanctuary including aquatic diversity as well as impact the water quality. It is crucial to promote and encourage farmers to practice organic farming. For this, inter-departmental coordination with the agriculture department, horticulture department is necessary. Apart from this, agro-forestry can also be promoted to support the livelihoods of the farmers. Market linkages have to be established for the organic agricultural produce for long term sustainability.

9.7.5 Improved protection

Effective management and protection of the sanctuary can only be assured by the active involvement of the forest department and local communities. Involving able local youth, through EDC programmes, in the protection of the sanctuary will help evoke a sense of responsibility and therefore will lead to better protection of the sanctuary.

9.8 Plan Flexibility

An annual plan would be prepared each year from the approved microplan for the concerned village. This would also incorporate the review of on-going activities and those already executed. Adjustments and revisions, if necessary, may be incorporated in this document in consultation with the committee members/ villagers.

Activities proposed in the sanctuary area

Entry point activities	Agricultural development works	Off-farm Income Generation Activities	Skill Development Trainings	Alternatives for biomass Resource
1. Establishment of Checkpost/Gates at the entry point. 2. Tourism infrastructure development. 3. Approach road for hamlets. 4. Community hall and EDC office. 5. Renovation of school building. 6. Single point electricity connection for all the villages. 7. Health unit buildings	1. Promoting organic farming through EDCs. 2. Horticulture (plantation of fruit bearing species). 3. Value addition to agricultural produce 4. Agroforestry to cater the fodder needs of the villages	1. Pisciculture 2. Provision of recommended fishing net to the mallah communities at the subsidised rate. 3. Development of Stations at select locations. 4. Poultry development, dairy production 5. Promotion of local handicrafts and souvenirs 6. Motor vehicle repair training. 7. General store/shop. 8. Training in sewing and stitching 9. Ecotourism (JALAJ.)	1. Ganga aquatic biodiversity, major plant identification for unemployed youth from the surrounding villages. 2. Training for inter-personnel skill development such as communication, green entrepreneurs hip. 3. Training for generating awareness. 4. Exposure visits.	1. Install alternate fuel sources such as bio-gas plants and fuel efficient <i>chullahs</i> in highly dependent villages. 2. Provision of LPG at subsidized rates in these villages and moderately dependent. 3. Plantation of fuel and fodder trees and fodder grasses on field bunds in all the villages.

9.3 Proposed activities in the sanctuary area

Chapter - 10

Research, Monitoring and Training

10.1 Introduction

One of the major goals of establishing Kachhua Wildlife Sanctuary (KWS) is to conserve the aquatic biodiversity of Ganga River and its habitat with the support of local communities and other important stakeholders. To meet the goals of the protected area management and to ensure its sustained success, it is imperative to involve distinctly practical and applied field of science for making decisions, in particular because it routinely involve monitoring of threatened species and protection of habitats sensitive to human disturbance. Hence, research and monitoring will be a crucial part of the management plan.

While research will help to improve the understanding of the ecology and socio-economic dynamics of the area, monitoring will help in reviewing the effectiveness of the management plan periodically and adjusting it accordingly. Therefore, research and monitoring should be holistic in nature covering various socio-ecological aspects of river conservation like river habitat quality, biodiversity value in terms of conservation of threatened species like Gangetic dolphin, gharial, turtles, water birds, flora and other species, drivers of species decline and impact of anthropogenic influences on species distribution, ecosystem services of the area and their contribution to well-being of local communities and other stakeholders, participatory and inclusive conservation, governance, institutions etc. In order to efficiently implement the set objectives, it is also important to focus on training of the frontline field staff along with some dedicated representatives of the local community to enhance their knowledge and build their capacity to carry out various monitoring activities in the KWS.

10.2 Research

Research plays a major role in protection of habitats and their biodiversity. Research can be either carried out to support management or to understand the natural and human-mediated processes with no help in management as such.

While previous studies have majorly focused on water quality and geomorphology of Ganga River in the area, there is still a substantial knowledge gap in important areas related to

ecosystem services, biodiversity and human ecology of the study area. We recommend that the following areas should be given emphasis to conduct research in the KWS area that could help in better management of the wildlife habitats and threatened species at least for next 3- 5 years:

- 10.2.1 Status of threatened species in KWS
- 10.2.2 Pattern of land use land cover change and its impact on habitat and biodiversity of KWS
- 10.2.3 A baseline ecological assessment of the area which includes inventorization of major fauna and flora present in different habitats of the study area and their conservation status
- 10.2.4 Assessment of ecosystem services and their contribution to local human well-being
- 10.2.5 Identification of priority species, ecosystem services and habitats for conservation and monitoring
- 10.2.6 Detailed ecological study of priority species of KWS to examine their distribution and resource utilization
- 10.2.7 Dependence of local communities on the natural resources of the KWS
- 10.2.8 Attitude and perception of various stakeholders towards conservation and management of KWS
- 10.2.9 Impact of climate change on hydrological regime of the stretch of Ganga river falling under KWS
- 10.2.10 Documentation of cultural and historical values of the protected area
- 10.2.11 Documentation of local and traditional knowledge
- 10.2.12 Assessment of ecotourism potential and identification of high potential areas

10.3 Monitoring

After identification of priority species, ecosystem services and habitats, it is important to have a monitoring program in place to examine their status with time and the effectiveness of management plan in meeting the aims of protected area. Systematically measuring, gathering, processing, sending and making information available of the natural and social environment of the study area using appropriate methods and tools comes under monitoring.

It is proposed that field staff of Forest Department and Management Committee of KWS together should carry out monitoring at regular interval. Since this area is a turtle rich area, their monitoring should be given focus along with other priority species. Being an area with high

anthropogenic pressure, we also urge for regular social monitoring to assess the communities' status, attitude and perception in response to the ongoing management activities.

10.3.1 Main consideration in design of monitoring program

The main objective of monitoring program is to strengthen and support the conservation and management of the sanctuary area by identifying areas that need focus and by providing feedbacks on the effectiveness of the activities.

Hence, the monitoring program will be focused on assessing river habitat quality, major conservation priority species of the sanctuary, and the socio-economic drivers that impact them, for which permanent protocols are suggested. Indicators for monitoring are chosen on the basis of availability of simple and standardized methods of data collection in field, they play some important ecological and environmental role, and the patterns of which can be used as a proxy to assess the status of the overall system.

10.4 Landuse/Landcover

The study of landuse/land cover (LU/LC) changes is important to detect spatial changes taking place in the sanctuary for the conservation of the species habitat and river ecosystem. At every five years interval for pre and post monsoon season, remote sensing data should be used to monitor the river habitat. This will illustrate habitat modification due to natural (in case of floods during monsoon), agricultural and other anthropogenic activities, built up areas or change in riparian vegetation cover etc.

10.5 Biodiversity monitoring

Freshwater biodiversity is increasingly threatened due to flow alteration, over exploitation of resources, pollution and developmental projects. Information on population trends of a species/community is essential for understanding the long-term conservation status of threatened species/community and also for predicting any change in the state of the system and impact from anthropogenic factors.

Hence, a long-term monitoring of major aquatic macro-fauna like Gangetic dolphin, gharial, water birds, turtles, fishes; aquatic vegetation including phytoplankton and macro-invertebrates

is prescribed. Professional institutions/NGOs should be engaged for this purpose and the work can be coordinated by local NGOs, State Forest Department or the Management Committee.

10.5.1 Monitoring of Phytoplankton

Phytoplankton are the primary producers and the base of food chain in the aquatic ecosystem. Higher concentration of pH, bicarbonates, phosphates, silicates, nitrates and nitrites in water are responsible for high phytoplankton growth. Phytoplankton studies and monitoring will help in providing information on the nutrient cycling, physico-chemical and biological conditions of water. Hence, seasonal monitoring of phytoplankton using standard procedures is recommended.

10.5.2 Monitoring of Aquatic Vegetation

The vegetation reflects the conditions of the site and help in assessing its state. It is an also important parameter for the presence of many species like turtles and water birds. The transect method is recommended to collect data on riverine vegetation and its phytosociological parameters. Phytosociological data will help in determining the composition of different plant groups which could be governed by different factors, which could be examined using data from other parameters

10.5.3 Monitoring of Invertebrates

Aquatic insects, freshwater crustaceans, aquatic annelids and zooplanktons form the prey base in the aquatic ecosystem for macro-faunal species like fishes, water birds and turtles. Invertebrate species should be monitored annually using sweep net method or funnel trap method.

10.5.4 Monitoring of Fish population and catch

Fishes are important components of aquatic ecosystems through their role as consumers of other organisms. They have a significant influence on the structure and function of these ecosystems. Because of this, adverse effects on fish can have flow-on effects on other aquatic organisms, even if they are not directly affected by those changes. Monitoring of fish communities can, therefore, serve as tool to indicate the ecological health of the sanctuary. Therefore, fish monitoring is recommended to be carried out annually using standard protocols.

10.5.5 Monitoring of Invasive species

Detection and Monitoring of Invasive species is important to check the loss caused by these species to the ecosystem services provided by the river. A systematic surveillance of invasive species to collect information regarding status and spread of known invasive species and the collection of data to evaluate progress and effectiveness of proposed activities, regular monitoring of plant community structure is imperative to reduce the invasion of unwanted weeds. This should be carried out once every two year to accurately monitor the trend in vegetation change, especially the spread of invasive species like *Eichhornia crassipes* (Mart.) Solms, *Parthenium hysterophorus* L., *Ipomoea carnea* Jacq.

Exotic fish species are a big challenge in conserving native fish population since exotic species not only increase rapidly in population, but they are also capable of spreading exotic diseases, thus decreasing the native fish diversity by competing them in terms of predation and degrading the habitat. Hence is monitoring invasive fish species is required for conserving the native fish species. To monitor invasive species we need to identify and target the identified invasive species whose population needs to be controlled in the given habitat. For this Proper quarantine norms formulated by the state government departments and quarantine measures should be adopted consulting NBFGR, ICAR, etc.

10.5.6 Monitoring of Reptiles (Gharial, Mugger and Turtle)

Seasonal monitoring of major reptile species like gharial, mugger and turtles needs to be conducted. For gharial and mugger, visual encounter method can be followed and for turtles, trap methods like gill net and box traps etc. are recommended.

10.5.7 Monitoring of Waterbirds

During winter, migratory birds come from higher altitude to lower altitude. For monitoring of water birds, regular counts should be undertaken in the entire stretch of the sanctuary. Total count or point count method can be used for the population estimation. Survey can be done during winter season. The collected data will provide a comprehensive understanding of the importance of the river habitat for migratory water birds and to plan and monitor habitat management strategies and actions. Data collected during this monitoring work will include detailed information on habitat structure and seasonal abundance and changes in different prey

items (aquatic flora and fauna). Local youth should be trained to be involved in conducting bird surveys and to further engage the local communities in conservation and management of KWS. The survey should be led by properly trained people. Results of the annual monitoring programme should be analyzed to assess the trends in population changes and change in species composition as well as identification of endangered / critically endangered species.

10.5.8 Monitoring of Aquatic mammals

Gangetic dolphin is an obligatory freshwater cetacean and endemic to Indian subcontinent that plays an important role in maintaining the balance of aquatic ecosystem by occupying the apex position in the food chain (Behera, 1995; Gomez-Salazar, 2012; Sinha and Kannan, 2014). To monitor this elusive species a double observer method can be used during pre-monsoon and post monsoon season (Simth and Reeves, 2000; Braulik et al, 2012).

10.5.9 Wildlife health monitoring

Any kind of infectious and non-infectious disease can have significant impact on the conservation status of the wild animal species. There many villages which are situated near the bank of the river stretch under KWS and surrounding area and it is a common practice to bring livestock for bathing in the river, drinking its water or grazing near the river.

Hence, the blood sample of the key faunal species and livestock in surrounding villages should be checked regularly for any kind of disease threat. Systematic disease surveillance should be done to detect any possibilities of the disease in the area. Properly preserved samples should be sent to National Institute of High Security Animal Diseases (HSADL, Bhopal) for the screening of various viral diseases.

10.5.10 Habitat monitoring

Habitat monitoring is essential to understand the efficacy of the Management Plan. Any changes in the habitat are expected to affect the associated wildlife. Hence, monitoring of wildlife habitat is crucial. Representative river stretches should be selected to monitor the changes in the vegetation structure at least within 100 m (will change depending on how far we get turtles nesting or otherwise present in both sides of the river) from the riverbank.

10.5.11 Monitoring of hydrological regime

Natural hydrological regime of the aquatic ecosystem plays an important role in the maintenance of species richness (Dutta et al., 2017). Water depth, river width, change in seasonal hydrology of the river in the sanctuary might result in an increased frequency of nest failure events. Bathymetric exercise should be carried out once every two years to know the siltation profile of the river in the sanctuary area. For this, an electronic echo sounder should be procured to get more reliable data.

10.5.12 Social monitoring

Monitoring of socio-economic conditions of fringe villages is important to assess the dependency of the local communities on the sanctuary. The quantity of biomass extracted like fish biomass or aquatic plants from the sanctuary need to be monitored regularly to know the extent of biomass extraction. This information would also help in assessing the impact of resource extraction from the river of the sanctuary. Attitude and perception of the local community towards the conservation and management of the sanctuary should be included while considering the social monitoring. In order to ensure that tourism activities do not interfere with conservation goals, tourism activities should be a regular feature of the monitoring programme. A tourist feedback record should be maintained periodically to know the satisfaction level of the visitors and to seek the suggestions related to improvement in the recreational activities.

10.5.13 Institutional monitoring

Regular monitoring and evaluation of institutions such as EDCs and KWST and its various line agencies should be done for ensuring timely achievement of goals and conflict resolution, if any, and timely action. It is crucial to check the workings of these institutions and their output regularly. This monitoring should be done once every 2 years.

10.6 Training and Capacity building

For the training and capacity building, expertise from various scientific fields should be involved. Target groups such as competent EDC members, field staff managers and decision

makers, local people and local NGOs should be taken into consideration for training programs. Scientific trainings related to identification of water birds, reptiles and other key faunal species along with vegetation sampling, wildlife rescue and aid etc, should be provided to build their capacities. Specific training programs in collaboration with institutions like Wildlife institute of India (WII)-Dehra Dun, Bombay Natural History Society (BNHS) and Turtle Survival Alliance- India can be consulted. Trained field staff should be given small projects on which they should collect scientific information from the field such as turtle species, water birds, and vegetation. Local community should be trained in tourism sector as guide or tour operators. The proposed monitoring activities have been summarized in Table 10.1.

Table 10.1 Summary table for proposed monitoring activities in the Turtle Wildlife Sanctuary

Parameters	Indicators	Monitoring Method	Monitoring Frequency
Habitat monitoring			
Landuse/Landcover Changes	% area under various landuse/landcover classes	GIS and Remote sensing data	Once in 5 years
Hydrological regime			
Hydrology	Inundation	GIS and Remote sensing data	Seasonally
Water depth	Bathymetry	Depth finder or Bamboo pole with marked scale	twice (pre and post monsoon) every year
Water quality	Standard procedure given by Central Pollution Control Board (CPCB)	Standard procedure given of Central Pollution Control Board (CPCB)	Annually, twice a year (pre and post monsoon)
Fauna			
	Invertebrates	Standard procedure like sweep net method	Annually

		or funnel trap method	
	Fish	Catch Per Unit Effort (Standard procedure)	Annually
	Reptiles	Visual encounter survey; Trap methods like hoops traps, gill net traps	Seasonally
	Birds	Total count or point count method	Annually, twice a year (summer and winter)
	Aquatic mammals	Visual encounter survey	Seasonally
	Wildlife health	Surveillance	Annually
Flora			
Phytoplanktons	Blue green algae	Standard procedure	Seasonally
Aquatic vegetation	Tress and Grasses	Transect	Seasonally
Social monitoring	Dependency of local people; Contribution of resources in their income; Attitude and perception of communities towards management and conservation; Number of visitors visiting the sanctuary	Socio-economic survey	Alternate years
Institutional monitoring	Stakeholders role	Questionnaire survey	Alternate years

Budget

[illegible]

	improvement											
	Total	32	12	19	9	17	17	17	7	12	2	144
		DEVELOPMENT OF EFFECTIVE PROTECTION SYSTEM										
1	Engagement of temporary watchmen	10	10	10	10	10	10	10	10	10	10	100
2	Establishment of Rescue and rehabilitation facilities	20	0	0	0	0	0	0	0	0	0	20
3	Maintenance of Rescue and Rehabilitation centre	10	10	10	10	10	10	10	10	10	10	100
4	Hiring boat and manpower for animal rescue	2	1	1	1	1	1	1	1	1	1	11
5	Training of local youths in Rescue and Rehabilitation	2	2	2	2	0	0	0	0	0	0	8
6	Construction and maintenance of Entry gate and watch tower	5	0	1	1	1	1	1	1	1	1	13
7	Field equipment, uniforms and other logistics	10	1	1	1	1	1	1	1	1	1	19
8	Training workshops for rapid response rescue team.	5	0	5	0	5	0	5	0	0	0	20
9	Procurement of rescue equipments for rapid response team	10	0	5	0	5	0	5	0	5	0	30

10	Development of Ganga Vatika	5	2	2	2	1	1	1	1	1	1	17
11	Nature guides training	2	2	0	2	0	2	0	0	2	0	10
	Total	96	33.5	25.5	19	16	20	15.5	15.5	17.5	15.5	274
		INTERPRETATION AND VISITOR CENTERS										
1	Renovation of Government building for Interpretation center	25	2	2	2	2	5	5	5	5	5	58
2	Development, printing and installation of Exhibits	25	5	5	5	5	5	5	5	5	5	70
3	Toilets and drinking water Facilities	5	0.5	0.5	0.5	0.5	1	1	1	1	1	12
4	Miscellaneous	2	2	2	2	2	2	2	2	2	2	20
5	Light and sound system	5	0	0	2	0	0	2	0	0	2	11
6	Purchase of material such as Binoculars, Spotting-scopes, Handheld lenses, Laptops, White board/Marker pens, Printer/Copier/Scanner etc.	10	1	1	1	0.5	0.5	0.5	0.5	1	1	17
7	Power back up facility	10	1	1	1	1	1	1	1	1	1	19
8	Maintenance of Interpretation center	2	2	2	2	3	3	3	3	3	3	26

	Total	84	13.5	13.5	15.5	14	17.5	19.5	17.5	18	20	233
		PUBLICATIONS										
1	Brochure	5	5	5	5	5	5	5	5	5	5	50
2	Checklist of wild animals, birds and aquatic fauna	5	5	5	5	5	5	5	5	5	5	50
3	Plant Identification Guide	5	5	5	5	5	5	5	5	5	5	50
4	Posters	5	5	5	5	5	5	5	5	5	5	50
5	Outreach material	5	5	5	5	5	5	5	5	5	5	50
6	Website creation, web hosting and upgradation	5	5	2	2	2	2	2	2	2	2	26
7	Audio-Visual aids and film production	20	5	2	2	2	2	2	2	2	2	41
	Total	50	35	29	29	29	29	29	29	29	29	317
		RESEARCH AND MONITORING										
1	Status of threatened species in KWS	2	2	2	2	2	2	2	2	2	2	20
2	Pattern of land use land cover change and its impact on habitat and biodiversity of KWS	2	0	0	2	0	0	2	0	0	2	8
3	Assessment of ecosystem services and their contribution	2	0	0	2	0	0	2	0	0	0	6

18	Assorted research	2	2	2	2	2	2	2	2	2	2	20
19	Research equipment	10	2	2	2	2	5	2	2	2	2	31
20	Research technician/Biologist	4	4	4	4	4	5	5	5	5	5	45
	Total	60	44	41	45	38	40	45	37	39	41	430
		ECODEVELOPMENT										
1	Establishment of EDCs	4	2	2	2	2	1	1	1	1	1	17
2	Capacity development and training	10	10	5	5	2	2	2	2	2	2	42
3	Implementation of alternate livelihood centers in selected locations	10	5	5	2	2	2	2	2	2	2	34
4	Ecotourism and home stay development	3	3	2	2	2	2	2	2	2	2	22
5	Value addition of local handicraft and agricultural products	5	5	2	2	2	2	2	2	2	2	26
6	Poultry development, dairy production	5	5	2	2	2	2	2	2	2	2	26
7	Formation and training of SHGs	5	5	2	2	2	1	1	1	1	1	21
8	Conduction of Skill development trainings	5	5	5	2	2	2	2	2	2	2	29

	Total	47	40	25	19	16	14	14	14	14	14	217
		ESTABLISHMENT COST										
1	Office Furniture	5	0	2	0	2	0	2	0	2	0	13
2	Office equipment	5	1	2	0	2	0	2	0	2	1	15
	Total	10	1	4	0	4	0	4	0	4	1	28
		GUEST HOUSES AND MAINTENANCE										
1	Maintenance	5	5	2	2	2	2	3	3	3	3	30
	Total	5	5	2	2	2	2	3	3	3	3	30
		MAN POWER ENGAGEMENT										
1	Veterinarian (1)	6	6	8	8	10	10	12	12	14	14	100
2	Conservation Biologist (1)	5	5	7	7	9	9	11	11	13	13	90
3	Ecodevelopment officer (1)	5	5	7	7	9	9	11	11	13	13	90
	Total	16	16	22	22	28	28	34	34	40	40	190
		CONTINGENCY										
1	Contingencies	5	5	7	7	8	8	9	9	10	10	78
	Total	5	5	7	7	8	8	9	9	10	10	78
	Grand Total	502	239	233	207.5	215	208.5	238	199	224.5	210.5	2477

Chapter 12

Organization and Administration

12.1 Structure and Function

The organizational strength of existing Kachhua Wildlife Sanctuary needs to be increased and upgraded to provide effective protection and implementation of the management plan. The primary function of the organization for managing the Sanctuary may be as follows:

- Development of Sanctuary habitat
- Protection of the Sanctuary flora and fauna and their habitat
- Boundary demarcation, maintenance and legal cases
- Ecological monitoring of the Sanctuary
- Carry out eco-development activities
- Increase awareness especially on the conservation value of the Sanctuary
- Promote tourism
- Undertake research and monitoring
- Crisis management

12.1.1 Organizational structure

The Principal Chief Conservator of Forest (Wildlife) and Chief Wildlife Warden (CWLW) heads Wildlife Wing of Forest Department, Uttar Pradesh will be supervising the management of Kachhua Wildlife Sanctuary (KWS). Deputy Conservator of Forests (Wildlife), Park and Sanctuary Division is the key officer to execute scheme for development and conservation of the Park. Under the DCF are the Assistant Conservator of Forests (Wildlife), Range Officers and staff posted at Range Office and at the check post around the Sanctuary. For proper management and monitoring of the Sanctuary, the staff strength is proposed to increase since many of the field staff might be casual workers. To avoid severe shortage of staff recruitment of staff to fill up the vacant post and creation of some more post is required (Table 12.1).

Table 12.1 Proposed staff strength in KWS

Sl. No.	Designation	Sanctioned Staff	Actual Staff	Proposed Staff
1	Deputy Conservator of Forest (DCF)			
2	Asst. Conservator of Forest (ACF)			
3	Range Officer (RO)			
4	Deputy Range Officer (DRO)			
5	Forester			
6	Head Forest Guard			
7	Forest Guard			
8	Head Clerk			
9	UDC			
10	LDC			
11	Driver			
12	Peon			
13	Chowkidar			
14	Mali			
15	Boatmen			
16	Sweeper			
17	Animal Attendant & Watcher			

12.2 Infrastructure and amenities

There is a need for a Wildlife Health/Veterinary Centre in addition to having a Nature Interpretation and Conservation Education Centre near the Sanctuary for effective and holistic management and rescue and rehabilitation operations.

Creation of well-equipped mobile squads and establishment of wireless network across would help to provide effective protection.

12.2.1 Staff amenities

12.2.1.1 Quarters

It is proposed to renovate or construct new infrastructure.

12.3 Incentive for staff

As a means to motivate and encourage the staff for their work that often ask for their round the clock attention and support, some incentives could be provided as proposed.

a. **Difficult Area Allowance (DAA)** for the staff posted on field duty in the Sanctuary can be provided @ 15% a month.

b. **Award for officer and staff in each category** may be given for meritorious service in a year. For all officers grade, there shall be one category. The award shall consist of a citation, memento and token cash prize. During important event such as celebration of wildlife week or such other would make for an ideal time to distribute awards.

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कार्यालय प्रधान मुख्य वन संरक्षक, वन्य जीव, उत्तर प्रदेश, लखनऊ

पत्रांक- 3179 / 28-11 (कछुआ वन्य जीव विहार), लखनऊ, दिनांक, अप्रैल 28, 2020

सेवा में,

1. मुख्य वन संरक्षक,
वन्य जीव, पश्चिमी क्षेत्र,
उ०प्र०, कानपुर।
2. मुख्य वन संरक्षक,
दक्षिणी क्षेत्र,
प्रयागराज (उ०प्र०)।

विषय:

कछुआ वन्य जीव विहार रामनगर-वाराणसी को दिखण्डित करने एवं नवादा, प्रयागराज के निकट गंगा नदी दोनों तटों से आवृद्ध 30 कि०मी० में फैले क्षेत्र को कछुआ वन्य जीव विहार घोषित किए जाने की अधिसूचना के सम्बन्ध में।

संदर्भ:-

प्रयागराज, वन एवं जलवायु परिवर्तन अनुभाग-4, उ०प्र० शासन का पत्रसंख्या-351/81-4-2020-623-2008टी०सी०, दिनांक 17.03.2020

महोदय,

उपरोक्त संदर्भित शासकीय पत्र द्वारा कछुआ वन्य जीव विहार रामनगर-वाराणसी को दिखण्डित करने एवं नवादा, प्रयागराज के निकट गंगा नदी दोनों तटों से आवृद्ध 30 कि०मी० में फैले क्षेत्र को कछुआ वन्य जीव विहार घोषित किए जाने की अधिसूचना निर्गत की गई है। उक्त अधिसूचना की प्रति संलग्न कर सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित की जा रही है।

संलग्नक:-उपरोक्तानुसार।

भवदीय,

(सुनील पाण्डेय)

प्रधान मुख्य वन संरक्षक, वन्य जीव,
उत्तर प्रदेश, लखनऊ।

पत्रांक 3179/उक्तदिनांकित।

प्रतिलिपि: प्रधान मुख्य वन संरक्षक और विभागाध्यक्ष उ०प्र०, लखनऊ को उक्त अधिसूचना की प्रति संलग्न कर सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

संलग्नक:-उपरोक्तानुसार।

(सुनील पाण्डेय)

प्रधान मुख्य वन संरक्षक, वन्य जीव,
उत्तर प्रदेश, लखनऊ।

पत्रांक 3179/उक्तदिनांकित।

प्रतिलिपि: निम्नलिखित को मय संलग्न सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

- 1- मुख्य वन संरक्षक, मिर्जापुर मण्डल, मिर्जापुर।
- 2- वन संरक्षक/क्षेत्रीय निदेशक, इलाहाबाद वृत्त, इर हाबाद।
- 3- वन संरक्षक/क्षेत्रीय निदेशक, वाराणसी वृत्त, वाराणसी।
- 4- जिलाधिकारी, वारपारसी, जिलाधिकारी, भदोही, जिलाधिकारी, मिर्जापुर एवं जिलाधिकारी, प्रयागराज।
- 5- प्रभागीय वनाधिकारी/प्रभागीय निदेशक, काशी वन्य जीव प्रभाग, रामनगर-वाराणसी, सामाजिक वानिकी प्रभाग, प्रयागराज, सामाजिक वानिकी प्रभाग, भदोही, सामाजिक वानिकी प्रभाग, वाराणसी एवं मिर्जापुर वन प्रभाग, मिर्जापुर।

संलग्नक:-उपरोक्तानुसार।

(सुनील पाण्डेय)

प्रधान मुख्य वन संरक्षक, वन्य जीव,

प्रेषक,

सुधीर गर्ग,
प्रमुख सचिव,
उत्तर प्रदेश शासन।

सेवा में,

संयुक्त निदेशक,
राजकीय मुद्रणालय,
ऐशबाग, लखनऊ।

पर्यावरण, वन एवं जलवायु परिवर्तन अनुभाग-4

लखनऊ, दिनांक, 17 मार्च, 2020

विषय-कछुआ वन्यजीव विहार, रामनगर, वाराणसी को विखण्डित करने एवं नवादा, प्रयागराज के निकट गंगा नदी दोनों तटों से आवद्ध 30 कि०मी० में फैले क्षेत्र को कछुआ वन्यजीव विहार घोषित किये जाने की अधिसूचना को गजट में प्रकाशित किया जाना।

महोदय,

उपर्युक्त विषयक अधिसूचना संख्या-336/81-4-2020-823/2008टीसी० दिनांक 17.03.2020 एवं अधिसूचना संख्या-346/81-4-2020-823/2008टीसी० दिनांक 17.03.2020 की हिन्दी एवं अंग्रेजी प्रति मय सी०डी० संलग्न कर प्रेषित करते हुए मुझे यह कहने का निदेश हुआ है कि कृपया इसे उत्तर प्रदेश आसाधारण गजट, विधायी परिशिष्ट भाग-4 के आगामी अंक में प्रकाशित करते हुए गजट में प्रकाशित अधिसूचनाओं की 200-200 प्रतियां शासन को अभिलेखार्थ अविलम्ब उपलब्ध कराने का कष्ट करें।

संलग्नक यथोक्त।

भवदीय,

(सुधीर गर्ग)
प्रमुख सचिव।

संख्या एवं दिनांक तदैव:-

प्रतिलिपि प्रधान मुख्य वन संरक्षक, वन्यजीव, उ०प्र० लखनऊ को इस आशय से प्रेषित कि संयुक्त निदेशक, राजकीय मुद्रणालय, ऐशबाग, लखनऊ से तत्काल सम्पर्क स्थापित कर अधिसूचना को गजट में प्रकाशित कराने हेतु सम्बन्धित को निर्देशित करने का कष्ट करें।

आज्ञा से,
(सुधीर गर्ग)
प्रमुख सचिव।

Uttar Pradesh Shasan
Paryawaran, Van Evam Jalwayu Parivaratan Anubhag-4

No.336/81-4-2020-823/2008 TC
Lucknow, dated 17-03-2020

Notification

Whereas, the area mentioned in the schedule below was declared as Kachhua Wild Life Sanctuary, Varanasi vide Government Notification No.1485/14-4-2008-823/2008 dated 21-05-2009 issued under Section-26A of the Wild Life (Protection) Act, 1972(Act No. 53 of 1972);

And, whereas, due to very low encounter rate of turtles in Kachhua Wild Life Sanctuary indicates high human disturbance leading to habitat alteration within a very small protected area;

And, whereas, the said area is no longer suitable for adequate ecological, floral, geomorphological, natural and zoological significance for the purpose of protecting, propagating Wildlife and its environment.

Now therefore, in exercise of the powers under Section-26A of the Wild Life (Protection) Act, 1972(Act No. 53 of 1972) read with Section-21 of the General Clauses Act 1897 (Act No. 10 of 1897), The Governor is pleased to rescind the aforesaid Notification No.1485/14-4-2008-823/2008 dated 21-05-2009 with effect from the publication of this Notification in the Gazette.

Schedule

District	Name of River	Area of Kachhua Wildlife Sanctuary, Varanasi
Varanasi	River Ganga	7.00 (seven) km. area of Mid stream of river Ganga from both the banks
Boundaries	Upstream	Ramnagar Fort
	Downstream	Malviya Rail/ Road bridge
	East	Eastern bank of river Ganga
	West	Western bank of river Ganga (Varanasi City)

Note:- This notification shall be subject to the final decision of the Supreme Court in I A No. 117425/2019 and 117429/2019 in writ petition civil No. 337/1995.

By order,

(Sudhir Garg)
Principal Secretary

उत्तर प्रदेश शासन
पर्यावरण, वन एवं जलवायु परिवर्तन अनुभाग-4
संख्या-336/81-4-2020-823/2008 टी0सी0
लखनऊ, दिनांक 17.03.2020

अधिसूचना

चूँकि नीचे अनुसूची में उल्लिखित क्षेत्र, वन्यजीव (संरक्षण) अधिनियम, 1972 (अधिनियम संख्या 53 सन् 1972) की धारा 26-क के अधीन सरकारी अधिसूचना संख्या 1485/14-4-2008-823/2008, दिनांक 21.05.2009 द्वारा कछुआ वन्यजीव विहार, वाराणसी के रूप में घोषित किया गया था;

और चूँकि कछुआ वन्यजीव विहार में कछुओं की अत्यन्त न्यून समागम दर के कारण उच्च मानव जनित हस्तक्षेप दर्शित होता है, जिसके परिणाम स्वरूप अत्यधिक छोटे संरक्षित क्षेत्र में प्राकृतवास परिवर्तित हो गया है।

और चूँकि उक्त क्षेत्र वन्यजीव या उनके पर्यावरण के संरक्षण एवं सम्बर्धन के प्रयोजन के लिये पर्याप्त पारिस्थितिक, वनस्पतिजात, भू-आकृतिजात, प्राकृतिक और प्राणिवैज्ञानिक महत्व के लिये अब उपयुक्त नहीं रह गया है।

अतः अब, साधारण खण्ड अधिनियम, 1897 (अधिनियम संख्या 10 सन् 1897) की धारा 21 के साथ पठित वन्यजीव संरक्षण अधिनियम, 1972 (अधिनियम संख्या 53 सन् 1972) की धारा 26-क के अधीन शक्तियों का प्रयोग करके राज्यपाल इसे अधिसूचना के गजट में प्रकाशित किये जाने के दिनांक से पूर्वोक्त अधिसूचना संख्या-1485/14-4-2008-823/2008, दिनांक 21.05.2009 को विखण्डित करती हैं:-

अनुसूची

जिला	नदी का नाम	कछुआ वन्य जीव विहार, वाराणसी का क्षेत्र
वाराणसी	गंगा नदी	दोनों तटों से गंगा नदी की मध्य धारा के किनारे का 7.00 (सात) कि०मी० क्षेत्र
सीमाएं	उर्ध्व प्रवाह	रामनगर किला
	अधो प्रवाह	मालवीय रेल/सड़क पुल
	पूर्व	गंगा नदी का पूर्वी तट
	पश्चिम	गंगा नदी का पश्चिमी तट (वाराणसी नगर)

टिप्पणी: यह अधिसूचना रिट याचिका सिविल संख्या 337/1995 में, आई.ए. संख्या 117425/2019 एवं 117429/2019 में उच्चतम न्यायालय के निर्णय के अधीन होगी।

भवदीय,
(सुधीर मर्ग)
प्रमुख सचिव

Uttar Pradesh Shasan
Paryawaran, Van Evam Jalwayu Parivaratan Anubhag-4

In exercise of the powers under clause (3) of Article 348 of the Constitution of India the Governor is pleased to order the publication of the following english translation of the notification no.-346/81-4-2020-823/2008TC, dated 17-03-2020 for general information:

Notification

No.346/81-4-2020-823/2008 TC
Lucknow, dated 17-03-2020

Whereas the State Government considers that the area, detailed in the Schedule below is of adequate ecological, faunal, floral, geomorphological, natural and zoological significance for the purpose of protecting, propagating and developing Wildlife therein and its environment;

Now, therefore, in exercise of powers conferred under sub section(1) of section 18 of the Wildlife (Protection) Act, 1972 (Act no. 53 of 1972), the Governor is pleased to declare its intention to constitute the area in the stretch of 30 km. along both sides of Ganga River falling in the districts of Bhadohi, Prayagraj and Mirzapur as Kachhua Wildlife Sanctuary as per schedule below:-

Schedule

Districts	Name of river	Area of Kachhua Wildlife Sanctuary
Prayagraj, Bhadohi and Mirzapur	Ganga	Area bounded by both banks of river Ganga in the stretch of 30 km. along main stream of River Ganga.
Boundaries	East (Down Stream of the River)	Latitude- 25.273769 Longitude-82.287486 Falling in Revenue Boundary of Village Baripur uparwar, Gyanpur of District Bhadohi.
	West (Up Stream of the River)	Latitude- 25.215000 Longitude-82.194814 Falling in Revenue Boundary of Village Kothari, Meja of District Prayagraj.
	North	Left Bank of River Ganga
	South	Right Bank of River Ganga

By order,
(Sudhakar Garg)
Principal Secretary

उत्तर प्रदेश शासन
पर्यावरण, वन एवं जलवायु परिवर्तन अनुभाग-4
संख्या-346/81-4-2020-823/2008 टी0सी0
लखनऊ, दिनांक 17.03.2020

चूँकि राज्य सरकार की राय है कि नीचे अनुसूची में विस्तृत रूप में उल्लिखित क्षेत्र वन्यजीव एवं उसके पर्यावरण के संरक्षण, संवर्धन एवं विकास के प्रयोजन के लिए पर्याप्त पारिस्थितिक, प्राणिजात, वनस्पतिजात, मू-आकृतिजात, प्राकृतिक तथा प्राणिवैज्ञानिक महत्व का है।

अतएव, वन्यजीव (संरक्षण) अधिनियम, 1972 (अधिनियम संख्या 53 सन् 1972) की धारा 18 की उपधारा(1) के अधीन प्रदत्त शक्तियों का प्रयोग करके राज्यपाल जिला भदोही, प्रयागराज एवं मिर्जापुर के अन्तर्गत गंगा नदी के दोनों तटों से आबद्ध 30 किमी० लम्बाई में फैले क्षेत्र को नीचे अनुसूची के अनुसार कछुआ वन्यजीव विहार के रूप में स्थापित करने के अपने आशय की घोषणा करती हैं:-

अनुसूची

जिला	नदी का नाम	कछुआ वन्य जीव विहार का क्षेत्र
प्रयागराज, भदोही और मिर्जापुर	गंगा	गंगा नदी के दोनों तटों से सीमाबद्ध गंगा नदी के मुख्य धारा का 30 किमी० लम्बाई में फैला क्षेत्र
सीमाएं	पूरब (नदी का अधोः प्रवाह)	ग्राम- बारीपुर उपरवार, ज्ञानपुर, जिला-भदोही की राजस्व सीमा में:- अक्षांश- 25.273769 देशान्तर-82.287486
	पश्चिम(नदी का उर्ध्व प्रवाह)	ग्राम कोठरी, मेजा, जिला-प्रयागराज की राजस्व सीमा में:- अक्षांश- 25.215000 देशान्तर-82.194814
	उत्तर	गंगा नदी का उत्तरी तट
	दक्षिण	गंगा नदी का दक्षिणी तट

आज्ञा से,

(सुधीर नारायण)
प्रमुख सचिव

Ecosystem services provided by KWS

The Ganga River stretch of the KWS provides direct and indirect benefits that are vital for human wellbeing in the region, termed as ecosystem services. KWS provides indirect use benefits in the form of regulating services i.e. benefits derived from the regulation of ecosystem processes, such as maintaining population and habitat, regulation of micro climate, soil fertility and soil formation, water purification and waste management, and ground water recharge (Table 1). KWS provides direct use benefits in the form of provisioning services and cultural services, which constitute products derived from the ecosystem and non-material benefits obtained from the ecosystem, respectively.

Table: 1 Groundwater resources in the CD blocks along the sanctuary.

	Prayagraj			Mirzapur	Bhadohi (Sant Ravidas Nagar)
	Handia	Manda	Urva	Chhanvey	Dheeg
Annual Groundwater Recharge (Ham)	5589.25	6352.00	5948.82	4435.10	6921.63
Annual Groundwater Draft (Ham)	3866.84	3747.09	3817.42	4152.49	5187.40
Groundwater Availability (Ham)	1612.03	2502.45	2038.05	141.42	1654.50
Level of Development (%)	69.18	58.99	64.17	93.63	74.94

Category	Safe	Safe	Safe	Critical	Semi critical
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Source: <http://upgwd.gov.in/StaticPages/Atlas2017.aspx>

An important ecosystem service provided by KWS is the provision of surface and ground water resources for consumptive use such as water for drinking and domestic use, livestock and irrigation, and non-consumptive use such as transportation. 84.41% of the households in the surveyed villages along the sanctuary have a drinking water facility, of which 6,101 households are serviced by a water pipeline, 6,609 households are serviced by a handpump and 1,863 households are serviced by a well. Animal husbandry benefits in the region from the availability of water and fodder, cultivated or extracted from the river. 2,739 households are engaged in animal husbandry, deriving an annual income of approximately ₹90,000/- annually. These households rear 13,682 cows and 11,179 buffaloes, which are valued at ₹ 3,68,640/- and ₹ 3,83,130/-, respectively, annually using the market price of the product derived i.e. milk, as proxy (Table 2).

Table 2: Economic value of livestock reared in surveyed villages.

S. No.	Livestock	Number	Milk production (litres)	Market price (₹/litre)	Value at market price (₹)
1.	Cows	13,682	8192	45	3,68,640
2.	Buffaloes	11,179	6966	55	3,83,130
3.	Goats	21,978	2,700	—	—
4.	Poultry	5,915	—	100	5,91,500
5.	Donkey	200	—	—	14,000
6.	Pig	180	—	—	3,60,000

Agriculture benefits from the river, primarily, due to the availability of water for irrigation and the fertile alluvial soil formation. In the survey villages, 72.75% of the land or 4,945.4 ha is cultivated. 16,381 households engage in agriculture earning an average annual income of ₹

26,342/- per household, which aggregates to ₹ 43,15,08,302/-; 13 households engage in floriculture earning an average annual income of ₹ 56,000/- per households, which aggregates to

₹ 7,28,000/-; and 306 households manage orchards earning an average annual income of ₹ 12,000/- per household, which aggregates to ₹ 36,72,000/-. The land near Ganga is cultivated 10 months in a year, with rice, wheat, barley, maize, peas and mustard as the principal crops. Nearly 550 kg of vegetables are produced in a year, fetching a revenue of nearly ₹ 12,000/-.

Boats are used as means to commute and transport goods from one bank to the other. In the surveyed villages, 182 households earn a livelihood via boating, with an average annual income of ₹ 1,62,000.

KWS provides biotic resources in the form of fish, fuel and fodder, and abiotic resources in the form of riverbed material. Nearly, 1000 kg and 3000 kg of fuel and fodder, and 2000 kg of riverbed material is extracted from the sanctuary, which is primarily used to meet the household requirements and not sold in the market. In the 38 surveyed villages, nearly 13.20 % of the households (i.e. 3510 households) are actively engaged in fishing. They earn an average annual income of ₹ 39,600/- per household from the activity, which aggregates to ₹ 13,89,96,000/- over all the households. The average catch per day is 8kg per household, sold at ₹ 60 per kg.

KWS provides cultural services in the form of recreation, and religious and spiritual services. Ganga River holds an integral place in the culture of India with numerous festivals and fairs centred on it. The main fairs organised in the area are *Ganga Snaan Parv* and *Dharmik Snaan*, which as the name suggests entails taking a dip in the holy waters of the Ganga. An important culturally significant site in the sanctuary is the *Sita Samahit Sthal*, commonly known as *Sitamarhi* temple, located in the Bhadohi (Sant Ravidas Nagar) district, along the banks of Ganga River. There is 110 feet high temple of Hanuman here, and according to Hindu mythology, it is believed that Sita absorbed herself into the Earth here. The tourist footfall primarily comprises of local tourists.

(Based on rapid village survey of KWS area)

Format of Microplan for Ecodevelopment around Protected Areas

Microplanning is the most critical and fundamental part of the entire process of eco-development planning. It is not merely a tool to generate information for planning but should be considered as an important part of the process of empowering the villagers by providing them an opportunity to plan for themselves and thereby develop their stakes in the plan prepared. Microplans are site specific and vary from village to village. Writing a microplan is a joint effort of the planning team and the village EDC, along with the active participation of/consultation with other stakeholders. The process of eco-development has to ultimately reach out to the poorest of the poor and the most dependent groups in the village who will need support of the management to come forward for the protection of the area. Women participation and empowerment is an important part of the process. There has to be complete transparency of action while formulating the microplans, particularly with respect to the problem analysis, objective setting, formulation of strategies and setting mutual responsibilities. Before the actual microplan document is prepared, sufficient time should be spent in community consultations, resource inventorying, consensus building and deciding about the activities. Similarly the monitoring indicators should be decided in consultation and agreement with the communities and other important stakeholders. Role of NGOs or community motivators can be very crucial during this entire process. The microplan does not have to be a sophisticated, computerized booklet. It should be a simple, indicative document written preferably in the local language and in a plain, straight forward style, so that the villagers are able to relate to it. It should be readily understood by people who have no technical training. The emphasis here is not to produce a document, but rather a set of agreements, that are acceptable to and have commitment of all the parties concerned. This acceptance and commitment emerges from a constant interaction among the main stakeholders and a genuine effort to integrate their concerns into the microplan. Village level microplans should be full-fledged documents bound in separate volumes and available in adequate numbers so that each concerned party has copies of these. However, a summary of the microplans in form of tables can be included in the working plan document. Given below is a broad framework that can be used for microplan preparation. This is an indicative outline and the users may modify / simplify the microplan structure as per site specific needs.

Chapter 1 Introduction

- **About the village:** This section would introduce the village briefly.
- **What is ecodevelopment:** This would talk about the general understanding of the villagers and the frontline staff about the ecodevelopment program.
- **About the PA/Sanctuary area:** This should provide brief introduction about the main conservation values and the problems faced by the wetland area.
- **Reason for selection of the village for ecodevelopment:** This section would narrate the reasons for selection of the village for program implementation. This information will be useful for making villagers understand the logic of selecting a particular village.
- **Methodology:** A brief outline of the processes followed in the preparation of the microplan would be provided in this section. It would also contain the sequencing of meetings/contacts/consultations undertaken before embarking upon actual plan preparation.

Chapter II

- **Description of the village**
- This chapter would give a general introduction of the village. It will include its location, communication, history, available facilities, demography, land use patterns, income and occupational structures and broad description of the resource use patterns.
 - **Location of the village:** This will include the location of the village with respect to the wetland areas, its distance from wetland boundary, district, and block and tehsil headquarters.
 - **Access and communication:** This will provide information regarding approach to the village and its access to facilities such as motor road, school, primary health center, veterinary center and market. If these facilities are not present in the village, distance of the village to the nearest such facilities should be mentioned.

- **Historical background of the village:** This section will attempt to trace a brief history of the village in terms of its location, resource use patterns and human wildlife interactions.
- **Village resources:** It will include adjoining forests/wetlands, agricultural lands, pasturelands, wastelands and village commons.
- **Rainfall pattern and water sources:** This will include both the annual distribution of the rainfall as well as pattern of rainfall over the last few years. Water sources should cover both the natural and man-made water bodies.
- **Demographic details:** Population of male, female and children along with the trends of population growth will be included in this section.
- **Community structure:** This section will include the caste and tribe structure of the village including number of families, population size and lifestyles of each group, specially focusing on those aspects which define their relationship with wetland and natural resources.
- **General economic conditions:** Following information in brief will be included in this section:
 - **Occupational and income structure**
 - **Land holding and cropping pattern**
 - **Livestock holding pattern**
- **Housing pattern:** This will provide information regarding the type of construction and the building materials used.
- **Social/political affiliations and leadership identification:** This section should identify the individuals and groups who can play a positive and leading role in this program.
- **Availability of local institutions and their current roles**
- **Panchayati Raj institutions**

Chapter III

Protected Area Mutual Impact Assessment

- **Impact of PA declaration on villagers:** Here all outcomes of PA declaration and their impacts on local people should be mentioned. Following are the possible outcomes of PA declaration on people.
 - **Positive impact of PA on the village:** This can include tangible benefits like employment, water, economic benefits due to tourism and resources, from the buffer zone as well as intangible benefits like cultural values and religious linkages, soil and water conservation and the environment. It should be used to strengthen the linkages of PA conservation with local well-being and prosperity.
 - **Human-wildlife interactions:** This section should discuss all aspects of the problems caused by wildlife to local people. This would include the wild animal species involved, number of people or extent of area affected, history and seasonality of the problem, extent of damage or loss and compensation patterns. Sketch maps can be used to show highly, moderately and mildly impacted villages/areas.
- **Impact of people on PA:** Here all wetland dependencies/uses, both for self consumption and sale, have to be, discussed. This would cover both the qualitative and quantitative information about the following:
 - **Grazing/fodder collection**
 - **Fuel collection**
 - **Fishing**
 - **Thatching and fencing materials**
 - **Collection of NTFPs**
 - **Other resources**

- **River dependent occupations:** Here all the occupations based on raw materials drawn from the river, the number of families involved, various castes/ tribes involved, whether full time or part time, estimated incomes and seasonality of such occupations should be discussed.
- **Offence and illegal activities:** This section should discuss the extent and seriousness of illegal activities and number of cases registered in the recent past (say last 5 years). Effectiveness of protection arrangements, attitude of the local people towards offences, and extent of cooperation in detecting cases and apprehending offenders shall be part of this discussion.
- **Summary of PA-people relations:** This section summarizes the existing mutual relationship of the PA management and the local communities.

Chapter IV

Stakeholders in the village

- **Major stakeholders in the village:** This should give a description of the different community groups in the village as well as other developmental agencies/NGOs and individuals working in the area.
- **Mutual relations between different stakeholders:** This section would be based on the stakeholder analysis. This will provide information about the strengths and weaknesses of different stakeholders. Conflict mapping of the stakeholders can also be a part of this section. For details please refer to (Badola et al, 2002: Ecodevelopment planning for Biodiversity Conservation a Guideline).
- **Linkages between the stakeholders:** This section would try to find out the possible collaborations between different stakeholders depending upon their mutual strengths.

Chapter- V Planning

This chapter is an important component of the microplan which would highlight different problems with respect to the conservation of PA and the village development. Based on the problem analysis, objective setting would be done and strategies to achieve these objectives

would be formulated. The strategies would give not only the activities and inputs but will also explain the possible processes being proposed. Though the plan will provide flexibility, this chapter should include the physical and financial targets of the activities and outputs.

- **Problem analysis:** This section would include the major problems and identification of the root causes of these problems. This should be done after a joint problem analysis exercise.
- **Objectives of the plan:** This would include the long term objective or the goal as well as the objectives with respect to specific problems. The objectives have to be focused, well defined and realistic so that these are achievable and can be measured easily. Objectives should be decided jointly by the planning team and the villagers with complete transparency.
- **Strategies and activities to achieve objectives:** This section should contain various strategies to achieve each objective. The strategies should also explain various other processes like generation of people's participation, ways to integrate the programs of other department/agencies, cost sharing between the people and the project authorities, fund raising mechanisms, awareness and environmental education, etc. From the strategies, should emerge different activities for each objective. Linkages with Panchayat should be made clear while deciding the strategies.
- **Feasibility analysis of proposed activities:** The proposed activities have to be tested for various feasibilities. This includes environmental feasibility, social feasibility, financial/market feasibility, technical feasibility as well as administrative/legal feasibility. A proper feasibility analysis would help in deciding the realistic list of activities for the microplan. The results of the feasibility analysis could be presented in the form of a table.
- **Agreed activities and their details:** This section would include the activities agreed upon after the feasibility analysis along with the man power requirement, intended beneficiaries and financial requirement for carrying out these activities (with unit costs). This section would also include cost sharing arrangements among the communities and project management/line agencies. Sometimes the contribution of the village communities may not be in financial terms, but in physical terms. This should also be clearly spelt out. The agreed responsibilities of the various line agencies, if any, should also be laid down along with the activities and period. Ultimately, the entire microplan can be presented in a

simplified logical framework (For details please refer to Badola et al, 2002: Ecodevelopment Planning for Biodiversity Conservation a Guideline); so that all the objectives, output, activities, monitoring indicators and assumptions can be seen clearly along with the linkages of these components, by the villagers (one need not use the complex names like logical framework but this will be a useful tool to make people understand the entire plan).

- **Annual physical and financial targets:** This section would be the gist of year wise physical and financial targets for the plan period. This should also mention about the amount of common fund expected from these activities and the strategies to manage and enhance this common fund.
- **Monitoring and evaluation:** This will give details about different indicators which will be monitored to see if the program is going on in the right direction of achieving the objectives. This will also clearly mention who will be responsible for monitoring, what will be monitored, where it will be monitored and how frequently it will be monitored. The indicators will also cover the monitoring of processes of these initiatives in the village. Evaluation, however, will be an external process, carried out generally by a team identified by the PA Management. The EDC and the staff involved in implementation should form a part of the evaluation team.

Chapter VI

Mutual rights and responsibilities

- **Benefit distribution and access to resources:** This section should explain how the expected benefits will be distributed. It should mention arrangements for access to resources and assets created (if any under the project) by various groups/sections in the village.
- **Mutual obligations and responsibilities:** A written agreement between the EDC (representing the villagers) and the Forest Department clearly stating the obligations of both parties (e.g. to stop grazing, or community protection on the part of villagers, and prompt payment of livestock compensation and completing the proposed tasks within the agreed time frame on part of the Forest Department). Individuals and organizations should be identified, stating the extent of their responsibilities.

- **Records to be maintained by EDC:** This section should list various records/registers to be maintained by the EDC and the people responsible for this work.

Logical Framework Analysis of problems and issues in the Kachhua Wildlife Sanctuary				
Goal		Measurable indicators	Means of verification	Assumptions
To develop the KWS as a well-managed protected area through optimizing ecosystem processes and functions of the KWS considering hydrological, ecological and social indicators		Increased no. of species in the KWS	Hydrological, Ecological and Social indicators	The Management plan is well implemented
Objectives	Activities	Measurable indicators	Means of verification	Assumptions
Objective 1: To secure the ecological integrity for biodiversity conservation and ensure sustained flow of ecosystem services in KWS	Construction of pillars and installation of sign boards for demarcation of different Zones of the Sanctuary	Boundary demarcation with pillars and signboards	Site verification of boundary using GPS and satellite imagery	Necessary support from concerned departments Adequate funds are made available
	Regular ecological survey for both terrestrial	Number of ecological surveys conducted and number of	Scientific report on ecological survey published based on	Adequate funds are made available

	and aquatic biodiversity	habitat variables measured	number of ecological surveys	
	Identification of anthropogenic activities in and around KWS that are affecting ecological integrity for biodiversity conservation and accelerating pollution loads	Identified drivers of changes and its scale of operation affecting terrestrial and aquatic environment and report on ecotoxicology of the River	Conservation Action Plan for priority species developed	Availability of funds
	Awareness programmes, meetings and Focus group Discussions with key stakeholders to solicit participation from key stakeholders in Sanctuary management	Number of Focus Group Discussions conducted with stakeholders	Record of meetings conducted and number of participation and name of the organization/ agencies participated	Participation from stakeholders
	Coordination meetings with state forest departments and other line agencies in implementation of the management plan	Number of coordination meetings conducted	Meeting records	Positive response from the department and line agencies
Outputs				

Measure to ensure Sustained flow of Ecosystem services in the KWS, are in place	Pillars and signboards constructed at intervals	Pillars and signboards are in place	Site verification of boundary using GPS and satellite imagery	Necessary support from concerned departments Adequate funds are made available
	Ecological surveys conducted for species monitoring and habitat assessment	Species conservation plans developed	Species conservation plans developed	Adequate and trained forest department staff
	Aware local communities and other stakeholders	Motivated stakeholders towards protection of sanctuary and biodiversity conservation	Formation of local institutions for conservation and management of sanctuary	Willingness of local community
	Implementation of management plan with inter-departmental support and coordination	Effective management mechanisms in place	Works done by different departments in KWS area	Willingness of departments
Objective 2: To develop and strengthen alternate livelihood opportunities for	Need based livelihood assessment	Need based assessment carried out	Number of livelihood centres established	Timely availability of budget

local communities				
	Development of site based sustainable livelihood framework	Site based livelihoods identified for training	Number of people trained	Responsive target groups
	Convergence with government and non-government agencies working on livelihood development	Number of interactions with the local communities and convergence with different agencies	Records and agreements signed with agencies	Positive response from the agencies
	Development of market linkages	Demand of the products made by local communities in the market	Self sustaining, independent and trained participants	Positive response and Good quality production by the community
	Facilitate skill development programmes that are in consonance in sanctuary management and biodiversity conservation	Local communities having income and reduced resource extraction from the sanctuary	Alternative livelihood options in place and monitoring of these at regular intervals	People are willing to adopt alternate livelihood options
	Develop incentive based mechanisms to involve local communities in sanctuary management and biodiversity conservation	Mechanisms developed to ensure economic benefits to local communities for their services	Local communities earning from conservation based livelihoods activities	Positive attitude of the forest department officials

	Involvement of local communities in activities conducted by various agencies as Payment for Ecosystem Services (PES)	PES based livelihood development	PES best strategies implemented	Departments willing to engage local communities
Outputs				
Reduced dependence on Sanctuary resources and increased participation of community in conservation activities	Alternate livelihood options in place	Local communities having good income and reduced resource extraction from the Sanctuary	Alternative livelihoods trainings being conducted in the centres	Line agencies working in collaboration with local communities and initiate livelihood options
	Involvement of other line agencies in developing alternate source of income	Improved livelihood of local communities and existence of EDCs and SHGs	Records of meetings and workshops held with the agencies for developing alternative livelihoods	Various alternative livelihoods initiated are maintained
	PES based livelihoods developed	Local communities support the conservation initiatives and working with various agencies	Local communities earning from conservation based livelihood initiatives	Local people are willing to participate in the activities

Objective 3: To develop KWS as a site for recreation and conservation education for visitors through participation of local communities.	Review of literature on terrestrial and aquatic system and species and their threats	Publication of dissemination material	Published awareness material	Timely availability of budget
	Awareness activities with various stakeholders including school teachers, students, religious groups, visitors	Number of awareness activities conducted	Records and photographs	Availability of funds
	Infrastructure for establishing Nature Interpretation and Conservation Education Centre	Functional interpretation centres and mobile exhibition centres established	Number of functional interpretation centre Number of documentaries, talks etc.	Infrastructure available for setting up of interpretation centre
	Identification of target audience and selection of sites for mobile exhibition in surrounding areas	Mobile exhibitions on different sites	Records of mobile exhibition center	Willingness of local communities to participate
Outputs				

Increased Tourist footfall, leading to increased income and participation of local communities in sanctuary management	Increased ecotourism in the Sanctuary and alternative livelihoods options available to the local communities	Income of the people involved	Discussion with the people involved	Concerned department takes prompt action to promote ecotourism
	Infrastructure for ecotourism such as signages, nature trails, home stays, local guides, boat facility are available.		On site visit	Concerned department develops and maintains infrastructure to promote ecotourism
Objective 4 Promote sustainable use of natural resources through the development of institutional mechanism and Ecodevelopment	Formation of management committee with participation of community members	Existence of management committee	Government Notification	Willingness of forest department
	Formation of EDC's in all the fringe villages	No. of EDC's formed	Records of Forest department and EDC's	Availability of funds, willingness of concerned department and Responsive target groups
	Identification of community based organisation	Women, Youth and other groups identified	Groups are engaged with the forest department activities	Willingness of the Forest department

	Training of EDC's and other organisations	Trainings conducted	Training records	Organisation willing to participate
	Involving communities in conservation works through awareness and incentives	Mechanism for incentivisation is in place	Awareness material and photos of events conducted Training records	Communities willing to participate
	Conduct skill development trainings	No. of skill development trainings conducted	No. of people trained	Availability of funds and willingness of communities
	Develop a Cadre of motivated youth	Cadre of youth is in place	Record of activities done by the youths	Positive attitude of the youths
	Creating linkages and coordination between different institutions	Synergy between different actors in conservation	Activities conducted jointly by the institutions	Institutions willing to participate
Outputs				
Development of institutional framework for increased Participation of the community in Park management and Better co-ordination among forest department, EDC's, SHG's and CBO's	Park management committee is working and taking decisions regarding Sanctuary management	No. of meetings conducted and decisions taken	Meeting records	Members of Management committee are active

	EDC's are active in at least 80% villages	No. of meetings conducted	Meeting and proceeding register of EDC's	Active participation of EDC members
	SHG's and CBO's are active and are participating in conservation activities	No. of activities conducted		
	Youth cadre conducting various awareness and other activities	No. of activities conducted	Records, Photographs	Forest department willing to engage youths in their activities
Objective 5: To strengthen the forest department through capacity building of the staff deployed for the protection of the sanctuary	Training on basic biology, identification techniques and protection status of aquatic species	Trainings have been conducted	Training records, Photographs	Adequate flow of funds to organize trainings
	Conducting Orientation trip to the sanctuary to equip them with proper monitoring techniques	Well trained staff	Discussion with forest department staff	Adequate funds, timely response of staffs for participation and ensuring proper implementation of plan
	Organization of trainings on rescue and rehabilitation of the major aquatic species so as to enhance skills of the frontline staff in handling and safe release of rescued	Trainings conducted and rescue centres are established	Decrease in cases of species mortality and well-functioning rescue center	Availability of funds and Willingness of the department to support and engage more staffs

	animals			
	Provision of reward and incentives for motivation and mitigation of poaching activities	Well trained and motivated staff	Reduced cases of poaching	Forest officials willing to make provision for incentives
Outputs				
Frontline staff of Forest department is trained for conservation and management planning of aquatic biodiversity and habitats of KWS	Capacity building workshop on conservation and management planning of KWS for front line staffs of Forest department	Workshop conducted and trained cadre identified	A pool of forest department officials and veterinarians successfully trained for ecological surveys, rescue operations and monitoring of the aquatic habitats of the KWS	Funds released in time; Forest department ready to train its staffs
	Effective sanctuary management mechanism is in place	Regulatory framework suitable for the sanctuary is in place	The sanctuary is legally protected	Concerned department takes prompt and effective action
Objective – 6 To foster a system of participatory conservation through engagement of key stakeholders for effective management	Stakeholder mapping and Analysis	Identification of key stakeholders	Stakeholders mapping Reporting of cases by the local peoples	Availability of funds and willingness of Forest department,

of KWS and adjoining landscape				
	Awareness programmes	Stakeholders are aware about conservation of sanctuary resources	Photographs, reports of the awareness program	Local people and other stakeholders are willing to participate.
	Trainings of stakeholders	Training programmes conducted	Records of training programme	Participation of stakeholders
	Involvement of local youths by creating awareness about the importance of biodiversity conservation	Youths are reporting to the Forest department about species	No. of cases reported by the communities	Active involvement of youths
Outputs				
Stakeholders involved in protection strategies and management of KWS	Establishment of village level institutions with representations of all concerned stakeholders.	Existence of management committees/ Ecodevelopment committees	No. of EDC's/management committees formed	Willingness of Forest department to engage communities in sanctuary management
	Better co-ordination between forest department and other stakeholder	Meetings and consultation between forest department and other stakeholder	Meeting records	Responsive stakeholders group

