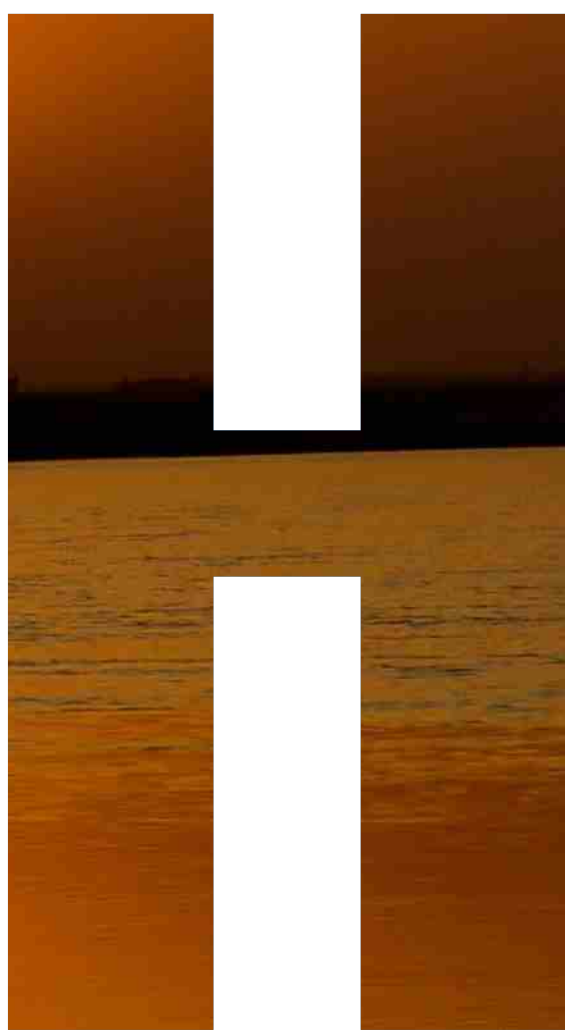


BIODIVERSITY CONSERVATION
AND GANGA REJUVENATION

BIHAR

DR



INTERIM REPORT
**BIODIVERSITY CONSERVATION
AND GANGA REJUVENATION**



Cover Photo: Shaikh Rahim Rashid

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PREFACE

The restoration of the Ganga River and its biodiversity is undoubtedly a challenging task. In addition to the complexities of river ecosystem conservation, the high resource dependence of the local communities residing along the river banks has also to be factored in. In view of this, the Wildlife Institute of India has taken up the 'Biodiversity Conservation and Ganga Rejuvenation' project in collaboration with the National Mission for Clean Ganga (NMCG). A comprehensive strategy to restore the biodiversity values of the Ganga River is being implemented under the project.

The pursuance of the goal of the project 'Science-based species restoration of the Ganga River through the involvement of multiple stakeholders' entails not only robust research and monitoring but also liaising with the multitude of stakeholders at the village, districts, state and national levels.

The Ganga Aqualife Conservation Monitoring Centre (GACMC) established at the Wildlife Institute of India (WII) campus in Dehra Dun, aims to be a dynamic centre of excellence for Ganga aqualife conservation and spearhead the conservation planning process through active synchronization with the various field teams working on different aspects of the project.

Under the project, various activities have been conducted in the state of Bihar. Rapid biodiversity assessments and survey of intensive monitoring sites in the state of Bihar confirm the rich and diverse aqualife retained by the Ganga River in the face of multiple stressors including reduced flows, pollution and unsustainable resource use.

Spearhead team comprising 13 officials of the Bihar Forest Department, has been constituted and members of the spearhead team are coordinating local level workshops and training activities. Several stakeholders' including Forest officials, Veterinarians, representatives from local governing bodies, local communities and students have been provided trainings on the various aspects of aqualife conservation.

A cadre of motivated and trained youth known as *Ganga Prahari* has been created throughout the five Ganga River states, including Bihar. These Guardians of Ganga are torchbearers of conservation initiatives in Bihar and are carrying forward the conservation activities.

This report summarizes the activities done under the project in the state of Bihar.

Indian National River, the Ganga, is lifeline to millions of inhabitants along its course and it is deeply embedded in the religious and cultural milieu of Indian civilization since ancient times. The River is one of the largest living river systems in the world and nurtures a vast array of floral and faunal species. The Ganga River originating from Gaumukh of the Gangotri glacier in Uttarakhand, flows through 5 states and become one with the Bay of Bengal at Gangasagar in West Bengal. The mainstem, as Padma, enters Bangladesh at the border near Farakka in West Bengal. The Ganga River basin expands over 11 states, nourishes over 500 million people and supports unique assemblage of biodiversity in three distinct biogeographic zones, viz. Himalayan, Gangetic Plain and Coastal Zone.

GANGA

THE LIFELINE OF MILLIONS

The state of Bihar is a part of the Gangetic Plain. The total stretch of the Ganga River in Bihar is 445 km, of which approximately 100 km is shared between Uttar Pradesh and Bihar. The active floodplain of the Ganga River is 535 km in Bihar state. As the river passes through the vast alluvium in Bihar, it is joined by the Ghagra River, at Revalganj and Son River, near Patna. Later Gandak River joins at Hazipur. A combined stream of Punpun, Morhan and Dorha rivers, meets the Ganga River at Fatuah. Small tributaries such as Harohar, Dhanayan, Mohani, Dharhara Nadi, Burhi Gandak, Man Nadi, and Jumania nadia join near Bhagalpur. At Kursela, downstream of Bhagalpur, it receives the Kosi River, one of the major contributor of flow to the Ganga, joins at Kursela at downstream Bhagalpur.



Course of Ganga River in Bihar



The Ganga Basin is home to about 25000 floral and faunal species. The aquatic faunal diversity of Ganga River is represented by the Gangetic river dolphin (*Platanista gangetica*), three species of otter, three crocodilian species including the critically endangered Gharial (*Gavialis gangeticus*), and at least 12 species of freshwater turtles including critically endangered *Batagur kachuga* and several fish species such as critically endangered Ganges shark (*Glyphis gangeticus*), Ganges stingray (*Himantura fluviatilis*), Mahseers (*Tor* spp.), Hilsa (*Tenualosa ilisha*) and several species of endemic freshwater crabs. In addition to these species, obligate aquatic species like waterbirds and island nesting birds are important component of the biodiversity.



AVIRAL AND NIRMAL DHARA NMCG PILLARS

The differential resource use by various stakeholders has resulted in conflicting resource use scenario in the Ganga River and the river ecosystem and its biodiversity are thus facing unprecedented habitat alterations and coping with a perilous amalgam of anthropogenic stressors.

To address this issue, the Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR,RD&GR), Government of India established the National Mission for Clean Ganga (NMCG) and initiated Namami Gange Programme with a comprehensive approach through 8 pillars of river restoration, viz. Sewerage Treatment Infrastructure, River-Surface Cleaning, Afforestation, Industrial Effluent Monitoring, River-Front Development, Public Awareness, Ganga Gram and most importantly, Biodiversity Conservation. NMCG identified Wildlife Institute of India (WII) as a lead partner institution for biodiversity conservation and aquatic species restoration in Ganga River through a collaborative project "Biodiversity Conservation and Ganga Rejuvenation". This project aims to prepare a science-based aquatic species restoration plan for Ganga River by involving multiple stakeholders.

Biodiversity Conservation: A systematic approach <i>The NMCG-WII project "Biodiversity Conservation and Ganga Rejuvenation" has six components.</i>		1 Establish Ganga Aqualife Conservation Monitoring Centre at WII Dehra Dun for science based conservation planning and dissemination of information.	2 Prepare biodiversity profile of Ganga River and develop pilot species restoration plans for select stretches and species.
3 Develop capacity of Forest Department and other stakeholders of the Ganga River States in monitoring of identified species of conservation significance.	4 Assist NMCG in establishing the rescue and rehabilitation centres for endangered fauna of the Ganga at select sites by developing human resources and infrastructure with support from the Forest and Veterinary departments.	5 Elicit participation of local communities in NMCG initiatives by providing platforms through Panchayati Raj System, capacity development and payment for ecosystem services.	6 Develop and implement conservation education programmes for the river side communities of the Ganga River.

The project is being implemented in the five Ganga River States. This report provides information on project activities undertaken in the state of Bihar.



National level project launch at Haridwar, Uttarakhand

THE BEGINNING OF COMMITMENT TOWARDS 'MOTHER GANGA'

National Level Project Launch

The project was launched at National Level on 7th July 2016 at Haridwar. The occasion was graced by Sushri Uma Bharti, Hon'ble Union Minister for Drinking Water and Sanitation, Shri Nitin Gadkari, Hon'ble Union Minister of Water Resources, River Development and Gang a Rejuvenation and Hon'ble Union Minister of Road Transport, Highways and Shipping of India and Dr. Mahesh Sharma, Hon'ble Minister of Tourism and Culture.

The project was simultaneously launched at Bhagalpur in Bihar.



Launch of the project at Bhagalpur, Bihar

ENSURING COLLABORATION AND SUPPORT

Liaison with partners in conservation

The Forest Department of Bihar is partner in WII's effort of Ganga aqualife conservation and is lending it's support through patronage, coordination and active involvement.

Cooperation and collaboration have been ensured for carrying out ecological assessment of the Ganga River and other field related activities.

Stakeholder Consultation Workshop in Bihar



'Stakeholder Consultation Workshop' was organized on 5th October 2017, to apprise the Bihar Forest Department personnel about the aims, objectives and importance of the Wildlife Institute of India's projects titled "Biodiversity Conservation and Ganga Rejuvenation" and the CAMPA funded "Development of Conservation Action Plan for River Dolphins" to develop a partnership with the Bihar Forest Department.

Stakeholder Consultation Workshop in Bihar



During this workshop, the participants were divided into three groups and they discussed on

Thematic groups	Deliberations
Group 1: Major issues affecting river biodiversity conservation in Bihar	Following issues were identified: numbers of large vessels, unsustainable fishing through dolphin oil baiting and mosquito nets, poaching of aquatic wildlife, disruption in river-bed morphology by dredging and release of heavy metals like arsenic, sand mining and loss of nesting and basking habitats, weak enforcement in regulations in fishing practices (season, net size), wastewater inflow, loss of flood plain wetlands, riverbed agriculture, floodplain landuse change
Group 2: Existing participatory mechanisms at National and State levels to be used for Biodiversity Conservation in aquatic ecosystems and livelihood security of local communities. Eliciting participation of local people and building their capacities for conservation.	Need of conducting a zonal and regional mapping of resources and capital in order to develop site specific strategies emerged during the discussion. Skill development via training of local communities, should be undertaken to reduce the anthropogenic pressure with respect to livelihood on the river. Year round awareness activities and an advertisement campaign to promote or market a healthy river must be undertaken. The consequences of activities detrimental to the river must be illustrated in a threatening manner in order to convince the people.
Group 3: Exploring Collaborative Engagements : Role of different organizations/agencies in conservation of River dolphin and aquatic biodiversity. Synergistic partnerships and platforms for collaborations. Preparing future generations for aquatic species conservation and monitoring.	At national level policy and decision making should be based on the information provided by state and regional level partners and agencies. Forest department should involve universities and NGOs in monitoring, protection, conservation, awareness activities. Irrigation department should maintain the flow and depth of the Ganga River, based on ecological flow principles. Inland Waterways Authority should consider aquatic species activities pattern and water requirement to minimize the impacts. Educational institute should generate information through regular research and monitoring, and prepare future generation for regular monitoring and assessment of the Ganga River. Local bodies and civil societies should implement projects related to conservation of biodiversity and develop alternative livelihoods for dependent communities.

THE DIVINE TOUCH: THRIVING AQUALIFE OF THE GANGA RIVER

A journey with Ganga

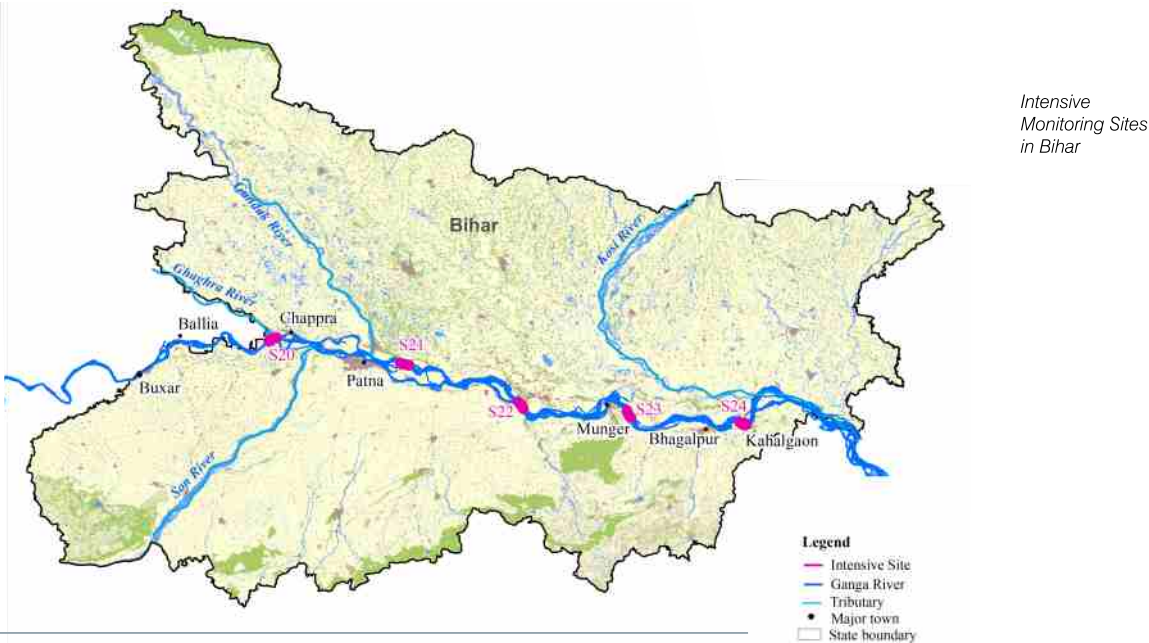
GATHERING INFORMATION THROUGH LITERATURE AND BIODIVERSITY ASSESSMENTS

Extensive literature review was carried out to derive the historical distribution of the priority species of the Ganga River and its tributaries. The distribution maps of these species were prepared to identify changes in their range from historical to present day.



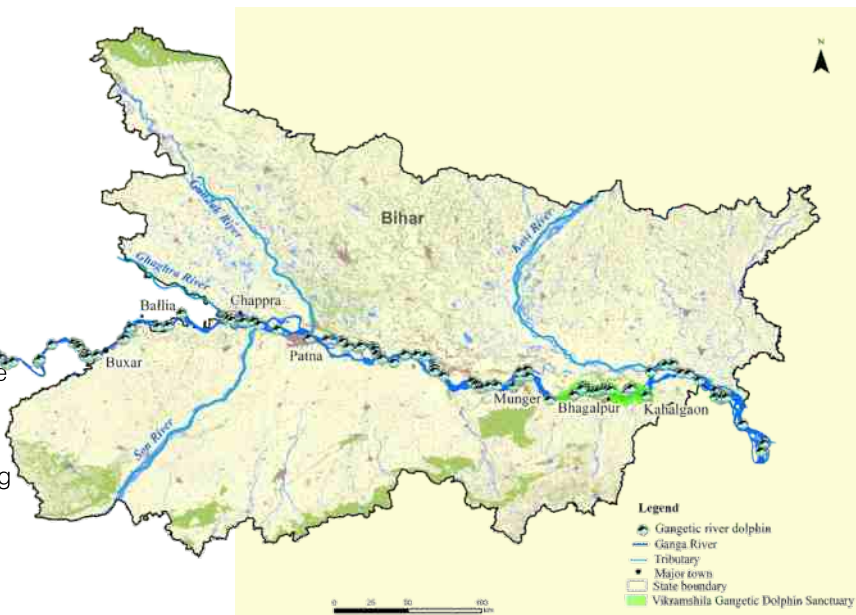
Researchers carrying out survey in Ganga River

Rapid Biodiversity Assessments of the Ganga River between Devprayag to Farraka Barrage covering a total distance of 2025 km were undertaken during 2017 and 2018. The survey strengthened the information on the status and distribution of the priority species in the Ganga River. Apart from undertaking rapid survey of the Ganga River, five intensive monitoring sites were also surveyed along the Ganga River in the state of Bihar.



The rapid biodiversity assessments revealed that Gangetic river dolphins are present throughout the length of the Ganga River in Bihar, from Buxar to Kahalgaon. Large congregations were observed in deep water pools (>3 m). Optimal habitats were present in the surveyed stretch, however dissolved oxygen, channel depth, fishing and disturbance due to human activities governed occurrence of Gangetic river dolphins.

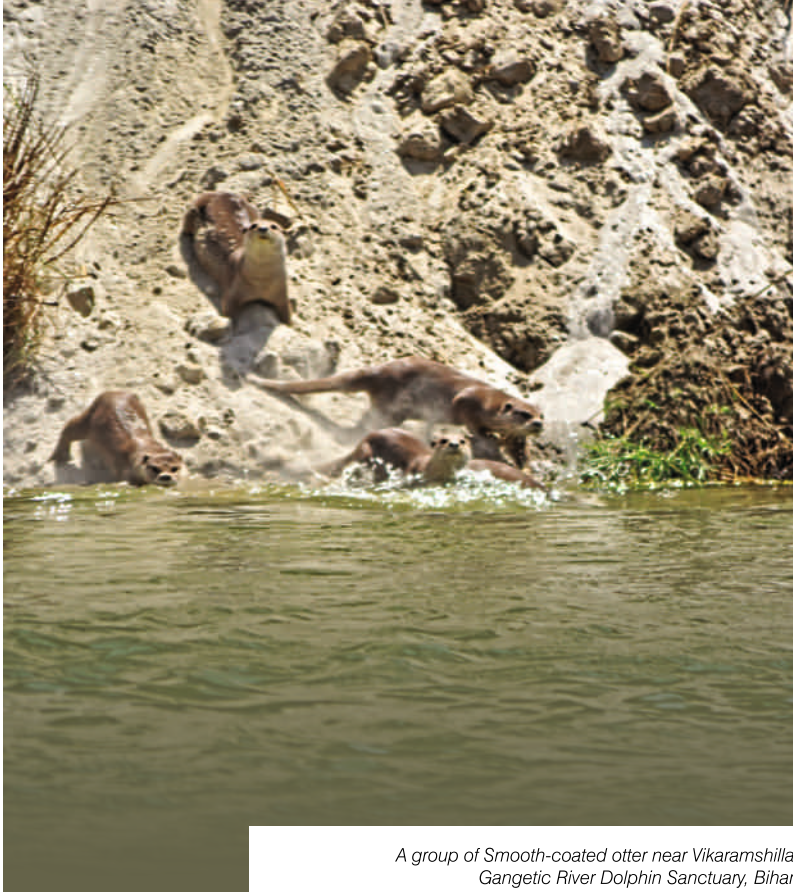
The Gangetic river dolphins are getting increasingly rare in small tributaries due to reduced flow and are now restricted to large tributaries of Ganga River and in deeper pools within the Ganga River.



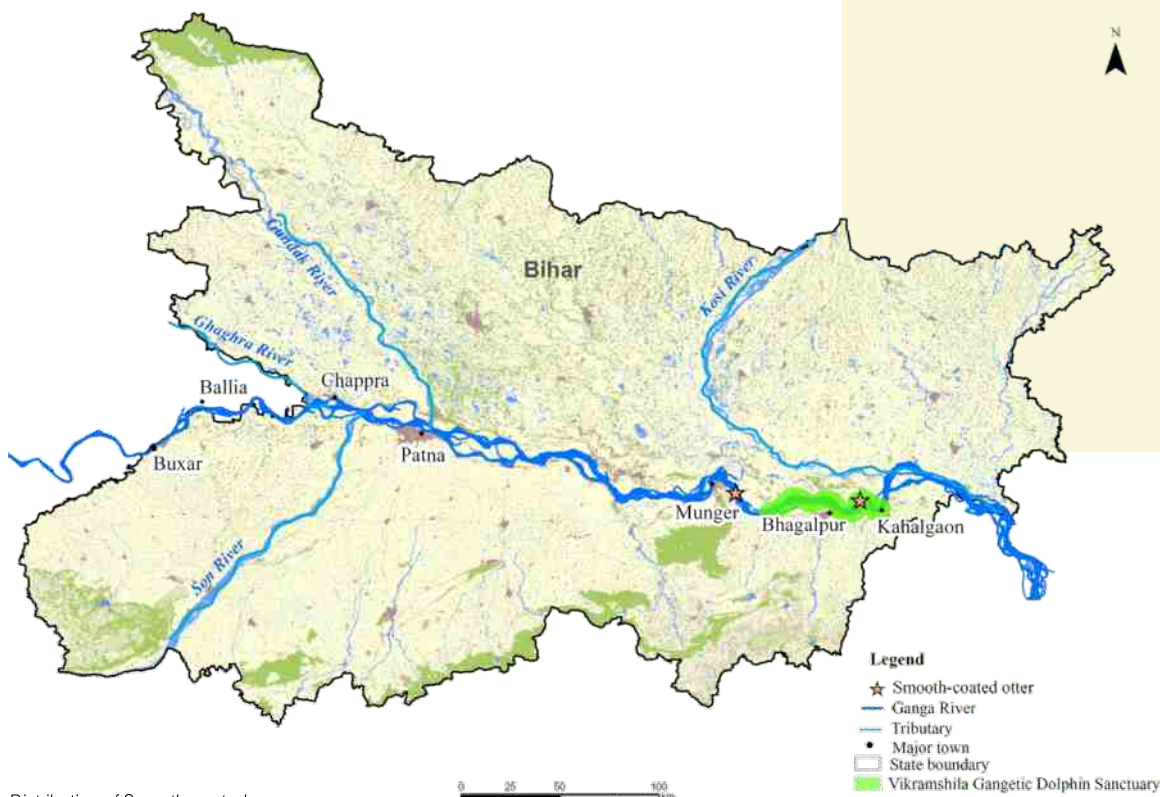
Distribution of Gangetic river dolphin in Ganga River, Bihar

Gangetic River Dolphin





A group of Smooth-coated otter near Vikramshilla Gangetic River Dolphin Sanctuary, Bihar



Distribution of Smooth-coated otter in Ganga River, Bihar

Otters once distributed in upper mountainous reaches of Ganga River, lower Gangetic plain and coasts, are now restricted to Protected Areas and undisturbed areas along Ganga River.

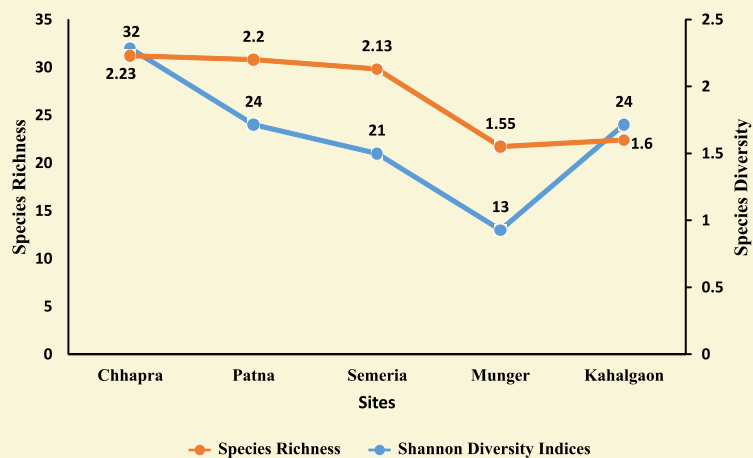
During the rapid biodiversity assessments indirect and direct signs of otter presence were found at Vikramshilla Gangetic Dolphin Sanctuary.



A flock of Bar-headed geese

The habitat variability in Ganga River and its wetlands provided suitable wintering grounds for migratory waterbirds and also sustain resident breeding birds.

During survey of the intensive monitoring sites, a total of 45 species of waterbirds belonging to 18 families were recorded.

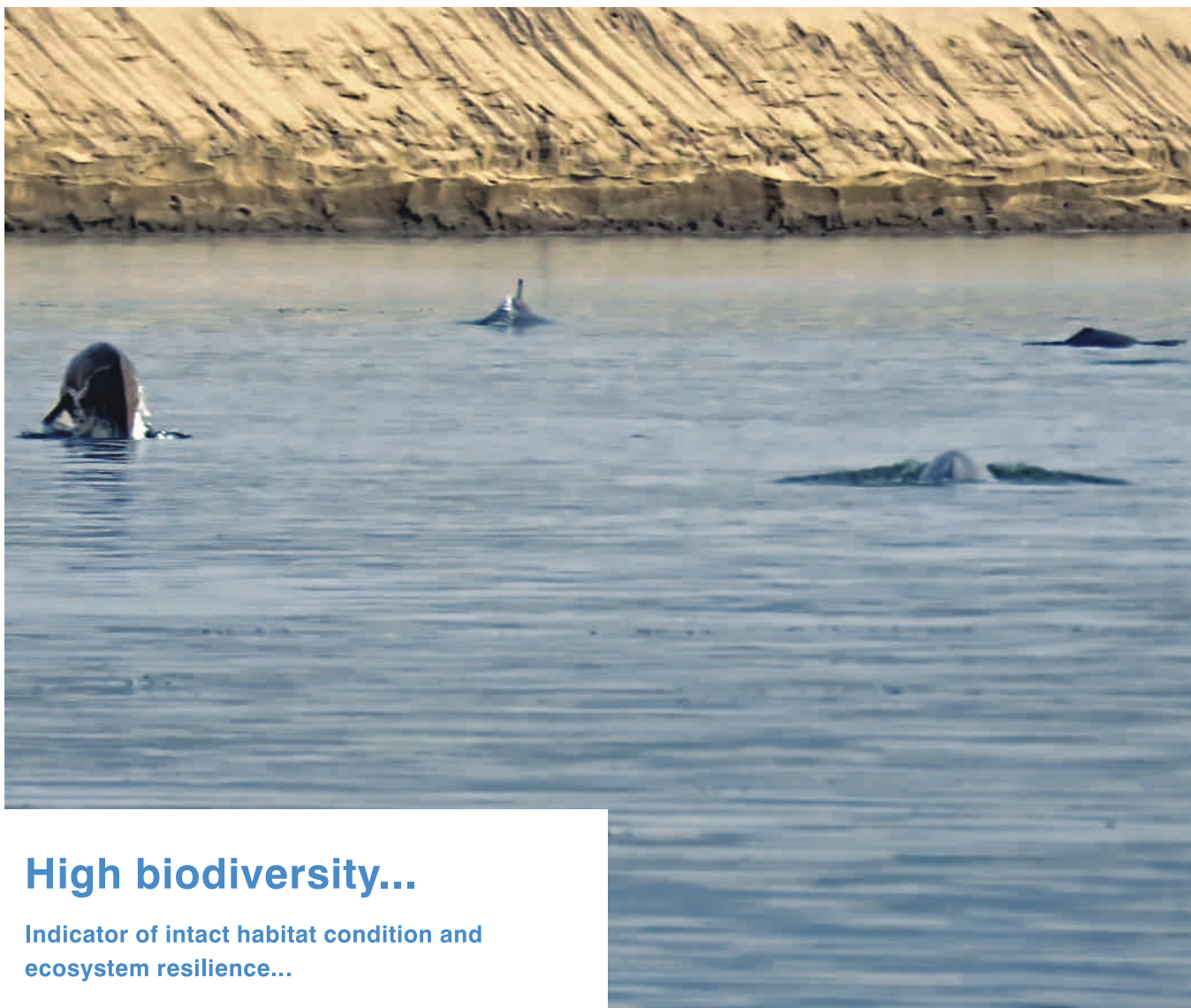


Waterbird species diversity and richness in the five intensive monitoring sites, Bihar

The 13 species of turtles, reported from Ganga River are distributed throughout the mainstem according to their habitat requirements. Once abundant, populations of most larger species have now declined or locally extirpated due to hunting, illegal trade, habitat loss and entanglement in fishing gears. Various in-situ and ex-situ efforts to restore populations of these species are ongoing.



Pangshura smithii individuals basking



High biodiversity...

Indicator of intact habitat condition and ecosystem resilience...

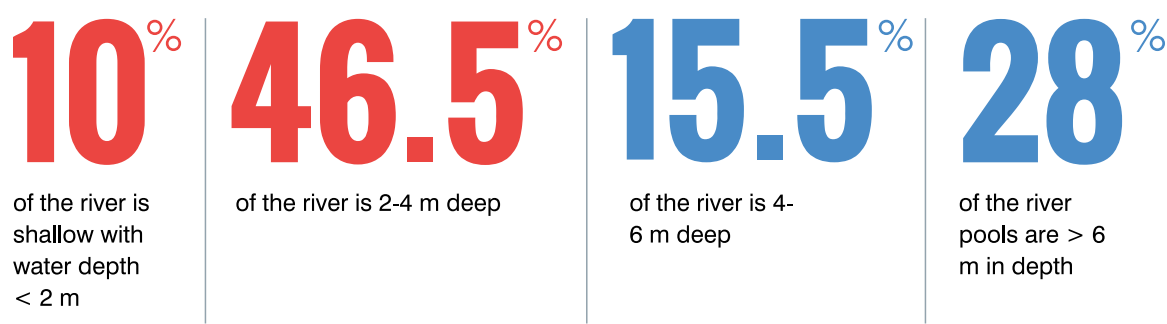
During survey of the intensive monitoring sites 23 species of odonates were recorded along the Ganga River in Bihar, of which 14 species were of dragonflies and 9 species were of damselflies. Six species of herpetofauna (amphibians and squamata reptile) belonging to three families were recorded. 25 fish species belonging to 12 families were also recorded from the intensive monitoring sites.



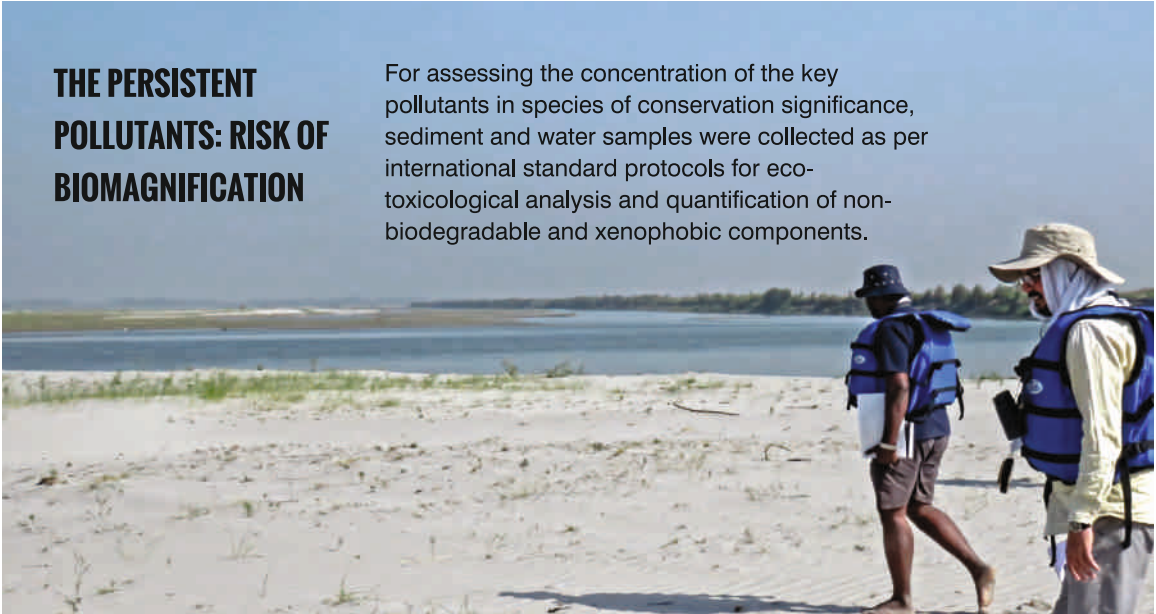
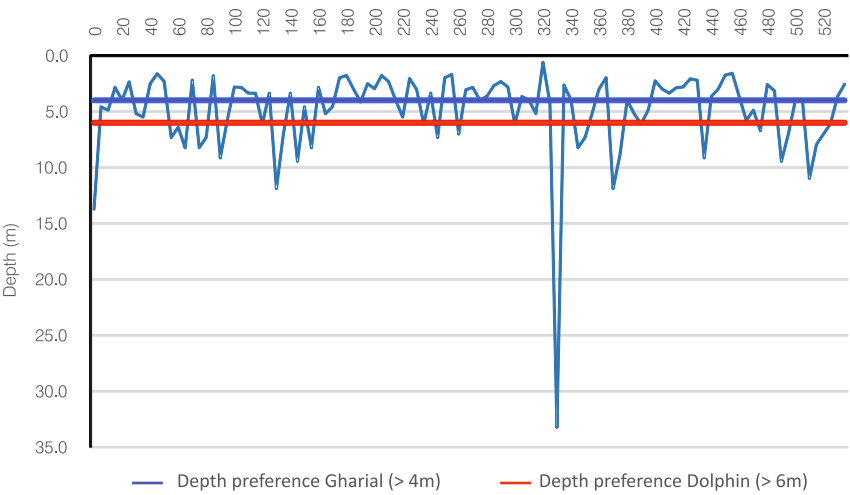
FIRST STEP TOWARDS DERIVING RELATIONSHIPS BETWEEN RIVER CONDITIONS AND OCCURRENCE OF MAJOR SPECIES

Status of habitat defining parameters such as water depth, river bank characteristics, and anthropogenic activities were observed along the Ganga River.

DEPTH PROFILE OF GANGA RIVER IN BIHAR



Depth profile of Ganga River from Buxar to Kahalgaon in Bihar

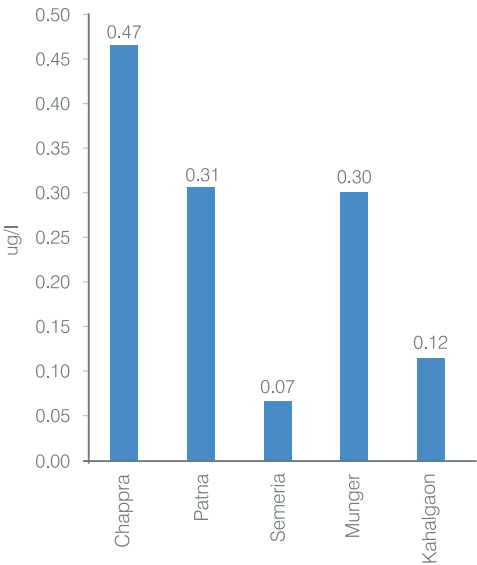


THE PERSISTENT POLLUTANTS: RISK OF BIOMAGNIFICATION

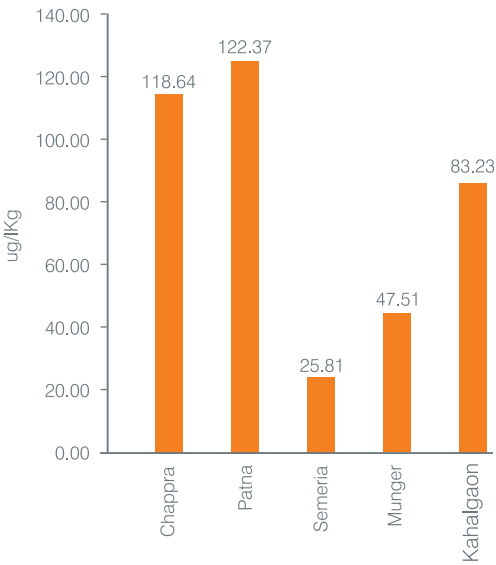
For assessing the concentration of the key pollutants in species of conservation significance, sediment and water samples were collected as per international standard protocols for ecotoxicological analysis and quantification of non-biodegradable and xenophobic components.

PESTICIDE CONCENTRATION IN THE GANGA RIVER

Highest pesticide concentration in water and sediments was found for Chhapra and for Patna respectively.



Pesticide concentration in water samples collected from five intensive monitoring sites in Bihar



Pesticide concentration in sediment at five intensive monitoring sites in Bihar



IN SEARCH OF CONSERVATION PRIORITY AREAS IN BIHAR

The 296 km stretch from Chhapra, Saran District, to Kahalgaon, Bhagalpur District, has been identified as a high biodiversity stretch in the state of Bihar. Falling within the Lower Gangetic Plain (7B), the Ganga River in this stretch is very wide, highly braided and meandering and passes through an extensive alluvial plain. The flow regime of this stretch is enhanced by substantial inflows from the Ghaghra and Son rivers near Chhapra and from the Gandak River at Patna.



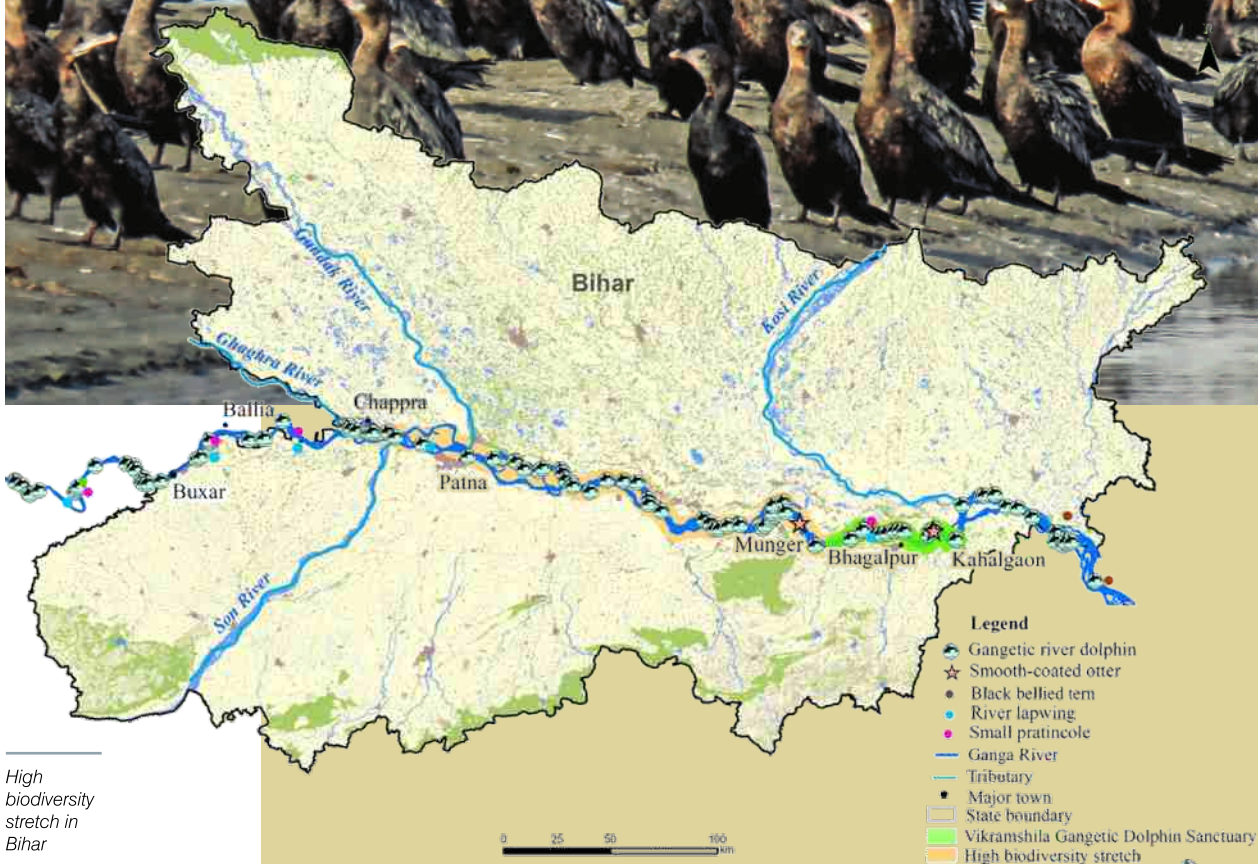
Landscape near the identified high biodiversity stretch in Bihar

There are major human settlements at Chhapra, Patna, Munger and Bhagalpur. The urban population and rural communities in this region are dependent on the Ganga River for their daily ablutions, drinking water, irrigation, fishing, municipal and industrial water, sand mining and daily commute.



BIODIVERSITY VALUE AND ECOLOGICAL SIGNIFICANCE

- Gangetic river dolphins, smooth-coated otters, 45 waterbird species, 61 fish species and 23 odonate species were encountered during the survey.
- About 65 km of this stretch from Sultanganj to Kahaugaon, is protected as Vikramshila Gangetic Dolphin Sanctuary.
- Large, stable islands, meanders and oxbow lakes within this stretch provide a mosaic of habitats for the aquatic fauna.



THREATS

1

The floodplains and the natural vegetation of this stretch of the river have been extensively replaced by croplands.

2

Unsustainable biological resource extraction is widespread in this stretch of the river.



3

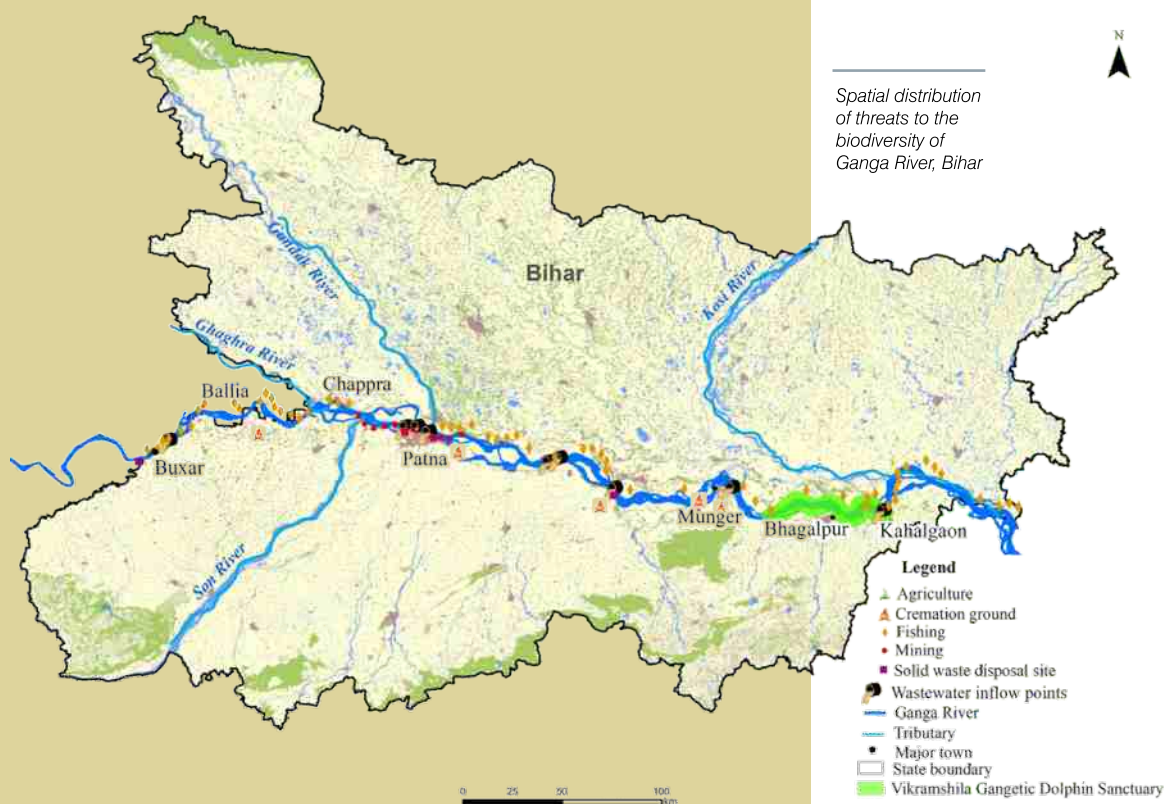
Bank feature alteration due to land-use changes such as agriculture, construction activities and sand mining has disrupted the lateral connectivity of the river in the floodplain.

4

Sandbar cultivation has rendered the habitat unsuitable for use as nesting sites by turtles.

5

The nitrate level was found to be higher than 10mg/L at Revelganj, Munger, and Kahalgaon along the Ganga River.





CAPACITY BUILDING OF FOREST DEPARTMENT AND OTHER STAKEHOLDERS

With the objective of developing capacity of the State Forest Departments, and other stakeholders for monitoring of identified species of conservation significance, management planning of wetlands and aquatic habitat, participatory management and conservation education, various training programmes have been conducted by WII. The trained human resource will carry forward the science-based species conservation and biodiversity restoration activities along the Ganga River.



First national level spearhead team training, Dehra Dun

THE LEGACY CONTINUES...

Spearhead Team: The Flagbearers

The spearhead team for the state of Bihar has been established, which comprises 13 forest officials. The spearhead team was trained during the first National level training workshop on 'Biodiversity conservation and monitoring of aquatic species of Ganga' held during 6th to 12th November, 2017 at Wildlife Institute of India, Dehra Dun, Uttarakhand. Subsequently, a field visit was organized from 10th to 12th November, 2017 at the National Chambal Sanctuary, Morena, Madhya Pradesh.

Training cum sensitization workshops

Two training and five sensitization workshops were conducted, in which 14 participants were trained and 512 were sensitized. These workshops were attended by the representative from the Bihar State Forest Department, Professors, College and school students, media personnel, Panchayati Raj Institutions and local communities.



Training workshop in progress, Dehra Dun

Activity	Name	Place	Number of participants
Training workshops	Biodiversity conservation and monitoring of aquatic species of Ganga	Dehra Dun, Uttarakhand	13
	Ecodevelopment planning for biodiversity conservation	Dehra Dun, Uttarakhand	1
Sensitization workshops	Biodiversity conservation and Ganga rejuvenation	Nalanda University, Nalanda, Bihar	35
	Biodiversity conservation and Ganga rejuvenation	Moiuddin Nagar, Samastipur, Bihar	211
	Biodiversity conservation and Ganga rejuvenation	Bhagalpur, Bihar	184
	Beat Plastic Pollution	Bhagalpur, Bihar	51
	Beat Plastic Pollution	Kahalgau, Bihar	31

OUR RIVER, OUR RESPONSIBILITY

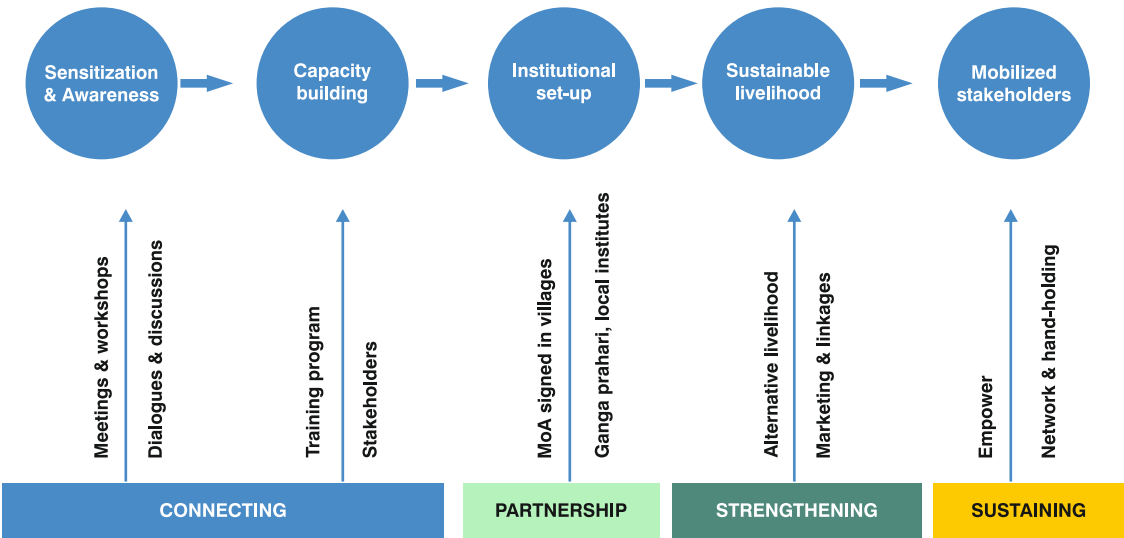
TRUST, LIVELIHOOD, CONSERVATION

The Ganga flows through a landscape with diverse ecological, social and economic conditions resulting in an array of stakeholders, who value this river and its associated ecosystems for a myriad of reasons. WII is addressing those overlapping and interacting mechanisms by which participation is expected to enhance river basin management by providing space for deliberation and consensus building for better quality decisions, mobilizing and developing human and social capital for better quality decisions and their implementation, and by raising the legitimacy of decisions to facilitate their implementation.



Reaching out to the stakeholders

Approach to community mobilization

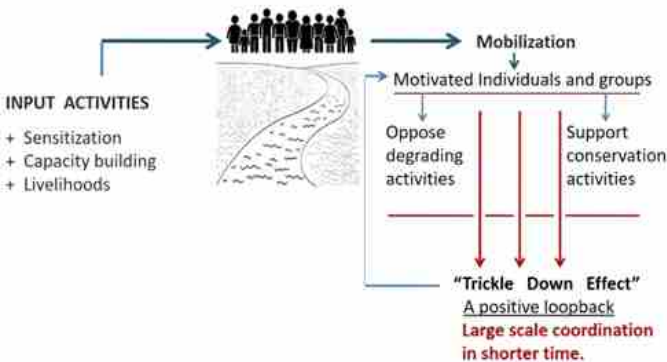


DEVELOP LINKAGES BY REVIVING EXISTING INSTITUTIONS AND FORMING NEW ONES WITH THE SUPPORT OF PANCHAYATI RAJ INSTITUTIONS



PATHWAY TO COMMUNITY MOBILIZATION

Activities conducted in form of meetings, workshops, livelihood interventions, mobilized the participants to take initiatives and volunteer the conservation efforts. Engagement with villagers resulted in a trickle-down effect within their respective communities and motivated individuals became Ganga Praharis. These motivated individuals are conducting various conservation related activities on their own, within their community.



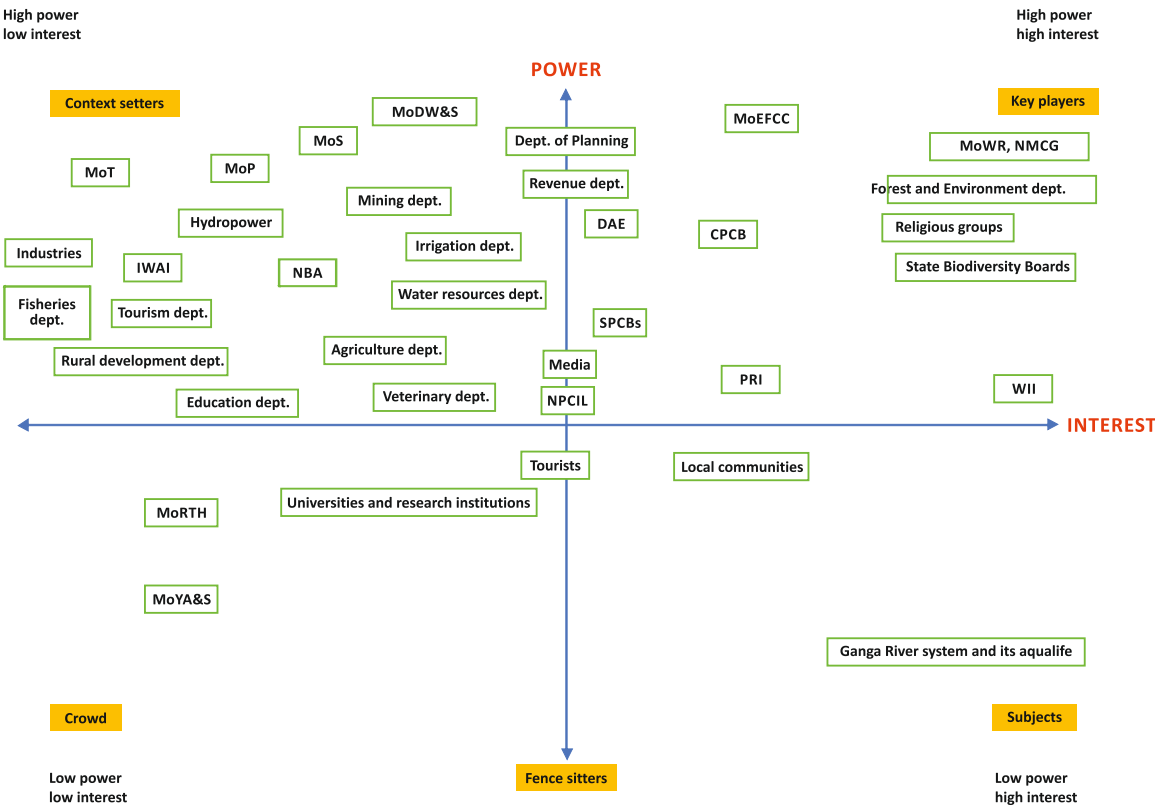


BUILDING TRUST, BUILDING BRIDGES

Stakeholder's participation in Ganga aqualife conservation

Stakeholder consultation meetings were carried out with the State Forest Departments, local governing bodies, educational institutions such as Patna University, Nalanda University, Tilka Manjhi Bhagalpur University, College of Agriculture Engineering - PUSA and local NGOs with the view to identify the stakeholders and bring all on a common platform for conservation and restoration of biodiversity of Ganga River.

Identifying Stakeholders: the game of power





Consultation with stakeholders of the Ganga River

The stakeholders can be categorized into five broad categories, based on the type and level of power they hold and their interest in Ganga restoration:

- **Key players** are the change makers, those who are actively involved in either planning or execution of the river conservation plan. They have both the interest and power to acquire information, funds and manpower to carry out the conservation activities with ease. Key players include Forest and Environment dept., Water Resources dept. etc.
- **Context setters** have high levels of power but low interest for the cause. This may be attributed to the different priorities and goals of these stakeholder groups. Context setters of the Ganga River include Agriculture dept., Irrigation dept. etc.
- **Subjects** are the victims, with high levels of interest due to the dependence on the Ganga River for their survival and livelihood but have low power. The Ganga River, its aqualife and the local people living on its banks are the subjects.
- **Crowd** includes the bystanders, i.e., the ones with neither the power nor the interest for the cause.
- **Fence sitters** are neutral. They have high power but no commitment, hence their interests are flexible according to the situation and if persuaded can be great supporters of conservation issues.

GUARDIANS OF GANGA: THE *GANGA PRAHARIS*



Map depicting presence of Ganga Praharis in Bihar

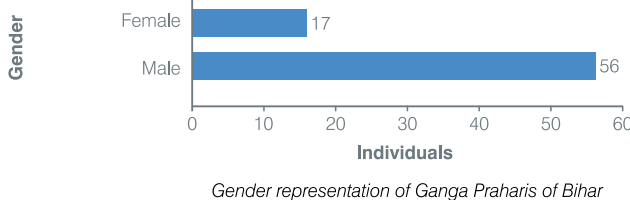
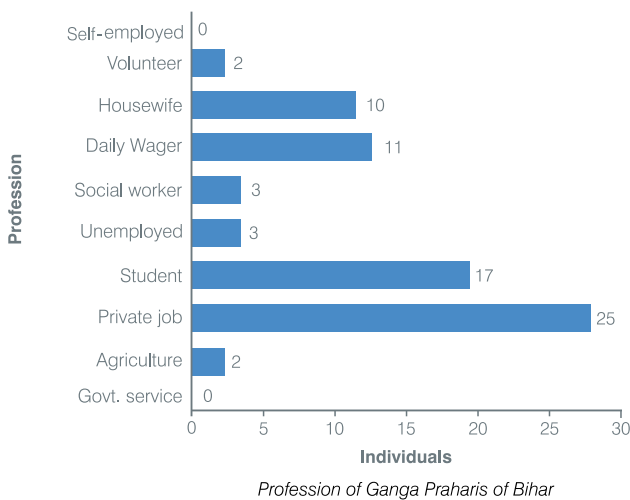
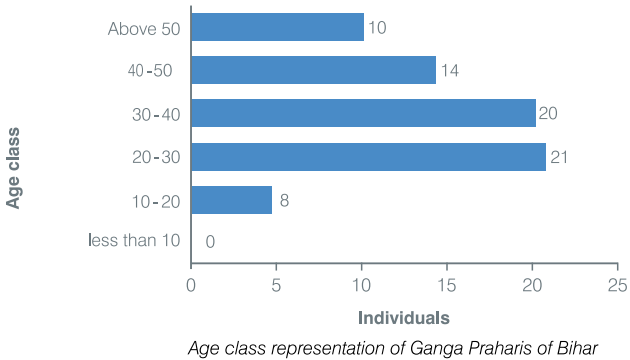
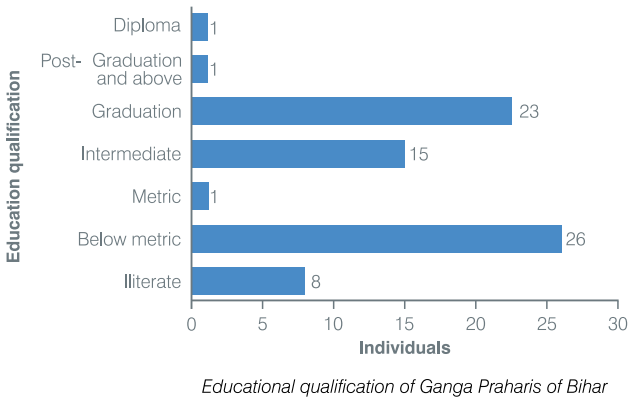
- Legend**
- Ganga River
 - Tributary
 - Ganga Prahari Districts
 - State boundary



IDENTIFICATION OF GANGA PRAHARIS

A total of 75 *Ganga Praharis* have been identified through series of site level consultative meetings, sensitization programmes, conducted in Bhagalpur, Samastipur, Kathiar, Purnea, Supaul districts of Bihar. Other agencies such as Bihar State Forest Department, Panchayati Raj Institutions, were also approached to facilitate the *Ganga Prahari* identification process.

The primary criterion for identification of a *Ganga Prahari* was the passion and zeal to work towards conservation of Ganga River and its biodiversity. People with different educational qualification, age groups and profession have joined this cadre. To ensure a fair and just representation of women from these districts, women folk were also approached individually.



Meetings and workshops conducted among the local communities mobilized the participants to take initiatives for the conservation efforts. These motivated individuals were identified and were trained to conserve the ecological integrity of the Ganga River. These guardians of the river known as *Ganga Praharis*, a cadre of motivated and trained volunteers from among the local communities are supporting local level institutions and actively participating in the activities carried out under the project.

LEARN, ADAPT, IMPLEMENT AND THRIVE

Ganga Praharis learning

Ganga Praharis were trained during the "First National level workshop for *Ganga Praharis* of five Ganga states" held at Rishikesh, Uttarakhand, in the month of March 2018. Additionally they have been trained in various aspects of ecological monitoring of the Ganga River and its biodiversity, tree plantation techniques, cleanliness drive, conduction of awareness programmes. *Ganga Praharis* are also being trained for alternate livelihood activities as per their interest and will be linked to various local environmental authorities, non-governmental organizations and other national academic and research institutions for sustainability of the programme.





Cleanliness drive organized by Ganga Praharis



Awareness programme conducted for Ganga Praharis in Naugachia, Bihar

Ganga Praharis adapting and implementing

Trained and motivated Ganga Praharis are contributing to conservation of Ganga aqualife, and are creating history at their respective sites. Since, their inception and training they have carried out about 60 activities:

Plantation drive during Ganga Vrikshroopan Saptah

Awareness programmes at various schools and colleges

Weekly cleanliness drives at Kahalgaon, Bhagalpur district

Activities conducted by Ganga Prahari in Bihar

S.No.	Type of Output Activity	Number	Total No. of Participants	Percentage of Female Participants
1	Awareness Programme	11	95	20
2	Cleanliness Drive	13	244	55
3	Ecological Survey	1	10	0
4	Plantation Drive	18	316	0
5	Rescue and Rehabilitation	6	41	0



Distribution of awareness material to school children at Navgachhia, Bhagalpur

Ganga Praharis have installed water dustbins and inflated tubes along the ghats. Duties have been assigned to each member on rotational bases to monitor the visitors so that they don't litter the ghat during peak rush hours in the morning and evening.



Water Dustbin installed by Ganga Praharis of Village Kahalgaon, Bhagalpur, Bihar

Catch them young: Bal Ganga Prahari

Interactive awareness workshops are being organized for school students with the support of the *Ganga Praharis*. As part of this activity WII aims to adopt schools established along the Ganga River and sensitize the students about the biodiversity of Ganga River and importance of conservation.

Interaction with School children at Govt. Secondary school, Samastipur



SUCCESS STORIES OF GANGA PRAHARIS FROM BIHAR

- Post sensitization, the *Ganga Praharis* of Bhagalpur are organizing regular cleanliness drives, plantation drives and awareness programmes. At Rajghat, Kahalgaon, the local angler community organizes the cleanliness drives and awareness programme regularly, which has resulted in visible improvement at Ghat. Women of this community actively participates in all the activities, which successfully sets an example of strengthened role of women in Ganga restoration.
- The *Ganga Praharis* of Navgachhia have joined hands to reduce plastic consumption and its disposal in Ganga River. They organized awareness programmes and talks in their communities and convinced the members of the local communities to replace plastic plates by eco-friendly plates (*Pattals*) in functions and ceremonies.
- Six incidences of priority species in distress have been reported by *Ganga Praharis* from Navgachhia and Bhagalpur. They also reported the incidences of accidental killing of the Gangetic river dolphin and recorded the morphometric details.

Weekly cleanliness drive at Rajghat, village Kahalgaon, Bhagalpur, Bihar



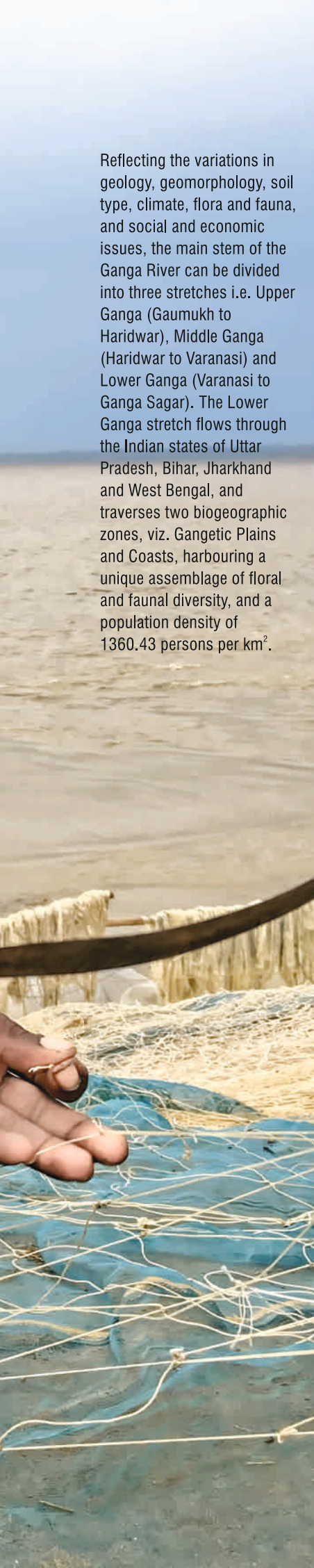
Ganga Prahari taking morphometric details of dead Gangetic river dolphin



Ganga Praharis conducting awareness programme for school student at Navgachhia, Bhagalpur

The Ganga River and its floodplains provide a host of ecosystem services that are vital for human wellbeing. The Ganga River provides water for drinking and domestic use, irrigation, hydropower, transport of goods and people, biotic and abiotic raw material, food, aids soil formation, water quality improvement, maintaining population of and habitats for biodiversity, water flow maintenance etc.; and provides opportunities for water-based recreation and sports, religious/cultural activities etc.

BENEFITING THE SOCIETY - ECOSYSTEM SERVICES PROVIDED BY THE GANGA RIVER



Reflecting the variations in geology, geomorphology, soil type, climate, flora and fauna, and social and economic issues, the main stem of the Ganga River can be divided into three stretches i.e. Upper Ganga (Gaumukh to Haridwar), Middle Ganga (Haridwar to Varanasi) and Lower Ganga (Varanasi to Ganga Sagar). The Lower Ganga stretch flows through the Indian states of Uttar Pradesh, Bihar, Jharkhand and West Bengal, and traverses two biogeographic zones, viz. Gangetic Plains and Coasts, harbouring a unique assemblage of floral and faunal diversity, and a population density of 1360.43 persons per km².

Description of the Lower Ganga Stretch

	LOWER GANGA Varanasi to Ganga Sagar ~ 1134 Km
Geology & Geomorphology	Gangetic plain region Distributary-delta system south and east of Farakka Craton margin & valley interfluve landscape A partly confined and confined floodplain Sinuous, braided channels and anabranches
Soil Types	Mainly alluvial soil - high erodibility; red soil - highly erodible; red and yellow soils and mixed red-and-black soil - moderately erodible; deep black, medium black and shallow black soils and lateritic soils - low erodibility
Climate	Gangetic Plain Annual rainfall: 60-160cm Avg annual temp: 5°C - 25°C in winter and 20°C - >40°C in summer Sundarban Delta High temperature & humidity (>80%) throughout the year Annual rainfall: 166.1 cm Daily min. temp in winter varies between 2°C and 4°C and rises to a max. of ~43°C in March.
Biogeography	Gangetic Plains (Lower Gangetic Plain - 7B) Coasts (East Coast - 8B)
Flora	Gangetic Plain Tropical Dry deciduous forest (<i>Dalbergia sissoo</i> , <i>Acacia nilotica</i> , <i>Madhuca indica</i>) Tropical Moist deciduous forest (<i>Shorea robusta</i> , <i>Tectona grandis</i> , <i>Terminalia arjuna</i>) (most of the original vegetation has been converted to cropland) Sundarban Delta Swamp-and-littoral-forest type vegetation (<i>Heritiera fomes</i> , <i>Nypa fruticans</i> , <i>Rhizophora apiculata</i>)
Fauna	Gangetic Plain Representative terrestrial fauna: Chital, Sambar Representative aquatic fauna: Gangetic river dolphin, Smooth-coated otter, Gharial, Mugger Avifauna: Sarus crane, Indian Skimmer Sundarban Delta Representative terrestrial fauna: Royal Bengal tiger, Barking deer, Leopard cat, Fishing cat Representative aquatic fauna: Northern river terrapin, Estuarine crocodile, Indian flapshell turtle, Indian soft-shelled turtle Avifauna: Lesser adjutant stork
Demography¹	Population: 9,43,57,799 Population Density: 1360.43 persons per km ² Major cities: Ballia, Patna, Bhagalpur, Sahibganj, Farakka, Berhampur, Serampore, Howrah, Kolkata
Land use Pattern	Farraka barrage The 'Jal Marg Vikas Project' (JMVP) on the National Waterway (NW) 1 (from Allahabad to Haldia~1620 km) Agricultural activities Construction Sand mining Biological resource extraction
Water Quality²	pH: 7.3 to 8.8 (7.4-8.5) DO: increasing trend, from 7.2 to 7.5 mg/L (6.2± 0.1 mg/L) BOD: decreasing trend, from 2.4 to 2.8 mg/L Nitrate concentration: 4.3 ± 0.5 mg/L

¹estimates based upon the population of the districts along the Ganga River using 2011 census data.
²pH, DO and BOD estimates are sourced from the assessment carried out by CPCB between 2003 and 2014; the pH and DO estimates in brackets and the Nitrate concentration estimates are based upon the study carried out by WII in 2017.

Source: WII-GACMC (2018)

22 key ecosystem services were identified for Lower Ganga; 11 provisioning, seven regulating and maintenance, and four cultural services, after an extensive literature review, river survey and meetings with representatives of various stakeholder groups .

Extent of the ecosystem services provided by the Ganga River

Ecosystem Services	Upper Ganga	Middle Ganga	Lower Ganga
Provisioning Services			
Consumptive use of water			
Drinking	•	●	●
Domestic use	•	●	●
Agriculture (irrigation)	•	●	●
Livestock (drinking, bathing etc.)	•	●	●
Industry	•	●	●
Non-consumptive use of water			
Power generation (hydro, nuclear and thermal)	●	•	•
Transportation	○	●	●
Resource Material			
Fish and other aquatic fauna for food	•	●	●
Fuelwood	•	•	●
Riverine vegetation for multiple uses	•	•	•
Riverbed material	•	●	●
Regulating & Supporting Services			
Maintaining population & habitat	●	●	●
Regulation of micro climate	●	●	●
Soil fertility	•	●	●
Soil formation (sediment deposition)	○	●	●
Water purification and waste management	●	•	•
Water cycle	•	•	•
Storm protection (through mangroves)	○	○	●
Cultural Services			
Tourism	●	●	●
Religious/Spiritual	●	●	●
Aesthetic	●	●	●
Heritage sites	●	●	●

Ecosystem Services:○→ none; •→ little/sometimes; ●→ medium; ●→ large

Acknowledging the Services Provided by the Ganga River - Stakeholder perception

To ascertain stakeholder perception regarding the benefits received from Lower Ganga, a questionnaire-based interview survey was conducted and 129 representatives were interviewed from different stakeholder groups.

Most cited Regulating and Maintaining Services

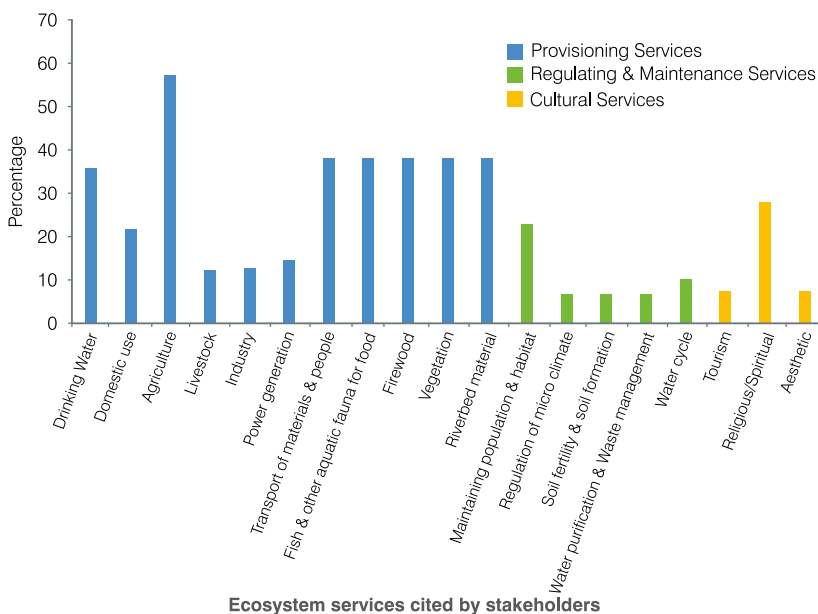
Maintains population and habitat of species > Water cycling > Micro climate regulation > Soil fertility

Most cited Provisioning Services

Water for irrigation > Provision of fish and other aquatic fauna for food > water for drinking

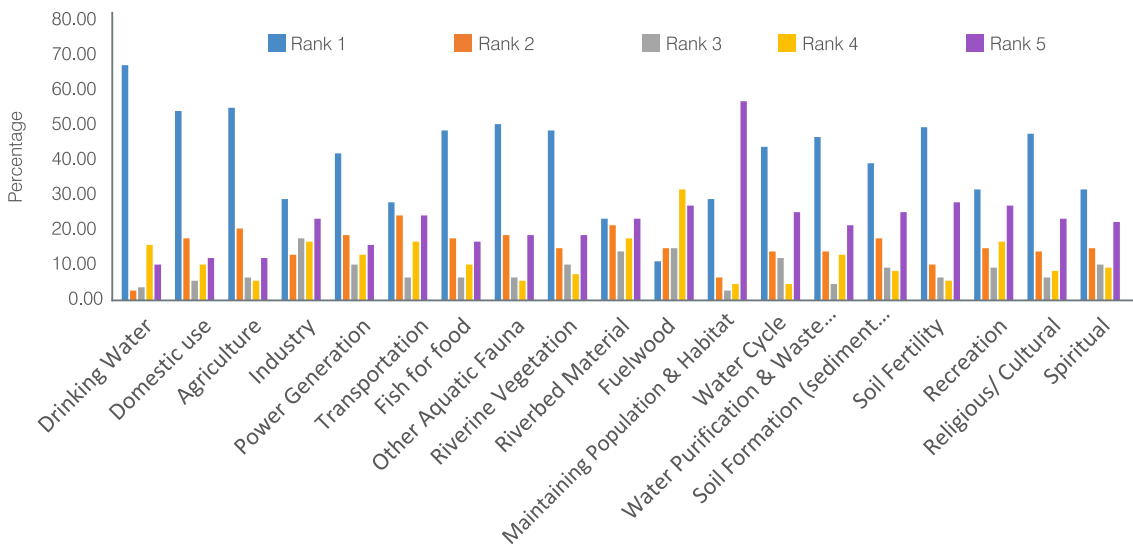
Most cited Cultural Services

Religious/spiritual > Tourism and aesthetic



Ecosystem services cited by stakeholders

The stakeholders were also asked to rank ecosystem services, based on the perceived extent and importance of these services with respect to Ganga River, with 'Rank 1' being the highest and 'Rank 5' the lowest. Provision of water for drinking, domestic use and agriculture were ranked highest by the respondents.



Ecosystem services ranked by stakeholders

Seven ecosystem services have been selected for further evaluation, based upon three factors, (a) the perception of various stakeholders regarding their contribution to human wellbeing and livelihood, (b) the extent and importance of services provided, and (c) the cost, time and man power requirement of conducting an evaluation. The methodology for their assessment has also been identified based on the objective of the evaluation i.e. 'economic appraisal of the ecosystem services provided by the Ganga River', the resource (time, cost and man power) required to execute the methods and the accuracy of results.

Methodology for assessing select ecosystem services provided by Lower Ganga

Ecosystem Service	Methodology
Power Generation (Thermal)	Market Price, Production Function
Fish	Market Price, Replacement Cost
Riverbed Material	Market Price, Production Function
Navigation/Transportation	Avoided Cost
Water purification & waste management	Avoided Cost
Cultural Services (Recreation & Religious/spiritual)	Invest
Qualitative Assessment via Participatory and Deliberative Methods	



BUILDING COMMUNICATION & NETWORKS

DIGITAL PLATFORM

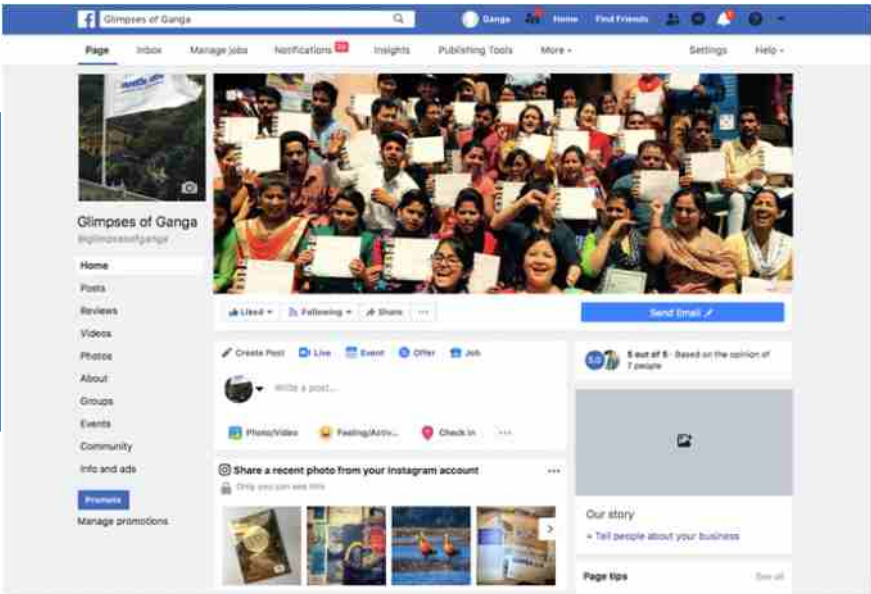
Webpage on the NMCG-WII's project "Biodiversity conservation and Ganga Rejuvenation" was launched (URL Link: <http://www.wii.gov.in/nmcg/national-mission-for-clean-ganga>). The webpage is a part of WII website and is widely accessible. Apart from this, various informative pages have also been created on social media. These web portals are enhancing people's perception about the significance of Ganga River and educating them about its biodiversity and the issues related to its biodiversity loss.



Webpage on NMCG-WII project

The social media pages "Glimpses of Ganga" on facebook and instagram provide information on the activities carried out in field.

Facebook page 'Glimpses of Ganga' depicting project activities



Instagram page 'Glimpses of Ganga' depicting



Youtube channel 'Glimpses of Ganga' has been created to depict the project activities and create a awareness among the masses. The channel has a documentary series focusing on the Ganga Prahari, and other activities of the project.

DATABASE ESSENTIAL

Advance database coverage for research

A database management framework for spatial and non-spatial data collected from various surveys and secondary literature was established through PostgreSQL software.

The database is accessible in web format for visualization and monitoring through WII intranet.

Training Database

A website has been developed with a retrievable database as a single point source where all capacity building related information's having extensive details about training programmes being conducted, training reports, training schedules, nature of input being given, training awareness materials, participants database including their contact number, email and their organisation. The data on the website is easily accessible and can be downloaded by anyone.

CAPACITY BUILDING OF FOREST DEPARTMENT AND OTHER STAKEHOLDERS

National Mission for Clean Ganga (NMCG) in collaboration with Wildlife Institute of India Project "Biodiversity Conservation and Ganga Rejuvenation"

"An endeavour to transform experience into shareable knowledge" (Pierre de Certeau, 1984)

CAPACITY BUILDING

Rejuvenating the Ganga River is an extensive and huge task, it calls for successful actions by policy-makers, protected area managers, forest staff of the forest department, research organisations, local institutions, NGOs and industries alike. However, inadequate awareness and sensitivity towards Ganga River and her fauna amongst various stakeholders is a major challenge in achieving the goals of the mission. Success of the efforts to revive the Ganga would depend on the involvement of these and other stakeholders. Critical success is now essential and this has to be covered in full encompassing the following topics: assessment, Budget and financial monitoring, Environmental impact and Technology, Community participation, Conservation education etc.

Capacity building is the combination of efforts, initiatives and performance to enhance the skills and capabilities of people and organisation or institution at local, national, regional and global levels, aims at sustaining development.

Training to build knowledge and skills in technical issues, enterprise management, community relations and other issues.

Implementing management systems to achieve sustainable performance objectives and ensure public health and environmental safety.

Advancing capabilities to create present and future efficient businesses.

Building partnerships with the public and private sectors, non-governmental organisations and other university community.

Effectiveness of Capacity building programs

- 1. To build knowledge and skills in technical issues, enterprise management, community relations and other issues.
- 2. To implement management systems to achieve sustainable performance objectives and ensure public health and environmental safety.
- 3. To advance capabilities to create present and future efficient businesses.
- 4. To build partnerships with the public and private sectors, non-governmental organisations and other university community.

Training database

Sl. No.	Name of the Training Programme	Organized by	Duration	Location	Participants	Remarks
1	Workshop on Biodiversity Conservation	Wildlife Institute of India	10 days	Dehra Dun	50	Completed
2	Training on Forest Management	Forest Department	5 days	Varanasi	30	In Progress
3	Workshop on Ganga Rejuvenation	NMCG	7 days	Allahabad	40	Completed
4	Training on Environmental Impact Assessment	Environmental Department	10 days	Delhi	60	Completed
5	Workshop on Community Participation	Community Development Department	5 days	Varanasi	20	In Progress

SPATIAL VIEW CAPACITY BUILDING OF FOREST DEPARTMENT AND OTHER STAKEHOLDERS

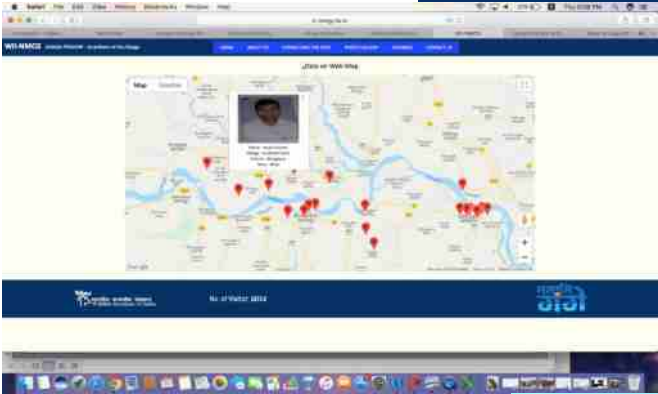
Ganga Prahari Database

Information on profile of the *Ganga Prahari* with their location was compiled to create database. This database is hosted on the web page of National Mission for Clean Ganga, Ministry of Water Resources River Development and Ganga Rejuvenation (MoWRRD&GR) The website was launched by the Honorable Minister of Water Resources River Development and Ganga Rejuvenation Shri Nitin Gadkari, on 22nd May 2018, on the occasion of World Biodiversity Day celebration, at New Delhi The website constantly monitors. and maintains the activities of each individual *Ganga Prahari* at their respective site.

Profile of Ganga Praharis



Name	Age	Gender	Education	Address
1. Anurag	25	Male	B.Tech. (Computer Science)	...
2. Anurag	25	Male	B.Tech. (Computer Science)	...
3. Anurag	25	Male	B.Tech. (Computer Science)	...
4. Anurag	25	Male	B.Tech. (Computer Science)	...
5. Anurag	25	Male	B.Tech. (Computer Science)	...
6. Anurag	25	Male	B.Tech. (Computer Science)	...
7. Anurag	25	Male	B.Tech. (Computer Science)	...
8. Anurag	25	Male	B.Tech. (Computer Science)	...
9. Anurag	25	Male	B.Tech. (Computer Science)	...
10. Anurag	25	Male	B.Tech. (Computer Science)	...
11. Anurag	25	Male	B.Tech. (Computer Science)	...
12. Anurag	25	Male	B.Tech. (Computer Science)	...
13. Anurag	25	Male	B.Tech. (Computer Science)	...
14. Anurag	25	Male	B.Tech. (Computer Science)	...
15. Anurag	25	Male	B.Tech. (Computer Science)	...
16. Anurag	25	Male	B.Tech. (Computer Science)	...
17. Anurag	25	Male	B.Tech. (Computer Science)	...
18. Anurag	25	Male	B.Tech. (Computer Science)	...
19. Anurag	25	Male	B.Tech. (Computer Science)	...
20. Anurag	25	Male	B.Tech. (Computer Science)	...



Location of Ganga Prahari on map available on NMCG homepage website

Ganga Prahari tab on the home page of NMCG website



Release of Ganga Prahari Database by Shri Nitin Gadkari, Honorable Minister of Water Resources, River Development and Ganga Rejuvenation at New Delhi



Home page of Ganga Prahari database



GANGA PRAHARI
SANGHARS OF THE GANGA
"A cadre of self motivated volunteers from the local community"

GANGA PRAHARI
Ganga Prahari are self motivated and trained volunteers from among the local communities working for biodiversity conservation and cleanliness of the Ganga River with the ultimate objectives of restoring the Normal and Aural Ganga.

PROGRAMME BACKGROUND
The biodiversity of the Ganga River is under stress due to reduced water availability, habitat degradation, pollution, and unsustainable resource extraction. To conserve the ecological integrity of the Ganga River, and, restore the direct dependency of the local communities on the river, the National Mission for Clean Ganga-Wildlife Institute of India (NMCG-WII) project 'Biodiversity Conservation and Ganga Rejuvenation' is involving members of the local community in the Ganga states (Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal) as guardians of the river who will henceforth be known as Ganga Prahari.

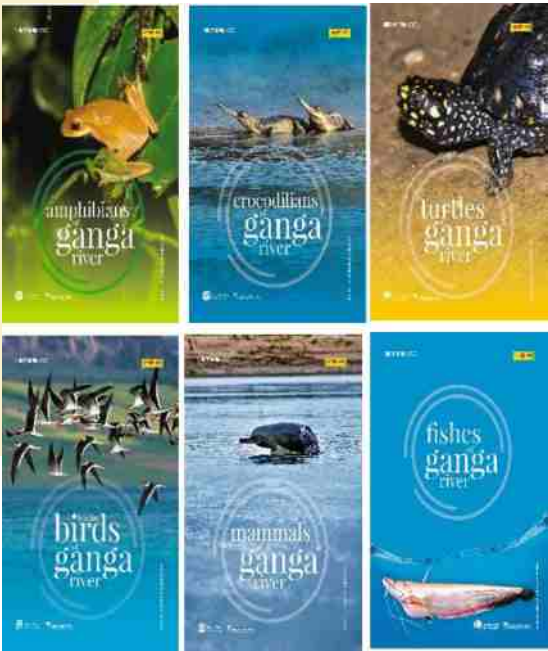
The aim of this initiative is to establish a motivated cadre of "Ganga Prahari" to support the local level institutions and monitor the quality of the natural resources of the river by mobilizing local communities at the grassroots level. This can be achieved by:

Creating awareness about the benefits of a clean and vibrant Ganga and create a sense of belongingness among people towards the Ganga River.

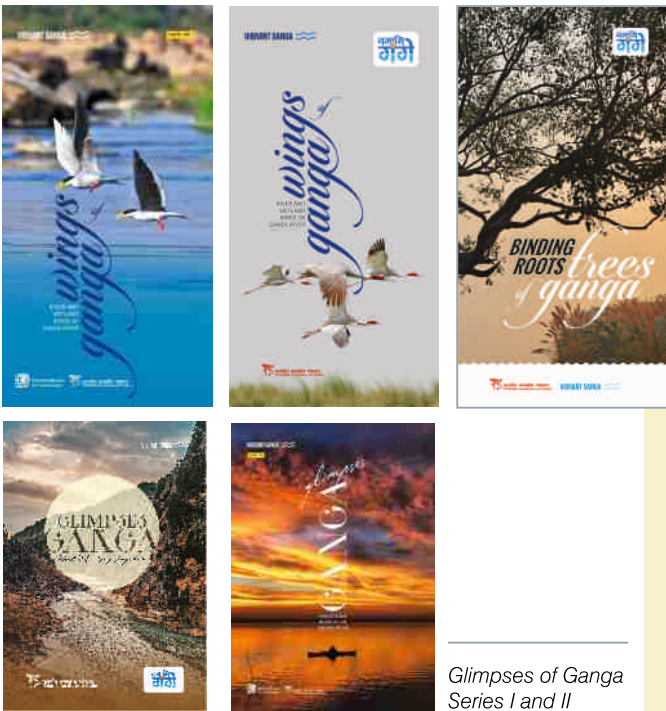
READ, LEARN AND SHOW THE WAY

Spreading awareness through print media

For dissemination of information on aquatic biodiversity of the Ganga River, their conservation status and threats, brochures, posters and booklets under the “Vibrant Ganga Series” on fish, amphibians, turtles, crocodiles, water birds and aquatic mammals have been published in Hindi and English.



Species
information
brochures under
Vibrant Gange
Series



Wings of Ganga
Series I and II;
Trees of Ganga
Series

Wings of Ganga:
Series I & II,
Glimpses of Ganga:
Series I & II,

Binding Roots:
Trees of Ganga

These provide scientific information on species taxonomy, conservation status, distribution, description, habitat, reproduction, major threats and distribution maps for birds, key aquatic species and tree species of the Ganga River respectively.

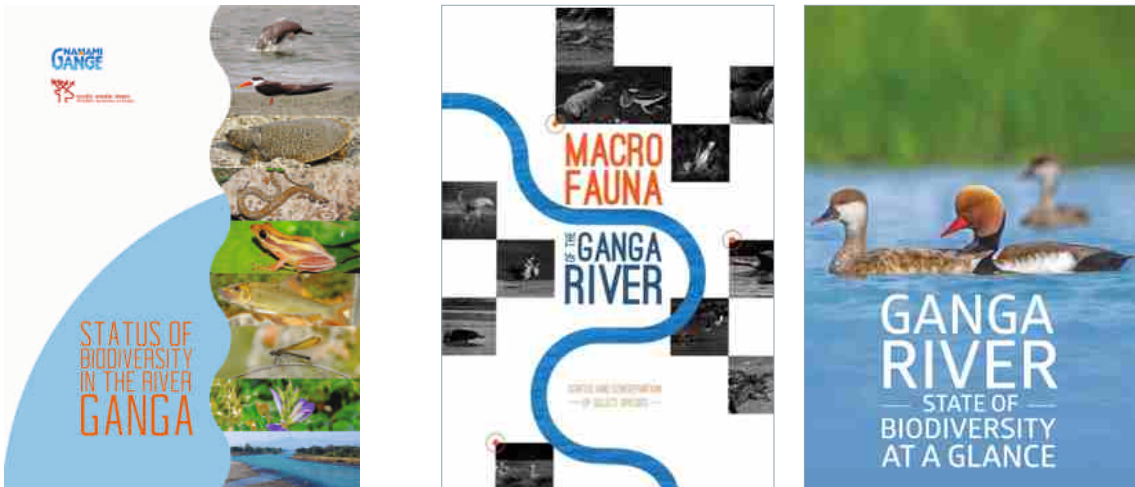
Glimpses of Ganga
Series I and II



Training manuals and field guides that are used in the training programme have been published. These publications will be used by the spearhead teams for future training programmes.

Training guide and curriculum

Stakeholder brochure and Framework for valuation of ecosystem services have also been published.



EVENTS AND CELEBRATION OF DAYS

“Ganga River Dolphin Day” 5th October 2017, and Wildlife Week were celebrated with postgraduate students of Nalanda University, Rajgir, Bihar at Sanjay Gandhi Biological Park, Patna, Bihar





The world environment day was celebrated on 5th June, 2018 on the theme “Beat the plastic pollution”. Two parallel programmes were conducted in Kahalgaon and Bhagalpur, in Bihar. In Kahalgaon, a sensitization workshop, awareness rallies and a cleanliness drive involving local people and 31 Ganga *Praharis* were organised. At Bhagalpur, an awareness programme was organized by Ganga *Praharis* which was attended by about 50 members of the local community and representatives of Mandar Nature Club. As part of the celebration a total of 55 saplings of different species were planted.

Ganga *Prahari* participating in the event organized on the occasion of World Environment Day, 5th June 2018





On the occasion of Teacher's Day 2018, a sensitization workshop was organised for teachers, students and *Ganga Praharis* at the Ramdhari High School, Bhagalpur, Bihar. The purpose of this workshop was to sensitize the participants on the importance and role of aqualife in maintaining a healthy ecosystem, emerging threats with mitigation measures and role of youth in conserving the biodiversity with emphasis on the indicator species. The workshop was attended by 165 students from classes 8th to 11th, 11 *Ganga Praharis* and 8 teachers.



Sensitization workshop organized for the school children on the occasion of Teacher's Day

THE TEAM

Project Leaders: V.B. Mathur and G.S. Rawat
Project Coordinators: Syed Ainul Hussain and Ruchi Badola

Components	Coordinating faculty	Co-coordinating faculty	Researchers
Establishment of Ganga Aqualife Conservation & Monitoring Centre	Syed Ainul Hussain	Ruchi Badola	Niladri Dasgupta, Shivani Barthwal, Michelle Irengbam, Anita Devi, Saurav Gawan, Sayantika Banerjee, Aishwarya R. Chandran, Ravindra Nath Tripathi, Shatakshi Sharma, Dipak Anand
Planning aquatic species restoration of Ganga River	J.A. Johnson	Syed Ainul Hussain	Rohitashva Shukla, Ajit Kumar, Sk. Zeeshan Ali, Goura Chandra Das, Ruchika Sah, Prabhaker Yadav, Dipti Dey, P. Gangaimaran, Kritish De, Bitupan Boruah, Anuja Mittal, Ajay Prakash Rawat, Rahul Rana, Chetan P.S. Ahada, Megha Shruti, Shaikh Rahim Rashid, Arkojyoti Sarkar
Capacity Building of Forest Department & other Stakeholders	Ruchi Badola	Syed Ainul Hussain	Sangeeta Angom, Monika Sharma, Monika Mehralu
Establishment of Rescue and Rehabilitation Centres	P.K. Malik	Parag Nigam, Suresh Kumar	Suvarnagowri Mallapur, Aftab Alam Usmani, Animesh Talukdar, Akshay Bajaj
Community Based Conservation	Ruchi Badola	Syed Ainul Hussain	Pariva Dobriyal, Hemlata Khanduri, Sandhya Joshi, Vipul Maurya, Deepika Dogra, Amanat K. Gill, Aditi Dev, Ekta Sharma, Shashi Joshi, Sunita Rawat, Mohd. Rahil, Manisha Mallick
Nature Interpretation and Education for Biodiversity Conservation	Bitapi Sinha	Gopi G.V.	Anjali Pathak, Dimpi A. Patel, Ravi Sharma, Taniya Trivedi
Project Management Unit			Rajeev Chauhan, Rajni Bohra, Neha Sharma, Rahul Kumar Gupta

THE SPEARHEAD TEAM

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Kaushal Kishor Jha	ROF, Bihar	9472041046	-
Sunil Kumar	ROF, Bihar	9576036419	-
Kanhiya Nand Kishor	ROF, Bihar	9931992411	-

NMCG

National Mission
for Clean Ganga,
Ministry of Water
Resources, River
Development &
Ganga Rejuvenation

GACMC

Ganga Aqualife
Conservation
Monitoring
Centre

Wildlife Institute of India

Chandrabani,
Dehradun-248001
Uttarakhand

