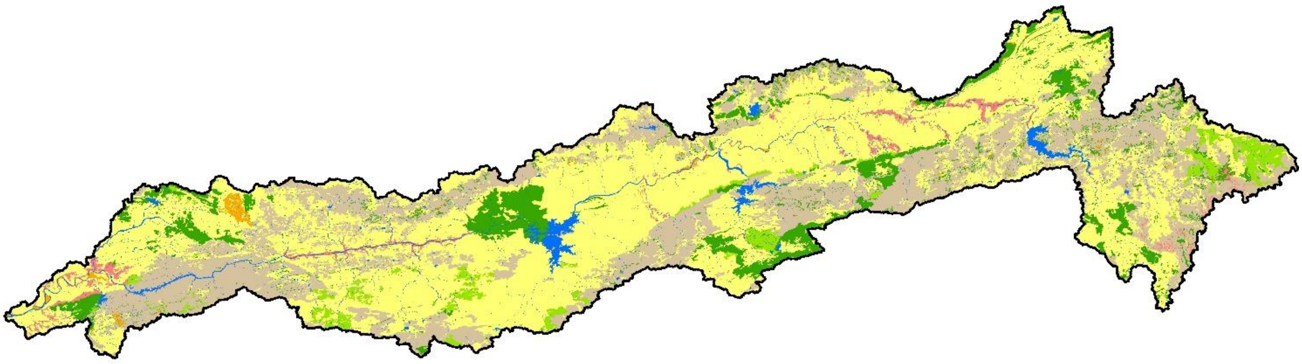
National River Conservation Directorate
Ministry of Jal Shakti,
Department of Water Resources,
River Development & Ganga Rejuvenation
Government of India

Geomorphological Mapping of Narmada River Basin



National River Conservation Directorate (NRCD)

The National River Conservation Directorate, functioning under the Department of Water Resources, River Development & Ganga Rejuvenation, and Ministry of Jal Shakti providing financial assistance to the State Government for conservation of rivers under the Centrally Sponsored Schemes of 'National River Conservation Plan (NRCP)'. National River Conservation Plan to the State Governments/ local bodies to set up infrastructure for pollution abatement of rivers in identified polluted river stretches based on proposals received from the State Governments/ local bodies.

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The Center for Narmada River Basin Management and Studies (cNarmada) is a Brain Trust dedicated to River Science and River Basin Management. Established in 2024 by IIT Gandhinagar and IIT Indore, under the supervision of cGanga at IIT Kanpur, the center serves as a knowledge wing of the National River Conservation Directorate (NRCD). cNarmada is committed to restoring and conserving the Narmada River and its resources through the collation of information and knowledge, research and development, planning, monitoring, education, advocacy, and stakeholder engagement.

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cGanga is a think tank formed under the aegis of NMCG, and one of its stated objectives is to make India a world leader in river and water science. The Centre is headquartered at IIT Kanpur and has representation from most leading science and technological institutes of the country. cGanga's mandate is to serve as think-tank in implementation and dynamic evolution of Ganga River Basin Management Plan (GRBMP) prepared by the Consortium of 7 IITs. In addition to this, it is also responsible for introducing new technologies, innovations, and solutions into India.

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Acknowledgment

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Preface

The Narmada River Basin is a region of immense geographical and ecological significance. Its diverse geomorphological features, shaped by tectonic activities and fluvial processes, form the foundation of its rich ecosystems and the livelihoods of the communities it sustains. However, despite its importance, a holistic understanding of its geomorphic attributes has remained elusive due to fragmented studies and limited comprehensive analyses.

This report seeks to bridge that gap by presenting an in-depth geomorphological mapping of the Narmada River Basin. By examining landform evolution, drainage patterns, river terraces, and erosional and depositional features, it provides a detailed account of the basin's geomorphic dynamics. The integration of multi-temporal Synthetic Aperture Radar (SAR) imagery over the past decade enhances the scope of this study, allowing precise analysis of floodplain dynamics and the formation of river islands. Tools like Sentinel-1 SAR imagery enable the detection and monitoring of sediment deposition and erosion processes, offering valuable insights into the basin's geomorphic changes.

The findings outlined in this report underscore the critical role of high-resolution geomorphological data in sustainable land management, flood hazard mitigation, and proactive planning for the region. By combining traditional geomorphological mapping techniques with advanced SAR-based analyses, this report sets a precedent for interdisciplinary approaches to studying and managing river basins. It aims to empower decision-makers, researchers, and stakeholders with actionable insights to ensure the resilience and sustainable development of the Narmada River Basin.

Centres for Narmada River Basin
Management and Studies (cNarmada)
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1. Introduction

The Narmada River, recognized as one of the prominent west-flowing rivers of India, extends over a length of approximately 1,312 kilometres. It originates from the Amarkantak Plateau, located in the Maikal Range of Madhya Pradesh at an elevation of about 1,057 meters above mean sea level (Kale, 2014). The river traverses a geologically complex and diverse landscape, flowing through significant formations such as the Vindhyan ranges, the Satpura hills, and the Deccan Traps basalts, before ultimately discharging into the Arabian Sea near Bharuch in Gujarat.

The geological diversity along its course plays a fundamental role in shaping the river's morphology, as it interacts with rocks of varying resistance and structural controls. The Narmada Rift Valley, a prominent tectonic feature formed through faulting during the late Cretaceous to early Tertiary period, has guided the linear, east-to-west alignment of the river (Valdiya, 2016). As the river flows along this tectonic rift, it exhibits various geomorphological features influenced by the interplay of fluvial processes—such as erosion, sediment transport, and deposition—and ongoing tectonic activity (Kale & Rajguru, 1985).

Table 1: Geomorphological Characteristics and Features of the Narmada River Basin

Aspect	Description
Tectonic Framework	East-west Narmada Rift Valley formed by crustal faulting during the late Cretaceous-Tertiary.
Lithology	Traverses Vindhyan, Satpura, and Deccan Traps; lithological resistance controls erosion.
Fluvial Processes	Erosion (upper reaches), sediment transport (middle), deposition (lower reaches).
Erosional Landforms	Gorges (e.g., Marble Rocks), waterfalls, and structural river terraces.
Depositional Landforms	Floodplains, natural levees, river islands, and delta near the Arabian Sea.
Floodplain Dynamics	Seasonal flooding drives sediment deposition, nutrient transport, and habitat formation.
River Terraces	Formed by tectonic uplift and fluvial incision, reflecting base-level changes.
Channel Patterns	Meandering and braided channels in low-energy depositional zones.

This dynamic fluvial system is marked by distinct landforms, including gorges, river terraces, and floodplains, reflecting the river's response to climatic fluctuations and tectonic uplift. For instance, in its upper reaches near Jabalpur, the Narmada has incised deeply into the resistant lithologies, creating striking features such as the Marble Rocks Gorge, a testament to the interplay of vertical incision and regional uplift (Sarkar et al., 1995). In the middle and lower reaches, broader floodplains and depositional terraces emerge, highlighting the role of sediment dynamics and decreasing gradients (Tandon et al., 2006).

Thus, owing to its tectonically controlled course and complex interaction with geological and geomorphic processes, the Narmada River is a significant system for understanding riverine evolution within a rift valley setting (Das et al., 2018).

2. Geomorphology of the Basin

The geomorphology of the Narmada Basin is shaped by the complex interaction of tectonic forces, geological formations, and various fluvial processes, including erosion, sediment transport, and deposition. The Narmada River traverses the Narmada Rift Valley, a significant tectonic depression that has played a pivotal role in influencing the formation of diverse fluvial landforms along its path. This rift valley originated due to tectonic activity during the late Cretaceous to early Tertiary period and has determined the river's predominantly linear, east-to-west alignment (Valdiya, 2016; Kale, 2014).

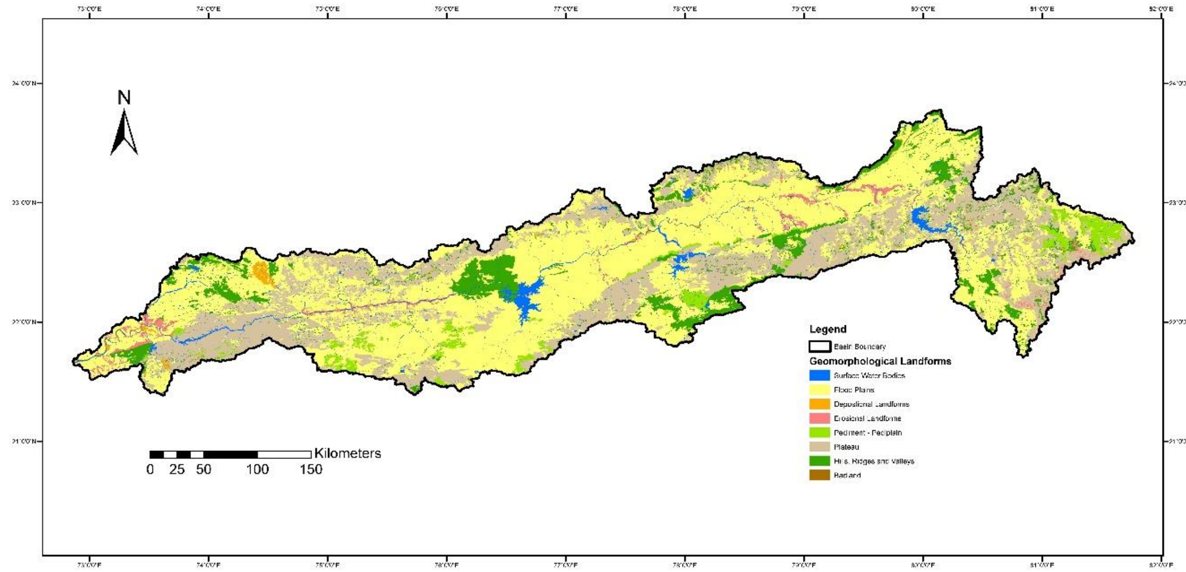

Fig. 01 Geomorphological Landforms of the Basin (Source: Bhukosh)

The continuous interaction between the river's hydrodynamics, the underlying geology, and external factors such as tectonic controls and climatic variations has resulted in the development of distinct landforms. These landforms include erosional features—such as gorges, river terraces, and waterfalls—as well as depositional features, including floodplains, meanders, natural levees, and the delta (Tandon et al., 2006; Das et al., 2018). Each landform is a product of specific geomorphic processes and reflects the river's dynamic evolution over geological timescales.

As shown in fig. 01 in the upper reaches of the Narmada River, where steeper gradients and resistant lithologies dominate, the river exhibits erosional landforms formed primarily through vertical incision and tectonic uplift. A classic example is the Marble Rocks Gorge near Jabalpur, which demonstrates the impact of the river's erosive power on resistant limestone formations (Sarkar et al., 1995). Conversely, in the middle and lower reaches, where the gradient decreases, and the river's energy diminishes, depositional landforms such as floodplains and meandering channels emerge due to sediment accretion and reduced stream velocity (Tandon et al., 2006; Kale, 2014).

3. Major Fluvial Landforms of Narmada Basin

Fluvial landforms are geomorphological features created by rivers and streams through erosion, transportation, and deposition. These processes operate across the river system, from the upper course (source) to the middle and lower course (mouth). The types of fluvial landforms can be classified into erosional landforms and depositional landforms, and features formed through the interplay of both processes. Fig. 02 showcases the different types of landforms formed due to various fluvial processes in river.

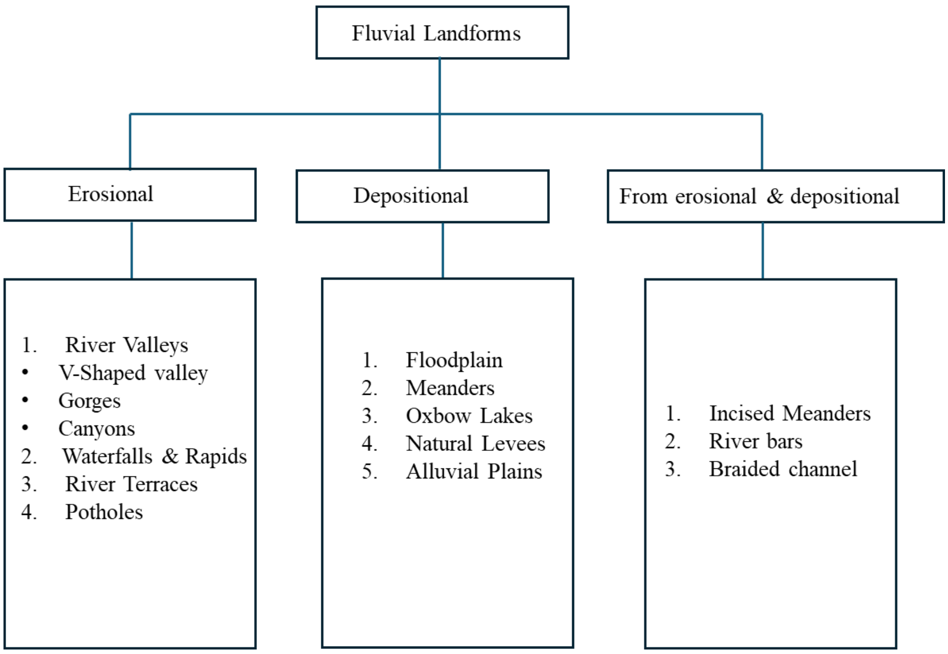

Fig. 02 Types of landforms formed due to various fluvial processes in river

3.1 Erosional Landforms:

Fluvial erosion is a dynamic process involving the removal, detachment, and transportation of surface material by the action of running water. This process plays a pivotal role in shaping the landscape, driven by mechanisms such as hydraulic action, abrasion, attrition, and solution.

- Hydraulic Action: The force of moving water exerts pressure on the riverbed and banks, dislodging particles and creating voids in the substrate.
- Abrasion: Sediment carried by the river acts like sandpaper, grinding and scraping against the channel, leading to further erosion.
- Attrition: Collisions between sediment particles reduce their size and shape, resulting in smoother and more rounded materials.
- Solution: Soluble minerals within the rock dissolve into the flowing water, gradually weakening the structural integrity of the terrain.

These processes collectively contribute to the formation of diverse erosional landforms, which are evident throughout the Narmada River Basin. The following is a detailed account of these erosional features:

3.1.1 Gorges:

Gorges are prominent erosional features in the upper course of the Narmada River. These narrow, steep-sided valleys are primarily formed by vertical incision into resistant lithologies due to the river's high energy and regional uplift. A well-known example is the Marble Rocks Gorge near Jabalpur, where the Narmada River cuts through massive limestone beds of the Vindhyan Group, creating a deep, narrow passage. This gorge is a classic outcome of tectonic uplift and the river's erosive capacity (Sarkar et al., 1995). The gorge's steep sides and smooth surfaces highlight abrasion and hydraulic action as key erosional processes.

3.1.2 River Terraces:

River terraces are step-like landforms occurring along the valley sides of the Narmada River. These terraces represent former floodplains abandoned due to tectonic uplift or base-level changes caused by regional and global climatic variations (Tandon et al., 2006). In the Narmada Basin, terraces are prominent in the middle course, where the gradient decreases, and sediment deposition alternates with periods of incision. Paired terraces occur symmetrically on both banks, while unpaired terraces form asymmetrically due to differential erosion and uplift. These terraces provide evidence of the Narmada River's adjustment to tectonic disturbances and climatic fluctuations over geological time (Kale, 2014).

3.1.3 Waterfalls and Plunge Pools:

Waterfalls are formed where the Narmada River flows over lithological discontinuities, such as resistant rock underlain by softer layers. The vertical drop causes erosional features such as plunge pools at the waterfall base. A notable example is the Dhuandhar Falls near Bhedaghat, where the river plunges approximately 10 meters over hard limestone rocks. The falls are accompanied by deep plunge pools carved by hydraulic action and abrasion (Das et al., 2018). The Dhuandhar Falls reflect the combined influence of tectonic activity and lithological control, as resistant rock layers slow erosion.

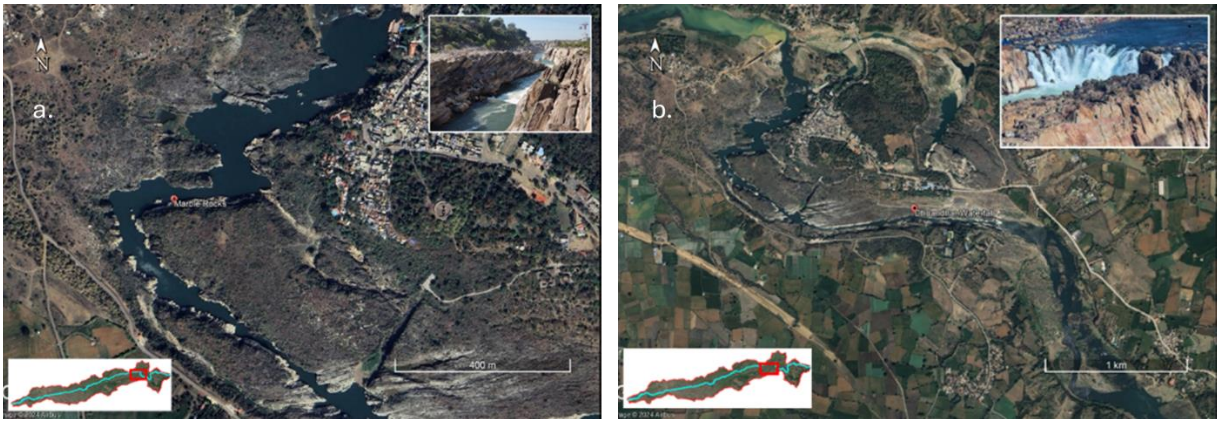

Fig. 03 Erosional landforms: a. Gorges b. Waterfall (Source: Google Earth)

3.2 Depositional Landforms:

As rivers progress through their middle and lower courses, they experience a gradual loss of energy, leading to the deposition of sediment. This process occurs when the river's velocity decreases, diminishing its ability to carry sedimentary loads. The resulting depositional features are shaped by the interplay of water flow, sediment characteristics, and environmental conditions. Below is a detailed account of the key depositional features observed in the Narmada River Basin:

3.2.1 Floodplains:

Floodplains are extensive depositional landforms occurring in the middle and lower reaches of the Narmada Basin. These flat, fertile areas are built through periodic overbank flooding, where sediments such as silt and clay are deposited. The floodplains of the Narmada River are especially prominent near Hoshangabad and Bharuch. They support agriculture due to their rich alluvial soil and nutrient deposition. These floodplains highlight the river's role in sediment transport and deposition under reduced energy conditions (Tandon et al., 2006). Details of this topic are discussed in Chapter X.

3.2.2 Meanders and Point Bars

Meanders are sinuous bends in the river channel, primarily occurring in the middle course of the Narmada Basin, where the river's gradient decreases and lateral erosion dominates. The river erodes its outer banks (due to higher velocity) and deposits sediments on the inner banks, creating depositional features called point bars. As the river matures, these meanders become more pronounced, reflecting the balance between erosion and deposition (Huggett, 2007).

3.2.3 Oxbow Lakes:

In regions where meanders become significantly pronounced, the river may cut through the neck of a meander during flood events, forming oxbow lakes. These are crescent-shaped, abandoned river channels that remain water-filled for a period. Although less common in the Narmada Basin than in other river systems, isolated oxbow lakes occur in its tributaries.

3.2.4 Natural Levees:

The river channel during floods. When the Narmada River overflows its banks, the heavier sediments settle near the channel, while finer particles are carried further away, creating natural levees. These features are prominent in the lower course of the basin, where the river has reduced velocity and greater sediment load (Kale, 2014). Natural levees protect the adjacent floodplains from minor flooding and influence channel migration over time.

3.2.5 Alluvial Fans:

Alluvial fans occur where tributaries of the Narmada River descend from the Satpura and Vindhyan ranges onto flatter terrain. These fans are formed by the sudden decrease in gradient, which causes the tributary to deposit its sediment load in a fan-shaped form. The coarse sediments in alluvial fans are indicative of high-energy depositional environments.

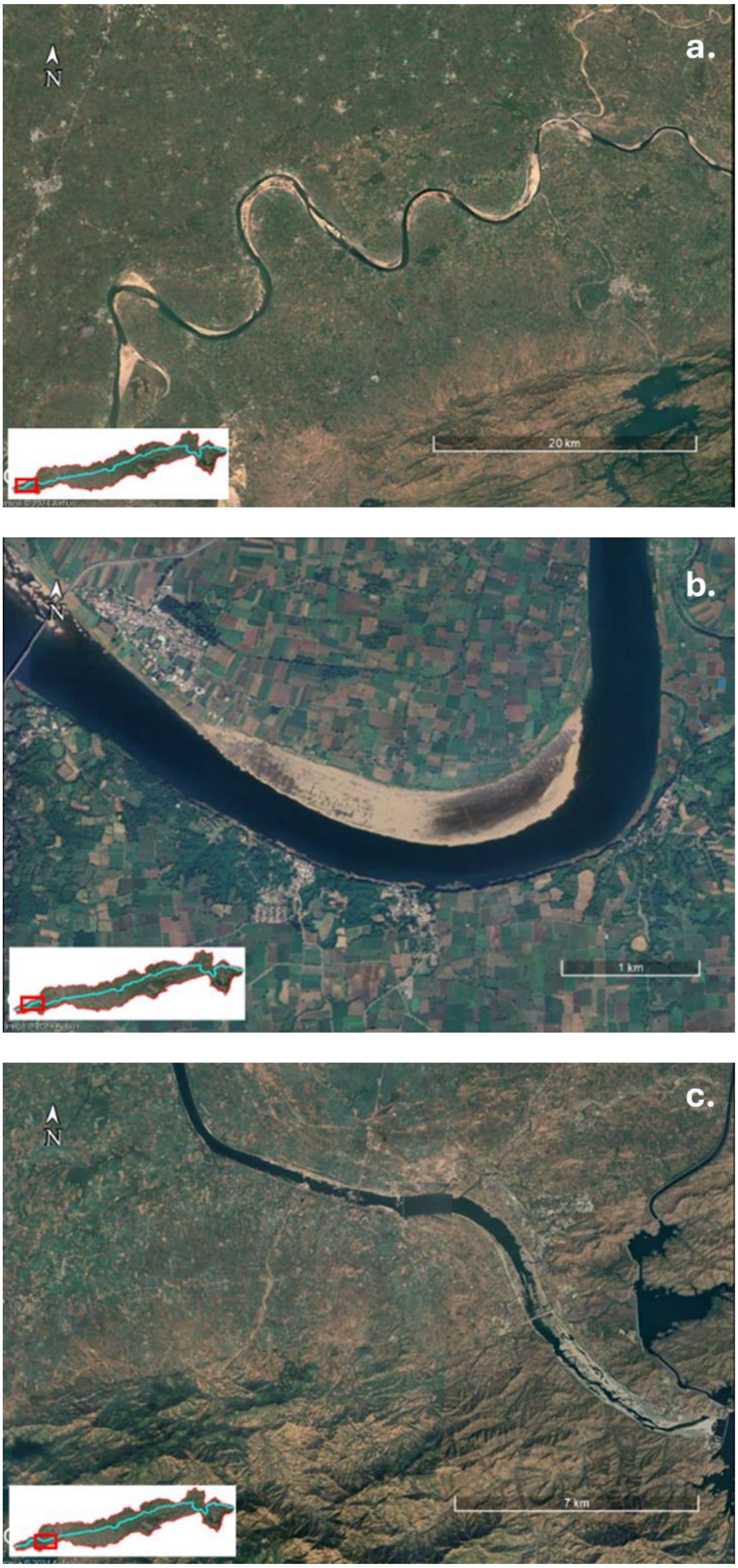

Fig. 04 Depositional Landforms: a. Meandering Channel, b. Point Bar, c. Alluvial Fan (Source: Google Earth)

3.3 Features from Erosion and Deposition:

Certain landforms are shaped by the intricate interplay of both erosional and depositional processes, demonstrating the dynamic balance between the removal and accumulation of earth materials. These hybrid landforms emerge in regions where river systems, influenced by variations in energy levels and environmental conditions, transition between eroding existing material and depositing transported sediments.

Braided Channels

Braided channels occur where the river carries a high sediment load and experiences fluctuating discharge. The river splits into multiple channels separated by sandbars and gravel deposits. Such features are observed in the middle reaches of the Narmada River, where lateral channel shifting and sediment deposits occur under reduced gradients.

4. Floodplain Mapping in the Narmada Basin

Rivers are fundamental natural resources that act as crucial linkages between terrestrial ecosystems and coastal marine environments. They facilitate the transport of nutrients, sediments, and freshwater to adjacent seas, thereby regulating coastal productivity and maintaining ecological equilibrium. The dynamic behavior of rivers, governed by intricate fluvial processes such as erosion, sediment transport, and deposition, plays a pivotal role in landform development and the continual reshaping of the Earth's surface. These processes form diverse geomorphic landforms, which serve as critical habitats and support various biotic communities dependent on riverine systems for survival and ecological functions.

Among these landforms, floodplains are particularly significant due to the multiple ecosystem services they provide, including freshwater availability, nutrient cycling, flood regulation, and the sustenance of biodiversity. However, escalating anthropogenic pressures and widespread encroachment on floodplains have led to environmental degradation and disrupted these systems' essential services. This increasing human intervention poses a significant threat to the ecological integrity of riverine landscapes.

Accurate floodplain delineation is essential for the conservation and management of ecosystem services, ensuring the preservation of ecological functions while mitigating the impacts of human activities on these fragile environments. Therefore, prioritizing the demarcation of floodplains along river courses using advanced scientific methods is crucial. The methodology employed in this study is described below.

4.1 Methodology

A 10-year maximum water extent analysis of the Narmada River was conducted within a 20 km buffer on each side of the river. Synthetic Aperture Radar (SAR) imagery was obtained from the Sentinel-1 satellite via the Google Earth Engine (GEE) platform. The images were captured in Ground Range Detected (GRD) mode, utilizing the VH polarization band with a spatial resolution of 30 m. Image processing was carried out using the Sentinel-1 toolbox in GEE.

The SAR images from GEE were normalized, calibrated, and ortho-rectified, with backscatter coefficients converted to decibels (dB). The backscatter coefficient reflects the amount of radar energy reflected to the antenna, influenced by factors such as dielectric constant, surface roughness, topography, and the local incidence angle. Water, with its high dielectric constant, results in minimal backscatter compared to land surfaces. Smooth water surfaces produce significantly lower backscatter, while rougher surfaces yield slightly higher values, assuming other factors remain constant \citep{campbell2011, smith1996}.

In this analysis, the VH polarization band was chosen because it is less sensitive to river surface roughness compared to other bands \citep{dubey2021}. To derive the annual maximum water extent, a minimum-value composite was created using images from 2015 to 2024. This method assumes that pixels with the lowest backscatter values during the year are most likely water pixels, as inundated areas exhibit minimal radar reflectance.

4.2 Results

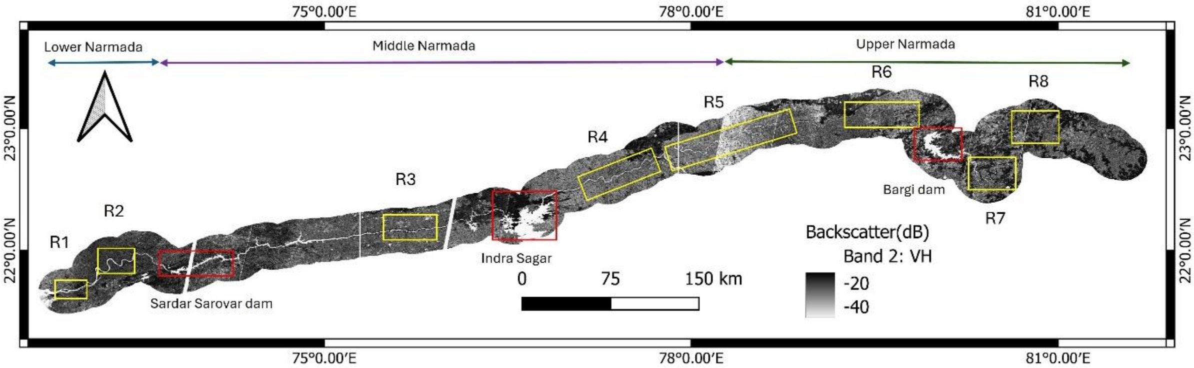

Fig. 05: A minimum-value composite of the SAR image collection for 2015 to 2024

(Reach R1-R9 are shown in the yellow bracket, and the red bracket shows major dams in the Narmada basin)

This section presents the reach-wise floodplain delineation, using SAR imagery, classified water extent over SAR imagery, and classified water extent over Google Earth imagery for each sub-basin. These analyses provide a comprehensive overview of the floodplain dynamics across the Basin. According to the SAR imagery, the storage capacity of the dams has remained largely unchanged from 2015 to 2024. Detailed information regarding the major reservoirs in the basin is provided in **Annexure 1.**

4.2.1 Upper Narmada Basin:

Reach 8 (R8)

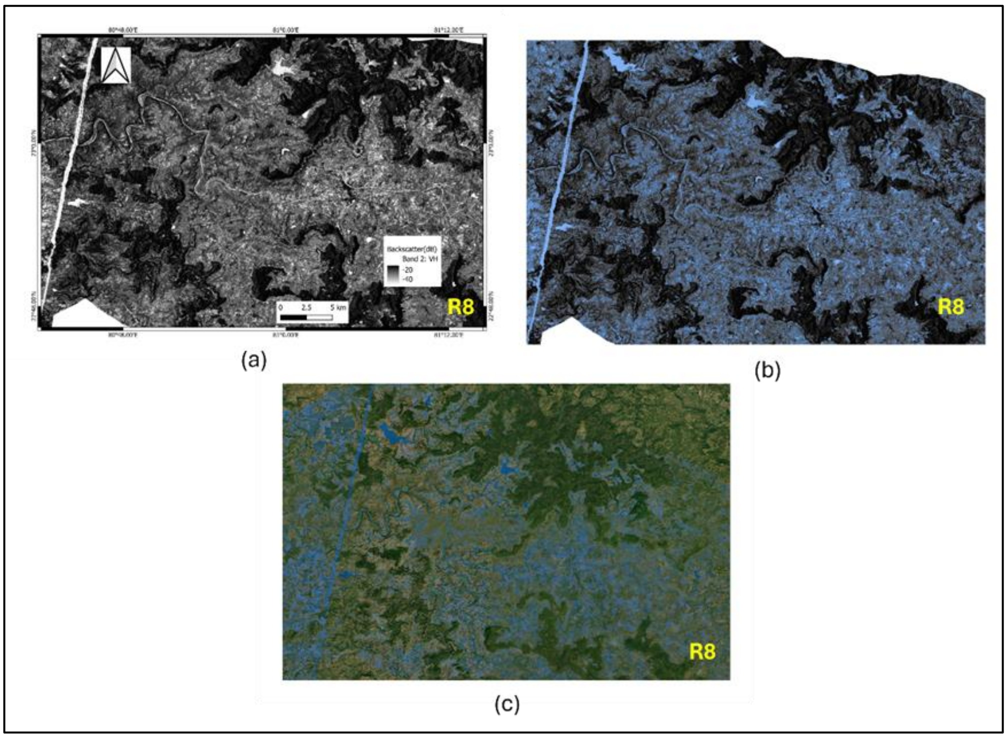

Fig.06 Reach 8: (a) SAR Image (b) Classified water extent over SAR image (c) Classified water extent over Google Earth image

At R8, near Amarkantak in the upper Narmada Basin, the average width of the river ranges from 110 m (as measured from Google Earth imagery), and the channel bed is primarily composed of bedrock. Based on SAR imagery from 2015 to 2024, the river flows within its channel, with maximum water extent observed across most of this reach. The hilly terrain contributes to the region being a confined valley margin, which limits the visibility of an active floodplain. However, there are a few areas within this reach where active flooding is observed.

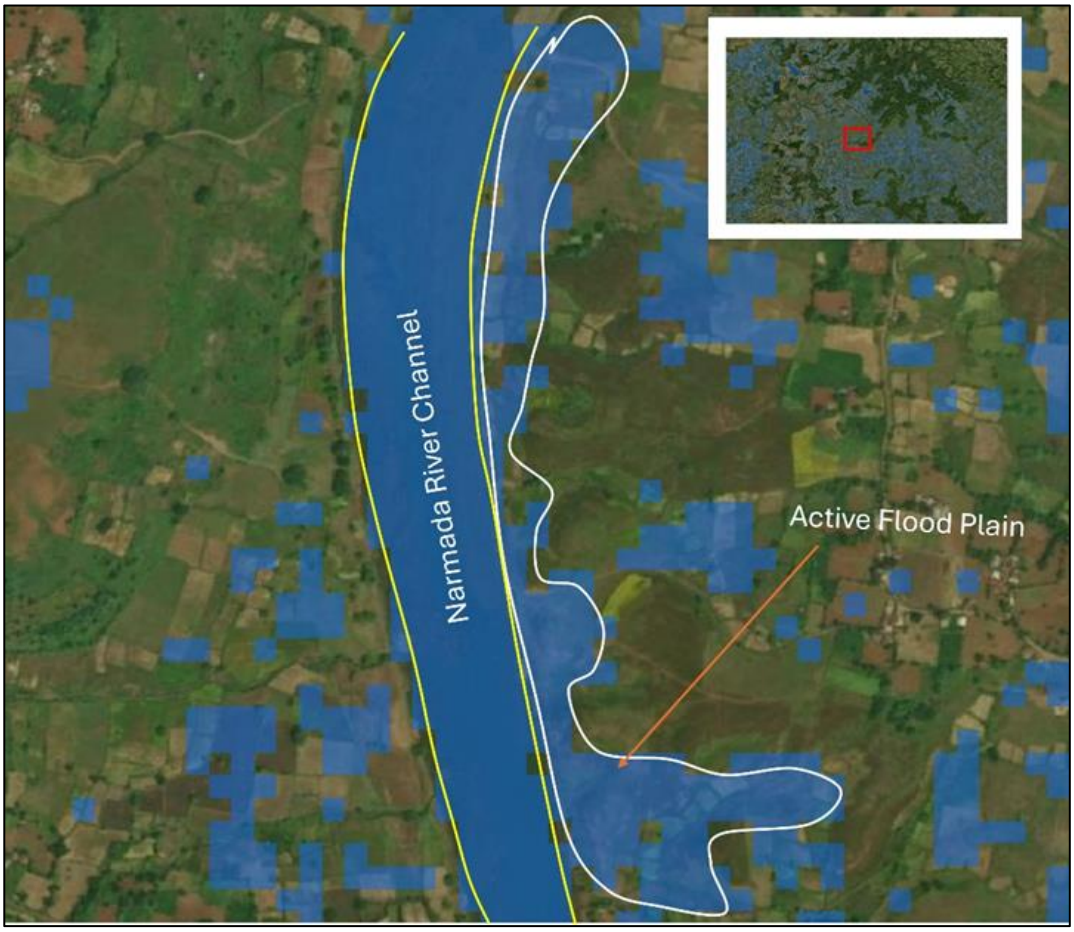

Fig. 07: Active Floodplain near Chaura raiyat (MP) (Source: Google Earth)

Reach 7 (R7)

At R7, the average width of the river channel is approximately 170 meters. The river predominantly flows through a confined valley, partly bordered by hilly terrain. Near Mandla, the left bank of the Banjar River joins the main Narmada channel as a tributary. Based on SAR imagery from 2015 to 2024, there is no visible active floodplain in this reach, as the maximum water extent does not show significant flooding.

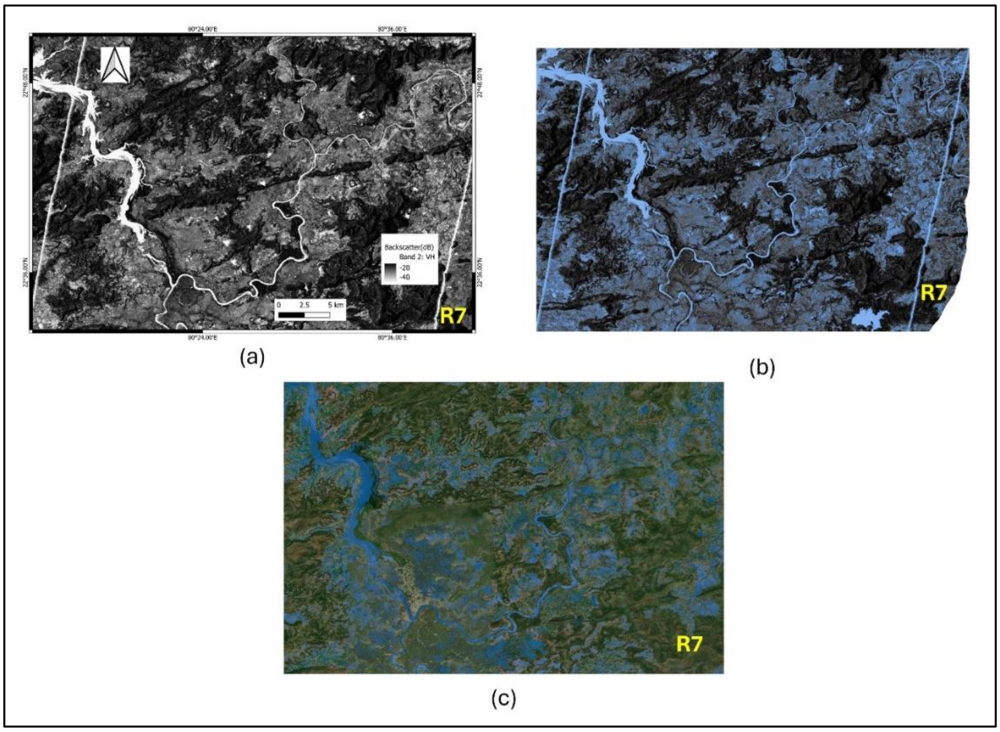

Fig.08 Reach 7: (a) SAR Image (b) Classified water extent over SAR image (c) Classified water extent over Google Earth

Reach 6 (R6)

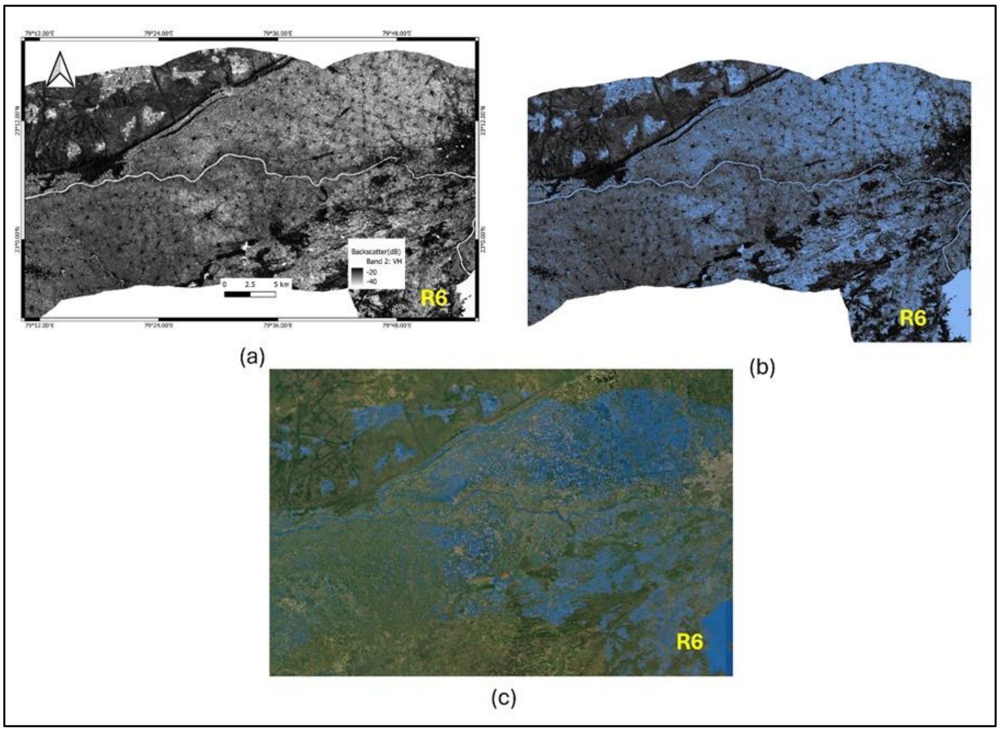

Fig.09 Reach 6: (a) SAR Image (b) Classified water extent over SAR image (c) Classified water extent over Google Earth image

At the R6 reach, downstream of the Bargi Dam, the river widens, with an average channel width of 220 meters. This region, near Jabalpur City, is characterized by steep gorges and waterfalls, including the Dhunadhar Falls. The incised channel in this area indicates a lack of significant active floodplains throughout the region. However, based on SAR imagery for maximum water extent from 2015 to 2024, a few pockets of active floodplains are observed near Jabalpur City, as shown in the figure below.

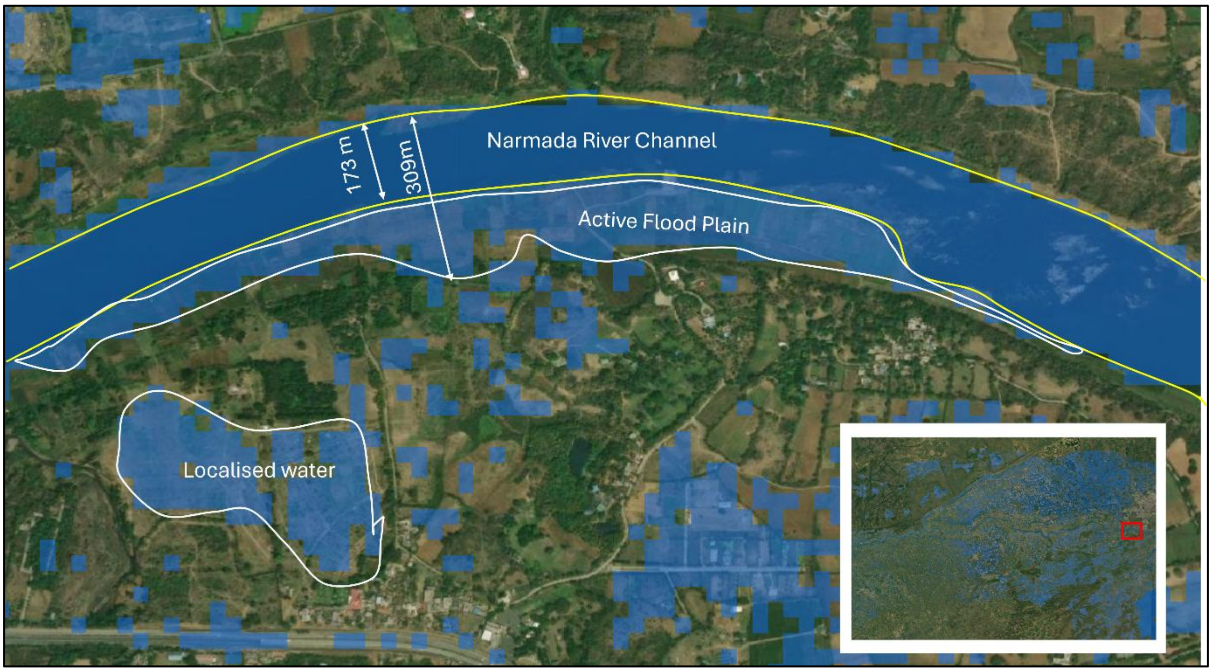

Fig. 10 Active Floodplain is shown near Jabalpur city (MP) (Source: Google Earth)

4.2.2 Middle Narmada Basin:

Reach 5 (R5)

Several smaller tributaries converge in this reach, with major tributaries such as the Shakkar River and Dudhi River joining the Narmada River from the left bank. The meandering characteristics of the river are particularly prominent in this reach. The average width of the river is 340 meters. Point bars are visible along the channel in the Narmada Basin. Compared to the upper reaches of the Narmada River, the Middle Narmada shows more active floodplain surfaces, which are more pronounced and widespread throughout the channel.

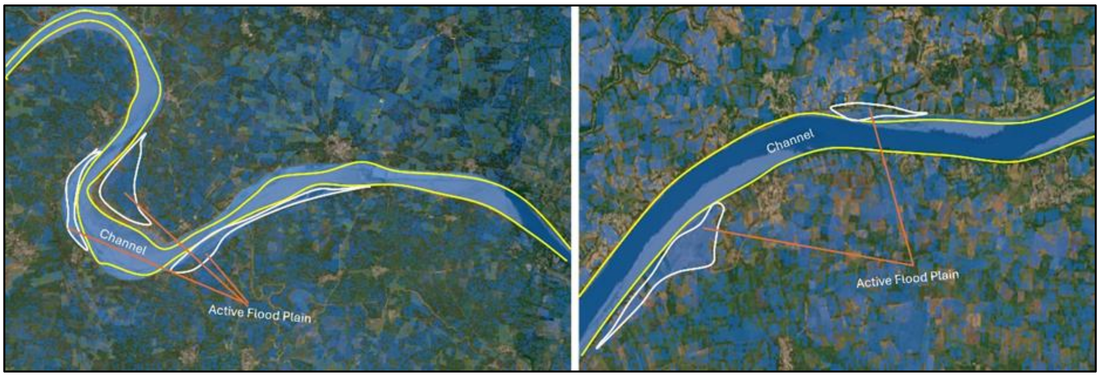

Fig. 11 Active Floodplain Near Bhatgaon and Narhera Village in MP

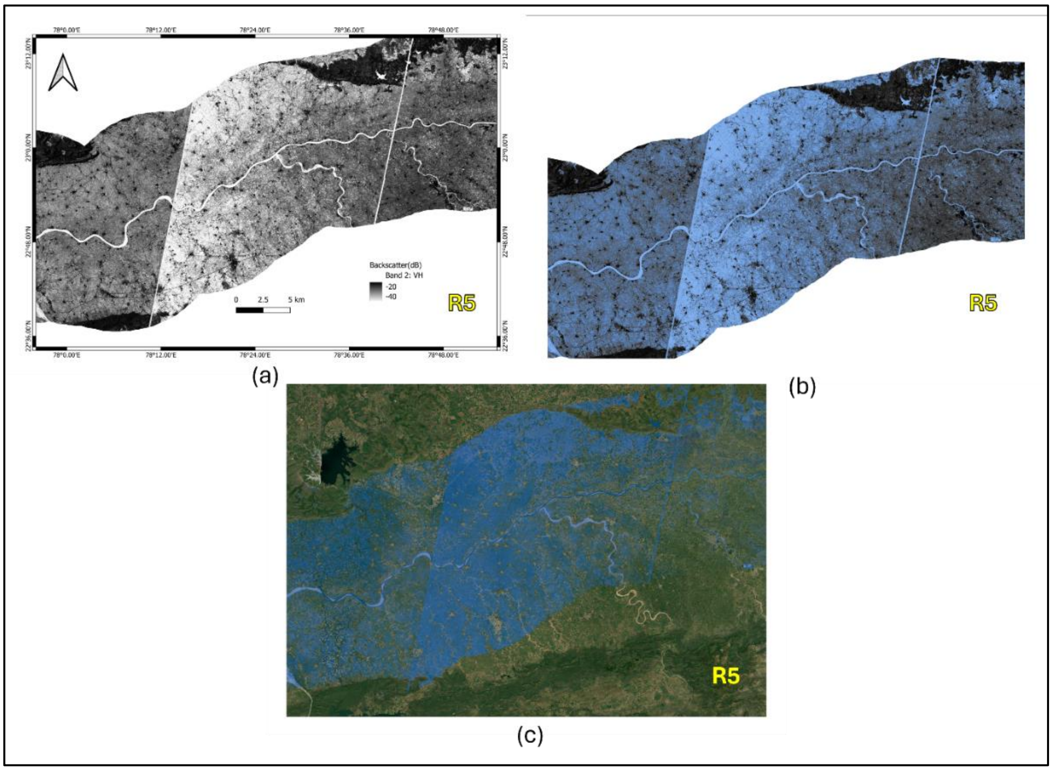

Fig.12 Reach 5: (a) SAR Image (b) Classified water extent over SAR image (c) Classified water extent over Google Earth image

Reach 4 (R4)

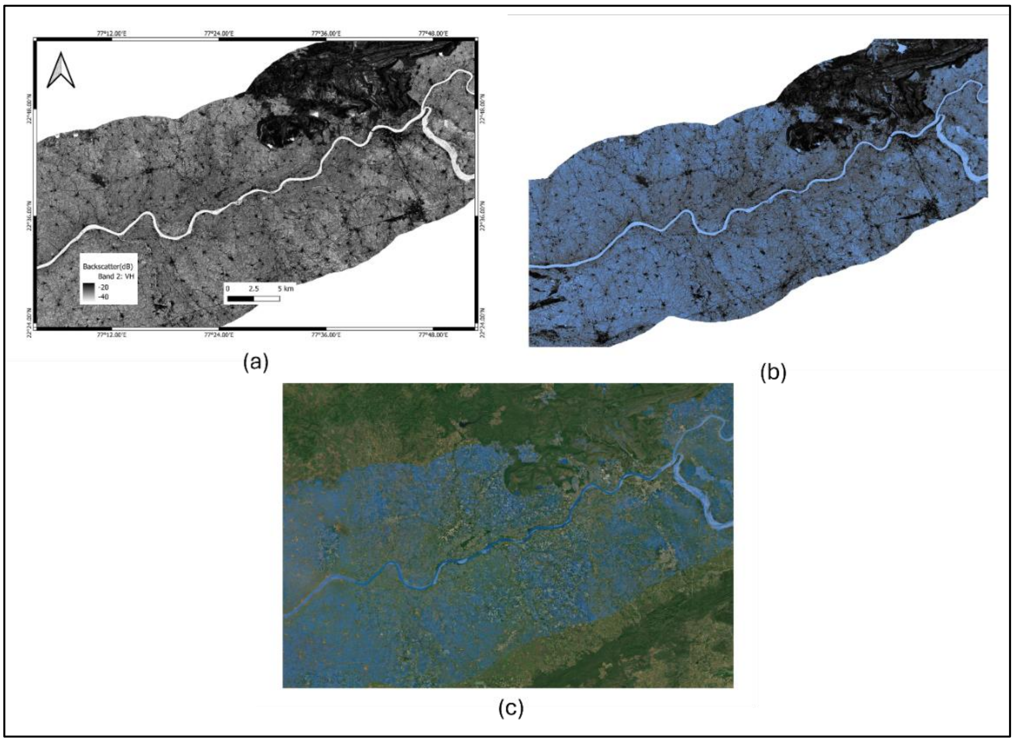

Fig.13 Reach 4: (a) SAR Image (b) Classified water extent over SAR image (c) Classified water extent over Google Earth image

At this reach, the main channel of the Narmada River is joined by one of its largest tributaries, the Tawa River. The river exhibits a meandering pattern, with an average width of 330 meters. Based on SAR imagery, active floodplains are not visible in this region, indicating that the river is incised and flows within its channel.

Reach 3 (R3)

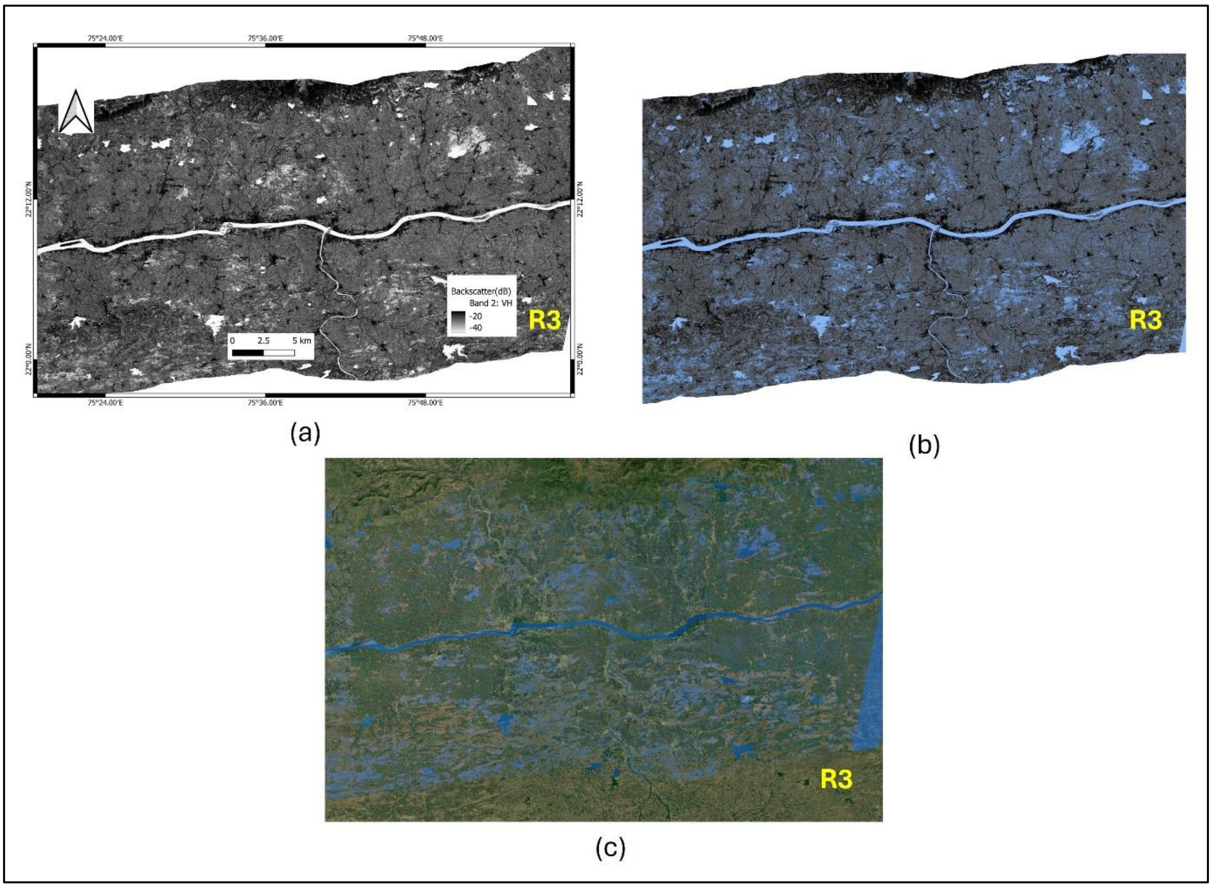

Fig.14 Reach 3: (a) SAR Image (b) Classified water extent over SAR image (c) Classified water extent over Google Earth image

In this river reach (R3), the main channel lies between two significant dams: downstream of the Omkareshwar Dam and upstream of the Sardar Sarovar Dam. SAR imagery from 10 years of data reveals stagnant water in the channel, with no visible active floodplains. The average width of the river channel is approximately 500 meters. The influence of the dams is clearly evident in this reach, with backwater effects observed downstream. The river channel widens due to the Sardar Sarovar Dam, creating backwater, while the upstream portion of the river features a narrower channel within a 150 km stretch.

4.2.3 Lower Narmada Basin:

Reach 2 (R2)

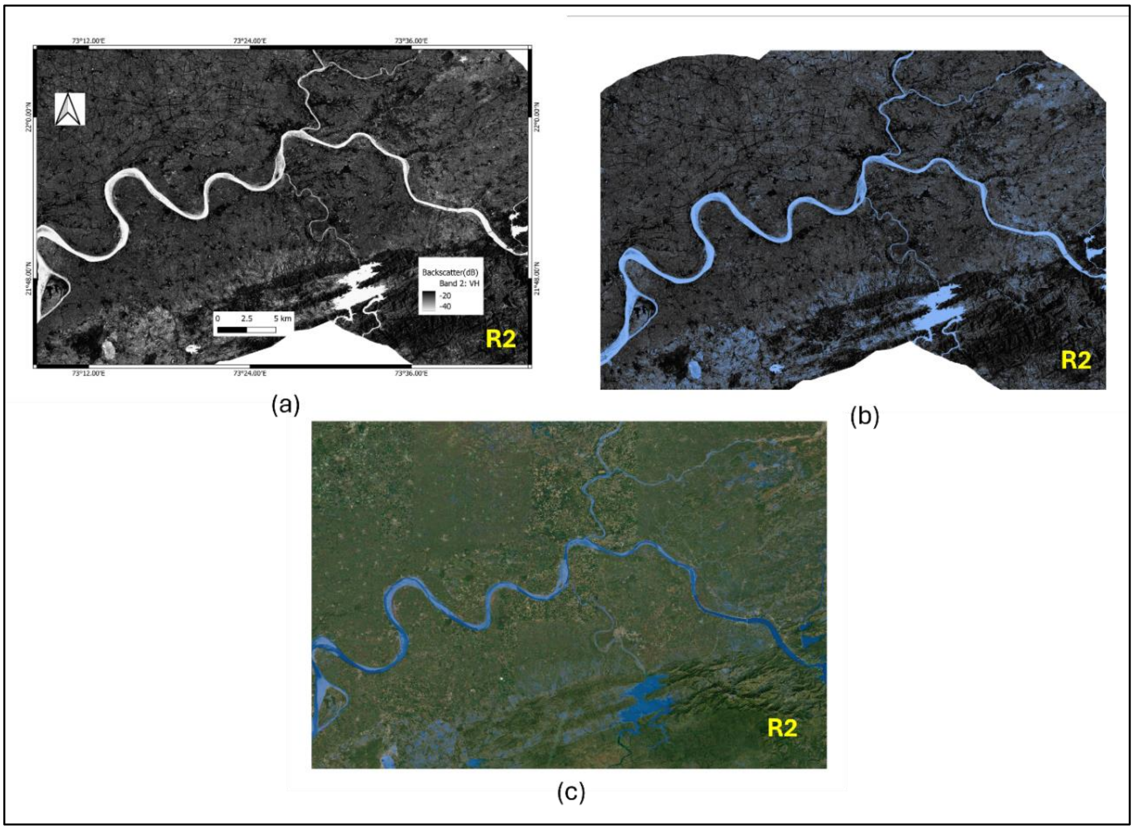

Fig.15 Reach 2: (a) SAR Image (b) Classified water extent over SAR image (c) Classified water extent over Google Earth image

A meandering pattern is more pronounced in this reach, with point bars visible along the channel. The river is joined by several major tributaries, including the Karjan and Orsang Rivers, on both the left and right banks. The average width of the channel is 520 meters. Active floodplains are more prominent in this region, although many of the channels are not well connected along the river course. This indicates that the river is widening in certain parts of the region.

Fig. 16: Active Floodplains near Rajpipla (Gujarat) (Source: Google Earth)

Reach 1 (R1)

Active flooding is more prominent in this reach, according to SAR imagery data from 2015 to 2024. The river is wider in this section, with some areas exceeding 2 km in width and an average channel width of 770 meters. The river forms numerous islands along its course, and a meandering pattern is clearly visible throughout the reach.

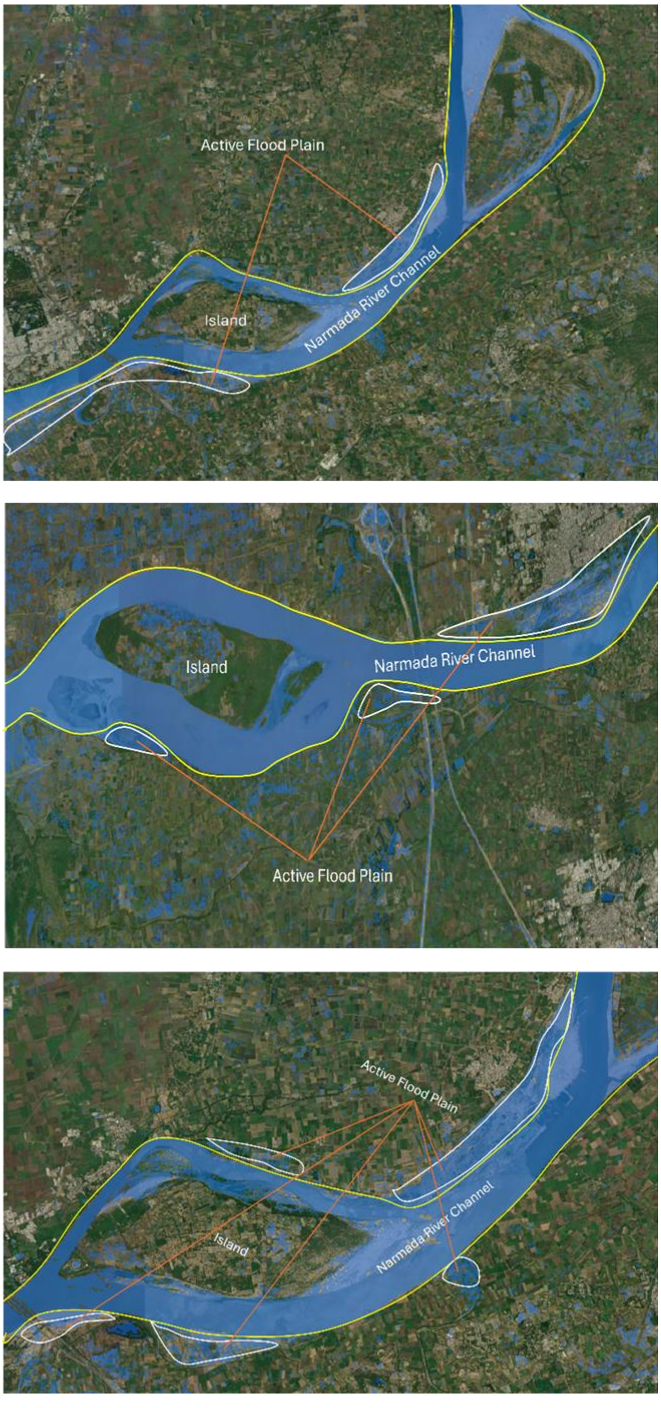

Fig. 17: Active Floodplains near Bharuch and Ankleshwar (Gujarat) (Source: Google Earth)

4.2.4 River Islands:

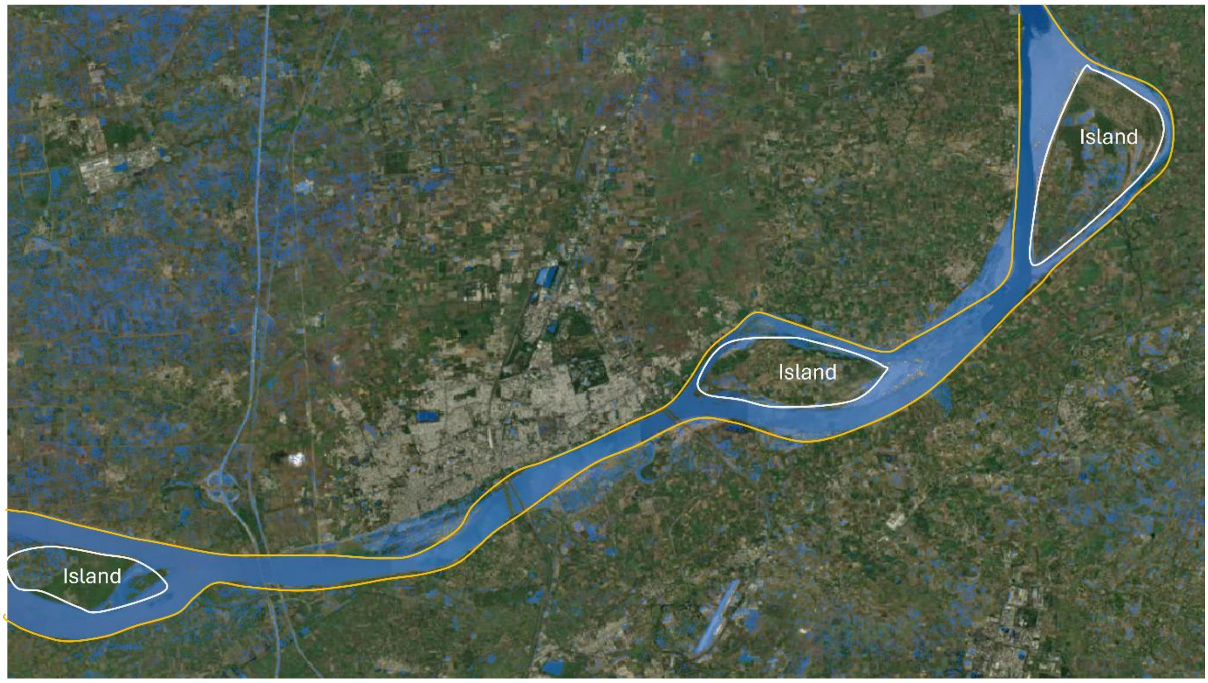

Fig. 18: River Island in Narmada River (Source: Google Earth)

River islands form through the deposition of sediment in areas where water velocity decreases, such as meanders or low-flow zones. As the river's flow slows, sediment (sand, gravel, silt) carried by the current settles, gradually building elevated landforms. Over time, these deposits accumulate to create islands, with vegetation typically stabilizing the surface. The size and shape of river islands are influenced by seasonal flow fluctuations; floods can cause erosion and reshape the islands, while lower water levels may expose or enlarge them. This process is driven by sediment dynamics, hydrology, and river morphology. In the lower Narmada River, three prominent river islands exist, with Kabirvad Island being the largest.

5. Conclusion

The Narmada River basin, with its distinct geomorphic features across the upper, middle, and lower reaches, exhibits significant variability in floodplain dynamics. The use of Synthetic Aperture Radar (SAR) imagery via the Google Earth Engine platform provides a robust methodology for floodplain mapping, enabling precise delineation of water extent over a decade (2015–2024). This approach, utilizing VH polarization, has proven effective in identifying areas of minimal backscatter, indicative of water bodies, and is essential for monitoring the maximum water extent along the river's course.

Floodplain mapping in the Narmada basin reveals a diverse landscape with varying degrees of active floodplains. The upper Narmada basin shows limited active floodplain areas, primarily confined to specific regions due to the hilly terrain and the river's narrow channel. In contrast, the middle Narmada basin exhibits more pronounced floodplain features, with the river meandering more and showing more extensive floodplain surfaces. The lower Narmada basin, with its wider channel and broader floodplain areas, demonstrates significant active floodplains, particularly around meandering sections and areas of tributary confluence.

Accurate floodplain mapping is critical for conserving these vital ecosystems. Floodplains provide essential services, including water storage, nutrient cycling, biodiversity support, and flood regulation. However, encroachment and human interventions in these areas have led to environmental degradation and disruptions in these vital functions. Mapping the floodplains of the Narmada River is key for effective land and water management, ensuring the preservation of ecological integrity and the services these areas provide.

In terms of distribution, floodplain coverage is least in the upper Narmada basin, where confined valley margins prevail. The middle basin shows moderate floodplain extents, with active areas primarily along meandering sections. The lower Narmada basin exhibits the most extensive floodplain areas, with large portions of the river characterized by active floodplains, making this region a critical focus for conservation efforts. The methodology applied in this study provides a valuable tool for understanding and managing floodplain dynamics, which is crucial for maintaining the ecological health of the Narmada River system.

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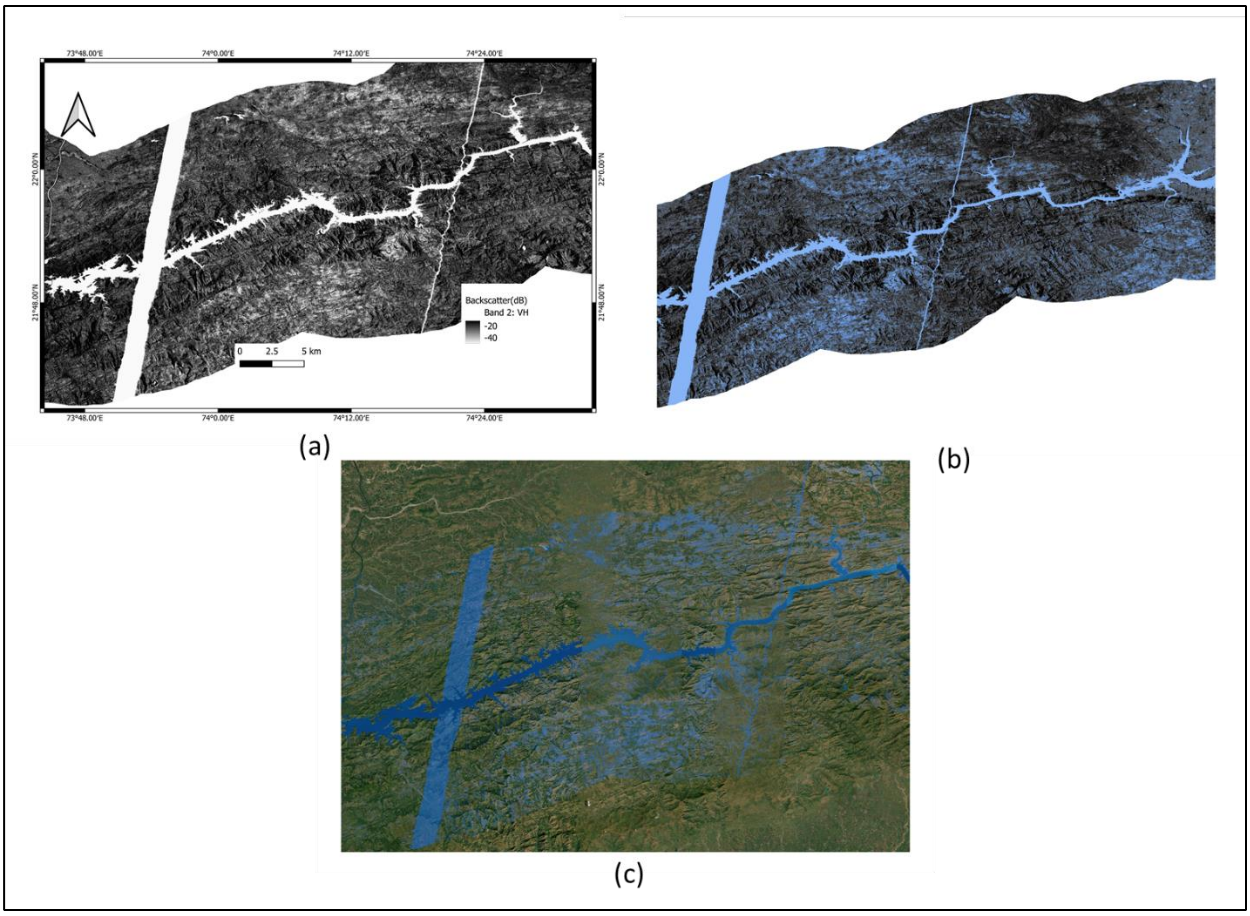
Annexures

Annexure 1

1. Sardar Sarovar Dam



(a) SAR Image (b) Classified water extent over SAR image (c) Classified water extent over Google Earth image

Coordinates: 21^{o} 49’ 49” N, 73^{o} 44’ 50” E

Height: 138.68 m

Height (Foundation): 163 m

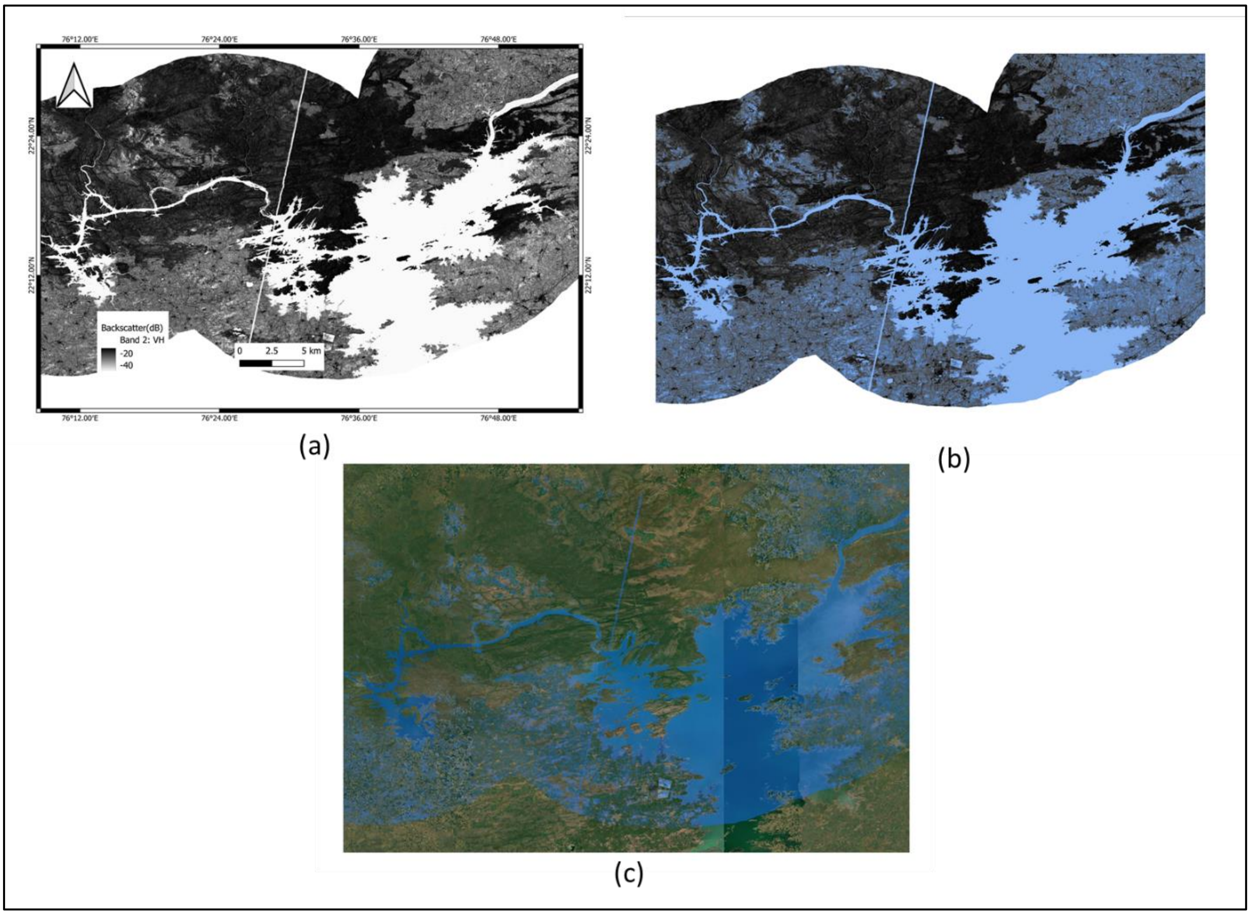
Length: 1210 m

Total Capacity: 9.460 km^3

Active Capacity: 5.760 km^3

Inactive Capacity: 3.700 km^3

2. Indira Sagar Dam



(a) SAR Image (b) Classified water extent over SAR image (c) Classified water extent over Google Earth image

Coordinates: 22^{o} 17’ 02” N, 76^{o} 28’ 17” E

Height: 92 m

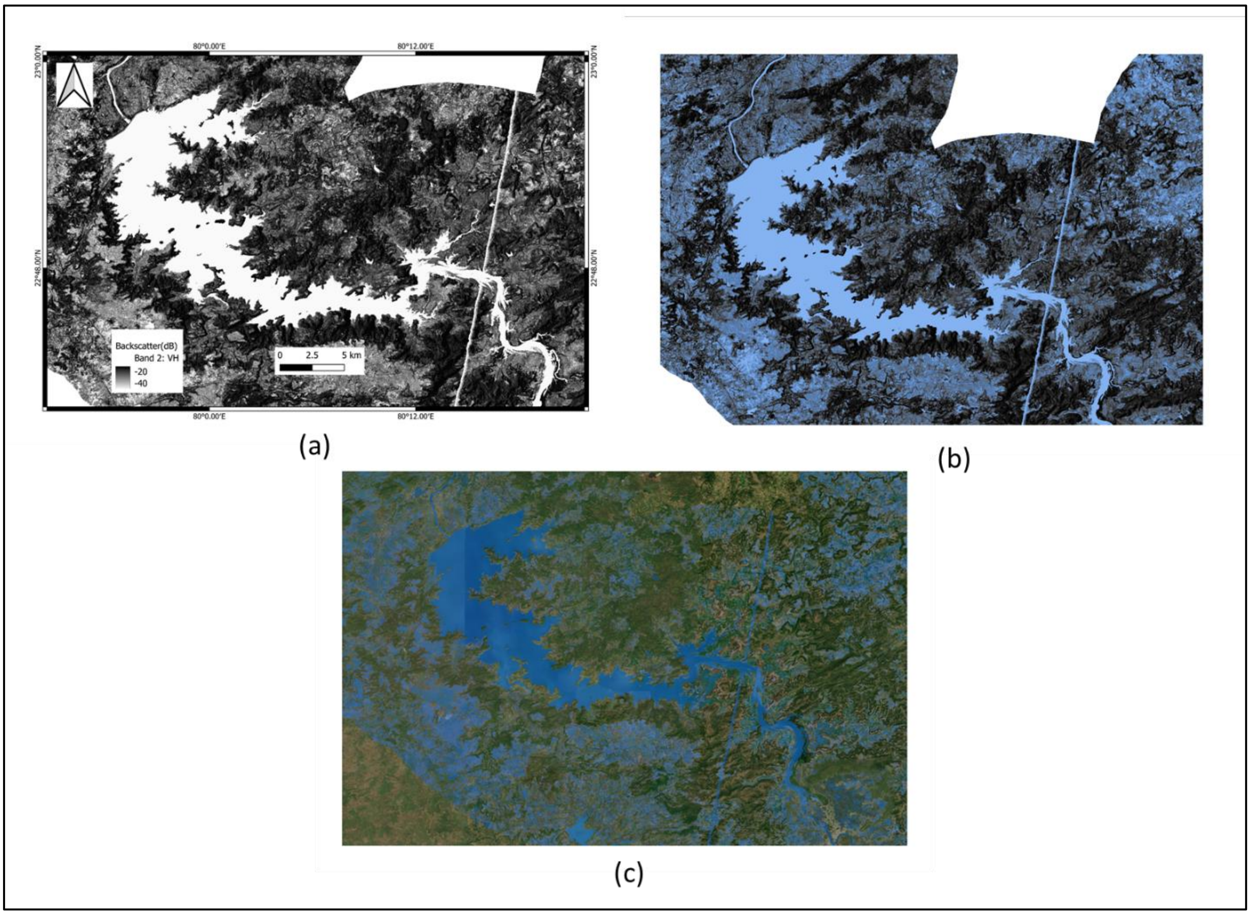
Length: 653 m

Total Capacity: 12.220 km^3

Active Capacity: 9.750 km^3

Inactive Capacity: 2.470 km^3

3. Bargi Dam



(a) SAR Image (b) Classified water extent over SAR image (c) Classified water extent over Google Earth image

Coordinates: 22^{o} 17’ 02” N, 76^{o} 28’ 17” E

Height: 69.80 m

Length: 5357 m

Total Capacity: 3,920,000,000 m^3

Active Capacity: 3,180,000,000 m^3

Inactive Capacity: 740,000,000 m^3