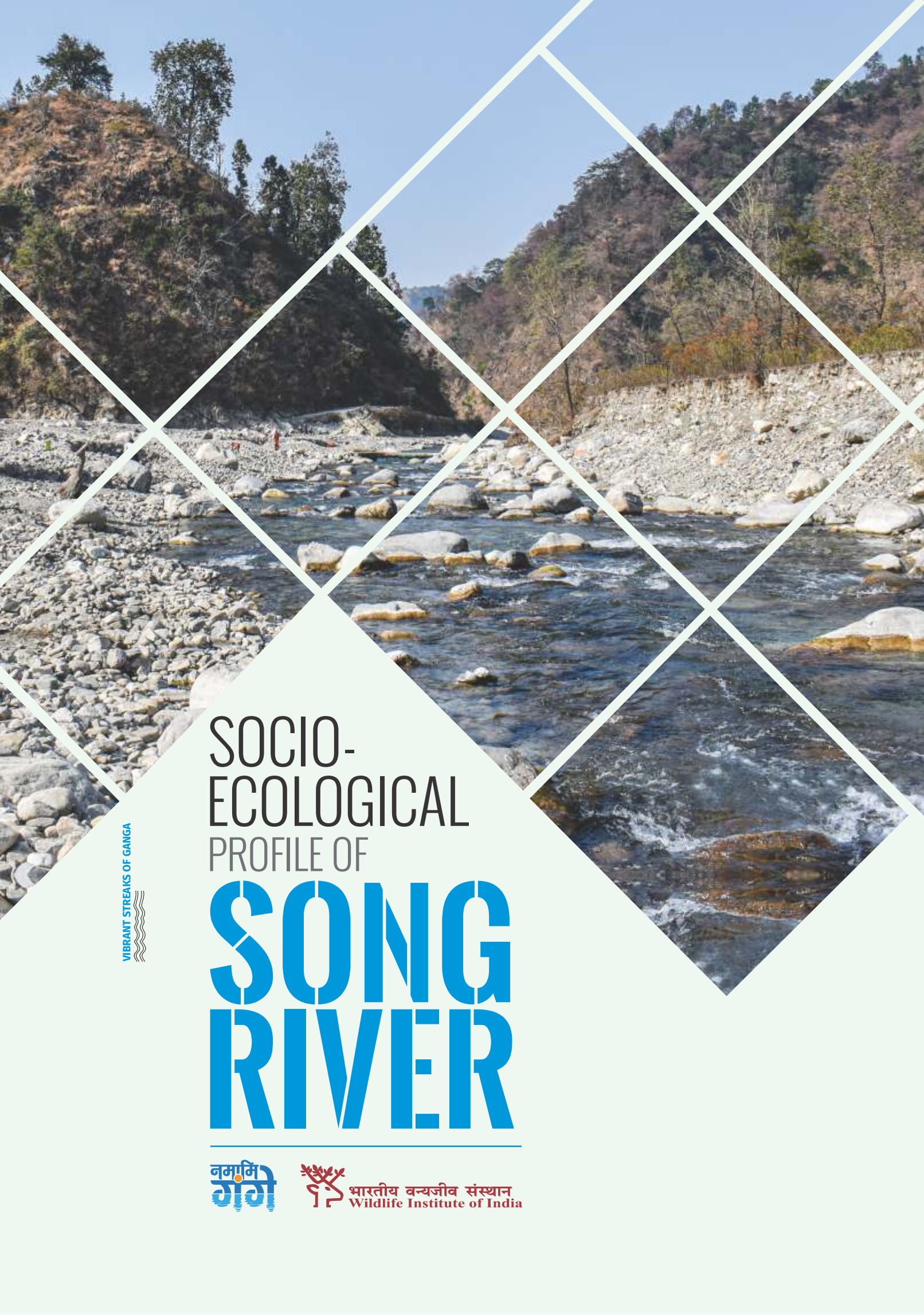




VIBRANT STREAKS OF GANGA



SOCIO- ECOLOGICAL PROFILE OF **SONG RIVER**



भारतीय वन्यजीव संस्थान
Wildlife Institute of India



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SOCIO-
ECOLOGICAL
PROFILE OF
**SONG
RIVER**



SOCIO ECOLOGICAL PROFILE OF SONG RIVER

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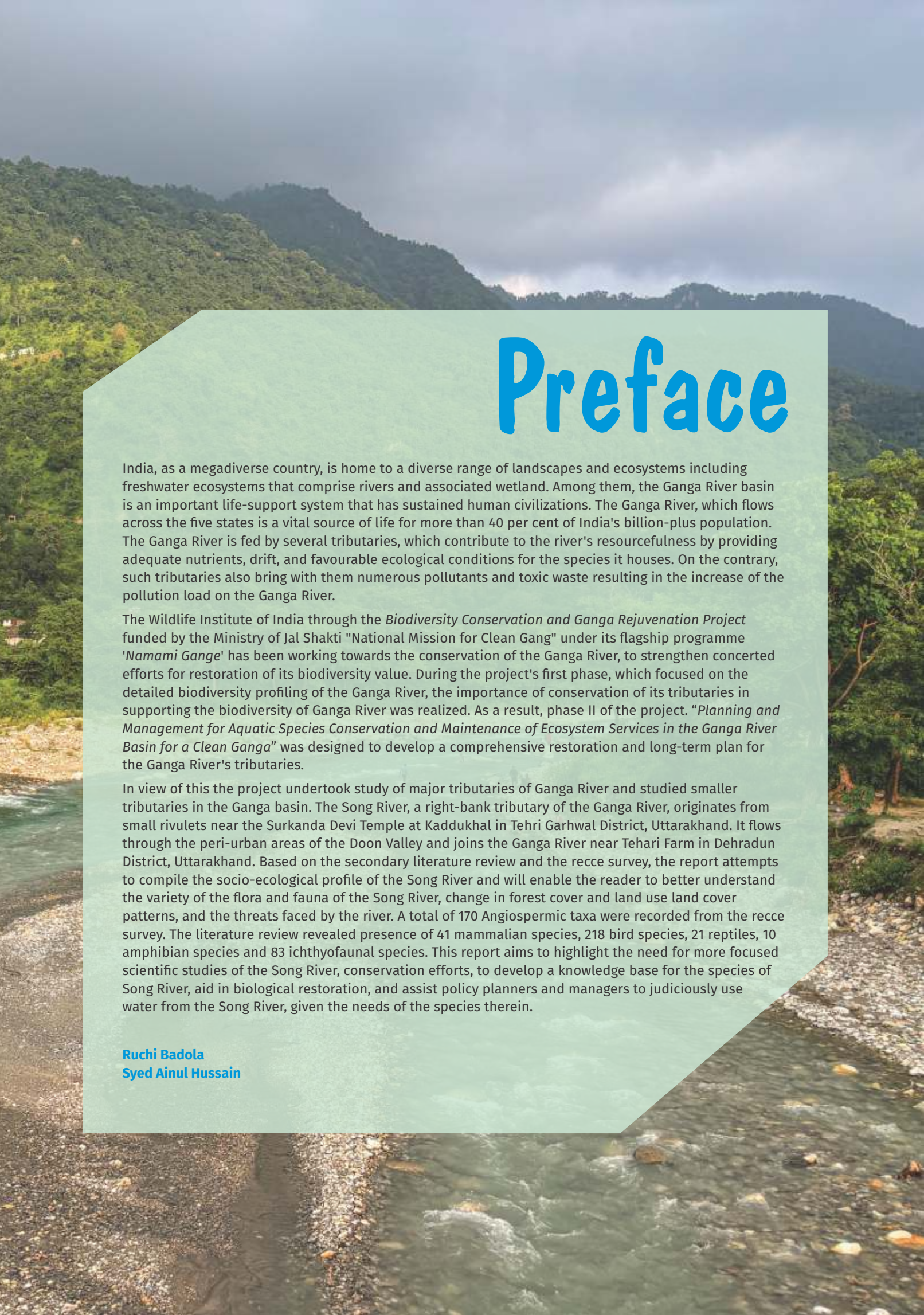
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Preface

India, as a megadiverse country, is home to a diverse range of landscapes and ecosystems including freshwater ecosystems that comprise rivers and associated wetland. Among them, the Ganga River basin is an important life-support system that has sustained human civilizations. The Ganga River, which flows across the five states is a vital source of life for more than 40 per cent of India's billion-plus population. The Ganga River is fed by several tributaries, which contribute to the river's resourcefulness by providing adequate nutrients, drift, and favourable ecological conditions for the species it houses. On the contrary, such tributaries also bring with them numerous pollutants and toxic waste resulting in the increase of the pollution load on the Ganga River.

The Wildlife Institute of India through the *Biodiversity Conservation and Ganga Rejuvenation Project* funded by the Ministry of Jal Shakti "National Mission for Clean Gang" under its flagship programme 'Namami Gange' has been working towards the conservation of the Ganga River, to strengthen concerted efforts for restoration of its biodiversity value. During the project's first phase, which focused on the detailed biodiversity profiling of the Ganga River, the importance of conservation of its tributaries in supporting the biodiversity of Ganga River was realized. As a result, phase II of the project. "*Planning and Management for Aquatic Species Conservation and Maintenance of Ecosystem Services in the Ganga River Basin for a Clean Ganga*" was designed to develop a comprehensive restoration and long-term plan for the Ganga River's tributaries.

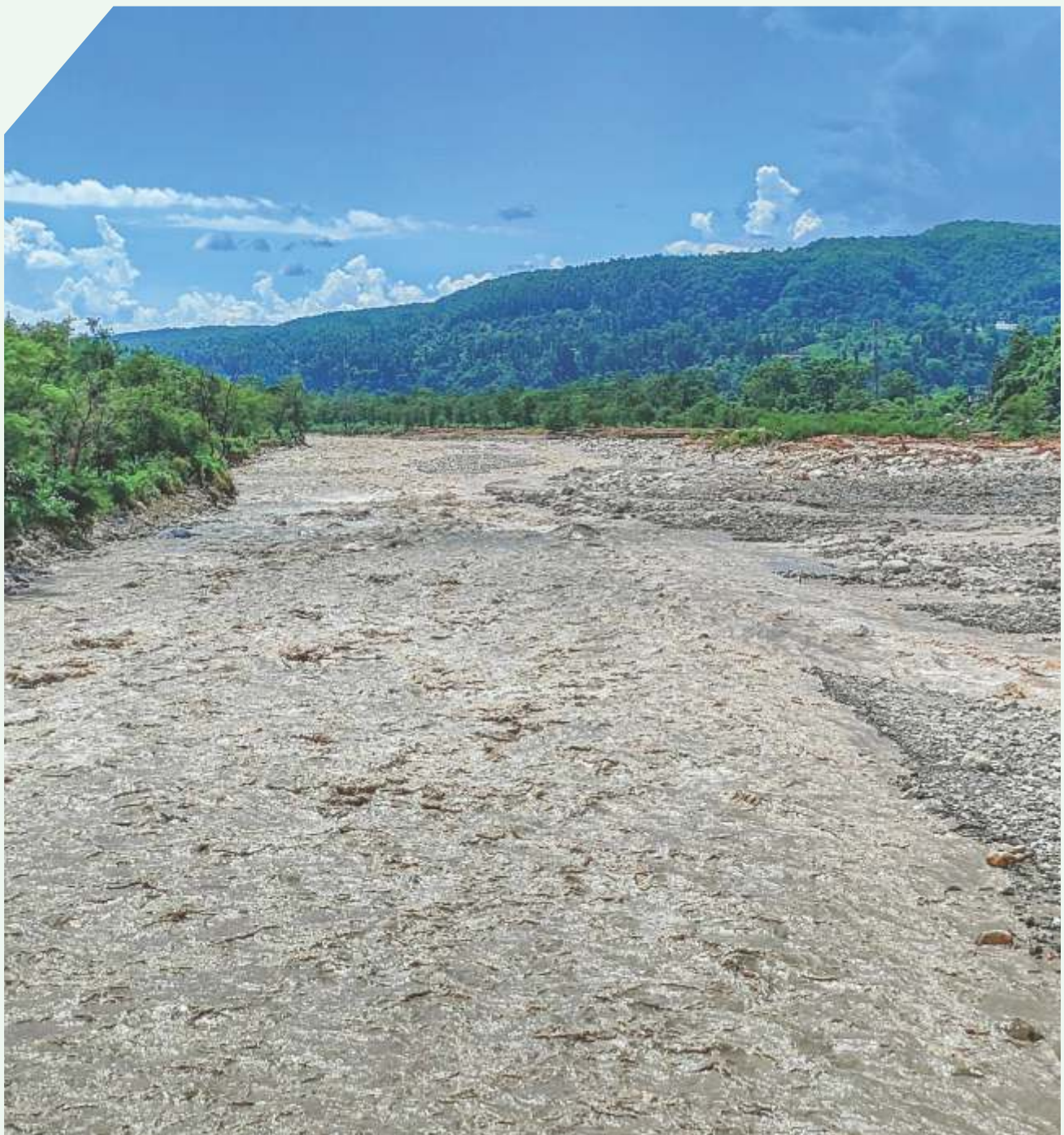
In view of this the project undertook study of major tributaries of Ganga River and studied smaller tributaries in the Ganga basin. The Song River, a right-bank tributary of the Ganga River, originates from small rivulets near the Surkanda Devi Temple at Kaddukhal in Tehri Garhwal District, Uttarakhand. It flows through the peri-urban areas of the Doon Valley and joins the Ganga River near Tehari Farm in Dehradun District, Uttarakhand. Based on the secondary literature review and the recce survey, the report attempts to compile the socio-ecological profile of the Song River and will enable the reader to better understand the variety of the flora and fauna of the Song River, change in forest cover and land use land cover patterns, and the threats faced by the river. A total of 170 Angiospermic taxa were recorded from the recce survey. The literature review revealed presence of 41 mammalian species, 218 bird species, 21 reptiles, 10 amphibian species and 83 ichthyofaunal species. This report aims to highlight the need for more focused scientific studies of the Song River, conservation efforts, to develop a knowledge base for the species of Song River, aid in biological restoration, and assist policy planners and managers to judiciously use water from the Song River, given the needs of the species therein.

Ruchi Badola
Syed Ainul Hussain

INTRODUCTION

The Song River is one of the tributaries of Ganga River and among the largest rivers in Dehradun district that drains the central and eastern part of the rapidly urbanizing Doon valley and flows through Tehri Garhwal and Dehradun district in Uttarakhand, India. It forms the eastern boundary of Dehradun city and is a major source of drinking water for the area it flows through. It is a spring fed river and drained by four tributaries - Bandal, Baldi, Suswa, and Jakhan Rao. Suswa is the major contributor of pollution load to Song River. The basin area

is dominated by forests followed by agricultural land and built up area. A part of Song River falls in the Rajaji National Park (RNP) where it is a perennial water source supporting wildlife around the year in RNP especially during summer months when natural water sources inside the park diminish. It flows through the Kansrao and Motichur forests of the RNP parallel to the Haridwar-Dehradun railway track. At present, the Song River and its biodiversity remains vulnerable due to several threats like small dam projects, water abstraction, sewage drain, plastic waste, unregulated tourism, sand mining, and riverbed cultivation.



COURSE OF THE RIVER

The Song River runs a total length of about 80 km and its basin covers an area of 1040.49 km². The Song River flows north-westerly to the east of Dehradun, then takes a sharp right-angled bend to flow southerly (Panikkar & Subramanyan 1996). It originates from small rivulets near the Surkanda Devi Temple at Kaddukhal, in the Dhanaulti mountain ranges, at an altitude of 2766 m (Rakesh et al. 2022). Bandal is the first tributary to join Song from the

north at Maldevta, forming a straight river course, which then meets Baldi at Sahastradhara and flows through Raipur, Lacchiwala, Doiwala, to meet Suswa at Kansrao and Jakhan Rao at Chiddarwala. Song then ultimately drains into Ganga River at Tehari Farm. The elevation of the Song River basin ranges from 303 to 2766 m, with steep slopes in the north and gentle slopes in the south. The drainage pattern of the Song River is mostly dendritic to sub dendritic (Figure 1).



Figure 1:
Drainage map
of Song River Basin

GEOLOGY AND GEOMORPHOLOGY

The Song River basin has formed as a result of fluvial, denudation and structural processes acting together. The northern part of the basin is marked by the elevated rugged mountainous terrain of lesser Himalaya having both peaks and U and V shaped valleys while the southern part of the area is characterized by piedmont fans and Doon valley. The river basin is mainly composed of quartzite with limestone, shale, chert with phosphorite, carbonaceous shale, calcareous shale, slate, phyllite, shaly slate, tilloids, marl and olive green carbonaceous shale (Pankaj and Kumar 2009). The landscape is characterized by a series of ridge-lines interspersed with valleys. The north-facing slopes, which also serve as the dip slopes, exhibit a gentler topography and lush vegetation. The southern hills of the Song River house a multitude of springs, particularly in the phyllite quartzite siltstone rock association, identified with Chandpur. The rock exposed in the area belong to geological ages between Neo-Proterozoic and Quaternary while the rock types here are Krol limestone, Nagthat quartzite and Chandpur slate (Panikkar and Subramanyan 1996) (Rupke and Sharma 1974). It is important to note that the Krol, Nagthat, Blaini, and Chandpur formations are at more risk to landslides in comparison to the Shiwalik formations (Rupke and Sharma 1974; Pachauri and Pant, 1992), which could be one of the reasons behind the occasional occurrences of landslides and erosions in the area, apart from unstable slope conditions and remnants of old mining activities and a possibility of an active fault (Sairku fault) (Panikkar and Subramanyan 1996).

Rainwater primarily turns into runoff, but a portion infiltrates the ground, finding its way into joints and crevices, eventually resurfacing as springs that contribute substantially to the river's water volume. The fractures in this formation, underlying the robust and highly metamorphosed quartzite, predominantly give rise to the formation of springs. Additionally, a considerable amount of water is sourced from the northern hill slope, featuring numerous tributaries with origins mainly from springs. The water-bearing stream within the Song River measures between 6.0 to 10.0 meters in width, boasting an average water depth of 0.6 meters.

From our reconnaissance survey, we observed that in the sampling sites until Maldevta, the riverbed is mainly made of boulders, pebbles and cobbles with boulders scattered extensively across the landscape and marked by a U and V shaped valley. The river channel was observed to be wide, single and straight. The river banks were mainly composed of boulders, cobbles and sand. Both banks of the Song River feature numerous steep slopes formed due to erosion, occasionally taking on semi-amphitheatrical or semi-circle shapes. After Maldevta, the river channel stays narrow and braiding occurs occasionally, forming channel bars composed of sand,

gravel, and boulders. The river channel is mainly composed of cobbles and small boulders while the riverbank is composed of gravel, cobbles, pebbles and sand. The river channel is marked by flat area of land with large floodplains.

SOIL TYPE

Song River basin is characterised by Cambisols and Fluvisols soil, covering approximately 61.72% and 38.28% of the basin, respectively. Cambisol soil is found in the basin's northern and central region whereas Fluvisol soil is found in the basin's southern regions (FAO-UNESCO, 1977).

CLIMATE

The region exhibits a diverse climate influenced by altitude, encompassing subtropical, humid, and temperate characteristics (Pankaj and Kumar 2009). In the hot and predominantly dry summer months extending from March to June, the temperatures vary between a minimum of 14°C and a maximum of 41°C. On the other hand, the cold winter period from November to February sees minimum and maximum temperatures ranging from 2°C to 21°C. January stands out as the coldest month, while June takes the lead as the hottest month in this climatic spectrum. The monsoon rainfall usually occurs between the months of June and September with July and August being the rainiest months of the season. The average annual rainfall is about 2247 mm. Additionally, a little rainfall occurs during December and February because of the western disturbances.

Song River near Song Barrage at Maldevta



LAND USE LAND COVER

Based on NRSC, ISRO data (2008-09 and 2018-19), two Land Use and Land Cover (LULC) maps of the Song River basin were prepared. The LULC of the Suswa River basin was categorised into 11 categories: Built-up, Kharif crop, Rabi crop, Double/Triple crop, Fallow land, Plantation, Evergreen forest, Deciduous forest, Degraded/Scrub forest, Wasteland, and Waterbodies. During 2008-09, the Song River basin was dominated by 53.19% of deciduous forest, followed by 10.73% of double/triple crop, 10.70% of evergreen forest, 7.11% of built-up area, 4.95% of wasteland, 3.84% of fallow land, 3.62% of degraded/scrub forest, 2.99% of waterbodies, 2.30% of Kharif crop, 0.52% of

plantation, and 0.05% of rabi crop. During 2018-19 the basin was dominated by 53% of deciduous forest, followed by 12.40% of double/triple crop, 10.81% of evergreen forest, 7.60% of built-up area, 3.83% of Kharif crop, 3.63% of degraded/scrub forest, 2.91% of waterbodies, 2.81% of wasteland, 2.12% of fallow land, 0.57% of plantation, and 0.32% of rabi crop.

LULC maps revealed that over ten years, there has been an increase of 1.67%, 1.53%, 0.49% in the double/triple crop, Kharif crop and built-up area, respectively. Furthermore, a decrease of 0.59%, 1.98%, 0.21%, 0.12% and 0.07% in the fallow land, wasteland, degraded/scrub forest, evergreen forest and deciduous forest area, respectively was noticed (Figures 2a & 2b and Table 1).

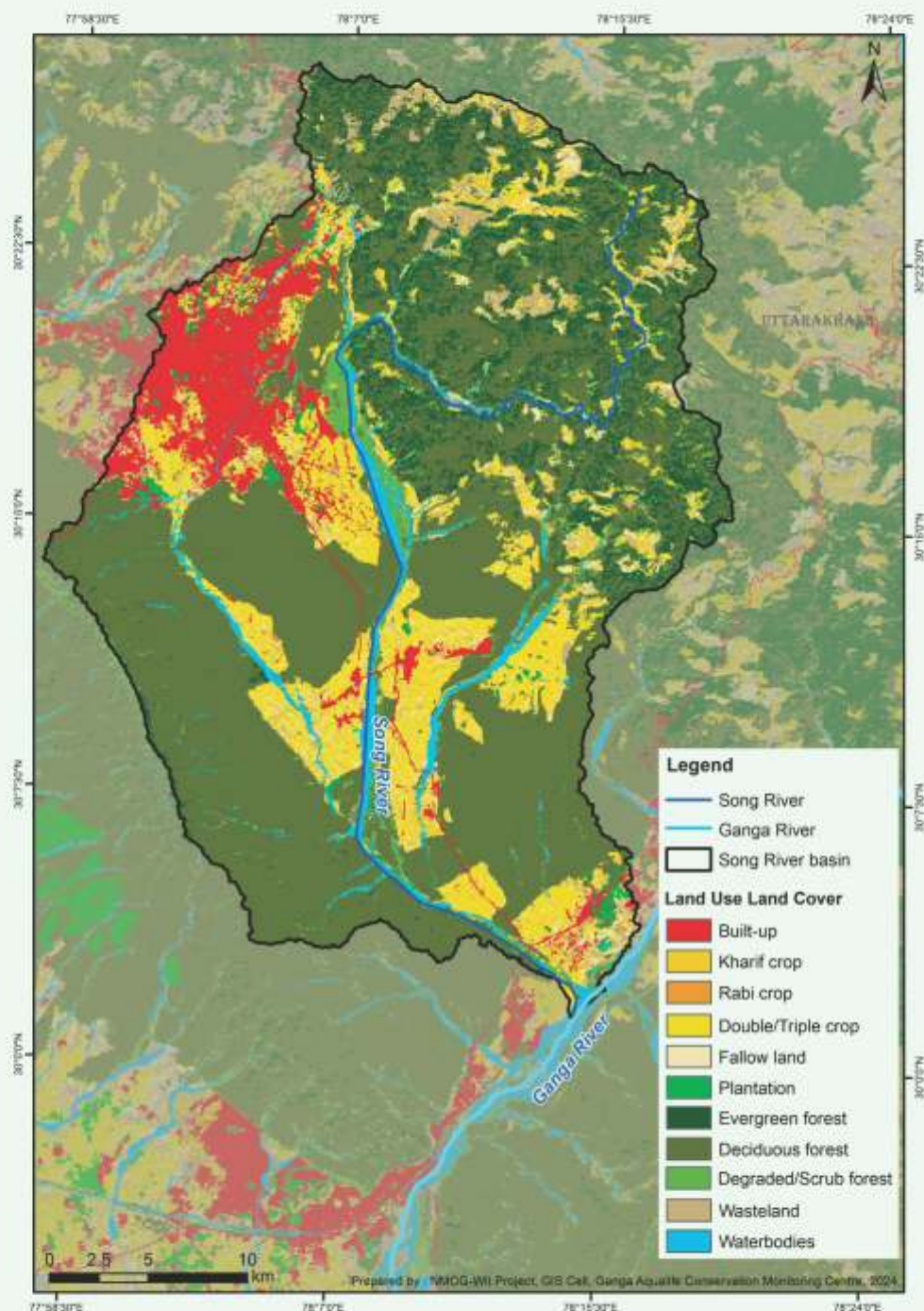


Figure 2a.
LULC map of
Song River
basin (2008-09)

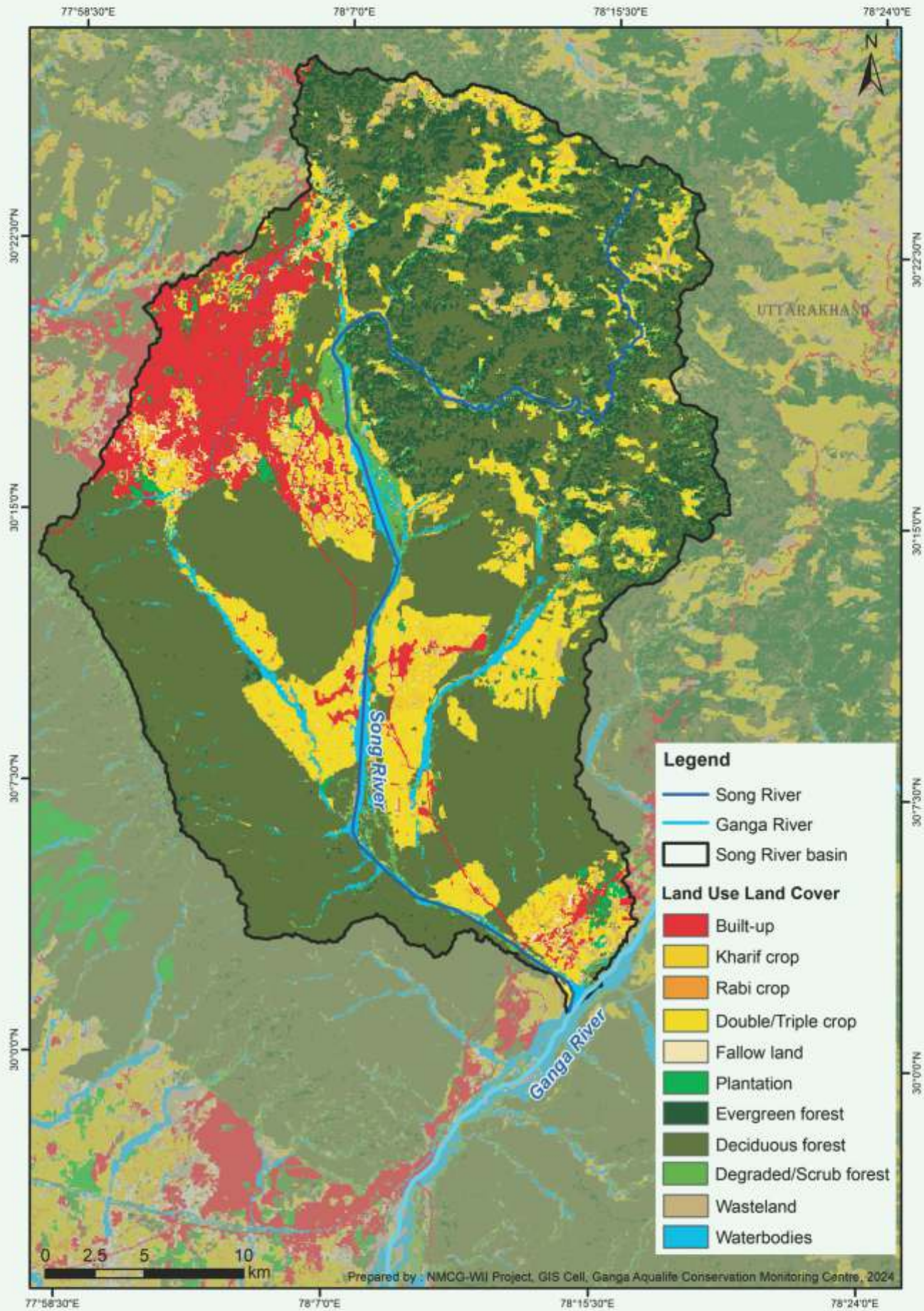


Figure 2b. LULC map of Song River basin (2018-19)

Table 1. LULC statistics of the Song River basin for 2008-09, 2018-19 and 2008 to 2019.

S.No.	LULC Classes	(2008-09)		(2018-19)		Area Change in km ²	Area Change in %
		Area in km ²	Area in %	Area in km ²	Area in %		
1	Built-up	73.94	7.11	79.07	7.60	5.13	0.49
2	Kharif crop	23.97	2.30	39.83	3.83	15.86	1.53
3	Rabi crop	0.49	0.05	3.33	0.32	2.84	0.27
4	Double/Triple crop	111.62	10.73	129.05	12.40	17.43	1.67
5	Fallow land	39.94	3.84	22.11	2.12	-17.83	-1.72
6	Plantation	5.36	0.52	5.98	0.57	0.62	0.05
7	Evergreen forest	111.4	10.70	112.47	10.81	1.07	0.11
8	Deciduous forest	553.46	53.19	551.46	53.00	-2	-0.19
9	Degraded/Scrub forest	37.69	3.62	37.76	3.63	0.07	0.01
10	Wasteland	51.55	4.95	29.2	2.81	-22.35	-2.14
11	Waterbodies	31.07	2.99	30.23	2.91	-0.84	-0.08
Total Area		1040.49	100	1040.49	100		

Source:

- 1) Land Use Land Cover (2008-2009), National Remote Sensing Centre, ISRO, Government of India, Hyderabad, India.
- 2) Land Use Land Cover (2018-2019), National Remote Sensing Centre, ISRO, Government of India, Hyderabad, India.

FOREST COVER

The Song River basin has 682.99 square km or 65.64% of the total area under various forest cover classes (FSI, 2019). According to the Forest Survey of India (2015 & 2019), the catchment area of the Song River is dominated by non-forest, followed by moderately dense forest, very dense forest, open forest, and scrubland. (Figures 3a & 3b). From 2015 to 2019, while there was an increase of 0.78% in the very dense forest, there was also an increase of 1.1% in open forest area and 0.83% in the non-forest area. A decrease of 2.04% was recorded for moderately dense (Table 2).

**Table 2.** Summary statistics of the forest cover of the Song River basin from 2015 to 2019.

S.No.	Forest Cover Classes	(2015)		(2019)		Area Change in km ²	Area Change in %
		Area in km ²	Area in %	Area in km ²	Area in %		
1	Scrubland	10.75	1.03	3.79	0.36	-6.96	-0.67
2	Open Forest	134.67	12.94	146.08	14.04	11.41	1.1
3	Moderately Dense Forest	301.59	28.99	280.42	26.95	-21.17	-2.04
4	Very Dense Forest	244.58	23.51	252.7	24.29	8.12	0.78
5	Non-forest	348.9	33.53	357.5	34.36	8.6	0.83
Total Area		1040.49	100	1040.49	100		

Source:

1. FSI. (2015). Indian State of Forest Report, Forest Survey of India.
2. FSI. (2019). Indian State of Forest Report, Forest Survey of India.

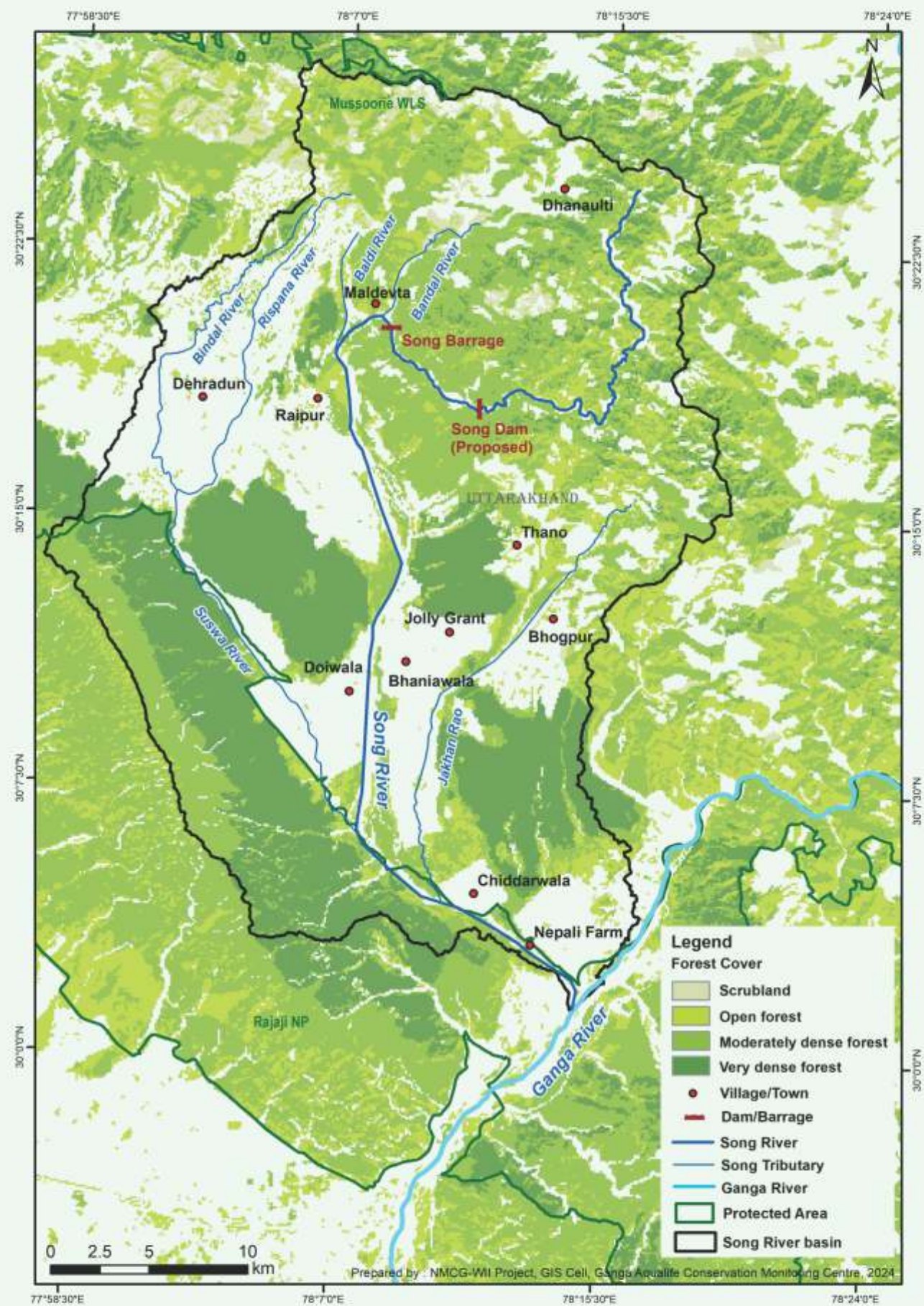


Figure 3a. Forest Cover of Song River basin in 2015

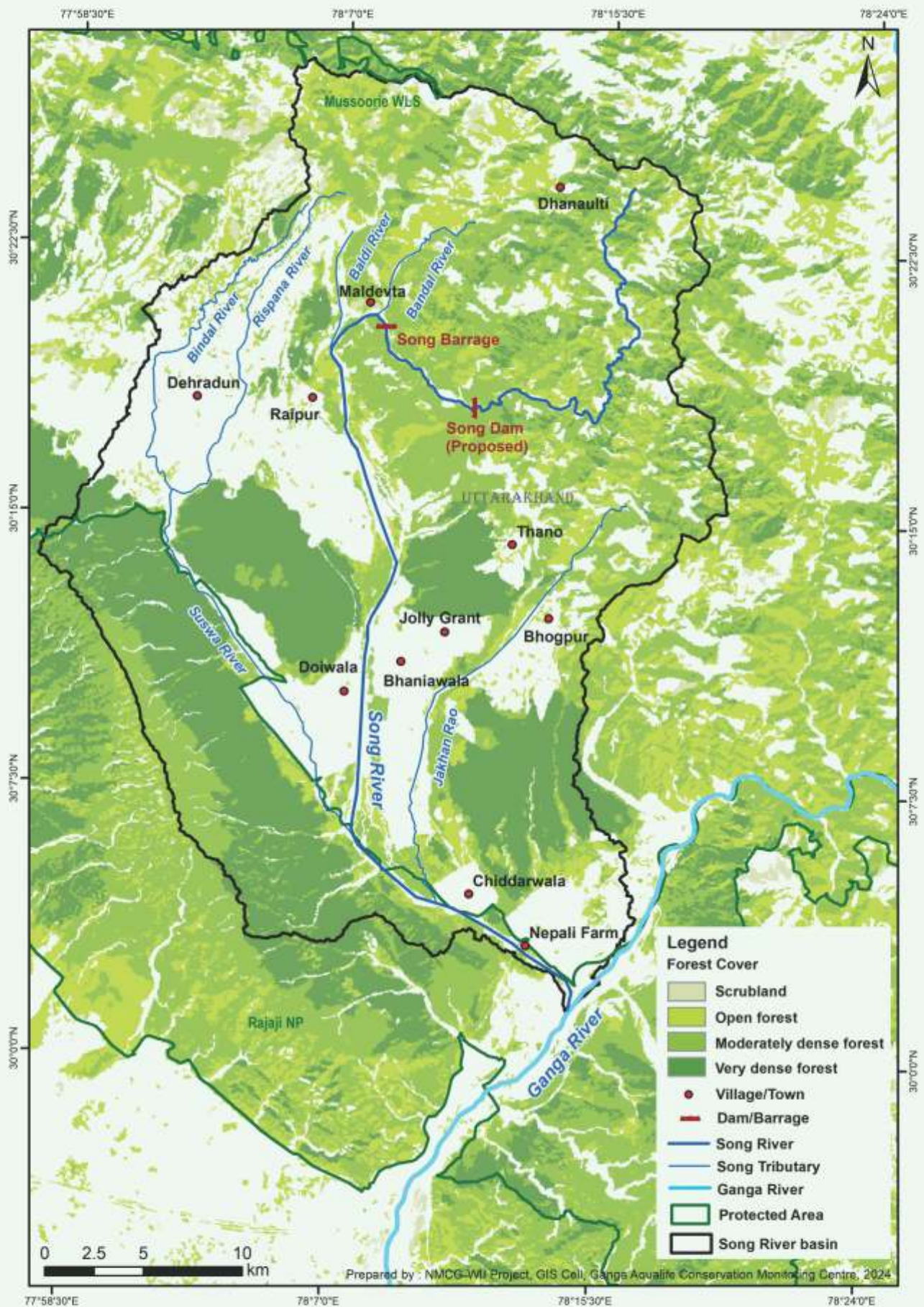


Figure 3b. Forest Cover of Song River basin in 2019

BIOGEOGRAPHY- FLORA AND FAUNA

The floral & faunal composition is diverse and interesting. Between the Himalaya in the north and the hills and the plateau in the south lies a vast Gangetic Plains which is one of the largest homogenous alluvial plains in the world.

The Song River basin falls into two biogeographic zones, the Himalaya and the Gangetic plains and two biotic provinces, namely, West Himalaya (2B) and Upper Gangetic Plain (7A) (Rodgers, Panwar & Mathur, 2014). Based on Champion and Seth (1968), classification of Indian forests, the forest area in and around Song River basin is typically North Indian Tropical Moist Deciduous Forest (3C) and Northern Tropical Dry Deciduous Forest (5B). The North Indian Tropical Moist Deciduous Forest (3C) has type Moist Sal-bearing Forest (3C/C2) and is further divided into two sub-types viz. Moist Siwalik Sal Forest (3C/C2a) and Moist bhabar Sal Forest (3C/C2b). Northern Tropical Dry Deciduous Forest (5B) has type Dry Sal-bearing Forest (5B/C1) and a sub-type Dry Siwalik Sal forest (5B/C1a).

Flora

The Song River undergoes a dry period lasting for nine months each year. However, when the rainy season arrives, it transports a considerable volume of water. The availability or scarcity of water in the Song River has a profound effect on the adjacent vegetation. Tropical forests, including Sal and Shisham, are prevalent in the Terai, Doon Valley, and Shivalik regions, particularly below an elevation of 300 m. Other tree species in this region

are Khair, Semal, Kanju, Sissoo and Haldu. Bushes and shrubs are also found in this region. Dominant tree species found in this area include *Shorea robusta*, *Bombax ceiba*, *Dendrocalamus strictus*, *Acacia catechu*, *Lagerstroemia parviflora*, *Terminalia arjuna*, *Aegle marmelos*, *Dalbergia sisoo sensu Miq.*, *Ficus benghalensis*, *Syzygium cumini*, *Ehretia laevis*, *Lannea coromandelica*, *Bauhinia variegata*, and *Tectona grandis* (Joshi, 2009).

During a reconnaissance survey along Song River, 170 taxa (Angiosperms) were recorded with 137 genera, 54 Families and 23 orders (Annexure VI). Poaceae was found to be the most dominant family with 26 species followed by Fabaceae (18 spp.), Asteraceae (13 spp.), Amaranthaceae (09 spp.). The life form (habit) dominance in Song River on the basis of number of species was dominated by herbaceous flora (87spp.), followed by Grasses (33 spp.), Shrubs (27 spp.), Trees (19 spp.), Climbers (4 spp.). Habitat preference of species found in survey was as follows: Aquatic (07 spp.), Semi-aquatic (110 spp.), Terrestrial (53 spp.). Among the species recorded, 44 plants were introduced while 126 plants species were found to be native to the region. Dominant families with highest number of introduced plants were Asteraceae and Fabaceae (9 spp. each). Dominant exotic plants seen during the survey were *Alternanthera ficoidea*, *Alternanthera philoxeroides*, *Amaranthus spinosus*, *Croton boplandianus*, *Eclipta prostrata*, *Ipomoea carnea*, *Jatropha curcas*, *Lantana camara*, *Lepidium didymium* etc.

Cane brakes, kind of bamboo and palm species, was once common along all the streams and drains in the Doon Valley, primarily in the Song River basin. *Calamus tenuis*, prickly climbing shrub with spines all over the plant, often scramble over surrounding vegetation. However, this vegetation type or plant species, although recording during a recce along the river, is now hardly noticeable.

Giant reed *Arundo donax* near Song River representing cane brakes habitat



Fauna

Rajaji National Park, runs along the edge of the river and is home to the cheetal, barking deer, sambar deer, wild boar, antelopes such as the nilgai, goral and of course the Asian elephant. The park is home to a diverse range of wildlife, encompassing primates like the Rhesus macaque and the Hanuman langur. Among the smaller mammals residing in the park are the Indian hare and the Indian porcupine. Notably, the park serves as a sanctuary for carnivores, including the majestic Bengal tiger protected under Project Tiger, as well as the leopard, and other lesser carnivores like the jackal, hyena, jungle cat, leopard cat, civets, Himalayan yellow-throated marten, Himalayan black bear, and sloth bear. Additionally, Rajaji is inhabited by an array of reptiles, pythons, King cobra, common krait, Indian cobra, and monitor lizard.

Husain (2015) documented presence of 10 amphibian species across 4 families in the basin. The Song River, as revealed in a literature review, harbors 21 reptilian species spanning 8 families (Bhatnagar, 1969; Hussain and Roy, 1992; Husan and Tilak, 1995; Singh et al., 2017; Singh and Joshi, 2018). Furthermore, the Song River basin is home to 41 mammal species from 20 families, including

endangered species such as the Asian elephant (*Elephas maximus*), hog deer (*Axis porcinus*), tiger (*Panthera Tigris*), among others (Joshi and Dixit, 2012; Joshi, 2016; Roy, 2016; Joshi et al., 2018). Annexures I to V provide a list of fauna found along the Song River Basin.

Avifauna

As per literature review in Doon Valley Forest of Dehradun district in the western Himalaya, a comprehensive bird survey identified 218 species from 50 families. Among these families, Turdinae was the most dominant with 18 species, followed by Picidae with 13 species and Sylviinae with 12 species. Of the total 218 species, 156 (71.55%) were reported as residential birds, 14 (6.54%) were summer visitors arriving during the summer from different states of India, 27 (12.16%) were winter visitors coming during the winter season from different states of India, and 21 (9.64%) bird species were altitudinal migratory, making their way to the Doon Valley from the high altitudes of Dehradun district (Joshi and Bhatt, 2015). A recce along the river revealed a total of 35 species belonging to 20 families, along the river basin, a list of the same has been provide in the (Annexure II).



Flock of Bar-headed geese *Anser indicus* flying over Song River at Tehari Farm near RNP

Fishes

Literature survey revealed presence of, a total of 83 species of fishes belonging to 5 order, 17 family and 46 genera from Song River. Fishes common name, vernacular name and IUCN status listed in (Annexure V). Order Cypriniformes is the most dominated order, contributing 57 Species and order Beloniformes shared least number of species (1). Family Cyprinidae is the most dominated

family, shared 28 species and family Belonidae, Badidae, Schilbeidae, Heteropneustidae, Clariidae and Amblycipitidae contributing least number of species only one (Figure 4). Order Siluriformes contributing highest number of family (7) and least number of family contributing order is beloniformes and Synbranchiformes (1). Among the 83 species, 66 species are least concern followed by 8 species are vulnerable, 2 species are near threatened, 4 species are Not evaluated, 2 species are

data deficient and one species *Tor putitora* (Hamilton 1822) are in endangered category as per IUCN status (2022) (Figure 5).

Major threats of fish fauna of Song River

- The fish fauna of the Song river are threatened due to overexploitation, alteration in freshwater habitat, untreated waste and affluent disposal.
- Intensive use of pesticides in agricultural areas has caused severe health issues in fish populations, resulting in widespread fish mortality.
- Excessive deforestation on river banks exacerbates the problem of soil erosion and siltation, resulting in low water levels, which affects the fish population.

Management for the conservation of fish fauna of Song River

- For the sustainable development of the Song Valley's fish resources, appropriate scientific planning and policy should be implemented.
- Afforestation should be done along riverbanks to alleviate soil erosion and siltation. Trees with high water retention capacity should be planted to improve water levels, raise oxygen levels and provide an excellent habitat for fish to thrive.
- Fish populations and water quality are negatively impacted by all non-scientific fishing techniques, such as the indiscriminate killing of numerous fish, including youngsters and brooder fish. The use of dynamite, ichthyotoxic plants, hammers, and bleaching powder should be prohibited, and those found guilty should face a fine.

- Fish studies must be conducted on a yearly basis in order to generate ideas for long-term fisheries development. stopped the contamination of the water.
- The state fishery and forest departments must develop strict regulations and laws for fish conservation.
- The best strategy for protecting the Song River's fish fauna is to raise public awareness of the significance of fish conservation.

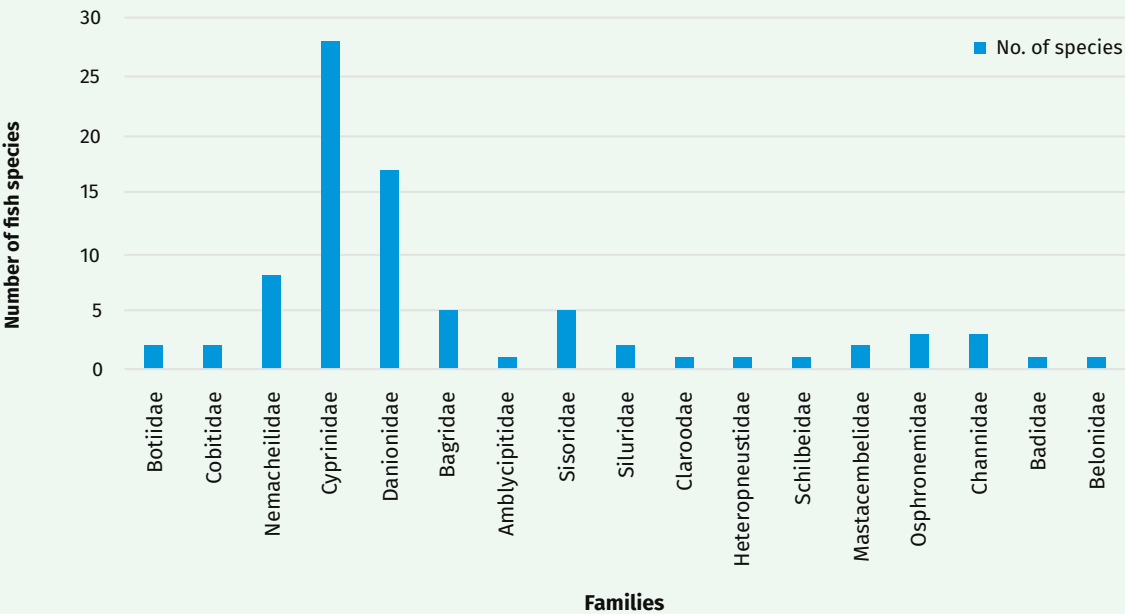


Figure 4: Showing species composition of fishes per family in Song River.

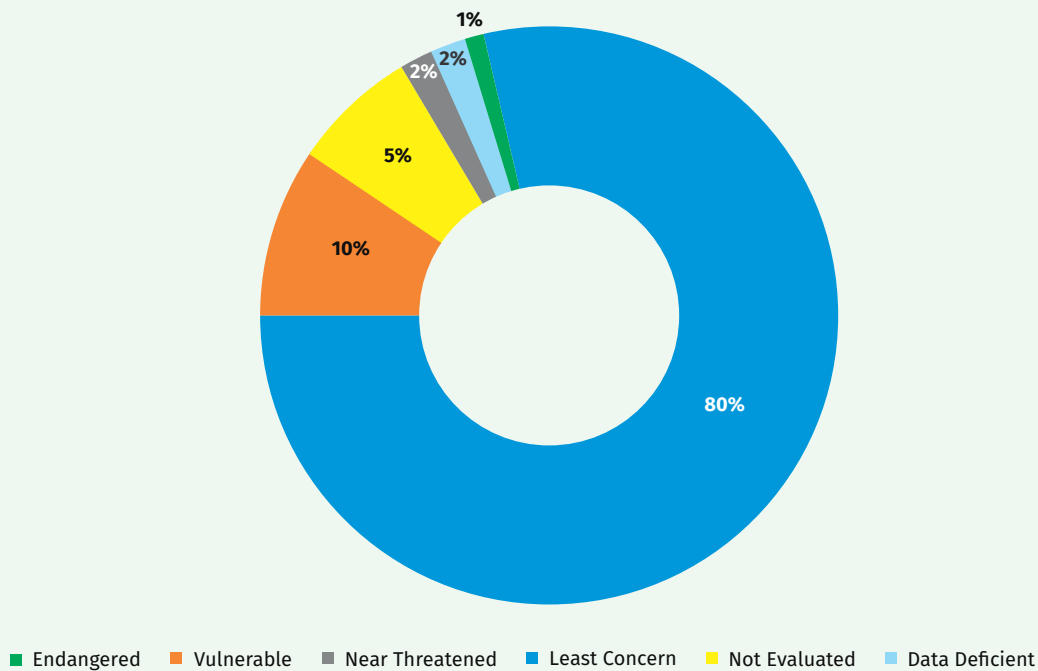


Figure 5: Showing IUCN status of fishes in Song River.

CONSERVATION STATUS

On 12 August 1983, the Government of Uttarakhand, under Section 35 (1) of the Wild Life (Protection) Act, 1972 (Joshi and Singh, 2007), merged Rajaji, Motichur, and Chilla wildlife sanctuaries, collectively declaring them as Rajaji National Park (RNP). The primary purpose behind this declaration was the promotion and development of wildlife in the region. Its designation as a National Park aimed to safeguard and preserve the indigenous flora and fauna, extending protection to territorial waters. Recognizing its strategic location in the Shivalik terrain and Western Himalaya, RNP has been designated as a conserved area, specifically the "Shivalik Elephant Reserve," as part of the "Project Elephant." This initiative seeks to ensure a sustainable population of Asian elephants in their natural habitat. In April 2015, the National Tiger Conservation Authority (NTCA) granted final approval for RNP to be designated as a tiger reserve.

RNP, encompassing part of River Song basin, stands as the sole Protected Area within the basin. About 7 km of the river passes through the Kansrao range of the RNP and approx. 8 km of the river passes through the Motichur range of the RNP.



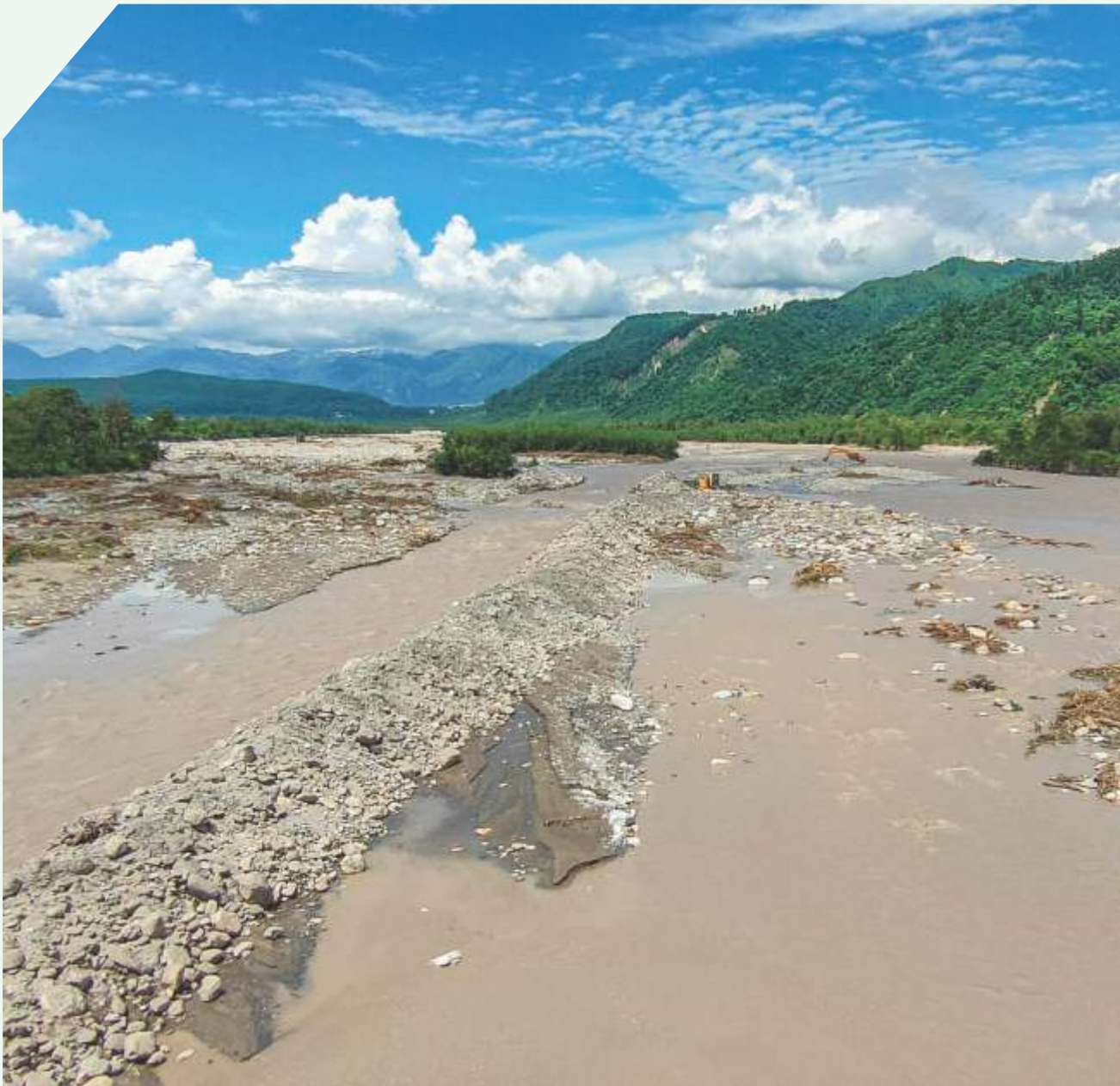
DEMOGRAPHY

Song river basin supports a human population of 5,10,068 lakh (GOI, 2011). Two blocks of the Dehradun district namely Doiwala, Raipur and two blocks of Tehri Garhwal

district namely Jaunpur and Chamba are part of the Song River basin. Doiwala, with a human population of 2.21 lakh is densely populated (381.22 person/km²) than the other three blocks (Figure 6 & Table 3). Agriculture and industrial market economy are the major source of livelihood in the basin.

Table 3. Block-wise human population statistics of the Song River basin for 2011

State	District	Name	Population	Population (%)
Uttarakhand	Dehradun	Raipur	1,65,386	32.42
		Doiwala	2,21,513	43.43
	Tehri Garhwal	Jaunpur	72,219	14.16
		Chamba	50,950	9.99
	Total	5,10,068	100	



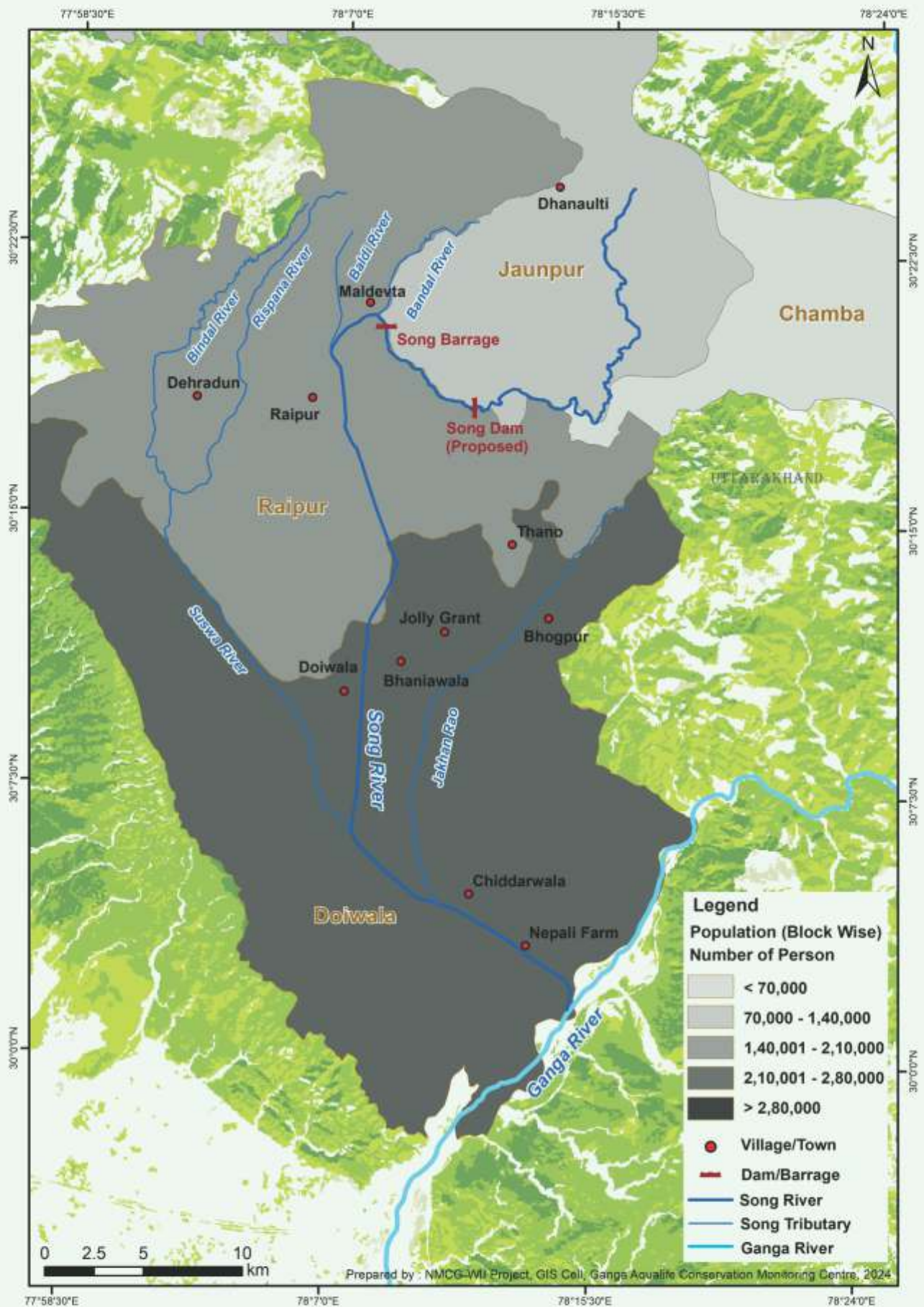


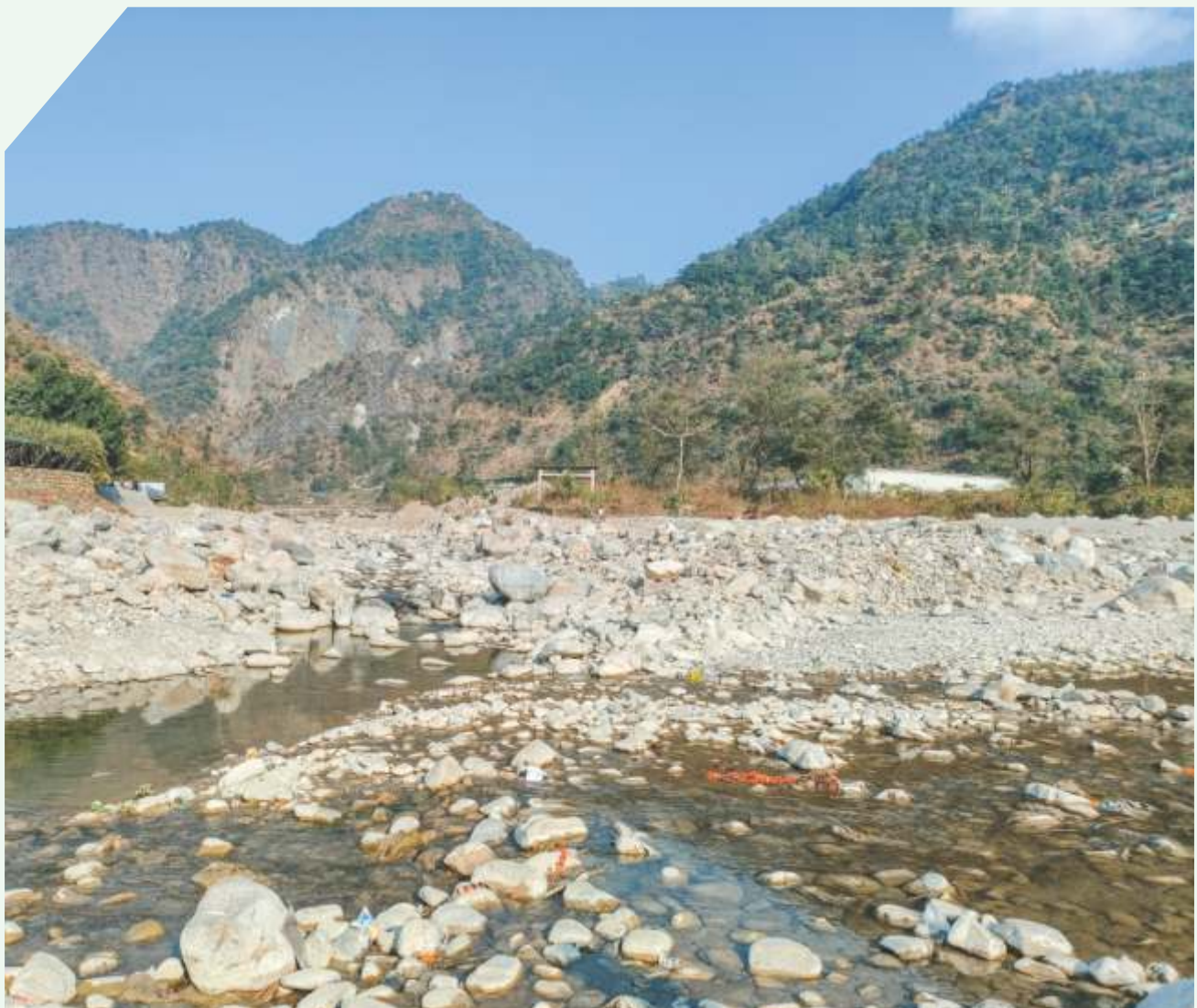
Figure 6: Human population status of the Song River basin (2011)

WATER QUALITY

Humans depend on water, land and forest but for these natural resources to be used to their maximum potential, sustainable management is required (Pimentel et al., 1994). Due to increased fresh water demand, urbanisation, and climate change, the world is moving towards to a fresh water shortage crisis (Boretti and Rosa, 2019). Water resource management are crucial in preventing global water crises (Ghosh and Gope, 2021). The challenge lies not only water demand but also in addressing water quality concerns. The deterioration of freshwater quality results from both human-induced (anthropogenic) and natural (geogenic) factors.

In the recce survey conducted along Song River, we assessed four parameters of water quality viz. Temperature in °C, pH, Electrical Conductivity (EC) in uS/cm, and Total Dissolved Solid (TDS) in mg/L at six sites. The temperature value ranged from 17.2°C to 19.5°C (Figure 7a). The pH value ranged from 7.16 to 8.44, which is under permissible limits as per United States

Environmental Protection Agency (US EPA) standards viz. (6.5 - 8.5) (Figure 7b). As per Figure 7c and 7d, the EC and TDS ranges was less than 500 uS/cm and 500 mg/L respectively, in the upper stretch of the Song River. In the lower stretch after the confluence with Suswa River till the confluence with Ganga River the EC and TDS range was found to be over permissible limit as per US EPA (2023) viz. greater than 500 uS/cm and 500 mg/L respectively. The most heavily inhabited areas of the Dehradun district are traversed by the Rispana and Bindal rivers, which drain their effluent into the Suswa River which merges the Song River (Mani et al., 2025). The domestic waste brought by Bangala Rao drain which goes into Song near Nepali Farm further adds to the pollution load of Song River. Song then eventually finds its way into the Ganga River. The Song River's banks should connect all of the nallahs and outlets with sewage pumping stations (SPS) or STP in order to prevent the mixing of domestic effluents and waste water (Kulshrestha, 2021; Bhutani, 2014). Also, water quality determines the flora and fauna of riverine ecosystem.



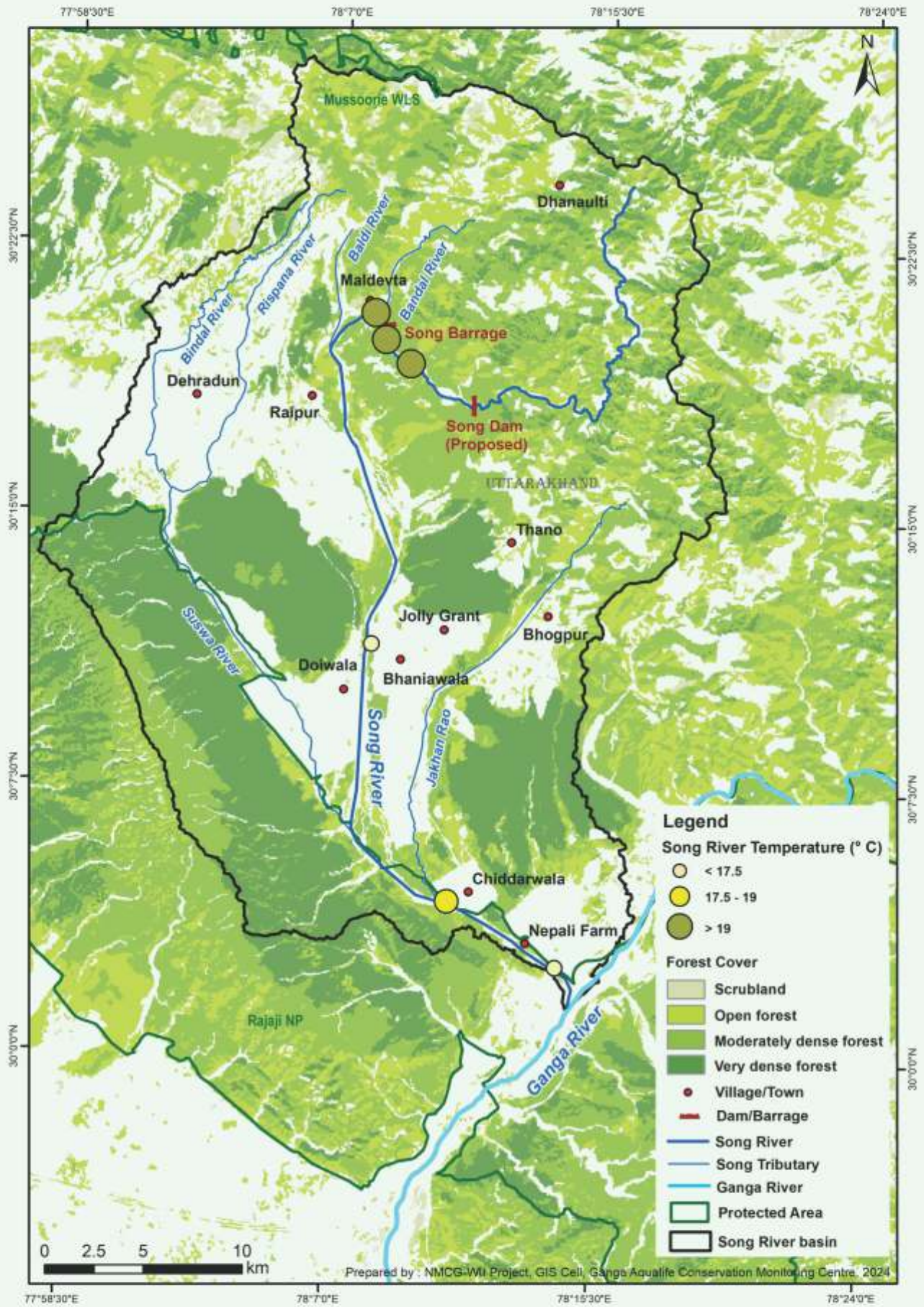


Figure 7a. Temperature map of Song River

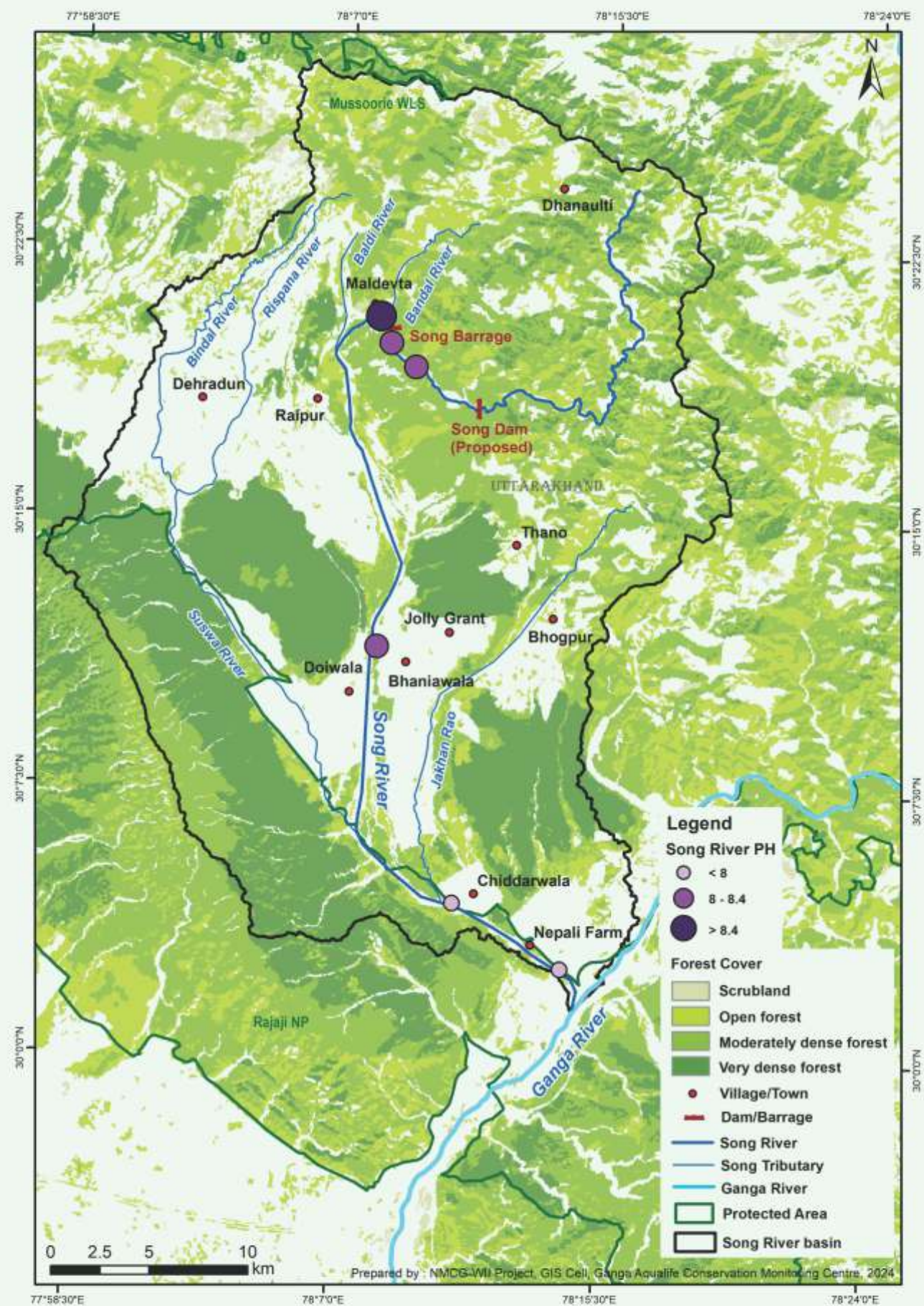


Figure 7b. pH map of Song River

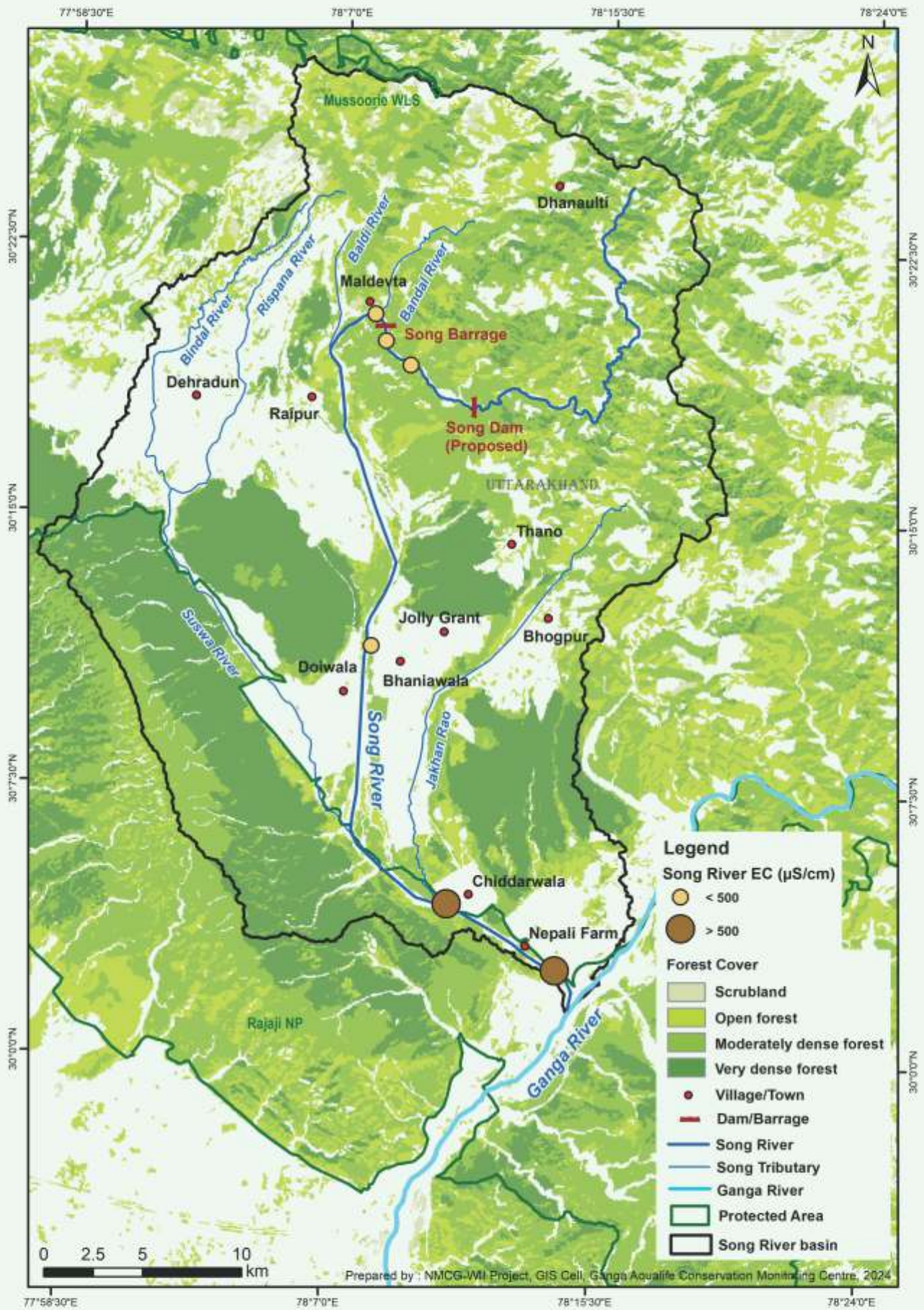


Figure 7c. EC map of Song River

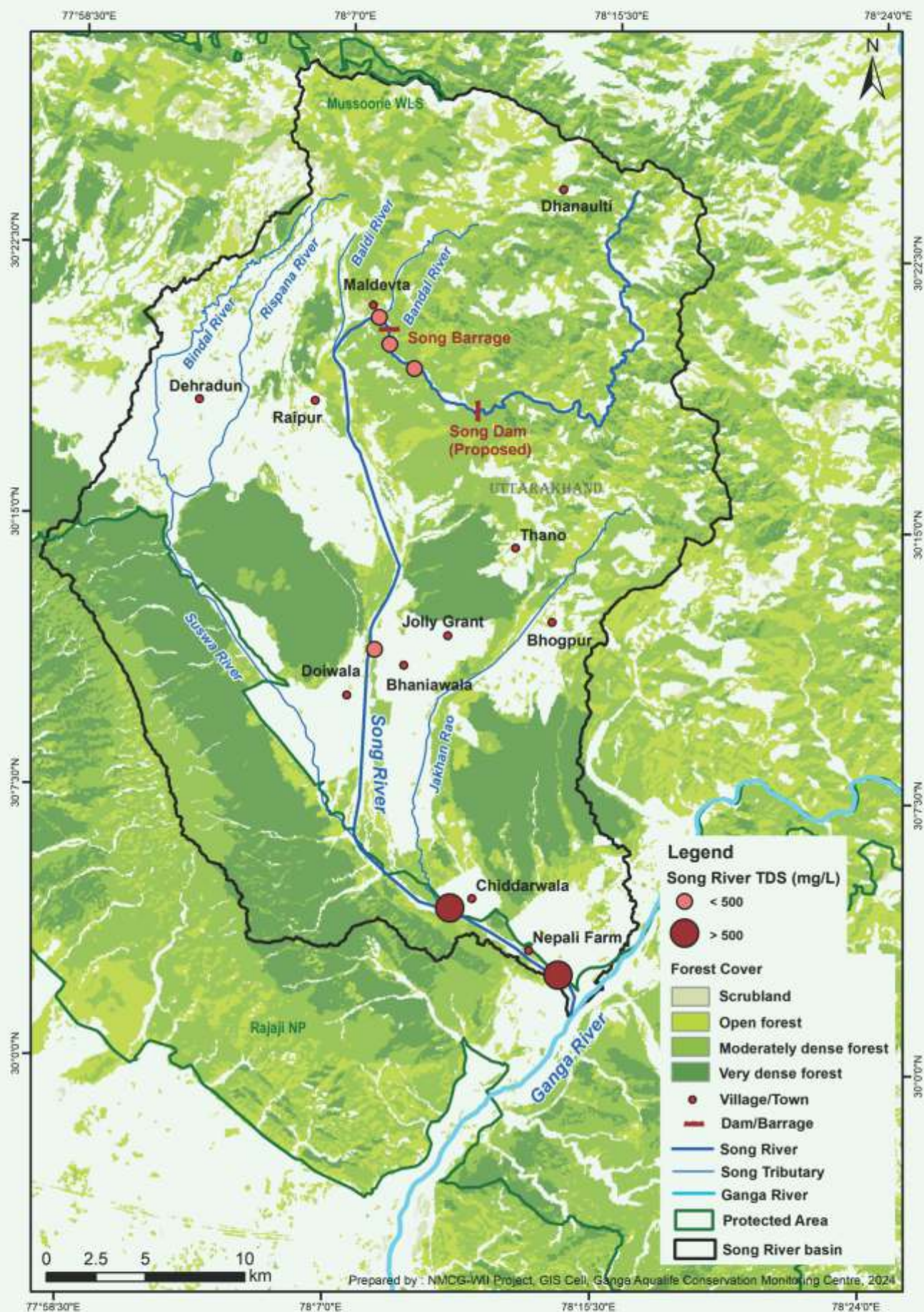


Figure 7d. TDS map of Song River



Song River after meeting Suswa River and Bangala Rao

THREATS

Urbanization, improper urban waste disposal, sand mining, industrial activities and unregulated tourism pose substantial threats to the Song River basin and its biodiversity (Figure 8). The direct dumping of domestic waste and sewerage into these rivers presents a significant challenge to river health. Anthropogenic pressures like channel modification due to construction of barrage, flyover bridges and hotels, illegal sand mining, unregulated tourism and pollution are particularly evident in the upper streams of the Song River. The middle section of the Song River benefits from coming under the boundary of Rajaji National Park. However, concerns arise for the lower portion of the river, which flows through a rapidly urbanizing and developing landscape. Potential issues include pesticide pollution, sedimentation, and nutrient contamination in the water. Illegal sand mining and industrial activities exacerbate threats in the lower stretch. Subudhi et al. (2023) found the water quality of Song River unfit for use and highly contaminated with various organic and inorganic pollutants at several sampled locations. Similarly, a study conducted by Mani et al. (2022) highlights that urban waste effluents from Dehradun city, discharged through Rispana and Bindal rivers, eventually merge into the Suswa River, which, in turn, joins the Song River before reaching the Ganga River. This merging poses a serious threat to the biological diversity and overall health of the

river. Pant et al. (2022) found water samples from Song River contaminated with coliforms and faecal coliforms bacteria namely, *Salmonella* spp., *Klebsiella* spp., *Escherichia coli*, *Pseudomonas* spp. and not fit for drinking. Bhutiani et al. (2014) found that the majority of the water quality parameters assessed at sites sampled along Song River were near to permissible limits suggesting an increased pollution load in the river. Illegal fishing compounds the threats, impacting the riverine habitat and associated species (Rana et al., 2017).

The rise in developmental activities has led to deforestation in the river basins, causing habitat fragmentation (Kumria, 2017). The growing human population has spurred building construction for both residential and non-residential purposes. Consequently, urbanization, industrialization and encroachment in the basin have the potential to adversely affect river hydrology and contribute to urban flooding and also poses a threat to surface water and groundwater quality (CGWB, 2022). The upcoming Song Dam proposed near Maldevta also poses a threat to the ecological connectivity and integrity of Song River. The dam is being built with the purpose of diverting water from Song dam to fulfil the domestic water requirements of Dehradun city and its suburban areas. This will impact the flow regime and the water level of the river and cause habitat alteration due to channel modification, which can further impact the wildlife dependent on the ecosystem.

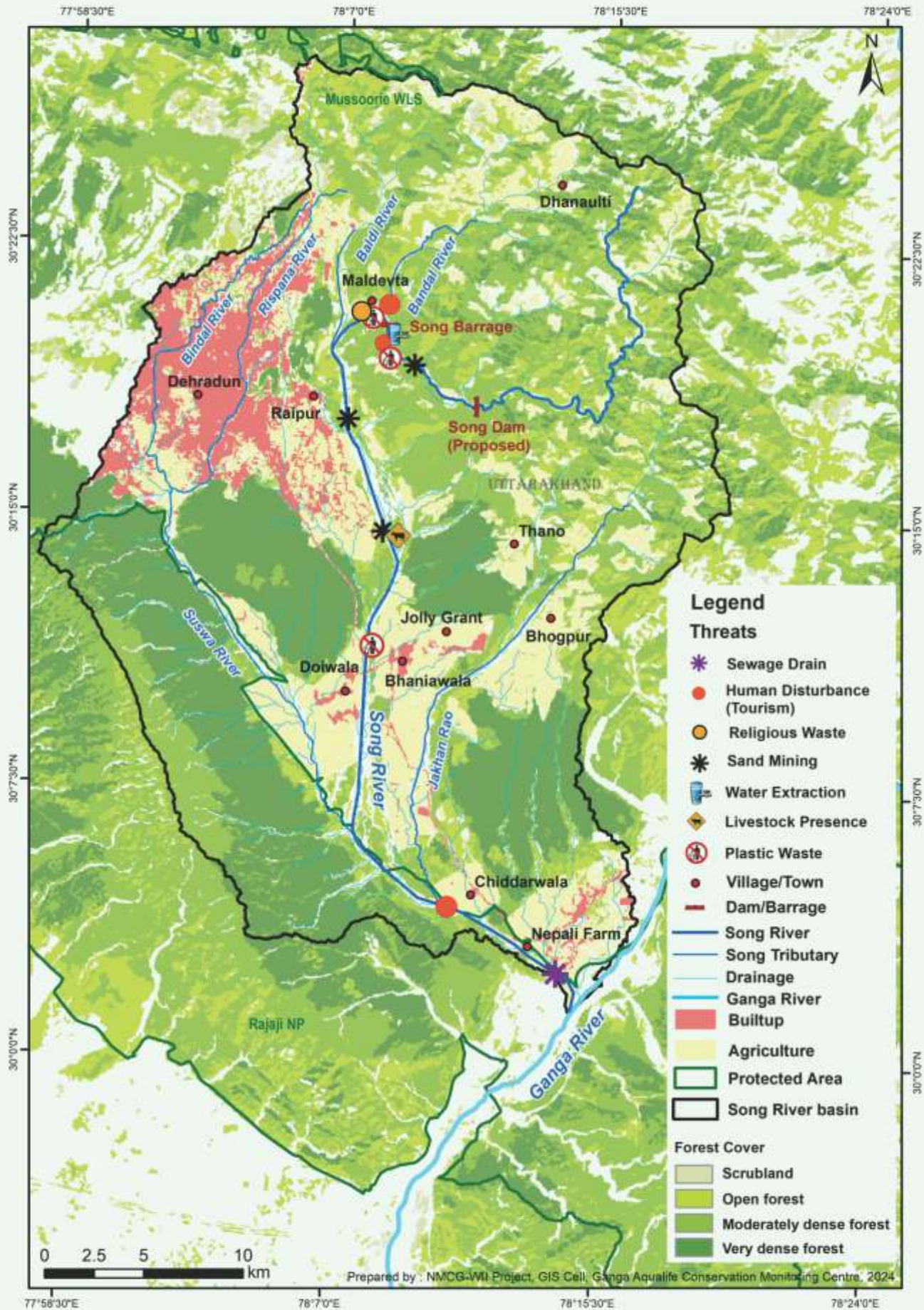


Figure 8: Threat map of Song River basin

CONSERVATION IMPLICATIONS

The Song River, despite its significance as a vital sub-tributary of the Ganga River and a habitat for diverse species, has not received adequate attention from management institutions and concerned authorities. Beyond its role in contributing to the flow and aquatic diversity of the mainstem, the Song River also contribute to the pollution load of the mainstem. Therefore, any conservation efforts aimed at the mainstem should also address the tributaries. To address this, a study focusing on the smaller tributaries of the Ganga River has been initiated.

There is a pressing need for more scientific investigations specifically centered on the ecological aspects of the Song River. This includes in-depth studies on biodiversity, encompassing flora and fauna, as well as research on ecotoxicology and the physicochemical characteristics of

river water. Understanding the threats to the river is crucial for identifying conservation actions that can enhance the ecological status of the Song River. Improved knowledge about the river's ecosystem will contribute to informed management planning.

Given that the Song River flows through a densely populated area where unplanned habitations contribute to solid and liquid waste, involving local communities and stakeholders in conservation planning is paramount. Engaging stakeholders in various ways will undoubtedly aid in the further rejuvenation of the river. However, for effective and resource-efficient planning, the roles of stakeholders in the rejuvenation program should be clearly defined based on their stakes and interests. Establishing a common platform or authority, aligned with the district Ganga committee, can be instrumental in formulating, implementing, and monitoring the rejuvenation activities.



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ANNEXURE I

Mammal species of the Song River basin

Family	Common name/s	Scientific name	IUCN status	IWPA status	Previous studies
Soricidae	Grey Musk Shrew	<i>Suncus murinus</i> (Linnaeus, 1766)	LC	-	b
Pteropodidae	Indian Flying Fox	<i>Pteropus giganteus</i> (Brunnich, 1782)	LC	Schedule II	a, b
	Fulvous Fruit-Bat, Leschenault's Rousette	<i>Rousettus leschenaultii</i> (Desmarest, 1820)	NT	-	b
Hipposideridae	Least Leaf-nosed Bat	<i>Hipposideros cineraceus</i> Blyth, 1853	LC	-	b
Vespertilionidae	Hodgson's Bat	<i>Myotis formosus</i> (Hodgson, 1835)	NT	-	b
	Indian Pipistrelle	<i>Pipistrellus coromandra</i> (Gray, 1838)	LC	-	b
Cercopithecidae	Rhesus Macaque	<i>Macaca mulatta</i> (Zimmermann, 1780)	LC	-	a, b, c, d
	Common Langur/ Northern Plains Gray Langur	<i>Semnopithecus entellus</i> (Dufresne, 1797)	LC	Schedule II	b, d
Manidae	Indian Pangolin	<i>Manis crassicaudata</i> E. Geoffroy, 1803	EN	Schedule I	a, b
Canidae	Asiatic Jackal, Golden Jackel	<i>Canis aureus</i> Linnaeus, 1758	LC	Schedule I	a, b
	Indian Fox	<i>Vulpes bengalensis</i> (Shaw, 1800)	LC	Schedule I	b
Ursidae	Sloth Bear	<i>Melursus ursinus</i> (Shaw, 1791)	VU	Schedule I	b
	Himalayan Black Bear	<i>Ursus thibetanus</i> Cuvier, 1823	VU	Schedule I	b
Mustelidae	Yellow-throated Marten	<i>Martes flavigula</i> (Boddaert, 1785)	LC	Schedule I	b
Viverridae	Small Indian Civet	<i>Viverricula indica</i> (E. Geoffroy Saint-Hilaire, 1803)	LC	Schedule I	a, b, c, d
	Common Palm Civet	<i>Paradoxurus hermaphroditus</i> (Pallas, 1777)	LC	Schedule I	b
	Himalayan Palm Civet	<i>Paguma larvata</i> (C.E.H. Smith, 1827)	LC	Schedule I	b
Herpestidae	Small Indian Mongoose	<i>Herpestes javanicus</i> <i>auropunctatus</i> (Hodgson, 1836)	LC	Schedule I	b
	Common Mongoose/ Indian Grey Mongoose	<i>Herpestes edwardsii</i> (E. Geoffroy Saint-Hilaire, 1818)	LC	Schedule I	a, b, c, d
Felidae	Jungle Cat	<i>Felis chaus</i> Schreber, 1777	LC	Schedule I	b, c, d
	Leopard Cat	<i>Prionailurus bengalensis</i> (Kerr, 1792)	LC	Schedule I	a, b, c

Family	Common name/s	Scientific name	IUCN status	IWPA status	Previous studies
	Common Leopard	<i>Panthera pardus</i> (Linnaeus, 1758)	VU	Schedule I	a, b
	Tiger	<i>Panthera tigris</i> (Linnaeus, 1758)	EN	Schedule I	b, c
Elephantidae	Asian Elephant	<i>Elephas maximus</i> Linnaeus, 1758	EN	Schedule I	b, c
Suidae	Wild Boar	<i>Sus scrofa</i> Linnaeus, 1758	LC	Schedule I	b
Cervidae	Spotted Deer/Chital	<i>Axis axis</i> (Erxleben, 1777)	LC	Schedule III	a, b, c
	Sambar Deer	<i>Rusa unicolor</i> (Kerr, 1792)	VU	Schedule I	a, b, c
	Barking Deer, Southern Red Muntjac	<i>Muntiacus muntjak</i> (Zimmermann, 1780)	LC	Schedule I	b, c
	Hog Deer	<i>Axis porcinus</i> (Zimmermann, 1780)	EN	Schedule I	c
Bovidae	Nilgai	<i>Boselaphus tragocamelus</i> (Pallas, 1766)	LC	Schedule II	b, c
	Himalayan Goral	<i>Naemorhedus goral</i> (Hardwicke, 1825)	NT	Schedule I	c
Sciuridae	Northern Palm Squirrel	<i>Funambulus pennantii</i> Wroughton, 1905	LC	-	a, b, c, d
	Red Giant Flying Squirrel	<i>Petaurista petaurista</i> (Pallas, 1766)	LC	Schedule I	b
Leporidae	Indian Hare	<i>Lepus nigricollis</i> Cuvier, 1823	LC	Schedule II	c
Hystricidae	Indian Crested Porcupine	<i>Hystrix indica</i> Kerr, 1792	LC	Schedule I	a, b, d
Muridae	Indian Mole Rat, Lesser Bandicoot-Rat	<i>Bandicota bengalensis</i> (Gray, 1835)	LC	-	b
	Indian Bush Rat	<i>Golunda ellioti</i> Gray, 1837	LC	-	b
	Common Indian Field Mouse	<i>Mus booduga</i> (Gray, 1837)	LC	-	b
	House Mouse	<i>Mus musculus</i> Linnaeus, 1758	LC	-	b
	House Rat	<i>Rattus rattus</i> (Linnaeus, 1758)	LC	-	b

^aJoshi, R. and Dixit, A. (2012); ^bJoshi, R. (2016); ^cRoy, A. (2016); ^dJoshi et al. (2018)

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ANNEXURE II

Avifaunal species of the Song River basin

Family	Common Name	Scientific Name/s	IUCN status	IWPA status	Previous studies
Podicipedidae	Little Grebe	<i>Tachybaptus ruficollis</i> (Pallas, 1764)	LC	Schedule II	a
Phalacrocoracidae	Great Cormorant	<i>Phalacrocorax carbo</i> (Linnaeus, 1758)	LC	Schedule II	a
Phalacrocoracidae	Little Cormorant	<i>Microcarbo niger</i> (Vieillot, 1817)	LC	Schedule II	a
Ardeidae	Grey Heron	<i>Ardea cinerea</i> (Linnaeus, 1758)	LC	Schedule II	a
Ardeidae	Indian Pond-heron	<i>Ardeola grayii</i> (Sykes, 1832)	LC	Schedule II	a
Ardeidae	Cattle Egret	<i>Bubulcus ibis</i> (Linnaeus, 1758)	LC	Schedule II	a
Ardeidae	Great Egret	<i>Ardea alba</i> (Linnaeus, 1758)	LC	Schedule II	a
Ardeidae	Intermediate Egret	<i>Ardea intermedia</i> (Wagler, 1829)	LC	Schedule II	a
Ardeidae	Little Egret	<i>Egretta garzetta</i> (Linnaeus, 1766)	LC	Schedule II	a
Ardeidae	Black-crowned Night-heron	<i>Nycticorax nycticorax</i> (Linnaeus, 1758)	LC	Schedule II	a
Ardeidae	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i> (Gmelin, 1789)	LC	Schedule I	a
Ciconiidae	Painted Stork	<i>Mycteria leucocephala</i> (Pennant, 1769)	NT	Schedule II	a
Threskiornithidae	Red-naped Ibis	<i>Pseudibis papillosa</i> (Temminck, 1824)	LC	Schedule II	a
Anatidae	Ruddy Shelduck	<i>Tadorna ferruginea</i> (Pallas, 1764)	LC	Schedule II	a
Anatidae	Northern Pintail	<i>Anas acuta</i> (Linnaeus, 1758)	LC	Schedule II	a
Anatidae	Common Teal	<i>Anas crecca</i> (Linnaeus, 1758)	LC	Schedule II	a
Anatidae	Indian Spot-billed Duck	<i>Anas poecilorhyncha</i> (Forster, 1781)	LC	Schedule II	a
Anatidae	Mallard	<i>Anas platyrhynchos</i> (Linnaeus, 1758)	LC	Schedule II	a
Anatidae	Red-crested Pochard	<i>Netta rufina</i> (Pallas, 1773)	LC	Schedule II	a
Anatidae	Common Pochard	<i>Aythya ferina</i> (Linnaeus, 1758)	VU	Schedule I	a
Accipitridae	Black-winged Kite	<i>Elanus caeruleus</i> (Desfontaines, 1789)	LC	Schedule II	a
Accipitridae	Oriental Honey-Buzzard	<i>Pernis ptilorhynchus</i> (Temminck, 1821)	LC	Schedule II	a
Accipitridae	Black Kite	<i>Milvus migrans</i> (Boddaert, 1783)	LC	Schedule II	a

Family	Common Name	Scientific Name/s	IUCN status	IWPA status	Previous studies
Accipitridae	Shikra	<i>Accipiter badius</i> (Gmelin, 1788)	LC	Schedule I	a
Accipitridae	Eurasian Sparrowhawk	<i>Accipiter nisus</i> (Linnaeus, 1758)	LC	Schedule I	a
Accipitridae	Changeable Hawk-Eagle	<i>Nisaetus cirrhatus</i> (Gmelin, 1788)	LC	Schedule I	a
Accipitridae	Bonelli's Eagle	<i>Aquila fasciata</i> (Vieillot, 1822)	LC	Schedule I	a
Accipitridae	Tawny Eagle	<i>Aquila rapax</i> (Temminck, 1828)	VU	Schedule I	a
Accipitridae	Red-headed Vulture	<i>Sarcogyps calvus</i> (Scopoli, 1786)	CR	Schedule I	a
Accipitridae	White-rumped Vulture	<i>Gyps bengalensis</i> (Gmelin, 1788)	CR	Schedule I	a
Accipitridae	Indian Vulture	<i>Gyps indicus</i> (Scopoli, 1786)	CR	Schedule I	a
Accipitridae	Egyptian Vulture	<i>Neophron percnopterus</i> (Linnaeus, 1758)	EN	Schedule I	a
Falconidae	Red-headed Falcon	<i>Falco chicquera</i> (Daudin, 1800)	NT	Schedule I	a
Falconidae	Lagger Falcon	<i>Falco jugger</i> (Temminck, 1825)	LC	Schedule I	a
Falconidae	Common Kestrel	<i>Falco tinnunculus</i> (Linnaeus, 1758)	LC	Schedule II	a
Phasianidae	Black Francolin	<i>Francolinus francolinus</i> (Linnaeus, 1766)	LC	Schedule II	a
Phasianidae	Grey Francolin	<i>Francolinus pondicerianus</i> (Gmelin, 1789)	LC	Schedule II	a
Phasianidae	Jungle Bush Quail	<i>Perdica asiatica</i> (Latham, 1790)	LC	Schedule II	a
Phasianidae	Kalij Pheasant	<i>Lophura leucomelanos</i> (Latham, 1790)	LC	Schedule I	a
Phasianidae	Indian Peafowl	<i>Pavo cristatus</i> (Linnaeus, 1758)	LC	Schedule I	a
Gruidae	Sarus Crane	<i>Grus antigone</i> (Linnaeus, 1758)	VU	Schedule I	a
Rallidae	Slaty-legged Crake	<i>Rallina eurizonoides</i> (Lafresnaye, 1845)	LC	Schedule II	a
Rallidae	White-breasted Waterhen	<i>Amaurornis phoenicurus</i> (Pennant, 1769)	LC	Schedule II	a

Family	Common Name	Scientific Name/s	IUCN status	IWPA status	Previous studies
Rallidae	Common Moorhen	<i>Gallinula chloropus</i> (Linnaeus, 1758)	LC	Schedule II	a
Charadriidae	Spur-winged Lapwing	<i>Vanellus spinosus</i> (Linnaeus, 1758)	LC	NL	a
Charadriidae	Little Ringed Plover	<i>Charadrius dubius</i> (Scopoli, 1786)	LC	Schedule II	a
Scolopacidae	Common Redshank	<i>Tringa totanus</i> (Linnaeus, 1758)	LC	Schedule II	a
Scolopacidae	Common Greenshank	<i>Tringa nebularia</i> (Gunnerus, 1767)	LC	Schedule I	a
Burhinidae	Eurasian Thick-knee	<i>Burhinus oedicnemus</i> (Linnaeus, 1758)	LC	NL	a
Glareolidae	Small Pratincole	<i>Glareola lactea</i> (Temminck, 1820)	LC	Schedule II	a
Laridae	Black-headed Gull	<i>Larus ridibundus</i> (Linnaeus, 1766)	LC	Schedule II	a
Laridae	River Tern	<i>Sterna aurantia</i> (Gray, 1831)	VU	Schedule I	a
Laridae	Black-bellied Tern	<i>Sterna acuticauda</i> (Gray, 1832)	EN	Schedule I	a
Columbidae	Rock Dove	<i>Columba livia</i> (Gmelin, 1789)	LC	NL	a
Columbidae	Eurasian Collared-dove	<i>Streptopelia decaocto</i> (Frisvaldszky, 1838)	LC	Schedule II	a
Columbidae	Red Collared Dove	<i>Streptopelia tranquebarica</i> (Hermann, 1804)	LC	Schedule II	a
Columbidae	Spotted Dove	<i>Spilopelia chinensis</i> (Scopoli, 1786)	LC	Schedule II	a
Columbidae	Asian Emerald Dove	<i>Chalcophaps indica</i> (Linnaeus, 1758)	LC	Schedule II	a
Psittacidae	Alexandrine Parakeet	<i>Psittacula eupatria</i> (Linnaeus, 1766)	NT	Schedule II	a
Psittacidae	Rose-ringed Parakeet	<i>Alexandrinus krameri</i> (Scopoli, 1769)	LC	Schedule II	a
Psittacidae	Plum-headed Parakeet	<i>Himalayapsitta cyanocephala</i> (Linnaeus, 1766)	LC	Schedule II	a
Psittacidae	Slaty-headed Parakeet	<i>Himalayapsitta himalayana</i> (Lesson, 1832)	LC	Schedule II	a
Cuculidae	Pied Cuckoo	<i>Clamator jacobinus</i> (Boddaert, 1783)	LC	Schedule II	a
Cuculidae	Indian Cuckoo	<i>Cuculus micropterus</i> (Gould, 1837)	LC	Schedule II	a
Cuculidae	Common Cuckoo	<i>Cuculus canorus</i> (Linnaeus, 1758)	LC	Schedule II	a
Cuculidae	Asian Koel	<i>Eudynamys scolopaceus</i> (Linnaeus, 1758)	LC	Schedule II	a

Family	Common Name	Scientific Name/s	IUCN status	IWPA status	Previous studies
Cuculidae	Sirkeer Malkoha	<i>Taccocua leschenaultii</i> (Lesson, 1830)	LC	Schedule II	a
Cuculidae	Greater Coucal	<i>Centropus sinensis</i> (Stephens, 1815)	LC	Schedule II	a
Strigidae	Spotted Owlet	<i>Athene brama</i> (Temminck, 1821)	LC	Schedule II	a
Strigidae	Eurasian Eagle-owl	<i>Bubo bubo</i> (Linnaeus, 1758)	LC	Schedule I	a
Caprimulgidae	Indian Nightjar	<i>Caprimulgus asiaticus</i> (Latham, 1790)	LC	Schedule II	a
Apodidae	Little Swift	<i>Apus affinis</i> (Gray, 1830)	LC	Schedule II	a
Alcedinidae	Pied Kingfisher	<i>Ceryle rudis</i> (Linnaeus, 1758)	LC	Schedule II	a
Alcedinidae	Common Kingfisher	<i>Alcedo atthis</i> (Linnaeus, 1758)	LC	Schedule II	a
Alcedinidae	White-breasted Kingfisher	<i>Halcyon smyrnensis</i> (Linnaeus, 1758)	LC	Schedule II	a
Meropidae	Asian Green Bee-eater	<i>Merops orientalis</i> (Latham, 1802)	LC	Schedule II	a
Coraciidae	Indian Roller	<i>Coracias benghalensis</i> (Linnaeus, 1758)	LC	Schedule II	a
Upupidae	Common Hoopoe	<i>Upupa epops</i> (Linnaeus, 1758)	LC	Schedule II	a
Bucerotidae	Indian Grey Hornbill	<i>Ocyrceros birostris</i> (Scopoli, 1786)	LC	Schedule II	a
Bucerotidae	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i> (Shaw, 1808)	LC	Schedule I	c
Megalaimidae	Brown-headed Barbet	<i>Psilopogon zeylanicus</i> (Gmelin, 1788)	LC	Schedule II	a
Megalaimidae	Blue-throated Barbet	<i>Psilopogon asiaticus</i> (Latham, 1790)	LC	Schedule II	a
Megalaimidae	Coppersmith Barbet	<i>Psilopogon haemacephalus</i> (Muller, 1776)	LC	Schedule II	a
Picidae	Speckled Piculet	<i>Picumnus innominatus</i> (Burton, 1836)	LC	Schedule II	a
Picidae	Grey-faced Woodpecker	<i>Picus canus</i> (Gmelin, 1788)	LC	Schedule II	a
Picidae	Grey-capped Pygmy Woodpecker	<i>Picoides canicapillus</i> (Blyth, 1845)	LC	Schedule II	a
Picidae	Yellow-crowned Woodpecker	<i>Leiopicus mahrattensis</i> (Latham, 1801)	LC	Schedule I	a
Picidae	Grey-capped Pygmy Woodpecker	<i>Picoides canicapillus</i> (Blyth, 1845)	LC	Schedule II	a
Picidae	Great Slaty Woodpecker	<i>Mulleripicus pulverulentus</i> (Temminck, 1826)	VU	NL	b
Alaudidae	Ashy-crowned Sparrow-lark	<i>Eremopterix griseus</i> (Scopoli, 1786)	LC	Schedule II	a
Alaudidae	Crested Lark	<i>Galerida cristata</i> (Linnaeus, 1758)	LC	Schedule II	a

Family	Common Name	Scientific Name/s	IUCN status	IWPA status	Previous studies
Hirundinidae	Wire-tailed Swallow	<i>Hirundo smithi</i> (Leach, 1818)	LC	Schedule II	a
Hirundinidae	Red-rumped Swallow	<i>Cecropis daurica</i> (Linnaeus, 1771)	LC	Schedule II	a
Laniidae	Bay-backed Shrike	<i>Lanius vittatus</i> (Valenciennes, 1826)	LC	Schedule II	a
Laniidae	Long-tailed Shrike	<i>Lanius schach</i> (Linnaeus, 1758)	LC	Schedule II	a
Oriolidae	Eurasian Golden Oriole	<i>Oriolus oriolus</i> (Linnaeus, 1758)	LC	Schedule II	a
Oriolidae	Black-hooded Oriole	<i>Oriolus xanthornus</i> (Linnaeus, 1758)	LC	Schedule II	a
Dicruridae	Hair-crested Drongo	<i>Dicrurus hottentottus</i> (Gould, 1842)	LC	Schedule II	a
Dicruridae	Black Drongo	<i>Dicrurus macrocercus</i> (Vieillot, 1817)	LC	Schedule II	a
Sturnidae	Bank Myna	<i>Acridotheres ginginianus</i> (Latham, 1790)	LC	Schedule II	a
Sturnidae	Common Myna	<i>Acridotheres tristis</i> (Linnaeus, 1766)	LC	Schedule II	a
Sturnidae	Jungle Myna	<i>Acridotheres fuscus</i> (Wagler, 1827)	LC	Schedule II	a
Sturnidae	Common Starling	<i>Sturnus vulgaris</i> (Linnaeus, 1758)	LC	Schedule II	a
Corvidae	Rufous Treepie	<i>Dendrocitta vagabunda</i> (Latham, 1790)	LC	Schedule II	a
Corvidae	House Crow	<i>Corvus splendens</i> (Vieillot, 1817)	LC	NL	a
Corvidae	Large-billed Crow	<i>Corvus macrorhynchos</i> (Wagler, 1827)	LC	Schedule II	a
Campephagidae	Black-headed Cuckooshrike	<i>Lalage melanoptera</i> (Ruppell, 1839)	LC	Schedule II	a
Campephagidae	Scarlet Minivet	<i>Pericrocotus flammeus</i> (Forster, 1781)	LC	Schedule II	a
Campephagidae	Rosy Minivet	<i>Pericrocotus roseus</i> (Vieillot, 1818)	LC	Schedule II	a
Campephagidae	Small Minivet	<i>Pericrocotus cinnamomeus</i> (Linnaeus, 1766)	LC	Schedule I	a
Aegithinidae	Common Iora	<i>Aegithina tiphia</i> (Linnaeus, 1758)	LC	Schedule II	a
Chloropseidae	Golden-fronted Leafbird	<i>Chloropsis aurifrons</i> (Temminck, 1829)	LC	NL	a
Pycnonotidae	Himalayan Bulbul	<i>Pycnonotus leucogenys</i> (Gray, 1835)	LC	Schedule II	a
Pycnonotidae	Red-vented Bulbul	<i>Pycnonotus cafer</i> (Linnaeus, 1766)	LC	Schedule II	a
Timaliidae	Black-chinned Babbler	<i>Cyanoderma pyrrhops</i> (Blyth, 1844)	LC	Schedule II	a

Family	Common Name	Scientific Name/s	IUCN status	IWPA status	Previous studies
Paradoxornithidae	Yellow-eyed Babbler	<i>Chrysomma sinense</i> (Gmelin, 1789)	LC	Schedule II	a
Leiotrichidae	Common Babbler	<i>Argya caudata</i> (Dumont, 1823)	LC	Schedule II	a
Leiotrichidae	Jungle Babbler	<i>Argya striata</i> (Dumont, 1823)	LC	Schedule II	a
Muscicapidae	Verditer Flycatcher	<i>Eumyias thalassinus</i> (Swainson, 1838)	LC	Schedule II	a
Stenostiridae	Grey-headed Canary Flycatcher	<i>Culicicapa ceylonensis</i> (Swainson, 1820)	LC	Schedule II	a
Rhipiduridae	White-browed Fantail	<i>Rhipidura aureola</i> (Lesson, 1831)	LC	NL	a
Monarchidae	Indian Paradise-flycatcher	<i>Terpsiphone paradisi</i> (Linnaeus, 1758)	LC	Schedule II	a
Cisticolidae	Ashy Prinia	<i>Prinia socialis</i> (Sykes, 1832)	LC	Schedule II	a
Cistocolidae	Common Tailorbird	<i>Orthotomus sutorius</i> (Pennant, 1769)	LC	Schedule II	a
Phylloscopidae	Common Chiffchaff	<i>Phylloscopus collybita</i> (Vieillot, 1817)	LC	Schedule II	a
Phylloscopidae	Grey-hooded Warbler	<i>Phylloscopus xanthoschistos</i> (Gray, 1846)	LC	Schedule II	a
Muscicapidae	Bluethroat	<i>Cyanecula svecica</i> (Linnaeus, 1758)	LC	Schedule II	a
Muscicapidae	Oriental Magpie-robin	<i>Copsychus saularis</i> (Linnaeus, 1758)	LC	Schedule II	a
Muscicapidae	Black Redstart	<i>Phoenicurus ochruros</i> (Gmelin, 1774)	LC	Schedule II	a
Muscicapidae	Plumbeous Water-redstart	<i>Phoenicurus fuliginosus</i> (Vigors, 1831)	LC	Schedule II	a
Muscicapidae	Common Stonechat	<i>Saxicola torquatus</i> (Linnaeus, 1766)	LC	NL	a
Muscicapidae	Grey Bushchat	<i>Saxicola ferreus</i> (Gray, 1846)	LC	Schedule II	a
Muscicapidae	White-capped Redstart	<i>Phoenicurus leucocephalus</i> (Vigors, 1831)	LC	Schedule II	a
Muscicapidae	Indian Robin	<i>Saxicoloides fulicatus</i> (Linnaeus, 1766)	LC	Schedule II	a
Muscicapidae	Blue Whistling-thrush	<i>Myophonus caeruleus</i> (Scopoli, 1786)	LC	Schedule II	a
Turdidae	Black-throated Thrush	<i>Turdus atrogularis</i> (Jarocki, 1819)	LC	Schedule II	a
Paridae	Great Tit	<i>Parus major</i> (Linnaeus, 1758)	LC	Schedule II	a
Motacillidae	Western Yellow Wagtail	<i>Motacilla flava</i> (Linnaeus, 1758)	LC	Schedule II	a

Family	Common Name	Scientific Name/s	IUCN status	IWPA status	Previous studies
Motacillidae	White Wagtail	<i>Motacilla alba</i> (Linnaeus, 1758)	LC	Schedule II	a
Motacillidae	White-browed Wagtail	<i>Motacilla maderaspatensis</i> (Gmelin, 1789)	LC	Schedule II	a
Dicaeidae	Fire-breasted Flowerpecker	<i>Dicaeum ignipectus</i> (Blyth, 1843)	LC	Schedule II	a
Dicaeidae	Thick-billed Flowerpecker	<i>Dicaeum agile</i> (Tickell, 1833)	LC	Schedule II	a
Nectariniidae	Purple Sunbird	<i>Cinnyris asiaticus</i> (Latham, 1790)	LC	Schedule II	a
Zosteropidae	Indian White-eye	<i>Zosterops palpebrosus</i> (Temminck, 1824)	LC	Schedule II	a
Passeridae	House Sparrow	<i>Passer domesticus</i> (Linnaeus, 1758)	LC	Schedule II	a
Passeridae	Chestnut-shouldered Petronia	<i>Gymnoris xanthocollis</i> (Burton, 1838)	LC	NL	a
Ploceidae	Russet Sparrow	<i>Passer cinnamomeus</i> (Temminck, 1836)	LC	Schedule II	a
Ploceidae	Baya Weaver	<i>Ploceus philippinus</i> (Linnaeus, 1766)	LC	Schedule II	a
Estrildidae	Scaly-breasted Munia	<i>Lonchura punctulata</i> (Linnaeus, 1758)	LC	Schedule II	a
Estrildidae	Red Avadavat	<i>Amandava amandava</i> (Linnaeus, 1758)	LC	Schedule II	a
Estrildidae	Indian Silverbill	<i>Euodice malabarica</i> (Linnaeus, 1758)	LC	Schedule II	a
Fringillidae	Yellow-breasted Greenfinch	<i>Chloris spinoides</i> (Vigors, 1831)	LC	Schedule II	a
Fringillidae	Common Rosefinch	<i>Carpodacus erythrinus</i> (Pallas, 1770)	LC	Schedule II	a
Emberizidae	Red-headed Bunting	<i>Emberiza bruniceps</i> (Brandt, 1841)	LC	Schedule II	a

^aNarang (1995), ^bKumar, & Shahabuddin (2012); ^cSingh (2000)

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ANNEXURE III

Reptilian species of the Song River basin

Family	Common Name/s	Scientific Name	IUCN status	IWPA status	Previous status
Viperidae	Himalayan White-lipped Pitviper	<i>Trimeresurus septentrionalis</i> (Kramer 1977)	LC	NL	e
Colubridae	Himalayan Trinket Snake	<i>Elaphe hodgsoni</i> (Günther, 1860)	LC	NL	d
Colubridae	Copper-head Trinket Snake	<i>Coelognathus radiatus</i> (Boie, 1827)	LC	NL	a
Typhlopidae	Brahminy Blind Snake	<i>Indotyphlops braminus</i> (Daudin, 1803)	LC	NL	b
Pythonidae	Indian Rock Python	<i>Python molurus</i> (Linnaeus, 1758)	NT	Schedule IV	b
Boidae	Red Sand Boa	<i>Eryx johnii</i> (Russell, 1801)	NT	NL	b
Colubridae	Common Wolf Snake	<i>Lycodon aulicus</i> (Linnaeus, 1758)	LC	NL	b
Natricidae	Checkered Keelback	<i>Fowlea piscator</i> (Schneider, 1799)	LC	NL	b
Colubridae	Twin-spotted Wolf Snake	<i>Lycodon jara</i> (Shaw, 1802)	LC	NL	c
Colubridae	Common Kukri Snake	<i>Oligodon arnensis</i> (Shaw, 1802)	LC	NL	b
Natricidae	Buff Striped Keelback	<i>Amphiesma stolatum</i> (Linnaeus, 1758)	LC	NL	b
Colubridae	Trinket Snake	<i>Coelognathus helenae</i> (Daudin, 1803)	LC	NL	b
Colubridae	Common Rat Snake	<i>Ptyas mucosa</i> (Linnaeus, 1758)	LC	Schedule II	b
Colubridae	Indian Gamma Snake	<i>Boiga trigonata</i> (Schneider, 1802)	LC	NL	b
Viperidae	Saw-scaled Viper	<i>Echis carinatus</i> (Schneider, 1801)	LC	NL	b
Viperidae	Western Russel's Viper	<i>Daboia russelii</i> (Shaw & Nodder, 1797)	LC	Schedule I	b
Geoemydidae	Spotted Pond Turtle	<i>Geoclemys hamiltonii</i> (Gray, 1831)	EN	NL	b
Geoemydidae	Brown Roofed Turtle	<i>Pangshura smithii</i> (Gray, 1863)	NT	NL	b
Geoemydidae	Indian Roofed Turtle	<i>Pangshura tecta</i> (Gray, 1831)	VU	Schedule IV	b
Geoemydidae	Indian Black Turtle	<i>Melonochelys trijuga</i> (Schweigger, 1812)	LC	NL	b
Trionychidae	Indian Flapshell Turtle	<i>Lissemys punctata</i> (Bonnaterre, 1789)	VU	Schedule IV	b

^aBhatnagar (1969); ^bHussain & Roy (1992); ^cHusan & Tilak (1995); ^dSingh et al. (2017); ^eSingh & Joshi (2018).

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ANNEXURE IV

Amphibian species of the Song River basin

Common Name/s	Family	Scientific Name	IUCN status	IWPA status
Indian Common Toad	Bufonidae	<i>Duttaphrynus melanostictus</i> (Schneider, 1799)	LC	NL
Marbled Toad	Bufonidae	<i>Duttaphrynus stomaticus</i> (Lutken, 1894)	LC	NL
Skittering Frog	Dicroglossidae	<i>Euphlyctis cyanophlyctis</i> (Schneider, 1799)	LC	NL
Paddy-field Frog	Dicroglossidae	<i>Fejervarya limnocharis</i> (Gravenhorst, 1829)	LC	NL
Jerdon's Bullfrog	Dicroglossidae	<i>Hoplobatrachus crassus</i> (Jerdon, 1853)	LC	Schedule II
Indian Bullfrog	Dicroglossidae	<i>Hoplobatrachus tigerinus</i> (Daudin, 1802)	LC	Schedule II
Short-headed Burrowing Frog	Dicroglossidae	<i>Sphaerotheca breviceps</i> (Schneider, 1799)	LC	NL
Indian Ornate Frog	Microhylidae	<i>Microhyla ornata</i> (Dumeril and Bibron, 1841)	LC	NL
Marbled Globular Frog	Microhylidae	<i>Uperodon systoma</i> (Schneider, 1799)	LC	NL
Himalayan Tree Frog	Rhacophoridae	<i>Polypedates maculatus</i> (Gray, 1830)	LC	NL

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ANNEXURE V

Fish species of the Song River basin

Species Name	Order	Family
<i>Botia dario</i> (Hamilton 1822)	Cypriniformes	Botiidae
<i>Botia dayi</i> Hora 1932	Cypriniformes	Botiidae
<i>Lepidocephalichthys annandalei</i> Chaudhuri 1912	Cypriniformes	Cobitidae
<i>Lepidocephalichthys guntea</i> (Hamilton 1822)	Cypriniformes	Cobitidae
<i>Nemacheilus corica</i> (Hamilton 1822)	Cypriniformes	Nemacheilidae
<i>Paracanthocobitis botia</i> (Hamilton 1822)	Cypriniformes	Nemacheilidae
<i>Paraschistura montana</i> (McClelland 1838)	Cypriniformes	Nemacheilidae
<i>Schistura beavani</i> (Gunther 1868)	Cypriniformes	Nemacheilidae
<i>Schistura doonensis</i> (Tilak & Husain 1977)	Cypriniformes	Nemacheilidae
<i>Schistura rupecula</i> McClelland 1838	Cypriniformes	Nemacheilidae
<i>Schistura savona</i> (Hamilton 1822)	Cypriniformes	Nemacheilidae
<i>Schistura scaturigina</i> McClelland 1839	Cypriniformes	Nemacheilidae
<i>Bangana dero</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Chagunius chagunio</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Cirrhinus mrigala</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Cyprinus carpio</i> Linnaeus 1758	Cypriniformes	Cyprinidae
<i>Garra gotyla</i> (Gray 1830)	Cypriniformes	Cyprinidae
<i>Garra lamta</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Labeo boga</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Labeo calbasu</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Labeo dyocheilus</i> (McClelland 1839)	Cypriniformes	Cyprinidae
<i>Labeo gonius</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Labeo pangusia</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Labeo rohita</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Naziritor chelynoides</i> (McClelland 1839)	Cypriniformes	Cyprinidae
<i>Pethia conchoni</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Pethia phutunio</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Pethia ticto</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Puntius chola</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Puntius sophore</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Puntius terio</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Schizopyge curvifrons</i> (Heckel 1838)	Cypriniformes	Cyprinidae
<i>Schizothorax niger</i> Heckel 1838	Cypriniformes	Cyprinidae
<i>Schizothorax plagiostomus</i> Heckel 1838	Cypriniformes	Cyprinidae
<i>Schizothorax progastus</i> (McClelland 1839)	Cypriniformes	Cyprinidae

Vernacular name	Common name	IUCN status	Previous study
-	Bengal loach or queen loach	LC	1,8,14
-	Hora loach	NE	9
Gadera	Annandale loach	LC	14
Ghiwa, Nauni	Guntea loach	LC	7,8,9,12,13,14,15
Gadera, Nauni	Stone loach	LC	7,15
Baktia, Gadera, Ghiwa, Nauni	Mottled loach	LC	1,7,8,9,10,12,14,15
Gadiyal, Gadera	-	NE	13,14
Gadera, Souna	Creek loach	LC	7,8,14,15
Gadera, Nauni	Dehradun loach	DD	7
Ghidiyala, Gaderi, Nauni	Stone loach	LC	1,7,8,9,13,14,15
Gadera, Nauni, Savna	Half banded loach, Stone loach	LC	1,4,7,8,13,14,15
-	River loach	LC	4,15
Kalabans, Moili	Kalabans	LC	1,4,7,8,9,11,13,14,15
Chhibban, Pathali	Chaguni	LC	4,7,8,9,13,14,15,16
-	Mrigal	LC	8
-	Common carp	VU	13
Dhanura, Gotla	Sucker head	LC	1,4,7,8,9,13,14,15,16
-	Lamta garra	LC	14,15
-	Boga labeo	LC	15
-	Orangefin labeo	LC	8,9
Bolla, Kali, Doongri	Kali	LC	1,7,8,9,11,13,14,15
-	Kuria labeo	LC	1
Gulabi Pankh	Pangusia labeo	NT	13,14
-	Rohu	LC	8,17
Kala Mahseer	Dark mahseer	VU	7,9,13,16
Kharauli-pothi, Chidhu, Puti	Rosy barb	LC	7,10,11,12,13, 14,15,16
-	Spottedsail barb	LC	8,15
Bhuri, Phuti	Ticto barb, Two-spot barb	LC	1,2,7,8,9,11,12,13,14,15,16
Katcha, Puti, Phuti, Ticker, Chidhu	Swamp barb or chola barb	LC	7,8,9,11,12,13,14,15
Phuti, Pothi, Phuti	Pool barb, spotfin swamp barb	LC	7,8,9,11,12,13, 14,15
Bhuri	One spot barb	LC	14
-	Sattar snowtrout	LC	8
-	Alghad snowtrout	NE	8
-	Hill trout	VU	1,8
Dinnawah, Paharimacchi	Dinnawah snowtrout	LC	1,7,8,13,14,16

Species Name	Order	Family
<i>Schizothorax richardsonii</i> (Gray 1832)	Cypriniformes	Cyprinidae
<i>Systomus sarana</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Tariqilabeo latius</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Tor putitora</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Tor tor</i> (Hamilton 1822)	Cypriniformes	Cyprinidae
<i>Amblypharyngodon mola</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Barilius barila</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Barilius lanceolatus</i> Husain, 2010	Cypriniformes	Danionidae
<i>Barilius vagra</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Cabdio jaya</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Cabdio morar</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Danio rerio</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Devario aequipinnatus</i> (McClelland 1839)	Cypriniformes	Danionidae
<i>Devario devario</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Esomus danrica</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Opsarius barna</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Opsarius bendelisis</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Opsarius dimorphicus</i> (Tilak & Husain 1990)	Cypriniformes	Danionidae
<i>Opsarius tileo</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Raiamas bola</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Rasbora daniconius</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Salmostoma bacaila</i> (Hamilton 1822)	Cypriniformes	Danionidae
<i>Mystus bleekeri</i> (Day 1877)	Siluriformes	Bagridae
<i>Mystus cavasius</i> (Hamilton 1822)	Siluriformes	Bagridae
<i>Mystus tengara</i> (Hamilton 1822)	Siluriformes	Bagridae
<i>Mystus vittatus</i> (Bloch 1794)	Siluriformes	Bagridae
<i>Sperata seenghala</i> (Sykes 1839)	Siluriformes	Bagridae
<i>Amblyceps mangois</i> (Hamilton 1822)	Siluriformes	Amblycipitidae
<i>Bagarius bagarius</i> (Hamilton 1822)	Siluriformes	Sisoridae
<i>Glyptothorax cavia</i> (Hamilton 1822)	Siluriformes	Sisoridae
<i>Glyptothorax pectinopterus</i> (McClelland 1842)	Siluriformes	Sisoridae
<i>Glyptothorax saisii</i> (Jenkins 1910)	Siluriformes	Sisoridae
<i>Glyptothorax telchitta</i> (Hamilton 1822)	Siluriformes	Sisoridae
<i>Ompok pabda</i> (Hamilton 1822)	Siluriformes	Siluridae
<i>Wallago attu</i> (Bloch & Schneider 1801)	Siluriformes	Siluridae

Vernacular name	Common name	IUCN status	Previous study
Asela, Sohal	Snowtrout	VU	7,8,9,13,14
Khami, Khangan, Phutia, Pothia, Puta, Puti	Olive barb	LC	1,7,8,9,11,12, 13,14,15
Dhanaura	Gangetic latia, Stone roller	LC	1,4,7,8,9,13,14, 15
Pila-par Mahseer	Putitor mahseer	EN	1,4,7,8,9,13,14, 15,16
Lal-par Mahseer, Machiyari, Makhani	Tor barb, Mahseer	DD	1,4,7,8,9,13,14,15,16
Dawla	Mola carplet	LC	9,11
Caedra, Gilland	Barred baril	LC	11,15
Chilwa, Dhaur	Song baril	NE	5,6
Popta, Dhaur, Childi, Chalra	Vagra baril	LC	1,6,7,8,11,13,14,15
Chilwa, Chal	Jaya	LC	6,13
Chilwa, Chal	Morari	LC	6,13
Dharidar Salari	Zebra danio	LC	6,7,11,12,13, 14,15
-	Giant danio	LC	15
Chand, Dhano, Dhono	Sind danio	LC	1,6,7,8,10,11, 12,13,14,15
Chal	Indian flying barb	LC	6,7,8,11,12,13, 14,15
Childi, Dhaur, Popta	Barna baril	LC	1,6,7,8,9,11,13, 14,15,16
Chaldi, Chilwa, Chedra, Dhau, Sunarar	Indian hill trout	LC	1,2,4,6,7,8,9, 11,13,14,15,16
Chilwa	Songi baril	VU	6,7
Chilwa	Tileo baril	LC	3,11, 13,16
Bhola, Balala, Bola, Gulabi Machli, Naulia	Trout barb	LC	1, 4, 6, 7, 8, 9, 13, 14,15
Bhuri, Bhurata, Bhuri, Dharidaar	Slender rasbora	LC	6,7,8,9,10,11, 12,13,14,15
-	Large razorbelly minnow	LC	8,9
Kater	Day's mystus	LC	7,8,11,12,13, 14
Tengra	Gangetic mystus	LC	9
Kater	Tengara catfish	LC	8,9,11,12,13, 14
-	Striped dwarf catfish	LC	7,8,14,15
Singara	Giant river catfish	LC	7
Chhoti singhi	Indian torrent catfish	LC	4,7,13,15
-	Goonch	VU	1,8
Pathar-chatti	Mountain cavia catfish	LC	14
Pathar-chatti	River cat	LC	1,4,7,8,9,13,14, 15
Pathar-chatti	-	VU	13
Sipliya	Telchitta catfish	LC	14
Pabda	Pabdah catfish	NT	7
Lanchi, Parhan	Helicopter catfish	VU	7

Species Name	Order	Family
<i>Clarias batrachus</i> (Linnaeus 1758)	Siluriformes	Clariidae
<i>Heteropneustes fossilis</i> (Bloch 1794)	Siluriformes	Heteropneustidae
<i>Pachypterus atherinoides</i> (Bloch 1794)	Siluriformes	Schilbeidae
<i>Macrognathus pancalus</i> (Hamilton 1822)	Synbranchiformes	Mastacembelidae
<i>Mastacembelus armatus</i> (Lacepede 1800)	Synbranchiformes	Mastacembelidae
<i>Trichogaster fasciata</i> (Hamilton 1822)	Anabantiformes	Osphronemidae
<i>Trichogaster labiosa</i> Day 1877	Anabantiformes	Osphronemidae
<i>Trichogaster lalius</i> (Hamilton 1822)	Anabantiformes	Osphronemidae
<i>Channa gachua</i> (Hamilton 1822)	Anabantiformes	Channidae
<i>Channa marulius</i> (Hamilton 1822)	Anabantiformes	Channidae
<i>Channa punctata</i> (Bloch 1793)	Anabantiformes	Channidae
<i>Badis badis</i> (Hamilton 1822)	Anabantiformes	Badidae
<i>Xenentodon cancila</i> (Hamilton 1822)	Beloniformes	Belonidae

(Chalotra and Rauthan (2017)¹, Farswan and Pemola (2021)², Gupta and Rana (2009)³, Hora and Mukerji (1936)⁴, Husain (2010)⁵, Husain (2018)⁶, Husain and Tilak (1995)⁷, Khanna et al. (2013)⁸, Kumar et al. (1990)⁹, Paunikar and Panwar (2021)¹⁰, Pemola Devi et al. (2023)¹¹, Rana and Gupta (2017)¹², Rana et al. (2017)¹³, Rauthan et al. (2023)¹⁴, Singh et al. (1983)¹⁵, Thapliyal et al. (2013)¹⁶, Upadhyay et al. (2012)¹⁷)

Abbreviation:

(LC: Least Concern, VU: Vulnerable, NT: Near Threatened, NE: Not Evaluated, EN: Endangered, DD: Data Deficient)

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Vernacular name	Common name	IUCN status	Previous study
Mangur	Walking catfish	LC	8,9,11,13
Singhi, Billi Macchi, Suighi	Asian stinging catfish	LC	7,9,11,13,14
Tengra	Indian potasi	LC	7
Baam	Barred spiny eel or Indian spiny eel	LC	8,11,12,13,16
Bam, Gaj	Zig-zag eel	LC	1,4,8,9,11,12,13,14
Sunera	Banded gourami, striped gourami	LC	8,14
Gourami	Thick lipped gourami	LC	14
Gourami	Dwarf gourami	LC	14
Sowan, Dawla	Dwarf snakehead	LC	1,7,8,9,10,11, 12,13,14,15
Sowar	Bullseye snakehead or great snakehead	LC	14
Sauli, Sewal	Spotted snakehead	LC	7,8,9,11,12, 13,14
Chiri	Badis	LC	7,9,12,13
Suwa	Needle fish	LC	1,7,8,9,11,13,14,15

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ANNEXURE VI

Flora of the Song River basin

Plant Name (Botanical name)	Family	Nativity	Common name	IUCN status
<i>Hydrilla verticillata</i> (L.f.) Royle	<i>Hydrocharitaceae</i> Jus.	Native	Waterhymes	LC
<i>Potamogeton crispus</i> L.	<i>Potamogetonaceae</i> Rchb.	Introduced	Crisp leaved pondweed	LC
<i>Colocassia esculenta</i> (L.) Schott.	<i>Araceae</i> Juss.	Native	Indian taro	LC
<i>Lemna perpusilla</i> Torr.	<i>Araceae</i> Juss.	Native	Duckweed	LC
<i>Spirodela polyrhiza</i> (L.) Schleid.	<i>Araceae</i> Juss.	Native	Giant Duckweed	LC
<i>Dioscorea bulbifera</i> L.	<i>Dioscoreaceae</i> R.Br.	Native	Air yam	-
<i>Calamus tenuis</i> Roxb.	<i>Arecaceae</i> Bercht. & J.Persel	Native	Slender rattan cane	LC
<i>Cyperus compressus</i> L.	<i>Cyperaceae</i> Juss.	Native	Poorland Flat Sedge	LC
<i>Cyperus rotundus</i> L.	<i>Cyperaceae</i> Juss.	Native	Nut grass	LC
<i>Cyperus difformis</i> L.	<i>Cyperaceae</i> Juss.	Native	Variable flats edge	LC
<i>Cyperus mindorensis</i> (Steud.) Huygh, syn. <i>Kyllinga nemoralis</i> (J.R.Forst. & G.Forst.) Dandy ex Hutch. & Dalziel	<i>Cyperaceae</i> Juss.	Native	White Water Sedge	LC
<i>Fimbristylis dichotoma</i> (L.) Vahl	<i>Cyperaceae</i> Juss.	Native	Eight day grass	LC
<i>Erioscirpus comosus</i> (Wall.) Palla syn. <i>Eriophorum comosum</i> (Wall.) Nees	<i>Cyperaceae</i> Juss.	Native	Hairy Cottongrass	-
<i>Enteropogon dolichostachyus</i> (Lag.) Keng	<i>Poaceae</i> Barnhart	Native	Long-Spike Finger Grass	-
<i>Echinochola colona</i> (L.) Link	<i>Poaceae</i> Barnhart	Native	Jungle rice	-
<i>Eragrostis tenella</i> (L.) P.Beauv. ex Roem. & Schult.	<i>Poaceae</i> Barnhart	Native	Japanese lovegrass	-
<i>Eragrostis unioides</i> (Retz.) Nees ex Steud.	<i>Poaceae</i> Barnhart	Native	Chinese Lovegrass	LC
<i>Dichanthium annulatum</i> (Forssk.) Stapf	<i>Poaceae</i> Barnhart	Native	Sheda Grass	-
<i>Digitaria stricta</i> Roth	<i>Poaceae</i> Barnhart	Native	Crab grass	-

Plant Name (Botanical name)	Family	Nativity	Common name	IUCN status
<i>Coix lacryma-jobi</i> L.	Poaceae Barnhart	Native	Job's Tears	-
<i>Chrysopogon fulvus</i> (Spreng.) Chiov.	Poaceae Barnhart	Native	reddish-yellow beardgrass	-
<i>Chrysopogon zizanioides</i> (L.) Roberty	Poaceae Barnhart	Native	vetiver grass	-
<i>Cynodon dactylon</i> (L.) Pers.	Poaceae Barnhart	Native	Scutch grass	-
<i>Cyrtococcum patens</i> (L.) A. Camus	Poaceae Barnhart	Native	bowgrass	-
<i>Apluda mutica</i> L.	Poaceae Barnhart	Native	Mauritian grass	-
<i>Arundo donax</i> L.	Poaceae Barnhart	Native	Narkat	LC
<i>Arundinella pumila</i> (Hochst. ex A.Rich.) Steud.	Poaceae Barnhart	Native	Dwarf Reedgrass	-
<i>Imperata cylindrica</i> (L.) Raeusch.	Poaceae Barnhart	Native	cogon grass	LC
<i>Neyraudia arundinacea</i> (L.) Henrard	Poaceae Barnhart	Native	Bichla Grass	LC
<i>Paspalum dilatatum</i> Poir.	Poaceae Barnhart	Introduced	Dallas grass	-
<i>Paspalum distichum</i> L.	Poaceae Barnhart	Introduced	Water finger-grass	-
<i>Paspalidium flavidum</i> (Retz.) A.Camus	Poaceae Barnhart	Native	Yellow Watercrown Grass	LC
<i>Poa annua</i> L.	Poaceae Barnhart	Native	Annual Bluegrass	LC
<i>Phragmites karka</i> (Retz.) Trin. ex Steud.	Poaceae Barnhart	Native	Tall Reed	LC
<i>Polypogon monspeliensis</i> (L.) Desf.	Poaceae Barnhart	Native	Annual beard -grass	LC
<i>Saccharum spontaneum</i> L.	Poaceae Barnhart	Native	Wild sugarcane	LC
<i>Thysanolaena latifolia</i> (Roxb. ex Hornem.) Honda	Poaceae Barnhart	Native	Asian broom grass	-
<i>Oplismenus compositus</i> (L.) P.Beauv.	Poaceae Barnhart	Native	Running mountain grass	LC
<i>Eleusine indica</i> (L.) Gaertn.	Poaceae Barnhart	Native	Indian goosegrass	LC
<i>Typha angustifolia</i> L.	Typhaceae Juss.	Native	Narrow leaf cattail	LC
<i>Potederia crassipes</i> Mart.	Pontederiaceae Kunth	Introduced	Common water hyacinth	LC
<i>commelinia benghalensis</i> L.	Commelinaceae Mirb.	Native	Bengal dayflower	-

Plant Name (Botanical name)	Family	Nativity	Common name	IUCN status
<i>Ranunculus sceleratus</i> L.	<i>Ranunculaceae</i> Juss.	Native	Celery-leaved buttercup	LC
<i>Argemone mexicana</i> L.	<i>Papaveraceae</i> Juss.	Introduced	Mexican prickly poppy	-
<i>Cissampelos pareria</i> L.	<i>Menispermaceae</i> Juss.	Native	Velvet leaf pareira	-
<i>Tinospora sinensis</i> (Lour.) Merr.	<i>Menispermaceae</i> Juss.	Native	Chinese Tinospora	-
<i>Cayrtia trifolia</i> (L.) Domin	<i>Vitaceae</i> Juss.	Native	Bush grape	-
<i>Celastrus paniculatus</i> Willd.	<i>Celastraceae</i> R.Br.	Native	Black oil plant, Jyotishmati	-
<i>Oxalis corniculata</i> L.	<i>Oxalidaceae</i> R.Br.	Native	Creeping woosorrel	-
<i>Croton boplandianus</i> Baill.	<i>Euphorbiaceae</i> Juss.	Introduced	Ban tulsi	-
<i>Euphorbia hirta</i> L.	<i>Euphorbiaceae</i> Juss.	Introduced	Asthma plant	-
<i>Mallotus nudiflorus</i> (L.) Kulju & Welzen	<i>Euphorbiaceae</i> Juss.	Native	False white teak	LC
<i>Ricinus communis</i> L.	<i>Euphorbiaceae</i> Juss.	Introduced	Caster bean plant	-
<i>Jatropha curcas</i> L.	<i>Euphorbiaceae</i> Juss.	Introduced	Physic Nut, Jatropha	LC
<i>Phyllanthus reticulata</i> Poir.	<i>Phyllantaceae</i> Martynov	Native	Black honey shrub	-
<i>Phyllanthus niruri</i> L.	<i>Phyllantaceae</i> Martynov	Native	Gale of wind	-
<i>Phyllanthus urinaria</i> L.	<i>Phyllantaceae</i> Martynov	Native	Stome breaker phyllanthus	-
<i>phyllanthus virgatus</i> G.Forst.	<i>Phyllantaceae</i> Martynov	Native	Seed under leaf phyllanthus	-
<i>Putranjiva roxburghii</i> Wall.	<i>Putranjivaceae</i> Meisn.	Native	Putranjiva	LC
<i>Bergia ammannioides</i> Heyne ex. Roth.	<i>Elatinaceae</i> Dumort	Native	Ammannia waterwort	LC
<i>Acacia catechu</i> (L.) Willd.,Oliv.	<i>Fabaceae</i> Lindl.	Native	Kher	LC
<i>Acacia nilotica</i> (L.) P.J.H.Hurter & Mabb.	<i>Fabaceae</i> Lindl.	Native	Gum arabic tree	LC
<i>Cassia fistula</i> L.	<i>Fabaceae</i> Lindl.	Native	Amaltash	LC
<i>Caesalpinia bonduc</i> (L.) Roxb.	<i>Fabaceae</i> Lindl.	Native	knicker nut	LC
<i>Desmodium triflorum</i> (L.)DC.	<i>Fabaceae</i> Lindl.	Native	Three-flower beggarweed	-

Plant Name (Botanical name)	Family	Nativity	Common name	IUCN status
<i>Medicago polymorpha</i> L.	<i>Fabaceae</i> Lindl.	Introduced	Toothed bur clover	LC
<i>Medicago lupulina</i> L.	<i>Fabaceae</i> Lindl.	Native	Black medick	LC
<i>Melilotus albus</i> Medik.	<i>Fabaceae</i> Lindl.	Indroduced	White Sweet Clover	LC
<i>Melilotus indicus</i> (A.) All.	<i>Fabaceae</i> Lindl.	Native	Indian Sweet Clover	-
<i>Mimosa himalayana</i> Gamble	<i>Fabaceae</i> Lindl.	Native	Himalayan mimosa	-
<i>Mimosa pudica</i> L.	<i>Fabaceae</i> Lindl.	Introduced	Touch me not plant	LC
<i>Pithecellobium dulce</i> (Roxb.) Benth.	<i>Fabaceae</i> Lindl.	Introduced	Monkeypod tree	LC
<i>Senna occidentalis</i> (L.) Link	<i>Fabaceae</i> Lindl.	Introduced	Coffee senna	LC
<i>Senna tora</i> (L.) Roxb.	<i>Fabaceae</i> Lindl.	Introduced	Chinese senna	-
<i>Trifolium resupinatum</i> L.	<i>Fabaceae</i> Lindl.	Introduced	Persian clover	LC
<i>Trifolium alexandrinum</i> L.	<i>Fabaceae</i> Lindl.	Introduced	Berseem clover	NA
<i>Vicia faba</i> L.	<i>Fabaceae</i> Lindl.	Introduced	Broad bean	-
<i>Vicia sativa</i> L.	<i>Fabaceae</i> Lindl.	Native	Common Vetch	LC
<i>Ficus semicordata</i> Buch.Ham. ex Sm.	<i>Moraceae</i> Gaudich.	Native	Drooping fig	LC
<i>Ficus virens</i> Aiton	<i>Moraceae</i> Gaudich.	Native	White fig	LC
<i>Holoptelea integrefolia</i> (Roxb.) Planch.	<i>Ulmaceae</i> Mirb.	Native	Indian elm	-
<i>Potentilla indica</i> (Andrews) Th.Wolf	<i>Rosaceae</i> Juss.	Native	Indian- strawberry	-
<i>Ziziphus nummularia</i> (Burm.f.) Wight & Arn.	<i>Rhamnaceae</i> Juss.	Native	Jhar Beri	LC
<i>Ziziphus oenophlia</i> (L.) Mill.	<i>Rhamnaceae</i> Juss.	Native	Jackel jujube	-
<i>Pouzolzia pentandra</i> (Roxb.) Benn.	<i>Urticaceae</i> Juss.	Native	Narrow-lef pouzolzs bush	-
<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	<i>Combretaceae</i> R.Br.	Native	Arjun	-
<i>Sizium cumnini</i> (L.) Skeeles.	<i>Myrtaceae</i> Juss.	Native	Jamun	-
<i>Flacourtia indica</i> (Burm.f.) Merr.	<i>Salicaceae</i> Mirb	Native	Batoko Plum	-
<i>Ammania baccifera</i> L.	<i>Lythraceae</i> J.St.-Hil	Native	Blistering ammannia	-

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<i>Ammannia multiflora</i> Roxb.	<i>Lythraceae</i> J.St.-Hil	Native	Many Flowered Ammannia	-
<i>Woodfordia fruticosa</i> (L.) Kurz	<i>Lythraceae</i> J.St.-Hil	Native	Fire Flame bush	LC
<i>Melia azedarach</i> L.	<i>Meliaceae</i> Juss.	Native	Chinaberry tree	LC
<i>Toona ciliata</i> M. Roem.	<i>Meliaceae</i> Juss.	Native	Indian mahogany	LC
<i>Aegle marmelos</i> (L.) Correa	<i>Rutaceae</i> Juss.	Native	Bel	NT
<i>Glycosmis pentaphylla</i> (Retz.) DC.	<i>Rutaceae</i> Juss.	Native	Gin berry	LC
<i>Murraya koenigii</i> (L.) Spreng	<i>Rutaceae</i> Juss.	Native	Kadipatta,curry leaf tree	LC
<i>Malvestrum coromandelianum</i> (L.) Garcke	<i>Malvaceae</i> Juss.	Native	Three lobed false mallow	-
<i>Helicteres isora</i> L.	<i>Malvaceae</i> Juss.	Native	Indian screw tree	-
<i>Sida acuta</i> Burm.f.	<i>Malvaceae</i> Juss.	Native	Common wireweed	-
<i>Urena lobata</i> L.	<i>Malvaceae</i> Juss.	Native	Caesarweed	LC
<i>Capparis zeylanica</i> L.	<i>Capparaceae</i> Juss.	Native	Ceylon caper	-
<i>Lepidium didymum</i> L	<i>Brassicaceae</i> Burnett	Introduced	Bitter Cress	-
<i>Cardamine hirsuta</i> L.	<i>Brassicaceae</i> Burnett	Native	Hairy Bitter Cress	-
<i>Rorippa dubia</i> (Pers.) H.Hara	<i>Brassicaceae</i> Burnett	Native	Diverse-Leaf Yellow Cress	-
<i>Nasturtium officinale</i> W.T.Aiton syn. <i>Rorippa officinalis</i> (W.T.Aiton) P.Royen	<i>Brassicaceae</i> Burnett	Introduced	Yellowcress	LC
<i>Polygonum barbatum</i> L.	<i>Polygonaceae</i> Juss.	Native	Bearded knotweed	LC
<i>Polygonum glabrum</i> (Willd.)M.Gomez	<i>Polygonaceae</i> Juss.	Native	Common marsh buckwheat	LC
<i>Polygonum plebeium</i> R.Br.	<i>Polygonaceae</i> Juss.	Native	common knotweed	LC
<i>Rumex dentatus</i> L.	<i>Polygonaceae</i> Juss.	Native	Toothed dock	LC
<i>Rumex hastatus</i> D.Don	<i>Polygonaceae</i> Juss.	Native	Arrowleaf Dock	-

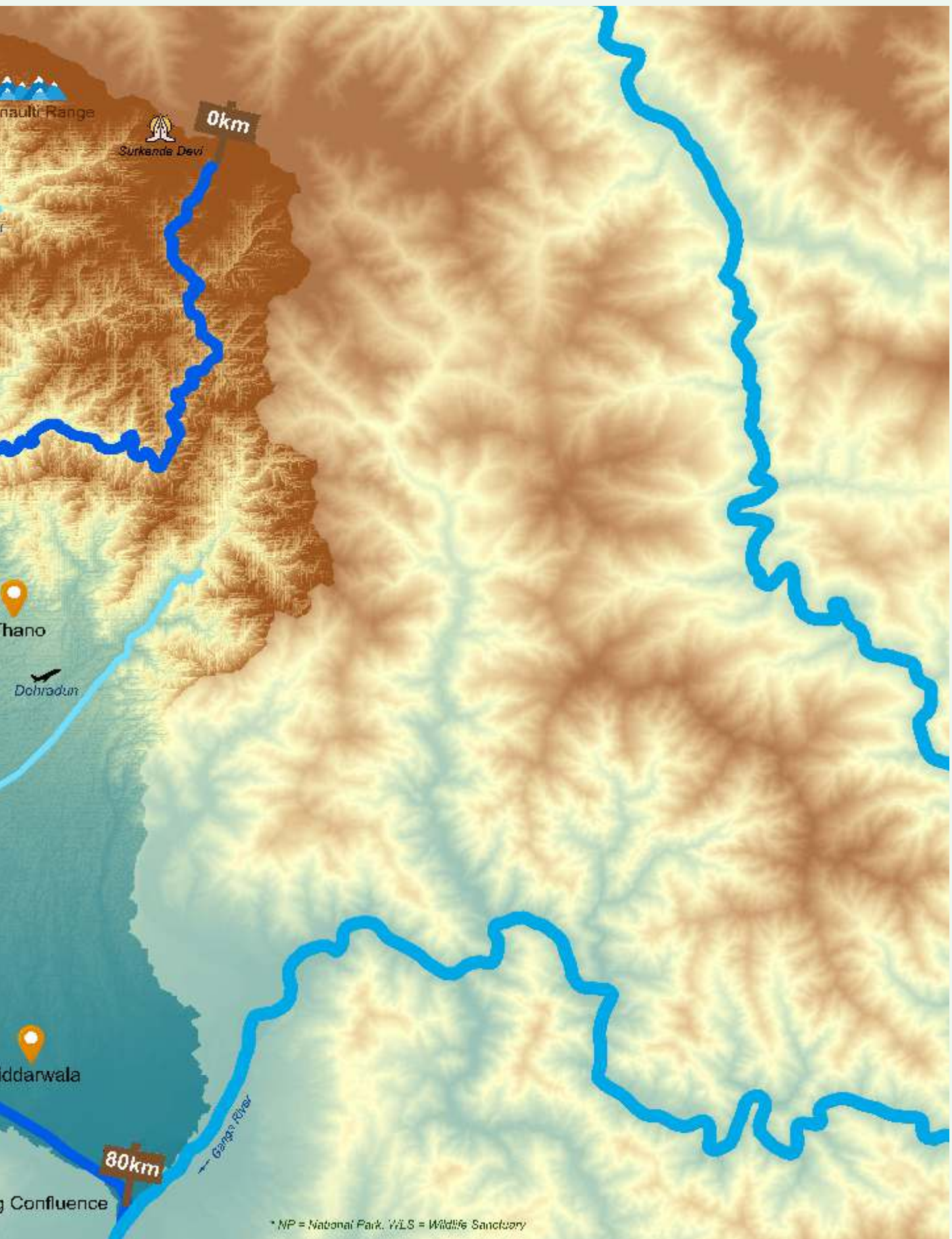
Plant Name (Botanical name)	Family	Nativity	Common name	IUCN status
<i>Achyranthes aspera</i> L.	<i>Amaranthaceae</i> Juss.	Native	Devils horsewhip	-
<i>Aerva lanata</i> (L.) Juss. ex Schult.	<i>Amaranthaceae</i> Juss.	Native	Mountain Knotgarss	-
<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	<i>Amaranthaceae</i> Juss.	Native	Stalkless joyweed	-
<i>Alternanthera ficoidea</i> (L.) Sm.	<i>Amaranthaceae</i> Juss.	Introduced	Josephs goat	-
<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	<i>Amaranthaceae</i> Juss.	Introduced	Alligator weed	-
<i>Amaranthus spinosus</i> L.	<i>Amaranthaceae</i> Juss.	Introduced	spiny amaranth	-
<i>Amaranthus viridis</i> L.	<i>Amaranthaceae</i> Juss.	Introduced	Green amaranth	-
<i>Chenopodium album</i> L.	<i>Amaranthaceae</i> Juss.	Native	Wild spinach	-
<i>Chenopdiastrum murale</i> (L.) S.Fuentes, Uotila & Borsch	<i>Amaranthaceae</i> Juss.	Native	Nettle-Leaved Goosefoot	-
<i>Tamarix dioica</i> Roxb. ex Roth	<i>Tamaricaceae</i> Lnk	Native	Red Tamarisk	-
<i>Opuntia cochenillifera</i> (L.) Mill.	<i>Cactaceae</i> Juss.	Introduced	Velvet Opuntia	DD
<i>Anagallis arvensis</i> L.	<i>Primulaceae</i> Batsch ex Borkh.	Introduced	The Scarlet Pimpernel	-
<i>Dicliptera paniculata</i> (Forssk.)	<i>Acanthaceae</i> Juss.	Native	Panicled foldwing	-
<i>Hygrophila polysperma</i> Anderson	<i>Acanthaceae</i> Juss.	Native	Dwarf hygrophila	LC
<i>Justicia adhatoda</i> L.	<i>Acanthaceae</i> Juss.	Native	Adulsa	LC
<i>Lepidagathis incurva</i> Buch.-Ham. ex D.Don	<i>Acanthaceae</i> Juss.	Native	Curved Lepidagathis	-
<i>Lepidagathis cuspidata</i> Nees	<i>Acanthaceae</i> Juss.	Native	Pointed-Leaf Lepidagathis	-
<i>Clerodendrum viscosum</i> Vent.	<i>Lamiaceae</i> Martinov	Native	Hill glory bower	-
<i>Colebrookia oppositifolia</i> Sm.	<i>Lamiaceae</i> Martinov	Native	Indian Squirrel til	-
<i>Colebrookia oppositifolia</i> Sm.	<i>Lamiaceae</i> Martinov	Native	Indian Squirrel til	-
<i>Nepeta hindostana</i> (B. Heyne ex Roth) Hanines	<i>Lamiaceae</i> Martinov	Native	North Indian catmint	-

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<i>Vitex negundo</i> L.	Lamiaceae Martinov	Native	Five-leaved chaste tree	LC
<i>Lindernia ciliata</i> (Colsm.) Pennell	Linderniaceae Borsch, K.Müll. &Eb.Fisch.	Native	Fringed False Pimpernel	LC
<i>Lindernia crustacea</i> (L.) F.Muell.	Linderniaceae Borsch, K.Müll. &Eb.Fisch.	Native	Malaysian false pimpernel.	LC
<i>Mazus pumilus</i> (Burm. f.) Steenis	Linderniaceae Borsch, K.Müll. &Eb.Fisch.	Native	Japanese mazus	-
<i>Scoparia dulcis</i> L.	Plantaginaceae Juss.	Introduced	Sweet broom weed	-
<i>Veronica anagallis</i> - aquatica L.	Plantaginaceae Juss.	Native	Water speedwell	LC
<i>Mecardonia procumbens</i> (Mill.) Small	Plantaginaceae Juss.	Introduced	Yellow flowered waterhyssop	-
<i>Lindenbergia macrostachya</i> (Benth.) Benth.	Orobanchaceae Vent.	Native	West-Himalayan Lindenbergia	-
<i>Verbascum chinense</i> (L.) Santapau	Scrophulariaceae Juss.	Native	Chinese Mullein	-
<i>Verbascum thapsus</i> Linnaeus	Scrophulariaceae Juss.	Native	Great mullein	LC
<i>Lantana camera</i> L.	Verbinaceae J.St.-Hil.	Introduced	Common lantana	-
<i>Lippia alba</i> (Mill.) N.E. Br. Britton & P.Wilson	Verbinaceae J.St.-Hil.	Introduced	Bushy lippia	-
<i>Phyla nodiflora</i> (L.)	Verbinaceae J.St.-Hil.	Native	Turkey tangle frogfruit	LC
<i>Ipomoea carnea</i> Jacq.	Convolvulaceae Juss.	Introduced	Bush morning glory	-
<i>Nicotiana plumbaginifolia</i> Viv.	Solanaceae Juss.	Introduced	Tex-Mex tobacco	-
<i>Solanum nigrum</i> L.	Solanaceae Juss.	Native	European black nightshade	-
<i>Solanum torvum</i> Sw.	Solanaceae Juss.	Introduced	Turkey Berry	-
<i>Solanum erianthum</i> D. Don	Solanaceae Juss.	Introduced	Big Eggplant	LC
<i>Solanum chrysotrichum</i> Schltld.	Solanaceae Juss.	Indroduced	Giant Devil's Fig	LC
<i>Ichnocarpus frutescens</i> (L.) W.T. Aiton	Apocynaceae Juss.	Native	Black creeper	-
<i>Haldina cordifolia</i> (Roxb.) Ridsdale	Rubiaceae Juss.	Native	Haldu	-

Plant Name (Botanical name)	Family	Nativity	Common name	IUCN status
<i>Spermadictyon suaveolens</i> Roxb.	Rubiaceae Juss.	Native	Forest Champa	-
<i>Wendlandia heynei</i> (Schantz) Santapau & Merchant	Rubiaceae Juss.	Native	Heyne's Wendlandia	LC
<i>Ageratum houstonianum</i> Mill.	Asteraceae Bercht. & J.Presl	Introduced	Blueweed	-
<i>Acmella ciliata</i> (Kunth) Cass.	Asteraceae Bercht. & J.Presl	Introduced	Toothache Plant	-
<i>Bidens pilosa</i> L.	Asteraceae Bercht. & J.Presl	Introduced	Beggar's Tick	-
<i>Caesulia axillaris</i> Roxb.	Asteraceae Bercht. & J.Presl	Native	Pink node flower	LC
<i>Cirsium arvense</i> (L.) Scop.	Asteraceae Bercht. & J.Presl	Native	Field Thistle	-
<i>Cirsium wallichii</i> DC. Species	Asteraceae Bercht. & J.Presl	Native	Wallich's Thistle	-
<i>Eclipta prostrata</i> (L.) L.	Asteraceae Bercht. & J.Presl	Introduced	False daisy	LC
<i>Gnaphalium pennsylvanicum</i> Willd.	Asteraceae Bercht. & J.Presl	Introduced	Pennsylvania Cudweed	-
<i>Parthenium hysterophorus</i> L.	Asteraceae Bercht. & J.Presl	Introduced	Carrot weed	-
<i>Tridax procumbens</i> L.	Asteraceae Bercht. & J.Presl	Introduced	Tridax daisy	-
<i>Silene anthemifolia</i> (Juss.) Sweet	Asteraceae Bercht. & J.Presl	Introduced	Button Burrweed	LC
<i>Sonchus oleraceus</i> L.	Asteraceae Bercht. & J.Presl	Introduced	common sowthistle	-
<i>Xanthium strumarium</i> L.	Asteraceae Bercht. & J.Presl	Native	Common cocklebur	-
<i>Hydrocotyle sibthorpioides</i> Lam.	Apiaceae Lindl.	Native	Water Pennywort	LC
<i>Lobelia alsinoides</i> Lam. Hel.	Campanulaceae Juss.	Native	Chickweed Lobelia	LC
<i>Centella asiatica</i> (L.) Urb.	Apiaceae Lindl.	Native	Asiatic pennywort	LC

List prepared based on recce conducted along the river basin.





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Wildlife Institute of India

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