

Cleanliness drives to make Rivers Plastic Free



PLANNING AND MANAGEMENT FOR AQUATIC SPECIES CONSERVATION AND MAINTENANCE OF ECOSYSTEM SERVICES IN THE GANGA RIVER BASIN FOR A CLEAN GANGA

Report

Flowing Towards a Plastic-Free Future:
Cleanliness drives to make Rivers Plastic Free

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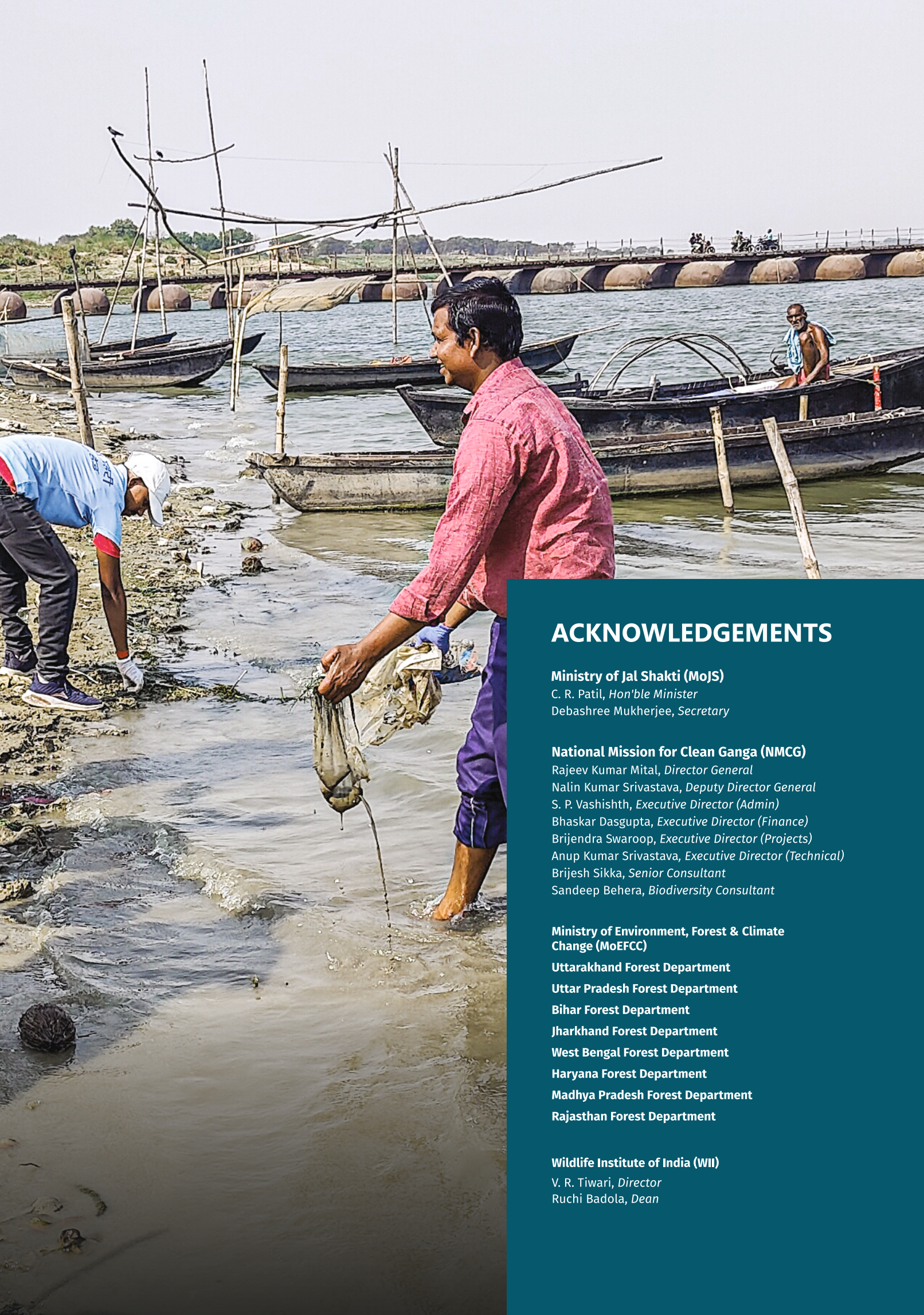
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INTRODUCTION

Ganga River often referred to as the lifeline of India, holds immense cultural, religious, and economic significance for millions. Flowing more than 2,500 Kms from the Himalaya to the Bay of Bengal, the Ganga and its tributaries sustain an array ecosystems and serve as a crucial water source for agricultural, industrial, and domestic needs. However, this revered river is under severe threat from plastic pollution, a burgeoning environmental crisis with far-reaching implications. Plastic waste, encompassing everything from single-use plastic bags and bottles to microplastics, has infiltrated the Ganga's waters, severely compromising its health and well-being. The problem is exacerbated by rapid urbanization, inadequate waste management infrastructure, and the widespread use of plastic in religious, cultural and day to day activities. Consequently, significant amounts of plastic debris are carelessly discarded into the river, where they get accumulated. This situation is even grave in the aquatic life, with species accidentally ingesting plastic particles, subsequently leading to injury, poisoning, and at times death of the individual. The detrimental effects of plastic pollution in the rivers are not only confined to environmental degradation but also extend to economic and social dimensions, affecting livelihoods dependent on the river.

In response to these pressing challenges, the Wildlife Institute of India (WII), a knowledge partner institute to the National Mission for Clean Ganga (NMCG), and the Social Development for Communities (SDC) Foundation, Dehradun, Uttarakhand joined hands on this World Environment Day to curtail the plastic contribution into river Ganga and its major tributaries by organizing one week long cleanliness drive under the NMCG-WII phase II programmes "Planning and Management for Aquatic Species Conservation and Maintenance of Ecosystem Services in the Ganga River Basin for a Clean Ganga" and "Jalaj - Connecting River and People to Realize Arth Ganga" implementing multifaceted approach involving segregated plastic waste management practices, community engagement, and innovative technological solutions.

World Environment Day 2024 themed on "Land Restoration, Desertification, and Drought Resilience," is intricately connected with the urgent need to tackle plastic pollution and enhance waste management. As desertification and drought threaten arable lands and water supplies, the accumulation of plastic waste exacerbates these challenges by contaminating soil and water resources,

further degrading ecosystems. Effective plastic pollution management is essential for restoring degraded lands and maintaining soil health, crucial for agricultural productivity and biodiversity. By integrating sustainable land management practices with robust plastic waste reduction and recycling initiatives, we can rehabilitate barren landscapes, mitigate the impacts of drought, and build resilient communities. This holistic approach underscores the importance of addressing both land degradation and plastic pollution to promote a healthier, more sustainable planet capable of withstanding climate-related challenges.

WII under the mentioned projects organised a week-long cleanliness drive along 18 rivers in 46 districts of nine (N=9) Ganga River basin states namely, Himachal Pradesh, Haryana, Rajasthan, Madhya Pradesh, Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal from the 16th to 21st May, 2024. More than 970 people including stakeholders (Fig. 1) such as Local communities, Ganga Praharis, Educational institutions, Forest Department, Panchayati Raj etc. participated in the campaign at 60 select locations (Table 1).

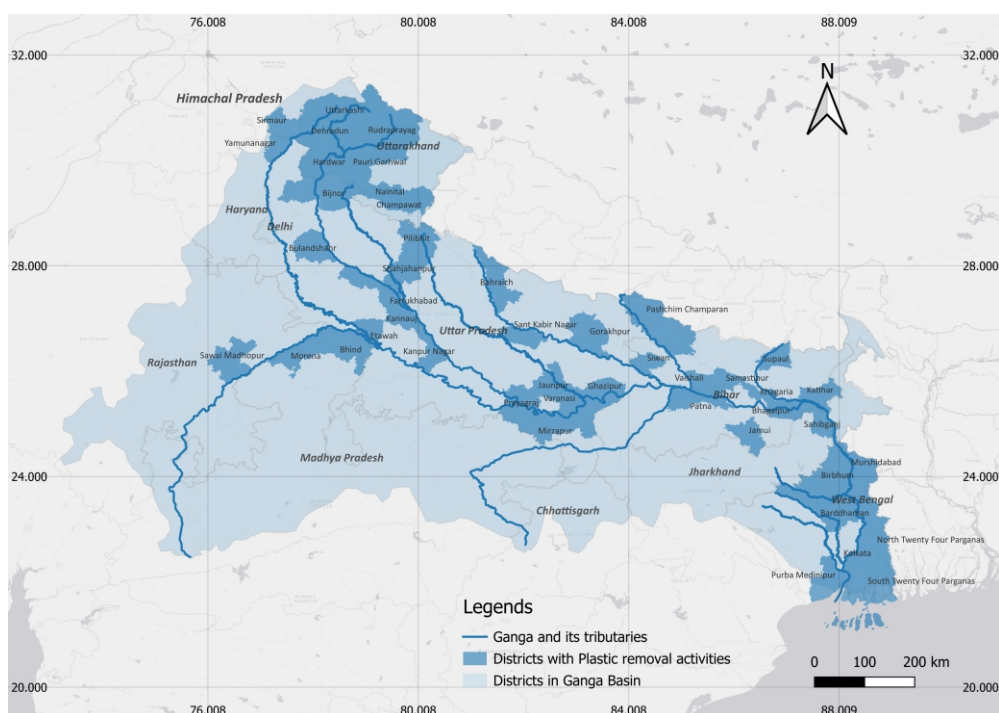


Table 1: Details of campaigning site along the Ganga River Basin

State	District	Place	Total No. of Participants	Stakeholders	River
Uttarakhand	Chamoli	Joshimath	28	Local Community and Ganga Prahari	Alaknanda
	Champawat	Kanda and Simalta	33	Local Community, Educational Institution and Bal Ganga Prahari	Benigad
	Haridwar	Chandighat	9	Local Community and Ganga Prahari	Ganga
	Rudraprayag	Ratura	13	Local Community and Ganga Prahari	Alaknanda
	Tehri	Tiwad	10	Local Community and Ganga Prahari	Bhagirathi
	Uttarkashi	Hina Bridge	16	Ganga Prahari	Bhagirathi
Uttar Pradesh	Ayodhya	Dhannipur	20	Local Community and Ganga Prahari	Ghaghara
	Bulandshahr	Gandhi Ghat	22	Local Community, Ganga Prahari and Bal Ganga Prahari	Ganga
	Chandauli	Tandakala Ganga Ghat	24	Local Community, Local Business, Ganga Prahari and Bal Ganga Prahari	Ganga
	Etawah	Raniya	24	Local Community and Ganga Prahari	Yamuna
	Farrukhabad	Panchal Ghat	15	Local Community, Fishermen, Religious Group, Ganga Prahari	Ganga
	Ghazipur	Barah Ji Ghat	22	Local Community, Bal Ganga Prahari, Ganga Prahari	Ganga
	Gorakhpur	Ram Ghat	15	Local Community, Fishermen, Ganga Prahari	Rapti
	Jaunpur	Barah Ghat Ramgarh	28	Local Community, Bal Ganga Prahari, Ganga Prahari	Gomti
	Kannauj	Mahadevi Ghat	15	Ganga Prahari	Ganga
	Kanpur	Paramath Ganga Ghat	14	Ganga Prahari	Ganga
	Kashganj	Kachhala Ghat	15	Local Community, Ganga Prahari	Ganga
	Mirzapur	Vindhyachal	21	Local Community, Ganga Prahari	Ganga

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State	District	Place	Total No. of Participants	Stakeholders	River
	Muzaffarnagar	Ganga ghat shukartal	18	Local Community, Ganga Prahari	Ganga
	Pilibhit	Triveni Ghat	40	Local Community, Ganga Prahari	Gomti
	Prayagraj	Sangam	22	Local Community, Ganga Prahari	Ganga and Yamuna
	Sahjhanpur	Raghunathpur	15	Local Community, Ganga Prahari	Ram Ganga
	Sant Kabir Nagar	Dhodhya	21	Local Community, Fishermen, Bal Ganga Prahari	Rapti
	Varanasi	Rajghat	24	Local Community, Ganga Prahari	Ganga
	Bijnor	Chaudhary Charan Singh Madhya ganga barrage	32	Local Community, Ganga Prahari	
Bihar	Bhagalpur	Kadwa, Ismilepur, Sidhi Ghat and Kali Ghat	66	Local Community, Fishermen, Panchayati Raj, Ganga Prahari	Kosi
	East Champaran	Nagdaha	7	Local Community, Ganga Prahari	Gandak
	Jamui	Nagi-Nakti bird sanctuary	8	Ganga Prahari	Kiul
	Katihar	Ganga- Kosi sangam	7	Local Community, Ganga Prahari	Ganga and Kosi
	Khagaria	Siswa	20	Local Community, Ganga Prahari	Kosi
	Patna	Kangan Ghat	13	Local Community, Ganga Prahari	Ganga
	Samastipur	Sidhi Ghat and Baba Bakanath Ghat	34	Local Community, Bal Ganga Prahari, Ganga Prahari	Ganga
	Siwan	Rakauli	8	Local Community, Ganga Prahari	Ghaghara
	Supaul	Atal Kosi Maha Setu	7	Local Community, Ganga Prahari	Kosi
	Vaishali	Konhara Ghat and Loa	30	Local Community, Ganga Prahari	Ganga
Jharkhand	West Champaran	Kali Ghat and Sonaha Ghat	21	Local Community, Forest Department, Bal Ganga Prahari, Ganga Prahari	Gadak
	Sahibganj	Maskalaiya, Ghatjamni, Kanhaiya Sthan, Udhwa Bird Sanctuary	57	Local Community, Forest Department, Ganga Prahari	Ganga
West Bengal	Birbhum	Bank of Kopai	23	Local Community, Ganga Prahari	Kopai
	Kolkata	Alipore Zoological Garden	20	Local Community, Ganga Prahari	Hooghly
	Murshidabad	Farakka Tal Ghat	13	Local Community, Ganga Prahari	Hooghly
	Nadia and Hooghly	Mayapur and Nayachar	23	Local Community, Ganga Prahari	Bhagirathi
	Purba Medinipur	Jalaj Amnay	51	Local Community, Fishermen, Local Business, Religious Group, Bal Ganga Prahari, Ganga Prahari	Keleghai
	South 24 Parganas	Pakhirala, Beguakhali and Diamond Harabour	23	Local Community, Ganga Prahari	Datta and Hooghly

State	District	Place	Total No. of Participants	Stakeholders	River
Himachal Pradesh	Sirmaur	Sataun and Rampur Ghat	43	Local Community and Ganga Prahari	Giri and Yamuna
Haryana	Yamuna Nagar	Tajewala	17	Local Community and Ganga Prahari	Yamuna
Madhya Pradesh	Bhind, Morena	Barhi bridge, Rajghat	7	Educational Institute and Ganga Prahari	Chambal
Rajasthan	Sawai Madhopur	Palighat	5	Local Community, Forest Department and Ganga Prahari	Chambal

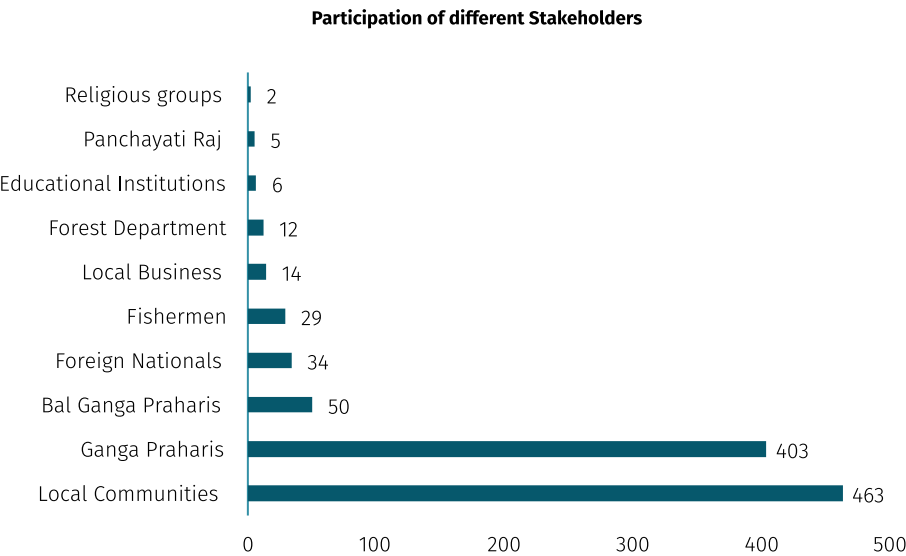


Figure 1: Participation of different Stakeholders

The campaign was undertaken in the vicinity of ecologically sensitive pockets of the Ganga River basin namely; Bakhira Wetland (Uttar Pradesh), Nagi Nakti Bird Sanctuary (Bihar) and Udhwa Lake Bird Sanctury (Jharkhand) holding immense ecological as well as economic importance. A few more sites such as Pakhirala in South 24 Parganas district of West Bengal, Chaudhary Charan Singh Madhya Ganga Barrage near Bijnor, Uttar Pradesh, Kanda and Simalta villages in Champawat district, Uttarakhand, Barhi Bridge in Bhind, Rajasthan and Palighat in Rajasthan holds significant importance as all them are in close proximity to Protected Area (PAs) viz. Sundarban Tiger Reserve, Haiderpur Wetland, Nandhaur Wildlife Sanctuary, Rajaji National Park and National Chambal Sanctuary respectively which all have momentous ecological significance.

The SDC Foundation, an environmental action and advocacy group, aims to build a resilient future for the Himalayan state of Uttarakhand. By strategically emphasizing climate resilience, promoting a circular economy via waste management, and encouraging sustainable urbanization, the foundation diligently works to preserve the region's natural beauty while nurturing vibrant and self-sustaining communities. They have also partnered with the Dehradun Cantonment Board and the Indian Institute of Petroleum (IIP), a CSIR institute, to strategically recycle the plastics categorically by making reusable products or sustainable, environment friendly fuel alternatives.

The WII-NMCG Phase II project and the Jalaj project are pivotal initiatives aimed at revitalizing the Ganga River ecosystem and promoting biodiversity conservation. The WII-NMCG Phase II project, led by the Wildlife Institute of India (WII) in collaboration with the National Mission for Clean Ganga (NMCG), focuses on ecological monitoring, habitat restoration, and the conservation of endangered species such as the Gangetic dolphin. Complementing this, the Jalaj project, an innovative component of the NMCG, emphasizes community-based approaches to environmental stewardship. It involves creating livelihood opportunities through sustainable tourism and river-based activities, fostering a sense of ownership among local communities in preserving the river's health. Together, these initiatives integrate scientific research, community engagement, and sustainable practices to enhance the ecological integrity of the Ganga and ensure long-term environmental and socio-economic benefits.

CAMPAIGNING SITES ON FLOWING TOWARDS A PLASTIC FREE FUTURE

UTTARAKHAND

7 Sites

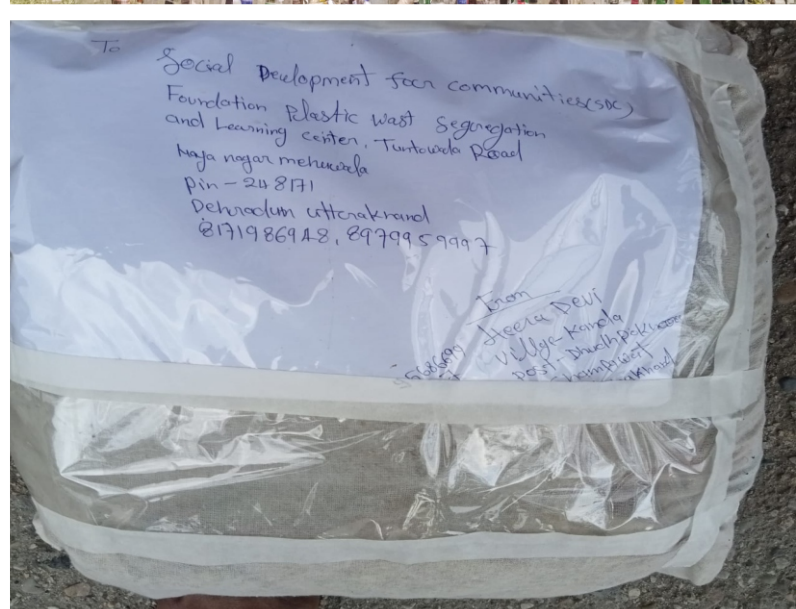
4 Rivers Covered

**More than
100 participants**

Ganga Praharis along with other local communities' members organized plastic free campaign in six districts of Uttarakhand. Seven (N=7) different sites along Alaknanda, Bhagirathi, Benigad and Ganga rivers were chosen for the campaign where more than 100 people participated actively for the cleanliness drive. During the programme, locals were sensitized about the ill-effects of different type of plastics and were also motivated to discourage the use of plastic in their day-to-day life.



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UTTAR PRADESH

19 Sites

6 Rivers Covered

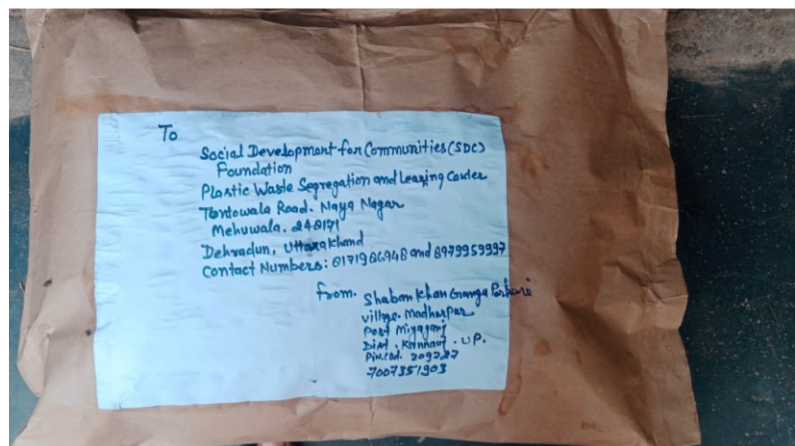
More than

400 participants

A series of campaign were organized in 19 sites in different districts along six (N=6) rivers namely; Ganga, Yamuna, Ghaghara, Gomti, Ramganga and Rapti. Around 400 participants participated in the events who were informed about the practical ways to reduce single-use plastics and were also introduced to concept of eco-bricks and sustainable alternate fuel made from recyclable plastics. They were also encouraged to adopt sustainable practices and alternate resources to reduce the use of plastics in their daily life and contribute in the aquatic biodiversity conservation.



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BIHAR AND JHARKHAND

20 Sites

5 Rivers Covered

**More than
270 participants**

In Bihar and Jharkhand, plastic waste collection campaign was organized in 20 different sites in 12 districts along five (N=5) major rivers viz. Ganga, Gandak, Kosi, Ghaghara and Kiul. A total of 270 participants including Ganga Praharis, State Forest Departments, fishermen, members of Panchayati Raj and local communities participated in the campaign and took forward the message on the ill-effects of single-use plastics on the aquatic environment. Ganga Praharis also sensitized the local community members and motivated them to adopt sustainable livelihood practices and refrain from using plastics to ensure a cleaner and healthier environment.



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WEST BENGAL

9 Sites

5 Rivers Covered

**More than
130 participants**

A total of 130 participants, along with Ganga Praharis, conducted cleanliness drives in five districts of West Bengal. Total of nine (N= 9) different sites were covered during the campaign along five major rivers viz. Bhagirathi, Hooghly, Kopai, Datta and Keleghai. The Ganga Praharis spearheaded the drive and amplified the importance of aquatic biodiversity conservation as well as the adverse effects of single-use plastic on aquatic environment to the local communities. They also inspired the locals to lean on to sustainable alternatives of plastic products to curb the adverse effects of plastics into the aquatic ecosystems.



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HIMACHAL PRADESH, HARYANA, RAJASTHAN, AND MADHYA PRADESH

6 Sites

3 Rivers Covered

**More than
70 participants**

A total of six (N=6) sites were covered during the campaign along Yamuna, Giri and Chambal rivers in which more than 70 participants, including; Ganga Praharis, Forest Department officials and local community actively took part. During the programme, the Ganga Praharis sensitized local communities on sustainable and reusable plastic alternatives to curtail the use of single-use plastics for a safer environment.



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OUTPUT AND IMPACT OF THE CAMPAIGN

A total of 72.2 kg plastic was collected at 60 different sites spread across the Ganga River Basin of which Multi-Layer Plastic (MLP) contributed the most (45.5 kg) followed by Banners & Bags (14.5 kg and 6.7 kg respectively). Low Density Plastics (LDP) were found to be least contributing in the entire collection only amounting 5.5 kg (Fig. 2).

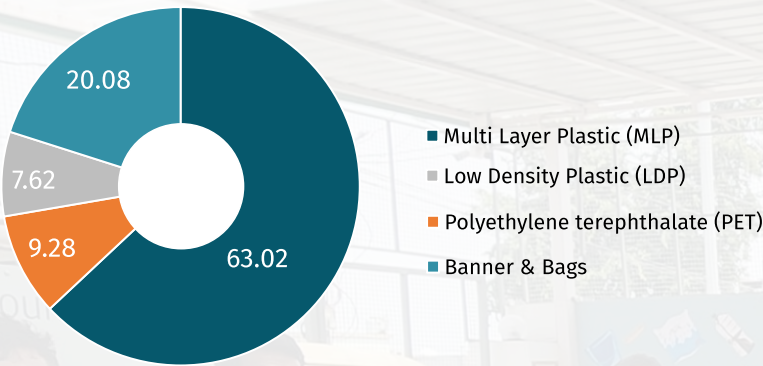


Figure 2: Type of Plastic Waste collected (%)

The campaign was meticulously covered on the social media handle, namely, Facebook, Twitter and Instagram for the NMCG-WII Ganga and Jalaj projects and the Namami Gange, Ministry of Jalaj Shakti, GOI. There was an extensive coverage of the event by local and national newspapers with an approximate reach of 18.5 lacs and 3.6 lacs persons, respectively.

Media Type	Name	Approximate Reach
Print	Dainik Bhaskar	60678
	Prabhat Khabar	390397
	Dainik Jagran	154321
	Hindustan	800139
	Punjab Kesari	239167
	Others	200000
Electronic	Facebook	250000
	Instagram	8790
	Twitter	107000



DISCUSSION

The "Flowing Towards a Plastic-Free Future" campaign offers significant insights into the widespread nature of plastic pollution across multiple river basins in India, revealing the critical intersections between environmental degradation, community health, and biodiversity conservation. The collection of 72.2 kg of plastic waste from 60 sites, with a predominant presence of Multi-Layer Plastics (MLPs) (45.5%), underscores the persistent challenge of managing non-recyclable materials. MLPs, often used in packaging for food and consumer goods like shampoo sachets and small food packets, pose a severe environmental threat due to their durability and resistance to degradation, making them a significant component of plastic waste in aquatic ecosystems.

The predominance of MLP waste is largely driven by economic factors, as many rural households can only afford small sachets of essential items like shampoo, detergents, and snacks. These single-use packages are more accessible for day-to-day purchases but result in a higher volume of plastic waste. The limited economic means in these communities restrict their ability to purchase larger, bulk-packaged goods, which would generate less waste per unit of consumption. This economic reality contributes to the widespread use of single-use plastics and MLPs, exacerbating plastic pollution in the environment.

This study's findings emphasise the urgent need to address the sources of plastic pollution at their origin, particularly through the implementation of Extended Producer Responsibility (EPR) schemes. EPR is a policy approach where producers are given significant responsibility-financial and/or physical-for the treatment or disposal of post-consumer products. By mandating that producers take back and manage the waste associated with their products, EPR can drive innovation in product design and materials management, reducing the environmental footprint of consumer goods.

The active participation of a wide range of stakeholders, including local communities including Ganga Praharis, educational institutions, forest departments, and civil society organisations, illustrates the potential for collaborative action in environmental conservation. The involvement of religious groups and fishermen in clean-up efforts highlights the diverse societal impacts of plastic pollution and the broad-based support needed to combat it effectively. This multi-stakeholder engagement is crucial, particularly in ecologically sensitive areas like Ramsar sites and wildlife sanctuaries, where the accumulation of plastic

waste can have devastating effects on local biodiversity and ecosystem services. For example, the campaign took place near protected areas like the Sundarban Tiger Reserve, Udhwa Bird Sanctuary, Nandhaur Wildlife Sanctuary, Asan Conservation Reserve, Hastinapur Wildlife Sanctuary, Col. Sher Jung National Park (CSJNP), Kalesar National Park, National Chambal Sanctuary, Nagi Bird Sanctuary, Rajaji National Park, Bakhira Wetland and Haiderpur Wetland all of which hold significant ecological importance.

Moreover, the study reflects the critical role of community-based initiatives in raising awareness and driving behaviour change at the grassroots level. The campaign's success in mobilising communities to participate in clean-up activities demonstrates the power of local action in addressing the challenge of the Ganga River conservation. However, the study also reveals gaps in waste management infrastructure and practices where improper disposal and lack of recycling facilities exacerbate the problem.

CONCLUSION

The outcomes of the "Flowing Towards a Plastic-Free Future" campaign reveal the importance of integrated and sustained efforts to address plastic pollution in India's river basins. The substantial collection of plastic waste, particularly MLPs, indicates that while community-driven clean-up initiatives are effective in reducing visible pollution, they must be complemented by systemic changes in production, consumption, and waste management practices.

The study highlights the need for robust EPR frameworks to ensure that producers are accountable for the entire lifecycle of their products, particularly for packaging materials that are challenging to recycle. By incentivising producers to design more sustainable products and take responsibility for waste management, EPR can significantly reduce the flow of plastic waste into aquatic ecosystems.

Additionally, the campaign's success in fostering community involvement suggests that future environmental initiatives should prioritise stakeholder engagement, ensuring that local populations are not only informed but actively participate in conservation efforts. This approach can lead to more sustainable outcomes, as communities take ownership of their environmental impact and contribute to long-term solutions.

IMPLICATIONS

This study's implications are profound, particularly in the context of policy development, environmental management, and community engagement.

POLICY DEVELOPMENT

Extended Producer Responsibility (EPR): Policymakers must prioritise the implementation of EPR schemes, particularly for products that generate significant amounts of plastic waste. This would involve setting clear guidelines for producers, including targets for waste reduction, recycling, and recovery and penalties for non-compliance. EPR can also drive innovation in packaging design, leading to the development of materials that are more easily recyclable or biodegradable.

Legislative Support for Community Initiatives: Legislative frameworks that support community-driven initiatives are needed. These could include grants or subsidies for local clean-up activities and policies that facilitate partnerships between government agencies, NGOs, and local communities.

Trade-related policy measures: Prohibition imposed on single-used plastic items, while restriction on the import of plastic waste should be implied. Along technical regulation and specification not related to bans, subsidies, and government procurement measures.

ENVIRONMENTAL MANAGEMENT

Improving Waste Management Infrastructure: The study highlights the need to enhance waste management infrastructure. This includes the development of efficient collection, segregation, and recycling systems that can handle different types of plastic waste, including MLPs.

Monitoring and Data Collection: Regular data collection can help track the effectiveness of waste management strategies and inform adaptive management practices.

Environmental Sound Management: ESM includes all the practicable steps that ensure that hazardous and other waste are managed in a manner that protects human health and the environment against the adverse effects. It includes

a waste management hierarchy including waste prevention, minimisation, reuse, recycling, recovery, and final disposal.

COMMUNITY ENGAGEMENT

Education and Awareness: The study highlights the essential role of environmental education in promoting a culture of sustainability, particularly in the context of plastic pollution and biodiversity conservation. It emphasizes the need to integrate educational programs into school curricula and community outreach initiatives, focusing not only on the impacts of plastic pollution but also on the importance of biodiversity conservation. Such programs should educate communities on the ecological consequences of plastic waste and foster an understanding of the critical relationship between waste management and the preservation of biodiversity.

Empowering Local Communities: Empowering local communities to take action against plastic pollution is critical. This can be achieved through capacity-building programs that provide communities with the knowledge and tools needed to manage waste effectively and participate in environmental conservation.

REPLICATION OF INITIATIVES

Scaling Up Successful Models: This campaign model can be replicated in other regions, particularly in areas with high biodiversity or significant ecological value. By scaling up successful initiatives, it is possible to create a broader impact on reducing plastic pollution at a national or even global level.

WAY FORWARD

Beating plastic pollution lies in fostering effective participation from local communities, who play a crucial role in driving sustainable environmental practices. Empowering communities through education and awareness programmes about the detrimental impacts of plastic waste can inspire collective action towards reducing plastic use and enhancing recycling efforts. Local initiatives, such as community regular clean-ups, plastic-free campaigns, and the establishment of local recycling centres, can significantly mitigate plastic pollution at the grassroots level. Additionally, promoting the use of eco-friendly alternatives and supporting local innovations in plastic waste management can further strengthen these efforts. By involving local communities in policy-making, encouraging sustainable consumer behaviours, and providing the necessary resources and support, we can create a robust, community-driven movement towards ensuring a plastic-free environment. This participatory approach ensures that our fight against plastic pollution is inclusive, effective, and sustainable, ultimately leading to healthier ecosystems and improved quality of life.

Ecologically sensitive pockets and PAs covered in the campaign

- **Bakhira Wetland**, a Ramsar site, located in the Sant Kabir Nagar district of Uttar Pradesh, is of immense ecological, socio-economic, and environmental importance. As the largest natural floodplain wetland in eastern Uttar Pradesh, it serves as a critical habitat for a diverse array of flora and fauna, including numerous migratory bird species. This biodiversity hotspot supports ecological balance, offering breeding grounds and food resources essential for wildlife. Additionally, the wetland plays a vital role in water purification, flood mitigation, and groundwater recharge, contributing to the overall health of the regional water systems. For local communities, Bakhira Wetland is a source of livelihood through fishing, agriculture, and tourism, emphasizing the need for sustainable management practices. Protecting and preserving this wetland is crucial not only for maintaining biodiversity and ecological functions but also for supporting the socio-economic well-being of the surrounding populations.
- **Udhwa Lake Bird Sanctuary**, located in the Sahibganj district of Jharkhand, is a vital ecological haven known for its rich biodiversity and crucial role in avian conservation. Nestled amidst the Gangetic floodplains, encompassing the twin lakes of Pataura and Berhale, the sanctuary serves as a crucial stopover and wintering

ground for a plethora of avian species, including endangered and rare birds. It serves as an essential breeding and feeding ground, supporting both resident and migratory populations, thereby contributing significantly to global biodiversity. The wetland ecosystem of Udhwa Lake also plays a critical role in water purification, flood control, and groundwater recharge, which are vital for maintaining the health of the surrounding environment. Furthermore, the sanctuary supports local livelihoods through eco-tourism and fishing, offering educational and recreational opportunities that enhance community awareness and involvement in conservation efforts. Preserving and conserving Udhwa Lake is not only imperative for safeguarding biodiversity and ecosystem services but also for ensuring the well-being of both nature and humanity in the region.

- **Nagi Nakti Bird Sanctuary**, nestled in the scenic landscape of Jamui district, Bihar, India, holds immense ecological significance as a sanctuary for avian biodiversity. Spanning over lush forests, marshes, and wetlands, encompassing two small but ecologically significant lakes Nagi and Nakti, this sanctuary serves as a vital habitat for a diverse array of bird species, including migratory, resident, and endangered birds. Its strategic location along bird migration routes makes it a crucial stopover and breeding ground for numerous avifauna. Beyond its ecological importance, Nagi Nakti Bird Sanctuary plays a vital role in supporting local

ecosystems, regulating water cycles, and preserving natural habitats. Additionally, it offers immense educational and recreational value, attracting birdwatchers, nature enthusiasts, and researchers to marvel at its avian diversity and pristine wilderness. Preserving Nagi Nakti Bird Sanctuary is imperative not only for safeguarding bird populations but also for maintaining ecological balance and promoting sustainable tourism and socio-economic development in the region.

- **Haiderpur Wetland**, located within the Hastinapur Wildlife Sanctuary in Uttar Pradesh, is a substantial ecological asset. Formed in 1984 after the construction of the Bijnor Barrage, it spans over 30,000 acres and is one of the largest human-made wetlands. This wetland plays a crucial role in supporting livelihoods, controlling floods, storing and purifying water. It is home to a rich biodiversity, including more than 30 species of plants, over 40 types of fishes, and more than 300 species of birds. The wetland also provides shelter to various wildlife species, including the critically endangered Gharial. Recognized as a Ramsar Site, an international designation for important wetlands, Haiderpur Wetland is a testament to the importance of preserving and maintaining our natural habitats.
- **Sundarban Tiger Reserve**, located at the mouth of the Ganges and Brahmaputra Rivers between India and Bangladesh, is a globally significant ecological site. Covering 10,000 km², it contains the world's largest area of mangrove forests. This reserve is the only coastal wetland tiger habitat in the world, and is home to the single largest population of tigers, which have adapted to an almost amphibious life. The reserve also supports a wide range of fauna, including globally endangered species like the Royal Bengal Tiger, Ganges and Irawadi dolphins, estuarine crocodiles, and the critically endangered endemic river terrapin (*Batagur baska*). The Sundarban Tiger Reserve also plays a crucial role in maintaining biodiversity, acting as a storm barrier, shore stabilizer, nutrient and sediment trap, and a source of timber and natural resources to the local communities.
- **Nandhaur Wildlife Sanctuary**, established in 2012, is an important ecological site in Uttarakhand. Spanning over 270 square kilometers, it is home to a diverse range of wildlife, including tigers, wild elephants, leopards, jungle cats, nilgai, small Indian civet, jackals, wild boars, flying foxes, and sloth bears. The sanctuary also hosts over 200 species of birds, making it a haven for birdwatchers and researchers. The sanctuary is primarily a sal forest with more than 100 species of trees, providing a rich habitat for various species. Since 2002, it has been a part of the Shivalik Elephant Reserve, and in 2004, the Wildlife Institute of India recognized it as one of the three viable habitats key to the long-term future of the tiger. The Nandhaur Wildlife Sanctuary plays a crucial role in biodiversity conservation and serves as a testament to the importance of preserving natural habitats.
- **Rajaji National Park**, located in Uttarakhand, India, is a noteworthy ecological and conservation landmark. Spanning over 820 km², it serves as an important ecological corridor, connecting the Shivalik and Himalayan ecosystems. The park is home to a diverse range of wildlife, including elephants, tigers, leopards, deer, and ghorals, and is particularly renowned for being at the northwestern limit of distribution for both Indian elephants and Bengal tigers. In 2015, it was declared a tiger reserve, making it a crucial part of the Rajaji-Corbett-Tiger Conservation Unit. The park also plays a significant role in maintaining biodiversity, acting as a storm barrier, shore stabilizer, nutrient and sediment trap, and a source of timber and natural resources. Its rich biodiversity and geographical significant location make it a significant conservation landmark.
- **National Chambal Sanctuary**, also known as the National Chambal Gharial Wildlife Sanctuary, is a significant tri-state protected area in northern India. Spanning over 5,400 km², it was established in 1979 for the protection of critically endangered species such as the gharial, the red-crowned roof turtle, and the endangered Ganges River dolphin. The sanctuary is located on the Chambal River near the tripoint of Rajasthan, Madhya Pradesh, and Uttar Pradesh. The sanctuary is home to a diverse range of fauna, including eight rare turtle species out of the 26 found in India. It is also the main area for the species reintroduction program of the crocodilian species *Gavialis gangeticus* (Gharial), supporting the largest population of Gharials in the wild.
- **Kalesar National Park (KNP)** is situated in the Yamunanagar district of Haryana and is part of the western end of the Shivalik landscape. KNP is known for harbouring a healthy population of common leopards.

In April 2023, a tiger was photocaptured in KNP after a gap of 110 years. A few months before, one adult tiger was also captured in camera traps in the adjacent Col. Sher Jung National Park (CSJNP) suggesting that the tigers from Rajaji Tiger Reserve using these forests as corridors to move around. Tiger pugmarks were reported from KNP and CSJNP until 2009 and 2013, respectively. But no direct sighting of the Tiger was reported after 1913. Hence, KNP along with the adjacent Colonel Sher Jung Bahadur National Park in Himachal Pradesh can form a suitable breeding ground and a new territory for the tigers. As an Important Bird Area (IBA), KNP also hosts more than 200 bird species, including the endangered egyptian vulture (*Neophron percnopterus*), near threatened species like painted stork (*Mycteria leucocephala*), river lapwing (*Vanellus duvaucelii*). With the Yamuna River flowing on its east, its protection is essential for the catchment conservation of the river.

- **Col. Sher Jung National Park (CSJNP)** is situated at Simbalbara in Himachal Pradesh, along the border between Himachal Pradesh and Haryana. Located in the Sirmour district, CSJNP, together with Kalesar National Park (KNP) in Haryana, forms a significant interstate conservation unit in the Western Shivaliks. This park is notable for being the only national park in the Shivaliks of Himachal Pradesh that has well-protected Sal forests. Positioned in the watershed of the Yamuna River, CSJNP also plays a crucial role in regulating the runoff of precipitation into the Yamuna.

The park is home to a substantial wildlife population, making it vital for long-term conservation efforts. The Common Leopard serves as the apex predator within the park, which also supports the westernmost population of Chital in the Himalayan foothills. Additionally, Gorals can be found on the steep ridges of the Shivalik hills. CSJNP is also a haven for bird enthusiasts, with about 117 bird species recorded in the park.

- **The Asan Conservation Reserve (ACR)** is situated in Dehradun district of Uttarakhand and is spread over an area of 444.4 ha. Located at the confluence of Asana and Yamuna rivers, it was formed due to the damming of Asan River in 1967 to form Asan Barrage and declared as a Conservation Reserve in 2005 under Section 36A of Wildlife (Protection) Act, 1972. It is also the first Ramsar site in Uttarakhand. ACR supports over

330 species of birds including the critically endangered red-headed vulture (*Sarcogyps calvus*), white-rumped vulture (*Gyps bengalensis*) and Baer's pochard (*Aythya baeri*), steppe eagle (*Aquila nipalensis*), and vulnerable- marbled teal (*Marmaronetta angustirostris*), common pochard (*Aythya ferina*), Indian spotted eagle (*Clanga hastata*). It is one of the best-known sites for the congregation of ruddy shelduck (*Tadorna ferruginea*) and red-crested pochard (*Netta rufina*). It also supports 49 species of fish, including the endangered Mahaseer (*Tor putitora*).

- **Hastinapur Wildlife Sanctuary** is spread across Meerut, Ghaziabad, Bijnore and Jyotiba Phule Nagar districts of Uttar Pradesh. The area was declared a Sanctuary in 1986 in order to protect and conserve the ecology and biodiversity of the Ganga basin. With an area of 2073 sq. km., the grassland of the Sanctuary holds a variety of flora, avifauna and a population of Swamp deer and Hog deer.

It was established to protect the state animal of Uttar Pradesh, viz., Swamp Deer (*Rucervus duvaucelii duvaucelii*). Other mammalian species recorded here include 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*). Along with rich mammalian fauna, the Sanctuary is home to 180 species of birds along with a large congregation of migratory waterbirds visiting the area during winter. Asian Openbill (*Anastomus oscitans*) has established several colonies while Sarus crane (*Grus antigone*) is also recorded to breed here.

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