

**Blended
Capacity Building Programme
for Stakeholders of River Ganga**

under Namami Gange Programme

LIFEFORMS IN GANGA

03



Indian Institute of Public Administration

New Delhi





OVERVIEW

NAME OF PROJECT

BLENDED CAPACITY BUILDING PROGRAM FOR STAKEHOLDERS OF RIVER GANGA

PROGRAMME



PREPARED FOR



National Mission for Clean Ganga

(Registered Society, Under Act 1860)
Ministry of Jal Shakti
Department of Water Resources, River Development & Ganga Rejuvenation
Government of India

PREPARED BY



भारतीय लोक प्रशासन संस्थान
INDIAN INSTITUTE OF PUBLIC ADMINISTRATION
Building Capacity for Good Governance

SPECIFIC FOCUS

STUDY CAPSULE 03 FOR COLLEGE STUDENTS

PROJECT TEAM

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Cover page image: Devprayag, Uttarakhand, India. Photograph by Dee Jays, Adobestock

Left image: Breathing roots of Keora trees at the World largest mangrove forest Sundarbans by Nazrul Islam, Shutterstock

INDIAN INSTITUTE OF PUBLIC ADMINISTRATION

MESSAGE THE DIRECTOR GENERAL

SHRI S.N. TRIPATHI



My young Companions,

“Children are the hands by which we take hold of heaven.”

The above quotation by Henry Ward Beecher has inspired me to join hands with you in rejuvenation and conservation of our holy river Ganga. I consider your role in the society and believe that your participation in this herculean task can improve the present state of our River.

To make the descent of Ganga worthwhile, you are being made a part part of the project - Blended Capacity Building Programme for Stakeholders of River Ganga under Namami Gange Programme. Ganga lies at the core of our culture and it is our firm belief that your awareness of the complex

Through this booklet, you will be taken to a journey along the Ganges and its basin. I want to create an imprint on you and mould each one of you into responsible adults. This learning process has been tailored for your effective engagement with inclusion of maps, quizzes and puzzles.

challenges faced by our national river can bring about behavioural change in the society at large.

I consider the potential of a child in contributing towards a cleaner, breathable future. It is MY hope and expectation to meet with your feelings, thoughts and awareness to foster a sense of belonging for River Ganga. I have faith in your tremendous curiosity and capacity & hope that together we can change mindsets and take it to practical application.

S N TRIPATHI
Director General, IIPA

PREFACE

Dear Students,

Universally and religiously, water is considered a purifying natural symbol. Indian rivers, besides being the lifeline for many are considered as manifestations of the divine. They connect state to state, past to present. The Ganges is our sacred river with a culturally significant history. It is not just a river but a deity, a cleanser of sins; It is our mother.

Ganga is a part of India's rich past. It is a symbol of purity and sanctity. It occupies a central space in the collective consciousness of the country, which is why Gangajal is considered the holy water. River Ganga, not only fosters exceptionally rich biodiversity, but it also contributes heavily to the livelihood of India. .

It is unfortunate that despite the admiration and reverence invoked by the river, it has become a dumping junkyard at innumerable points. Human greed and misconduct have degraded the river quality. It is indeed a matter of concern that the river has altered its flow over the years; with that, the National Mission for Clean Ganga (NMCG) has stepped in to keep the river clean, pure and healthy for the benefit of existing and future generations. It is a matter of pride for IIPA to be entrusted by the project "Blended Capacity Building for Stakeholders of River Ganga" under the Namami Gange programme.

With the aim of conserving and rejuvenating River Ganga, The 'Ganges -Children's Handbook' has been prepared to make children interact with our national river. The book encompasses a holistic view of the river Ganga by posing the challenges and opportunities in and around Ganga basin.



V.K. SHARMA
Professor, IIPA



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Assistant professor, IIPA



LIFE IN THE GANGES

Above image: Great Himalayan National Park
© IUCN/Graeme Worboys

With biodiversity as one of key pillars, *Namami Gange programme* provided projects like *Biodiversity Conservation* and *Ganga Rejuvenation, Fish and Fishery Conservation in Ganga River, Ganges River Dolphin Conservation Education Programme*. Further five biodiversity centers have been established at *Dehradun, Narora, Allahabad, Varanasi and Barrackpore*. These centers have identified restoration of different identified priority species. The following sections describe important ecological habitats of *Ganga River Basin*, the lifeforms in them and leading threats.

ECOLOGICAL HABITATS

Habitat is an ecological part of the environment where animals or plants and other organisms live. It is a place where an organism lives and thrives with the capability of reproducing and finding food for its survival. All organisms have specific habitats. Some organisms are flexible and can survive in various habitats, while others are specific and cannot survive in any other habitat. Therefore, each habitat can support specific types of species. **River ecosystem** is habitat of diverse flora and fauna and these benefit the human. *Ganga River Basin* contains forests, wetlands etc. that supports aquatic and terrestrial life forms.

“O Ganga, strange are your ways, you fill up the sea but dry up Bhavsagar – the sea of troubles of worldly life.”

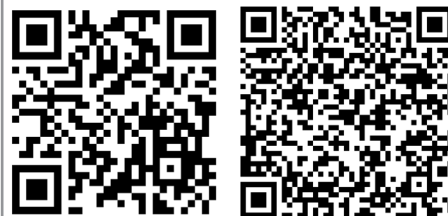
– Ratnakar

Rejuvenation:
the act to increase the grade and speed of flow of (a stream), usually by uplift of the surrounding land

Restoration:
the act of restoring or state of being restored, as to a former or original condition, place, etc

Terrestrial:
A terrestrial animal or plant lives on land or on the ground rather than in the sea, in trees, or in the air.

TO KNOW MORE



SCAN CODES

TYPES OF FORESTS IN GANGA BASIN

The conditions of *geology* and *hydrology* changes with the river course leading diversity forests to co-exists in *Ganga River Basin*. The floral and faunal resources comprises majorly of tropical moist and dry deciduous forests. They are further subdivided in into six major categories. The distribution of these forests and major species visually identifiable in respective areas are discussed here.

Tropical:
Tropical weather is hot and damp weather that people believe to be typical of the tropics.

Deciduous:
A deciduous tree or bush is one that loses its leaves in the autumn every year.



Tropical Moist Deciduous

Distribution: Eastern Rajasthan, Kathiawar, Punjab, Central India, Rainshadow area of Deccan

Major species: Teak, Sal, Bijasal, Laurel, Palas Khair, Khendu

TYPES OF FORESTS IN RIVER GANGA BASIN



Tropical Dry Deciduous

Distribution: Sutlej-Ganga Plains, Himalayan foothills and Eastern Plateau

Major species: Sal, Teak, Sandal wood, Arjun, Jarul, Ebony, Mulberry, Kusum siris, Palas, Mahau, Simil, Dhup



Himalayan Dry Deciduous

Distribution: Zanskar range and Great Himalayan range below the range of 1000m

Major species: Chilgoza, Deodar, Oak, Maple, Ash, Celtis, Parrotia, Olive Oak



Sub Tropical Conifereous

Distribution: Eastern Rajasthan, Kathiawar, Punjab, Central India, Rain shadow area of Deccan Plateau

Major species: Chir, Pine



Himalayan Moist

Distribution: Western Himalayan elevations between 1500m and 3000m

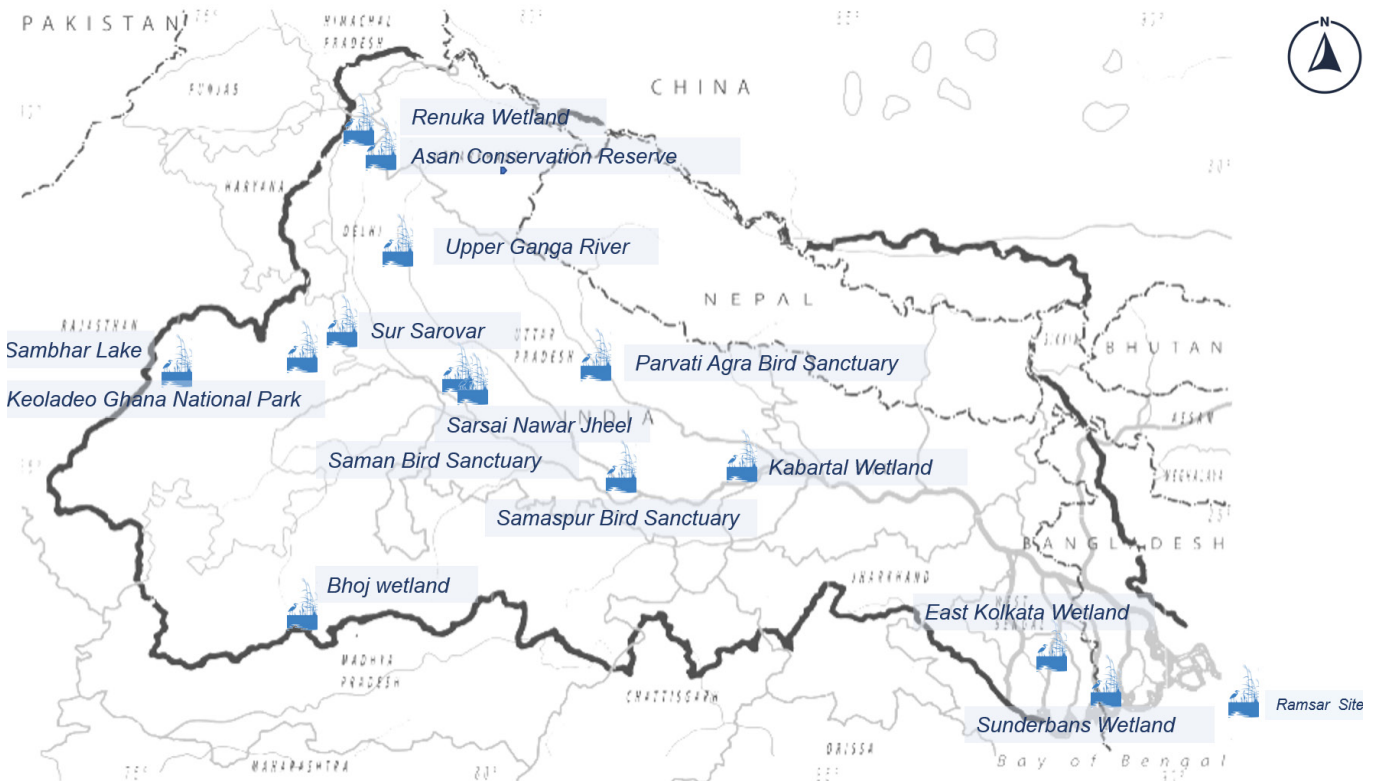
Major species: Deodar, Spruce, Maple, Walnut, Poplar, Cedar, Chestnut, Birch, Oak

Source(Clockwise):

1. Shutterstock/S.B. stock
2. Shutterstock/Abhishekmittal
3. Shutterstock/Balajishrinivasan
4. Shutterstock/Niteenrk
5. Shutterstock/Chai_B

WETLANDS IN GANGA BASIN

Wetlands are vital for human survival. They are among the world’s most productive environments; cradles of biological diversity that provide the water and productivity upon which countless species of plants and animals depend for survival. Managing wetlands is a global challenge and the *Ramsar Convention* presently counts 171 countries as *Contracting Parties*, which recognize the value of having *one international treaty* dedicated to a single ecosystem.



Above image: Ramsar Sites in River Ganga Basin

Further, the *Convention* uses a broad definition of wetlands. This includes all *lakes and rivers, underground aquifers, swamps and marshes, wet grasslands, peatlands, oases, estuaries, deltas and tidal flats, mangroves and other coastal areas, coral reefs, and all human-made sites such as fish ponds, rice paddies, reservoirs and salt-pans*. These *Ramsar Sites* acquire a new national and international status. They are recognized as being of significant value not only for the country or the countries in which they are located, but for humanity as a whole. There are currently over 2,400 *Ramsar Sites* around the world. *India* has forty one *Ramsar Sites* as of November 2020 and sixteen of them fall under *Ganga River Basin*.

Peatland:
an area of land consisting of decaying plant material, usually containing many species of flora and fauna

Salt-pans:
a shallow basin, usually in a desert region, containing salt, gypsum, etc, that was deposited from an evaporated salt lake

Contracting Parties:
a person, company, state, country, etc, entering into a legal contract.

TO KNOW MORE

SCAN CODES

LIST OF RAMSAR SITES IN GANGA BASIN

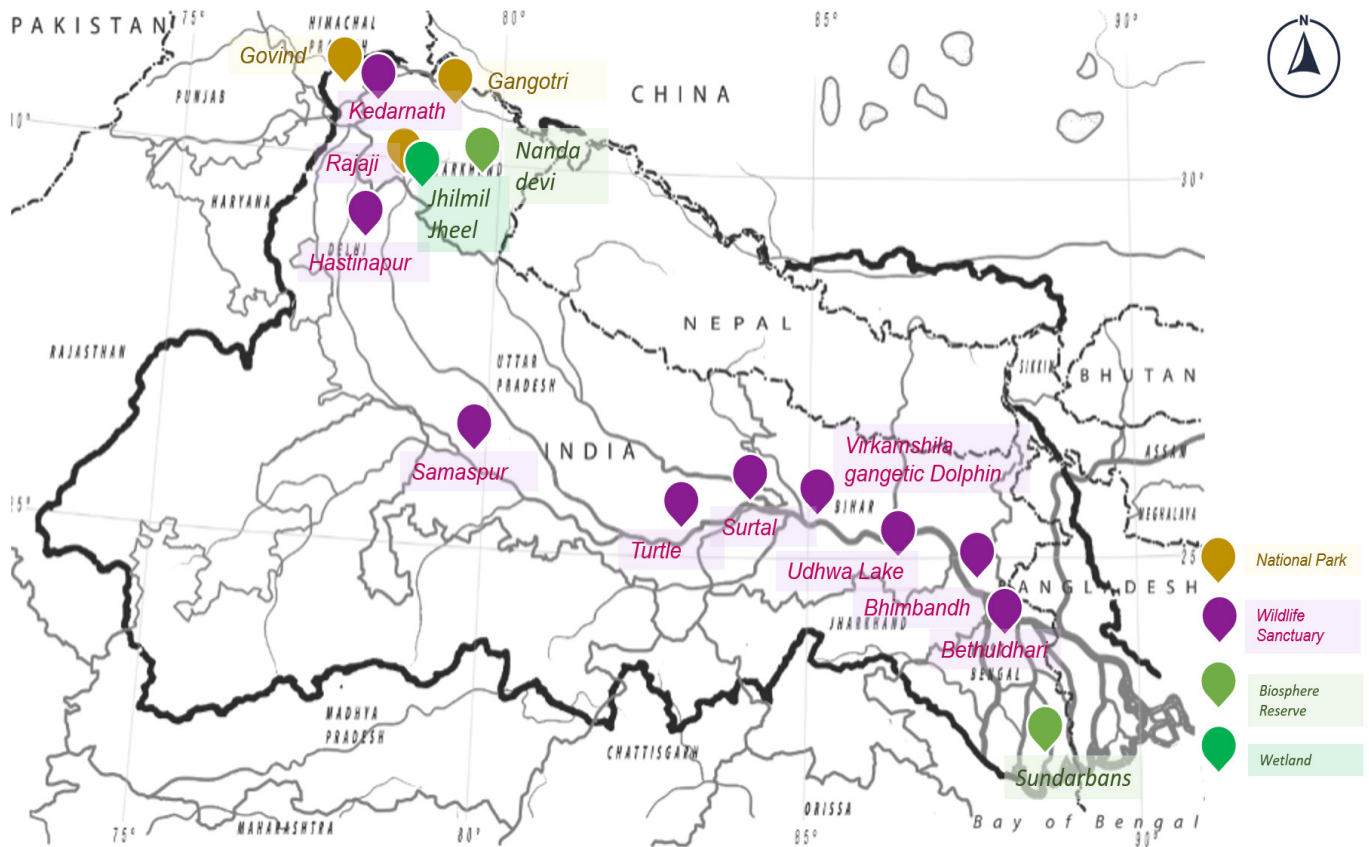
Name of Wetland	State	Designation dates	Area
<i>Renuka Wetland</i>	Himachal Pradesh	2005	20 ha
<i>Asan Conservation Reserve</i>	Uttarakhand	2020	444.4 ha
<i>Nawabganj Bird Sanctuary</i>	Uttar Pradesh	2019	224.6 ha
<i>Parvati Agra Bird Sanctuary</i>	Uttar Pradesh	2019	722 ha
<i>Samaspur Bird Sanctuary</i>	Uttar Pradesh	2019	799.4 ha
<i>Saman Bird Sanctuary</i>	Uttar Pradesh	2019	526.3 ha
<i>Sandi Bird Sanctuary</i>	Uttar Pradesh	2019	308.5 ha
<i>Sarsai Narwar Jheel</i>	Uttar Pradesh	2019	161.3 ha
<i>Sur Sarovar</i>	Uttar Pradesh	2020	431 ha
<i>Upper Ganga River</i>	Uttar Pradesh	2005	26,590 ha
<i>Kabartal Wetland</i>	Bihar	2020	2,620 ha
<i>Keoladeo National Park</i>	Rajasthan	1981	2,873 ha
<i>Sambhar Lake</i>	Rajasthan	1990	24,000 ha
<i>Bhoj Wetland</i>	Madhya Pradesh	2002	3,201 ha
<i>East Calcutta Wetlands</i>	West Bengal	2002	12,500 ha
<i>Sundarban Wetlands</i>	West Bengal	2019	423,000 ha

*“We forget that the water cycle and the life cycle are one.
Water and air, the two essential fluids on which all life depends, have become global garbage cans.”*

– Jacques Cousteau, Oceanographer

PRETECTED AREAS IN GANGA BASIN

The *River Ganga Basin* constitutes of several ecologically important habitats which have many *endemic and threatened species*. *River Ganga Basin* has two biospheres reserves, twenty nine National parks, seventy five animal sanctuaries and ten tiger reserves. The section elaborates on major conservation areas found along the banks of the *River Ganga*.



Above image: Conservation areas in River Ganga Basin

Endemic:
the branch of science concerned with the properties of the earth's water, and especially its movement in relation to land

Threatened:
the science, which deals with the physical structure and substance of the earth, their history, and the processes, which act on them

Reserve:
areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters

TO KNOW MORE



SCAN CODES

In Uttarakhand, we have six major conservation areas along the river.

UTTRAKHAND

Gangotri National Park

located between 30°50–31°12 N, 78°45–79°02 E coordinates and is the largest protected area with an area of 2,390 km² in Uttarakhand⁽²⁾. The elevation ranges from 1,800 to 7,083 m and is situated in the Himalayan Ecozones (western Himalaya) of India. Fifteen species of mammals and one fifty bird species have been documented from the park.

Govind National Park

located at 35°55–31°17 N, 77°47–78°37 E coordinates are part of high Western Himalayan highland situated in the Uttarkashi district of Uttarakhand, covering an area of about 958 km². The area lies under climatic zones⁽⁴⁾ starting from sub-tropical (1200–1700 m) to temperate (1700–3500 m) and alpine (>3500 m). The region has been identified as an area of importance for Snow leopard (*Panthera uncia*) conservation. Seventy species of butterflies, twenty species of mammals and hundred species of birds from the sanctuary⁽⁵⁾

Nanda Devi National Park

The Park spread across three districts of Uttarakhand that is Chamoli, Pithoragarh and Bageshwar with a span of over 6407.03 km². The park is also the second biosphere reserve of the country. The park is divided into zones, core Zone (Nanda Devi National Park and Valley of Flower National Park) and the outer buffer zone. The studies at Park show the diversity of flora and fauna ranging between 800-1000 plants. Further, five hundred and twenty species of fauna⁽⁶⁾ including twenty nine species of mammals, two hundred twenty eight birds, three reptiles, eight amphibians, two hundred twenty nine species of arthropods, fourteen mollusks, six annelids and two hundred avifaunal species have been reported in the reserve. The area of reserve is also a part of Western Himalayas Endemic Bird Area.

'Project Dolphin' for protecting the Gangetic river dolphins, a species of freshwater dolphins primarily found in the Ganga and Brahmaputra rivers and their tributaries is launched in 2020

Commonly found Flora⁽³⁾

Chirpine (*Pinus roxburghii*), Deodar (*Cedrus deodara*), Fir (*Abies webbiana*), Spruce (*Picea smithiana*), Oak (*Quercus sp.*) and Buransh (*Rhododendron sp.*)

Commonly found Fauna

Snow leopard (*Panthera uncia*), Blackbear (*Ursus thibetanus*), Brown bear (*Ursus arctos*), Muskdeer (*Moschus chrysogaster*), Bluesheep or Bharal (*Pseudois nayaur*), Himalayan tahr (*Hemitragus jemlahicus*), Himalayan monal (*Lophophorus impejanus*), Koklass (*Pucrasia macrolopha*), Himalayan Snowcock (*Tetraogallus himalayensis*).

Commonly found Fauna⁽⁵⁾

Snow leopard (*Panthera uncia*), Asiatic black bear (*Ursus thibetanus*), Himalayan brown bear (*Ursus arctos*), Himalayan musk deer (*Moschus chrysogaster*), Bharal (*Pseudois nayaur*), Himalayan tahr (*Hemitragus jemlahicus*).

Commonly found Flora⁽⁷⁾

Gandrayan (*Angelica glauca*), Sweet flag (*Acorus calamus*), Putchuk (*Saussurea costus*), Ratanjot (*Arnebia benthamii*), Harvish (*Dioscorea deltoidea*), Aril (*Taxus baccata*)

Commonly found Flora:

(*Rhododendron arboretum*), (*Myrica esculenta*), (*Quercus leucotrichophora*), (*Quercus semecarpifolia*), (*Abies pindrow*), (*Cedrus deodara*)



Above image: Snow leopard
Shutterstock/Nagel Photography

Know Your Biodiversity:

Climate change threatens two-thirds of snow leopard habitat. The population of this vulnerable species is dropping. In the Himalayas, the gradual deterioration of their habitat takes them to human habitation in search of food and other necessities, causing many cases of negative human wildlife interactions. They are also poached for their pelts, bones and other body parts.

UTTRAKHAND

Kedarnath Wildlife Sanctuary

located at 30°25–30°41 N, 78° 55–79°22 E, covering a total area of 975.20 km².⁽⁸⁾ Sanctuary provides a large number of habitats for wildlife, making it rich in faunal diversity with over thirty species of mammals, two hundred forty species of birds, one hundred forty seven of butterflies, nine of snakes and ten of fishes recorded from the sanctuary. The sanctuary has been home to the endangered Himalayan musk deer (*Moschus leucogaster*), thus having high conservation significance.

Know Your Biodiversity:

Golden Mahseer species has been reported from the Himalayan region in India. The feeding and breeding habitats are lost almost throughout their distributional range and thus this species is declining.

Himalayan musk deer are listed as *endangered* on both the IUCN Red List and are threatened by hunting, habitat fragmentation, habitat reduction, and habitat destruction. Although many musk deer reside in one of several protected areas, poaching activities continue to increase as musk becomes more valuable.

Rajaji National Park

located at 29°15' to 30°31'N, 77°52' to 78°22'E with an expanse⁽⁹⁾ of 820.42 Km². The Ganga River cuts Rajaji National Park into two, with the Chilla range lying in the east and rest on the west of river. Named after C. Rajagopalachari (Rajaji), was notified in 1983 by merging three wildlife sanctuaries, namely, Rajaji, Chilla and Motichur⁽¹⁰⁾. Its suitable location in the Shivalik landscapes designates it as Shivalik Elephant Reserve for the "Project Elephant". In April 2015, the National Tiger Conservation Authority (NTCA) gave the final approval to the protected areas being declared as a tiger reserve. The region has undergone degradation and fragmentation of its habitat due to various developmental activities, such as building roads and rail network, urbanization, increasing road traffic and land encroachment for agriculture. Nine species of mammals, two hundred twenty eight birds, three reptiles, eight amphibians, two hundred twenty nine species of arthropods, fourteen mollusks, six annelids and two hundred avifaunal species have been reported for the reserve. The area of reserve is also a part of Western Himalayas Endemic Bird Area.

Commonly found Fauna

Leopard (*Panthera pardus*), Snow leopard (*Uncia uncia*), Himalayan black bear (*Selenarctos thibetanus*), Sambar (*Rusa unicolor*), Barking deer (*Muntiacus muntjak*), Himalayan tahr (*Hemitragus jemlahicus*), Goral (*Nemorhaedus goral*), Bharal (*Pseudois nayaur*), Ibex (*Capra ibex*), Markhor (*Capra falconeri*), Himalayan tahr (*Hemitragus jemlahicus*) and Takin (*Budoreas taxicolor*). Zangul (*Cervus eldi eldi*) and Musk deer (*Moschus moschiferus*).



Above image: Golden Mahseer
Shutterstock/Yarddo



Above image: Himalayan Musk Deer
Shutterstock/Alexey Seafarer

Commonly found Fauna^(8, 10)

Subtropical zone: Chir (*Pinus roxburghii*), Utis (*Alnus nepalensis*), Kaamala Tree (*Mallotus philippensis*), Indian mahogany (*Toona ciliate*)

Temperate zone: Oak (*Quercus spp.*), Deodar (*Cedrus deodara*), (*Juglans regia*), Buransh (*Rhododendron arboretum*), morinda (*Picea smithiana*)

Sub-alpine zone: Brammi (*Taxus wallichiana*), Oak (*Quercus semecarpifolia*), Chir (*Pinus wallichiana*), Buransh (*Rhododendron campanulatu*)

Alpine zone: heathgrass (*Danthonia cachemyriana*), Spikenard (*Nardostachys jatamansi*), katuka (*Picrorhiza kurroa*), Kunth (*Androsace globifera*), Arand (*Acontium heterophyllum*), Kashmir balsam (*Acontium balfourii*), Cushion Rock Jasmine (*Gentiana sp.*) and five fingers (*Potentilla sp.*)

Know Your Biodiversity:

Asian elephant is listed as *Endangered species* on the IUCN Red List. The species affected by the loss of their natural habitat due to the expanding human population. Since only males have tusks, poaching leads to extremely skewed sex ratios.



Right image: Asian Elephant
Shutterstock/Mogens Trolle

Jhilmil Jhil Conservation Reserve

The wetland (Jhil) is saucer shaped covering a total area of 37.83 km². It was India's first conservation reserve declared on declared on 14th August 2005 (10). The lower swamp areas are crucial habitat for Swamp Deer or Barasingha (*Rucervus duvaucelii duvaucelii*). The jhil shows a diversity of 18 species of mammals and 160 species of migratory birds. The area has four major type of naturalized plantations of Teak, Eucalyptus hybrid, Sheesham and Khair.

UTTARPRADESH

Hastinapur Wildlife Sanctuary

situated at 29°7' N to 78°4' E of Uttar Pradesh with an area of 2073 km² was declared a sanctuary in 1986⁽¹¹⁾. The area in compromises of a variety of landforms and mixture of different habitats such as wetland, marshes, dry sand beds and gently sloping ravines. The vegetation classifies into tall wet grasslands, dry short grasslands, scrubs and plantations. The wildlife sanctuary is suitable habitat of Swamp Deer⁽¹²⁾ (*Rucervus duvaucelii duvaucelii*). Sanctuary has been a locale to 180 species of birds and also witnesses a large congregation of migratory water birds visiting the area during winter.

Turtle Wildlife Sanctuary

located at 25°44'58.25"N, 83°17'21.24"E in Varanasi District that is 7 km stretch of Ganga River⁽¹³⁾ flowing from Varanasi city (Ramnagar Fort to Malviya Rail/Road Bridge). Sanctuary was declared to ensure the survival of turtles and revive the ecosystem as the species promote organic removal of half-burnt human corpses. A 'Turtle Rehabilitation Plan' was initiated, under which turtle breeding centers were set up in Sarnath (Varanasi) and Kukrail Forest (Lucknow).

Commonly found Fauna

Bengal Tiger (*Panthera tigris tigris*), Asiatic elephant (*Elephas maximus*), Jungle Cat (*Felis chaus*), Leopard (*Panthera pardus*), Goral (*Naemorhedus goral*), Striped Hyena (*Hyaena hyaena*), Indian Hare (*Lepus nigricollis*), Himalayan Black Bear (*Ursus thibetanus laniger*), Sloth Bear (*Melursus ursinus*), Jackal (*Canis aureus*), King Cobra (*Ophiophagus hannah*), Rhesus macaque (*Macaca mulatta*), Indian Porcupine (*Hystrix indica*), Monitor lizard (*Varanus bengalensis*)

Commonly found Fauna

Swamp Deer (*Rucervus duvaucelii duvaucelii*), Hog deer (*Axis porcinus*), Blackbuck (*Antelope cervicapra*), Nilgai (*Boselaphus tragocamelus*), wild boar (*Sus scrofa*), Golden jackal (*Canis aureus*), Jungle cat (*Felis chaus*) and Fishing cat (*Prionailurus viverrinus*), Asian Openbill (*Anastomus oscitans*), Sarus crane (*Grus antigone*), Indian Skimmer (*Rynchops albcollis*)

Commonly found Flora

Amaltas (*Cassia fistula*), Rohini (*Malolotus philippinensis*), Palash (*Butea monosperma*), Shisham (*Dalbergia sissoo*), Sal (*Shorea robusta*), Sandan (*Ougeinia Oojeinensis*), Khair (*Acacia catechu*), Arjun (*Terminalia arjuna*), Baans (*Dendrocalamus strictus*), Semul (*Bombax ceiba*), Chamaror (*Ehretia laevis*), Aonla (*Embllica officinalis*), Ber (*Ziziphus mauritiana*), Chilla (*Casearia tomentosa*), Bel (*Aegle Marmelos*), Kachnar (*Bauhienia variegata*)

Know History of Biodiversity:

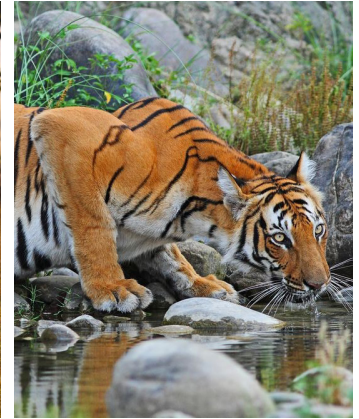
In Ancient Indian Art from 2500 B.C. (indus Period) to 4th century A.D. (Gupta period), aquatic animals are depicted along with wild animals, domestic animals and birds. The major aquatic animals seen in Ancient Indian art are;

1. Crab, 2. Crocodile, 3. Fish 4. Frog, 5. Turtle, and 6. Otter.

Things to Know:

Batagur kachuga is mainly a river turtle. The species is highly susceptible to major hydrological projects and their impacts on river flow dynamics and nesting beaches, and water pollution. It is very shy and human activities on and along the river probably are disturbing, with impact on thermal biology and fitness. Entanglement in fishing nets has a significant impact on subpopulations. Hunting for eggs and meat has stressed populations of this species.

Barasinghas are listed as an endangered species by the IUCN. Degradation of habitat, along with predation and hunting has brought barasinghas to low population levels.



Sarus Crane has been categorized as “vulnerable” under IUCN list. Cranes have been adversely affected by poaching and agriculture. Conserving as much natural wetlands as possible has been suggested as the best way to protect the crane.

Bengal tiger is Endangered under IUCN. Researchers estimate a 50% survival rate for young tigers. Tigers help regulate populations of their large herbivore prey, which put pressure on plant communities. Because of their role as top predators, they may be considered keystone species.

Samaspur Wildlife Sanctuary

located at 26°00'00"N and 81°25'00"E an area of 7.80 km² was declared as a bird Sanctuary in 1987. Sanctuary has been acknowledged as an 'Important Bird Area'⁽¹⁴⁾ site by Bombay Natural History Society while the wetland is included in the list of wetlands identified under National Wetland Conservation Programme of the Ministry of Environment, Forest & Climate Change. More than 250 species⁽¹⁵⁾ of birds have been recorded from the Sanctuary. Twelve species of fish have been reported from the lake at Samaspur. The lake provides a refuge to thousands of migratory waterfowl including Greylag geese, Northern pintail and Common teal and Northern shoveler. Approximately, fifty thousand water birds conglomerate this Sanctuary during winter's season in months of November to March⁽¹⁶⁾.

Surha Taal Wildlife Sanctuary

located in the Ballia District at 25°51' N 84°10'E with an area of 34.32 km². The narrow outlet of the wetland called 'Kathar Nala', about 23 km long, which links it with the River Ganga. The area was declared a bird sanctuary in the year 1991⁽¹⁴⁾. The lake supports rich fish fauna with 23 species of Cypriniformes along with 12 species of Siluriformes, three of Symbrachiformes, 13 of Perciformes, three species of Clupeiformes and one each of Tetraodontiformes and Beloniformes⁽¹⁵⁾. Four exotic species i.e. Cyprinus carpio, Aristichthys nobilis, Hypophthalmichthys molitrix and Ctenopharyngodon idella have also been recorded from the Sanctuary

GREENING GANGA : AFFORESTATION ALONG THE GANGA BASIN

Major Green Interventions under Forestry Program:

- Soil and moisture conservation works*
- Distribution of plant amongst farmers, villages and forest dwellers*
- Preparation of trenches/pits*
- Developing saplings and plants in nurseries*
- Public outreach activities including tree planting*
- Developing Eco parks along Ganga banks*

BIHAR

Bhimbandh Wildlife Sanctuary

located at 25°13'48"N, 86°16'48"E in Munger district of Bihar, from a distance of 7 km from the Ganga River (17). The area is famous for its hot springs with the Bhimbandh springs are the hottest, with a temperature of 52°C to 65°C, and provide ample opportunities for the exploration of geothermal energy potential. The Sanctuary has a forest cover of 681.99 km². The Sanctuary supports diverse mammalian fauna as Tiger (*Panthera tigris*), Leopard (*Panthera pardus*), Sloth bear (*Melursus ursinus*), Sambar (*Rusa unicolor*), Four-horned antelope (*Tetracerus quadricornis*) and Chital (*Axis axis*) have been recorded from the area

Vikramshila Gangetic Dolphin Wildlife Sanctuary

located at 25°17'23" N, 86°55'48" E, in Bihar for conservation of the Endangered Gangetic river dolphin (*Platanista gangetica*). The area was declared as a sanctuary in the year 1991⁽¹⁶⁾. Other important aquatic mammalian fauna includes the Vulnerable Indian smooth-coated otter (*Lutrogale perspicillata*). The Sanctuary is an 'Important Bird Area' that habitats hundreds of Indian skimmers (*Rynchops albicollis*), Pallas's fish eagle (*Haliaeetus leucoryphus*), Greater spotted eagle (*Clanga clanga*) and Lesser kestrel (*Falco naumanni*). Greater adjutant (*Leptoptilos dubius*) and Lesser adjutant (*Leptoptilos javanicus*).

JHARKHAND

Udhuwa or Udhwa Lake

located 24°59'37"N, 87°49'21"E and situated in the Sahebganj district of the state of Jharkhand(19). The Sanctuary has two water bodies i.e. Patauran (1.55 km²) and Berhale (4.10 km²), interconnected by a water channel. Records of eighty three species of both aquatic and terrestrial birds, including rarities like the Nordmann's greenshank or Spotted greenshank (*Tringa guttifer*). Near threatened Black-necked stork (*Ephippiorhynchus asiaticus*), Critically Endangered Oriental white-backed vulture (*Gyps bengalensis*), Lesser adjutant (*Leptoptilos javanicus*), Pallas's fish eagle (*Haliaeetus leucoryphus*), Oriental darter (*Anhinga melanogaster*) and Oriental white ibis (*Threskiornis melanocephalus*) have also been recorded from here(14). In addition twenty two species of fish have also been recorded.



Things to Know:

Ganges River dolphins are among the most endangered of all cetaceans. With rising human populations in Southern Asia, the natural habitat of Ganges River dolphins has been extensively modified and degraded. Agricultural and industrial discharges are polluting the river systems in which these dolphins live and feed. The accumulation of heavy metals and organo-chlorides is posing serious health risks to the animals.



Things to Know:

Indian white-backed vulture declines and is now listed as Critically Endangered. The reasons of threat are disease, pesticides, environmental contamination, poisoning, reduced food availability, calcium deficiency, reduced nesting habitat, nest predators, hunting, and aircraft strikes. They are important as a scavenger in the ecosystems in which they live.

WEST BENGAL

Bethuadahari Wildlife Sanctuary

situated in the Nakashipara area of Nadia District, West Bengal. With an area of 67 ha, it was recognized in 1980 to conserve the highly diverse Gangetic alluvial ecozone (19). The sanctuary is home to a large population of Spotted deer (*Axis axis*), Golden jackal (*Canis aureus indicus*), Bengal fox (*Vulpes bengalensis*), Porcupine (*Hystrix indica*) and Northern plains gray langur (*Semnopithecus entellus*). Beside mammalian fauna, the area supports various bird and reptilian species. The area also has a population of the Critically Endangered Gharial (*Gavialis gangeticus*) as its main attraction.

Sundarban Biosphere Reserve

the largest delta in the world and consists of 10,200 km² of mangrove forest. The expanse of spread over India is 4200 km². The Sunderban Biosphere Reserve is located at 21°10'46" N, 88°58'21" E. The areas include Sunderban Tiger Reserve, Sunderban National Park (core area), Halliday Island and Lothian Island Wildlife Sanctuaries with Sajnakhali Wildlife Sanctuary (buffer area). The area is also demarcated as UNESCO World Heritage site, an 'Important Bird Area'. Sunderban has extremely rich diversity of aquatic and terrestrial flora and fauna (20). Over 200 species of birds have been reported from the area including the rare Masked finfoot (*Heliopais personatus*). Sunderban also has the largest population of estuarine crocodile (*Crocodylus porosus*). The mangrove forests of Sunderban are home to Tiger (*Panthera tigris*), with perhaps the largest tiger population in the world



Things to Know:

Gharial is found in the northern part of the Indian subcontinent Indian and categorized as Critically Endangered (IUCN). The decline from an estimated 436 adult Indian gharials in 1997 to 182 in 2006 represents a 58% drop across their range. The biggest threat to them is habitat loss and disturbance caused by people clearing riparian areas for firewood or farmland or mining river banks for sand. Action groups such as the Gharial Multi-Task Force are working to avoid the extinction of this animal in the wild.



Things to Know:

Ganges shark (*Glyphis gangeticus*) is endemic to India. It inhabits the River Hooghly in West Bengal, as well as the rivers Ganges, Brahmaputra, Mahanadi in the states of Bihar, Assam and Orissa. It is amongst the twenty most threatened shark species and is categorized as a Critically Endangered species in the IUCN Redlist. The population is decreasing due to over fishing, habitat degradation, increasing river utilisation, and building of dams. Its fin and jaws are in high demand in the international trade, and is also fished by locals for its meat and oil.



Things to Know:

In India, a restocking program for Salt water crocodile was introduced and more than 1,400 saltwater crocodiles were released, with approximately 580 surviving. The population has now become moderately stable at around 1,000 total crocodiles in India. Habitat loss associated with coastal development and intensive hunting for hides has drastically reduced populations throughout much of the range. The Saltwater Crocodile has been thought of as one of the most intelligent and sophisticated of all reptiles. Their barks are a way of communicating with one another

JATAKA TALE



The Tortoise That Loved His Home Too Much.....

Once on a time, when Brahmadata was reigning in Benares, the Bodhisatta was born in a village as a potter's son. He plied the potter's trade, and had a wife and family to support.

At that time there lay a great natural lake close by the great river of Benares. When there was much water, river and lake were one; but when the water was low, they were apart. Now fish and tortoises know by instinct when the year will be rainy and when there will be a drought.

So at the time of our story the fish and tortoises which lived in that lake knew there would be a drought; and when the two were one water, they swam out of the lake into the river. But there was one tortoise that would not go into the river, because, said he, "here I was born, and here I have grown up, and here is my parents' home. Leave it I cannot!"

Then in the hot season the water all dried up. He dug a hole and buried himself, just in the place where the Bodhisatta was used to come for clay. There the Bodhisatta came to get some clay. With a big spade he dug down, until he cracked the tortoise's shell, turning him out on the ground as though he were a large piece of clay. In his agony the creature thought, "Here I am, dying, all because I was too fond of my home to leave it!" And in the words of these following verses, he made his moan:

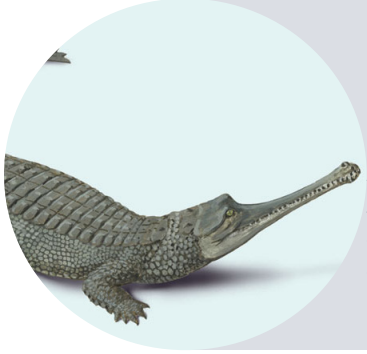
*Here was I born, and here I lived; my refuge was the clay;
And now the clay has played me false in a most grievous way;
Thee, thee I call, oh Bhaggava; hear what I have to say!
Go where thou canst find happiness, where'er the place may be;
Forest or village, there the wise both home and birthplace see;
Go where there's life; nor stay at home for death to master thee.*

So he went on and on, talking to the Bodhisatta, until he died. The Bodhisatta picked him up, and collecting all the villagers addressed them thus: "Look at this tortoise. When the other fish and tortoises went into the great river, he was too fond of home to go with them, and buried himself in the place where I get my clay. Then as I was digging for clay, I broke his shell with my big spade, and turned him out on the ground in the belief that he was a large lump of clay. Then he called to mind what he had done, lamented his fate in two verses of poetry, and expired.

So you see he came to his end because he was too fond of his home. Take care not to be like this tortoise. Don't say to yourselves, 'I have sight, I have hearing, I have smell, I have taste, I have touch, I have a son, I have a daughter, I have numbers of men and maids for my service, I have precious gold.' Do not cleave to these things with craving and desire. Each being passes through three stages of existence."

Thus did he exhort the crowd with all a Buddha's skill. The discourse was bruited abroad all over India, and for full seven thousand years it was remembered. All the crowd abode by his exhortation, and gave alms, and did good until at last they went to swell the hosts of heaven.

ECOSYSTEM ROLES OF BIO-DIVERSITY ALONG THE GANGES



Indian gharials are important predators of fish. Unfortunately the numbers of gharials are now so low that their effects on the ecosystem may not be significant

Mugger Crocodile are important for maintenance of the structure and function of fresh water ecosystems since they are a apex predator and keystone species affecting all of the animals below them in the food chain.



Turtles are also known as bioengineers of aquatic system. They help seed dispersal and river bed sand regulation. Painted terrapins eat a variety of plant materials in their habitat. The turtles in general are scavengers and can patrol the organic garbage like eating up dead fish from lakes and rivers. Chitra indica has also been known to feed on carrion and dead carcasses. The turtles and its eggs also provide food for other predators. The soft-shelled turtles may limit the growth of populations of its prey, which includes fish, amphibians, insects, and some crustaceans.





They control primary production in aquatic ecosystems through direct consumption and nutrient cycling making them secondary consumers of the food chain. They are also regarded as indicators Good Indicators of ecological functioning.

Amphibians can affect ecosystem structure through soil burrowing and aquatic bioturbation and ecosystem functions such as decomposition and nutrient cycling through waste excretion and indirectly through predatory changes in the food web.



Removing amphibians from a particular habitat can affect drastically algae communities, invertebrate populations, predator dynamics, leaf litter decompositions, and nutrient cycling.



Dudhwa Reed Frog: This species is currently known only from the type locality of Dudhwa National Park in Uttar Pradesh, India.

Himalaya Paa Frog: This species is restricted to northwestern India and northern Pakistan found elevations of 2,000-3,000m.



Tytler's Pond Frog: The species is found in bank side vegetation, and within scrubland and tropical forest habitats throughout eastern Ganga Region.





Fish communities can regulate the carbon-fixing capacity of nutrient-rich lakes, and thus, mediate the fluctuation of carbon between a lake and the atmosphere.

Bioturbation (the physical disturbance of sediment associated with foraging or burrowing activities by consumers), fishes can modify the structure of bottom conditions in rivers and lakes.



Fish generate a large number of services related to their movement patterns, including daily, seasonal, and yearly migration patterns in lakes, rivers, estuaries, and oceans. Fish that are consumed also transport nutrients across spatial boundaries and thereby link different ecosystems.

Fish communities, and specific species, are excellent indicators of biological and ecological integrity due to their continuous exposure to water conditions. Fishes display a group of biotic responses, such as changes in growth, distribution and abundance related to water pollution, critical habitat degradation, eutrophication, organic enrichment, chemical toxicity, thermal changes and food availability





Smooth-coated otters impact aquatic vertebrate and invertebrate communities via predation.

The role of small clawed otter in the ecosystem is not well understood. They impact the populations of shellfish and crustaceans in their area.

They play pivotal role in river ecosystems. They are predators, meaning they help control the populations of food species they prey upon. This affects the ecosystem as a whole, and as a result, their presence is a signal that the ecosystem is healthy.

Ganges River dolphins are top predators in their river ecosystems. They are important in controlling and maintaining healthy fish and crustacean populations, their primary sources of food.



Source(Clockwise):

1. Shutterstock/S.B. stock
2. Shutterstock/Abhishekmittal
3. Shutterstock/Balajishrinivasan
4. Shutterstock/Niteenrk
5. Shutterstock/Chai_B

THEARTS TO OF BIO-DIVERSITY ALONG THE GANGES

Many factors disturbing the ecological integrity of National River Ganga have been recognized through GRBMP studies [IITC, 2014]. Seven critical factors that are elevated due to anthropogenic actions are described below.

1. Habitat Fragmentation: Over the past two centuries, the Ganga river network has been considerably fragmented by dams and barrages. These obstructions slice the rivers into pieces, thereby interrupting the flow of water, nutrient, sediments and aquatic species in the rivers. Needless to say, the innumerable intercepts on the Ganga river network have fragmented the once unified river habitat into disjointed ecological stretches.

CASE STUDY

In the Upper Ganga Basin, the obstructions comprise several run-of-the-river (ROR) hydroelectric projects in the Bhagirathi and Alaknanda head streams. In addition to these, a cascade of six additional dams on River Alaknanda and four on River Bhagirathi are under construction, while numerous other projects on these rivers have been proposed. Many of these projects are planned end to end, i.e. the tail waters of one project are head waters of the next one. Thus, long stretches of rivers between dams and tail-water releases are almost devoid of water. Overall, an estimated 86 km length of River Bhagirathi is thus without any flow whatsoever. Besides, sediments get trapped behind the dams, thereby disrupting the downstream river's water-sediment balance and affecting nutrient flow and fertility of the downstream river. Downstream of the hydroelectric projects in the Bhagirathi and Alaknanda basins, the Pashulok barrage on River Ganga near Rishikesh diverts nearly all the dry-weather flow of main Ganga River into the power channel of Chilla Power Station. The tail water of this power station joins the Ganga river near Bhoopatwala. Thus, a distance of about 15 km from Pashulok barrage to the junction of the tail waters with the river has no flow. Further downstream, Bhimgauda Barrage, Madhya Ganga Barrage and Narora Barrage intersect the river successively to divert water to the Upper, Middle and Lower Ganga Canals. Further downstream, Rivrrage in West Bengal, which diverts part of the flow into a canal to feed the Bhagirathi-Hooghly river.

[Rajvanshi, 2012; SANDRP, 2012, NIH, 2014]

2. Habitat Shrinkage: Large anthropogenic water abstractions are being effected from the Ganga River Network all over the basin, thereby considerably shrinking the aquatic space of river species. The additional sub-surface outflows and reduced base flows of the rivers due to amplified groundwater pumping in the basin, the contraction of the riverine habitat over the past one-and-a-half centuries is likely to have been grievous for the biodiversity-rich Ganga river that existed earlier.

CASE STUDY

The dams and barrages on the rivers are used to divert river flows, which includes the Tehri reservoir that supplies significant amounts of River Bhagirathi's water for urban needs. Then, after the start of the main stem of River Ganga, the Bhimgauda Barrage diverts nearly all the river water to the Upper Ganga Canal (having head discharge capacity of about 300 cu.m/s) at Haridwar. The flow diverted into the Upper Ganga Canal is regulated at Mayapur head works. During lean seasons, only a little water is led back into the Ganga River downstream at Kankhal, with the stretch from Haridwar to Kankhal being nearly dry. Thus, even after the confluence with River Yamuna near Allahabad, the Ganga river flow is slow and significantly less than what it was a century or two ago. These activities lead to the local extinction of the Gangetic Dolphin from the Middle Ganga Stretch up to Allahabad may also be due to the diminished dry season flows in this stretch. [IITC, 2012a; Sinha et al., 2010; UPID-FAO, 2008]

[Rajvanshi, 2012; SANDRP, 2012, NIH, 2014].

3. Habitat Alterations: Unrestrained gravel and sand mining from river beds combined with the dumping of construction wastes in rivers have altered river forms, drastically in places, besides also probably contributing to river pollution. Other alterations include those caused by manmade structures such as river constriction through levees, embankments, guide walls and even bridges. Many of these alterations in river morphologies adversely affect benthic flora and fauna, fish breeding sites and the egg laying sites of soft and hard shell turtles.

CASE STUDY

Bridges are generally considered, but ill-designed bridges can interrupt the natural flow pattern, e.g. as reported for bridges on River Mandakini in Chitrakoot, M.P. One of the bridges is the exclusive property of a RSS-affiliated institution, Deen Dayal Shodh Sansthan. The second bridge over the Mandakini has been built by a BJP leader Arun Mishra and a retired cop, Bhanuprasad Singh. The third structure is owned by self-styled spiritual guru. The first bridge is partially open to pilgrims but the other two are for personal use, said RTI activist Nityanand Mishra, who is leading the fight against the environmental pillage. He has moved the green tribunal and demanded removal of encroachments. Rampant illegal mining at the Mandakini catchment area and around the Mokamgarh Mountains is disturbing the ecological balance of Chitrakoot, which draws more than 50 lakh pilgrims annually.

[Mishra,

2013]

4. Habitat Pollution: the discharge of treated and untreated municipal wastes from many Class I and Class II towns of NRGB in the river is rampant, resulting in high levels of organic pollutants and pathogens (like fecal coliforms) and probably some emerging pollutants. Added to these are untreated or semi-treated industrial wastes from various manufacturing units. The high levels of such pollutants in the river have their own fatal effects on river biota.

CASE STUDY

In 1985, M.C. Mehta filed a writ petition in the nature of mandamus to prevent these leather tanneries from disposing of the domestic and industrial waste and effluents in the Ganga River. The Supreme Court bifurcated this writ petition into two parts known as Mehta I and Mehta II. Mehta I [M.C. Mehta v. Union of India, [1987] 4 SCC 463]: In this petition, the petitioner requested the court to request the Supreme Court (the Court) to restrain the respondents from releasing effluents into the Ganga river till the time they incorporate certain treatment plants for the treatment of toxic effluents to arrest water pollution. The Committee noted that the leather industry is one of the significant industries besides paper and textiles consuming large quantities of water. Most of the water used is discharged as wastewater. The wastewater contains toxic substances that deplete the Oxygen content of the clean river water in which they are discharged. This results in the death of aquatic life and emanates foul odor.

<http://lawtimesjournal.in/m-c-mehta-v-union-of-india-ganga-pollution-case/>

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5. Habitat Invasion by Alien Species: Invasion of ecosystems by alien species can transpire only after their introduction into the ecosystem, which is often anthropogenic.

But, even after their introduction, alien species have to surpass the native species in the ecosystem. Often, this competitive benefit in river ecosystems accrue from manmade changes in rivers to which indigenous variety are not well adapted.

CASE STUDY

Exotic species of fish, notably the Common Carp (Cyprinus carpio) and Tilapia (Oreochromis niloticus), have invaded River Ganga's waters downstream of Allahabad, after having swamped the Yamuna river. Downstream of Allahabad they have greatly populated the river, largely displacing Indian Major Carps (IMC) and other indigenous fishes of River Ganga. In all, seven species of exotic fish have been reported in river Ganga including the Thai magur, (Clarias gariepinus) and Grass carp (Ctenopharyngodon idella). But it is not only the middle and lower reaches that have been invaded. The sighting of another exotic fish – the brown trout (Salmo trutta fario) downstream of Jhalai is an important signal of the presence of invasive species reaching up to Bhagirath.

[Leprieur et al., 2008]

6. Habitat Encroachment: The encroachments have become extensive with widespread construction activities on floodplains and even farming on river beds during lean flow seasons. On the one hand, the increased constructions on flood plains have led to altered runoff patterns into rivers, increased pollution inflows with runoff, reduced groundwater recharge and, hence, decreased base flows in rivers, and curtailed ecological linkages between the river, its floodplains, and floodplain wetlands.

CASE STUDY

Power plant on the banks of the Pandu River, a Ganges tributary near the city of Kanpur, burns 600,000 tons of coal each year and produces 210,000 tons of fly ash. The ash is dumped into ponds from which slurry is filtered, mixed with domestic wastewater, and then released into the Pandu River. Fly ash contains toxic heavy metals such as lead and copper. The amount of parts per million of copper released in the Pandu before it even reaches the Ganges is thousand times higher than what is there in the uncontaminated water. The city of Varanasi, levels of fecal coliform bacteria from human waste in the river. A heavy concentration of human beings releases around 200 million liters of untreated human sewage into the river each day, leading to large concentrations of fecal coliform bacteria.

[Hans, 1999]

7. Habitat Malnutrition: The reverse phenomenon of anthropogenic nutrient deprivation in the river has received little attention. The general notion of anthropogenic effects on nutrient concentrations in rivers is that of nutrient enrichment, i.e. increased concentrations of nitrogen (N), phosphorous (P) and other nutritional elements commonly present in agricultural, domestic and industrial wastewaters. But the opposite phenomenon of nutrient depletion is often overlooked. Thus, the effect of dams on nutrient availability in downstream reaches of rivers is of obvious significance. While macronutrients like N and P may actually get compensated (or even more than compensated) due to their increased influx from anthropogenic wastewaters, the same may not be true of the many essential micronutrients if their main supplier to the river ecosystem are sediments from upland reaches.

CASE STUDY

Effects of the Three Gorges Dam on phosphorus depletion in MLY (i.e. Middle and Lower Yangtze River) deserve mention. The study is relevant not only for its quantification of P deprivation due to the Three Gorges Dam, but also because – like National River Ganga – the Yangtze river of China (originating from Tibetan glaciers) also carries significant upland sediments with its flow. Now, until major dam constructions begun on River Yangtze in the 1990s, the river discharged about 940 km³ /yr water and 478 Mt/yr of sediment into the East Sea. The MLY stretch (below the Three Gorges Dam) up to the estuary is about 2,000 km long but gets very little sediment added in the MLY reach. The Three Gorges Project (with several large dams constructed in the upland river basin) began operating since 2003.

Study reveals that by 2011 (i.e. within 10 years of operation of the Three Gorges Project) the total sediment load in MLY reduced to only 6% of its previous long-term average (thereby resulting in extensive scouring of the river channel), while nutrient-rich fine sediment load reduced to only 8% of its long-term average. As a result, the Total P and Particulate P loads delivered to the MLY reduced to only 23% and 16.5% of their long-term averages. Now P had already been a limiting nutrient for the Yangtze River's bioactivity, hence its further reduction was a matter of grave concern.

The study concluded that when P is trapped with sediment in upstream reservoirs and depleted from riverbed re-suspension, the nutrient regime in the MLY is altered. Extremely high and further elevated ratios of nitrogen to P can reduce the bioproductivity and promote unusual algal blooms in downstream waters.

Zhou et al. [2013]

8. Habitat Disturbances: Frequent disturbances of the Ganga river habitat by humans have received little attention, but this is a definitive threat to riverine creatures. In particular, dredging and plying of noisy ships, frequent or intermittent dredging of the river bed. These activities are harmful they disrupts not only the benthic and hyporheic flora and fauna, but also aquatic animals that depend on the river bed and bank sediments for spawning, shelter, scavenging or other needs.

CASE STUDY

Plastic pollution from discarded fishing gear in the Ganga River poses a threat to wildlife such as the critically endangered three-striped roofed turtle and the endangered Ganga river dolphin, according to an international team, including researchers from the Wildlife Institute of India. The researchers noted that fishing nets – all made of plastic – were the most common type of gear found. The researchers used a list of 21 river species of "conservation concern" identified by the Wildlife Institute of India in Uttarakhand. They combined existing information on entanglements of similar species worldwide with the new data on levels of waste fishing gear in the Ganga to estimate which species are most at risk.

<https://www.ndtv.com/india-news/plastic-pollution-from-discarded-fishing-gearthreatens-ganga-wildlife-study-2332046>

Ganga Biodiversity Projects

1. Biodiversity Conservation and Ganga Rejuvenation: Wildlife Institute of India, Dehra Dun, forms an integral part NMCG's vision for Ganga Rejuvenation by restoring Ganga's ecological integrity. It is being acknowledged that a successful river restoration project should be based on the ecological character of a healthy river that includes the aquatic biota as good indicators of river health. River restoration projects aim to maintain or increase ecosystem goods and services and biodiversity value while protecting downstream and coastal ecosystems. The main aim of this project thus is to develop a science-based aquatic species restoration plan for Ganga River by involving multiple stakeholders.

2. Saving the Ganges river dolphin: This project aims to enhance the conservation of the endemic and endangered Ganges river dolphin (*Platanista gangetica*) in Kailali District through the engagement of local communities in citizen science-based data collection and livelihood enhancement. Simultaneously, policymakers will be lobbied to develop effective dolphin conservation policies. Project partners will engage experts and stakeholders in Nepal and India to work together to develop a bi-national Ganges River Dolphin Trans-boundary Conservation Action Plan, which is essential to the long-term conservation of the migratory species.

(<https://www.iucn.org/asia/countries/nepal/saving-ganges-river-dolphin>)

3. Turning Turtle: There are 13 species of freshwater turtles identified in the Upper Ganga River, of which WWF-India is working towards conserving three species. WWF-India initiated turtle conservation in Uttar Pradesh in collaboration with State Forest Department, District Administration, local communities and experts in 2012. Freshwater turtles prefer to nest and bask on the river banks, thus the riverbed farmers have regularly sited turtles in their agricultural land and river banks.

Through WWF-India's community-led conservation initiatives the farmers have now become active care-takers of turtles nests found in their fields and river banks. Mitra- friends of the river, are the result of an idea initiated by WWF-India. Today there are approx. 4,000 individuals who call themselves Ganga/ Ramganga Mitras. A diverse group of self-motivated individuals who have come forward to protect rivers and the biodiversity it homes, like the turtles.

(https://www.wwfindia.org/news_facts/feature_stories/turning_to_turtle/)

SHORT NOTES:

On October 5, 2009, the then PM declared the Gangetic river dolphin as the national aquatic animal. A notification was issued by the MoEFCC the following year. Now, the National Mission for Clean Ganga celebrates October 5 as National Ganga River Dolphin Day.

2,808 turtles have been nurtured and released in the River Ganga and Ramganga in December, 2018. Mitras participate in monitoring changes, taking positive action for river health and influencing policy makers.

Wildlife Institute of India (WII) in the second phase of its survey of the entire main stem of the Ganga river (the main river without its tributaries), has found that 49 per cent of the river has high biodiversity and that biodiversity sightings, including of the Gangetic Dolphin and otters, have increased in the river. Scientists at the institute say that this indicates reducing pollution levels and a healthier state of the river.

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