

GIS study on Impacts of Multiple Water Channel in Dibru-Saikhowa National Park

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ABSTRACT

Dibru-Saikhowa National Park (DSNP) in Assam is a highly dynamic riverine landscape shaped by the Brahmaputra system and its tributaries, especially the Siang, Dibang, Lohit, and Dibru rivers. Over the last four decades, repeated flooding, bank erosion, channel migration, and river capture have transformed the park from a comparatively compact landmass into a fragmented wetland island. This manuscript presents a GIS- and remote sensing-based interpretation of fluvio-morphological change between 1985 and 2024 using satellite imagery, shape file overlay, and visual comparison of channel evolution. The analysis indicates a sharp decline in the park area from about 395 sq. km in 1985 to 220 sq. km in 2024. The growth of active channels, including the development of Channel-1, has accelerated erosion, isolated habitat patches, and affected fish resources and wildlife habitats. In addition, the catch per unit of fishes has decreased drastically in the last decade. The study highlights the importance of continuous geospatial monitoring and integrated conservation planning to protect this ecologically sensitive national park.

Keywords: Dibru-Saikhowa National Park, GIS, remote sensing, river channel migration, erosion, wetland fragmentation

Introduction

Dibru-Saikhowa National Park, located in the upper Brahmaputra Valley of Assam, India, is one of the most distinctive floodplain ecosystems in the region (Talkudar, 1996). The

park lies within the Tinsukia and Dibrugarh districts and is renowned for its semi-evergreen forests, grasslands, wetlands, and rich faunal diversity. It supports species such as the

Gangetic dolphin, Bengal tiger, feral horse, and numerous migratory birds. The park also contains one of the largest salix swamp forest tracts in northeastern India (Nongmaithem et al., 2016).

The ecology of DSNP is tightly linked to the hydrology of the Brahmaputra and its tributaries. River-bank erosion, deposition, flooding, and channel migration continually reshape the park boundary and internal land cover. In recent decades, these fluvial processes have intensified and created a dense network of active and seasonal channels, leading to fragmentation of the landmass and the conversion of parts of the park into a dynamic riverine island. As a result, habitat loss, erosion of the park perimeter, and changes in fish and wildlife distribution has become major conservation concerns (Gogoi et al., 2012).

This manuscript focuses on the geomorphological changes observed between 1985 and 2024 and explains how remote sensing and GIS techniques can be used to trace long-term landscape transformation in a vulnerable floodplain environment.

Methods and Methodology

DSNP is situated between latitudes 27°30'N and 27°48'N and longitudes 95°08'E and 95°35'E, with an average elevation of around 118 m above sea level. The area was declared a Biosphere Reserve in 1997 and later designated as a national park in 1999. It is bordered by the Siang River to the northeast and the Lohit and Dibru rivers to the south. The park experiences a tropical monsoon climate with high rainfall, seasonal flooding, and strong river discharge, all of which contribute to repeated erosion and landform change.

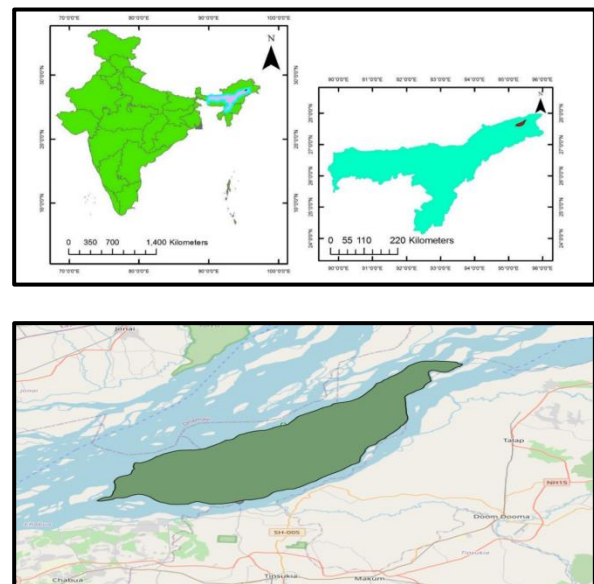


Fig 1: Study area of Dibru-Saikhowa National Park, Assam

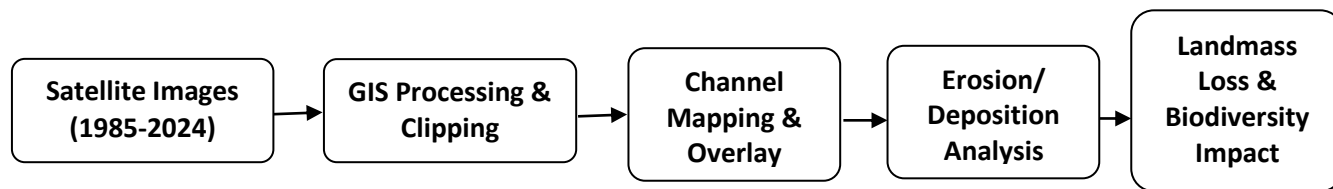


Fig 2: Conceptual workflow of the GIS-based analysis

Result

The analysis shows a clear long-term reduction in the area of DSNP. In 1985 the park covered approximately 395 sq. km, but by 2000 it had reduced to about 328 sq. km. The decline continued in later years, with the park shrinking to around 295 sq. km in 2020 and to approximately 220 sq. km by 2024 as shown in Table 1. This change reflects the cumulative effect of river-bank erosion, channel widening, and recurring flood events.

Year	Estimated area (sq. km)	Change from previous year	Loss since 1985 (%)
1985	395	—	—
2000	328	67 sq. km	16.96%
2020	295	33 sq. km	25.32%
2024	220	75 sq. km	44.30%

Table 1: Change in landmass of Dibru-Saikhowa National Park, 1985–2024

A major turning point in the channel network was the emergence and widening of Channel-1. **This channel was formed when the Lohit River captured the Dangori during the 1988 floods.** Over time it became a permanent and dominant channel, expanding from a narrow stream to a wide active watercourse. Its growth contributed substantially to the isolation of DSNP from the mainland and increased the overall fragmentation of the park.

By 2024, the park was influenced by a braided fluvial pattern with multiple active channels, distributaries, cut-off meanders, and oxbow-like water bodies. This dynamic hydrology has helped create wetland habitat, but it has also accelerated erosion, separated land patches, and reduced the continuity of forest and grassland habitats.

Channel Evolution and Landscape Change

In 1985, the river system around DSNP was relatively stable and the park contained fewer, narrower channels. Early signs of infiltration were visible in the north-eastern sector. By 2000, stronger river-bank erosion, course shifts, and the formation of cut-off meanders had enlarged the channel network and pushed water deeper into the park interior. In 2024, the number of major active channels had increased further, creating a complex braided system that has fragmented the park into smaller land units.

Impact on Fish Resources

A field-based observation near settlement areas around DSNP showed a noticeable decline in fish catch and fish growth over the last decade. The change is associated with altered channel flow, habitat fragmentation, sediment stress,

climate variability, and changing fishing practices. Table 2 presents the observed decline

for representative fish species recorded in the study.

SL No.	Local name	Scientific name	Family	IUCN status	10 years ago	Present day
1	Kokila	<i>Xenentodon cancila</i>	Belontiidae	LC	40–50 kg	2–10 kg
2	Bahu	<i>Gibelion catla</i>	Cyprinidae	LC	100–150 kg	30–40 kg
3	Petgali	<i>Chagunius chagunio</i>	Cyprinidae	LC	10–15 kg	2–5 kg
4	Lachim	<i>Cirrhinus reba</i>	Cyprinidae	LC	40–50 kg	10–12 kg
5	Rohu	<i>Labeo rohita</i>	Cyprinidae	LC	70–80 kg	20–25 kg
6	Kuri	<i>Labeo gonius</i>	Cyprinidae	LC	10–20 kg	4–5 kg
7	Bhabo	<i>Osteobrama cotio</i>	Cyprinidae	LC	40–50 kg	5–10 kg
8	Puthi	<i>Puntius sophore</i>	Cyprinidae	LC	100–110 kg	15–20 kg
9	Tita puthi	<i>Puntius javanicus</i>	Cyprinidae	LC	80–90 kg	3–5 kg
10	Kathbhonga	<i>Rasbora daniconius</i>	Cyprinidae	LC	40–50 kg	18–20 kg
11	Darikona	<i>Danio devario</i>	Cyprinidae	LC	4–5 kg	1–2 kg
12	Moa	<i>Amblypharyngodon mola</i>	Cyprinidae	LC	110–150 kg	60–70 kg
13	Seni	<i>Systomas sarana</i>	Cyprinidae	LC	50–70 kg	2–5 kg
14	Mirika	<i>Cirrhius mrigala</i>	Cyprinidae	LC	30–40 kg	10–15 kg
15	Silver carp	<i>Hypophthalmichthys molitrix</i>	Cyprinidae	LC	20–25 kg	15–20 kg
16	Seni puthi	<i>Cyprinus carpio</i>	Cyprinidae	Vulnerable	25–30 kg	8–15 kg
17	Batia	<i>Lepidocephalichthys guntea</i>	Cobitidae	LC	3–5 kg	0.5–1 kg
18	Chanda	<i>Chanda nama</i>	Ambassidae	LC	40–45 g	5–6 g
19	Kawoi	<i>Anabas testudineus</i>	Ambassidae	LC	4–5 kg	1–2 kg
20	Goroi	<i>Chana punctata</i>	Channidae	LC	10–15 kg	3–5 kg
21	Cheng	<i>Channa gachua</i>	Channidae	LC	1–2 kg	0.5–1 kg
22	Sal	<i>Channa striata</i>	Channidae	LC	8–10 kg	2–4 kg
23	Lal tengara	<i>Mystus tengara</i>	Bagridae	LC	15–20 kg	10–12 kg
24	Singora	<i>Mystus carcio</i>	Bagridae	LC	15–20 kg	10–12 kg
25	Ari	<i>Sperata seenghala</i>	Bagridae	LC	20–25 kg	3–5 kg
26	Magur	<i>Clarius magur</i>	Clariidae	LC	30–40 kg	4–6 kg
27	Singhi	<i>Heteropneustes fissilis</i>	Heteropneustidae	LC	30–40 kg	6–8 kg
28	Bordowa	<i>Pachypterus atherinoides</i>	Schibeidae	LC	2–3 kg	500–700 g

Discussion

The geo-morphological evolution of DSNP over the past four decades has been driven mainly by the dynamic interaction of the Brahmaputra, Siang, Dibang, and Lohit rivers. The study shows that channel widening, river capture, and repeated flooding have steadily reduced the park area and broken the landscape into smaller fragments (Gogoi et al., 2012; Borgohain et al., 2016; Neog, 2017; Das, 2022). This trend has important ecological consequences because the park depends on connected wetlands, stable

banks, and seasonally balanced hydrology to sustain its biodiversity.

The reduction in fish catch and the reported decline in fish growth indicate that hydrological change is not only a geo-morphological problem but also a livelihood issue for people living near the park. Habitat fragmentation, siltation, altered flow velocity, and spawning-site loss are all likely to have contributed to this decline (Nongmaithem et al., 2016). The present study

revealed a significant decline in catch per unit effort relative to levels recorded a decade earlier.

Human encroachment, agricultural expansion, and climate change have further intensified the problem. Increased monsoon variability and glacier melt may be strengthening river discharge and erosion, making the park even more vulnerable (Sarma and Acharjee, 2012). Continuous GIS-based monitoring, buffer

protection, restoration of wetlands, and careful management of human activities are therefore essential.

Conclusion

In conclusion, Dibru-Saikhowa National Park is undergoing rapid landscape transformation. The park remains a biodiversity hotspot, but its long-term stability will depend on timely intervention, scientific monitoring, and integrated conservation planning.

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