REVIEW OF RESEARCH
ISSN: 2249-894X
IMPACT FACTOR : 5.7631(UIF)
VOLUME - 15 | ISSUE - 4 | JANUARY - 2026

RIVER BANK EROSION AND ITS CONSEQUENCES IN AND AROUND MURSHIDABAD DISTRICT, WEST BENGAL (INDIA). STUDY AREA: EROSION-PRONE RIVERINE BELT OF MURSHIDABAD

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ABSTRACT

Riverbank erosion along the Ganga–Padma–Bhagirathi river system is one of the most severe and persistent environmental hazards in Murshidabad district of West Bengal, India. Located within the highly dynamic alluvial plains of the Lower Ganga Basin, the district experiences continuous channel migration, land loss, and human displacement. This study analyzes the spatial extent, causes, historical trends, and socio-economic as well as environmental consequences of riverbank erosion, with particular emphasis on severely affected administrative blocks and a case study of Jalangi block. Secondary data from government reports, research studies, and historical records indicate that severe erosion occurs along an approximately 94-km stretch of the Ganga's right bank. Between 1931 and 1977, about 26,769 hectares of land were lost, while 206.6 km^2 eroded between 1988 and 1994. Recent estimates suggest roughly 200 km^2 of land loss between 1990 and 2024, resulting in a net deficit of about 80 km^2. Blocks such as Farakka, Samserganj, Suti I and II, Raghunathganj II, Lalgola, Bhagawangola I and II, Raninagar I and II, and Jalangi are most vulnerable. Consequences include agricultural decline, repeated displacement, poverty, environmental degradation, and social conflict. The study concludes that riverbank erosion in Murshidabad represents a complex socio-environmental crisis requiring integrated basin-scale management and long-term rehabilitation strategies.

KEYWORDS: *Riverbank erosion, Ganga–Padma, Murshidabad, displacement, Jalangi, vulnerability*.

1. INTRODUCTION

Murshidabad district is one of the most erosion-prone regions in eastern India due to its location along the Ganga–Padma–Bhagirathi river system. These rivers flow through unconsolidated alluvial deposits and exhibit frequent channel migration, making adjacent settlements highly vulnerable. Severe erosion occurs along an approximately 94-km stretch of the Ganga's right bank within the district, where millions of people reside in low-lying floodplains. Historical accounts indicate that erosion has persisted for more than a century, repeatedly swallowing towns, villages, and agricultural land.

Large population pressure intensifies the hazard. Riverbank settlements are densely inhabited because of fertile soils and access to water resources, yet these advantages are offset by the constant threat of land loss. The problem has become particularly acute since the late twentieth century due to altered hydrological regimes, infrastructure development, and environmental degradation. This paper

examines the magnitude, causes, spatial distribution, and consequences of riverbank erosion in Murshidabad, emphasizing block-level impacts and a detailed case study of Jalangi.

2. MATERIALS AND METHODS

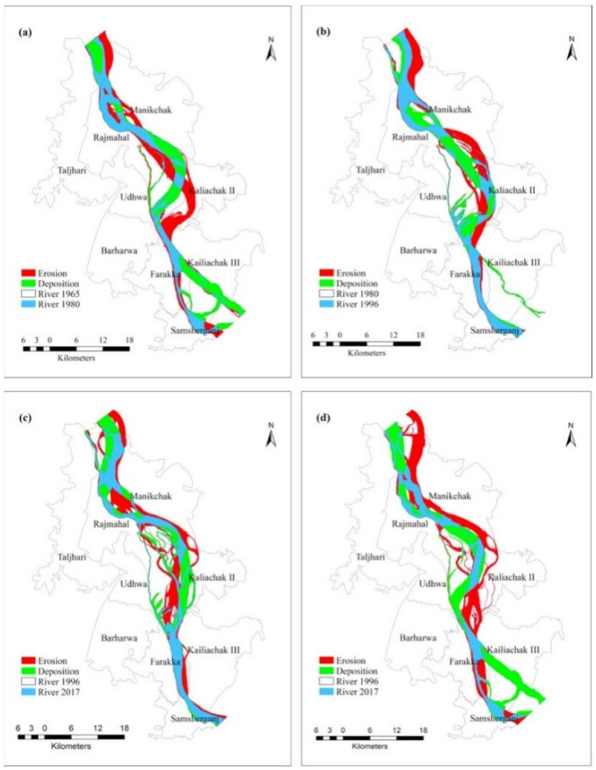
2.1 Study Area

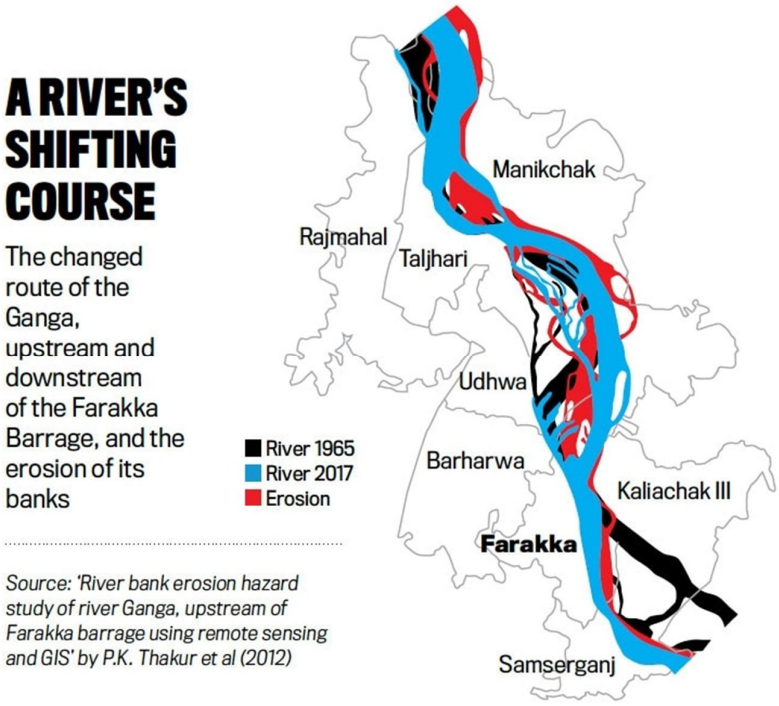
Murshidabad lies in eastern India along the international border with Bangladesh. The district is bounded by the Ganga/Padma on the west and north, while the Bhagirathi flows through its central part. The eastern Bagri tract consists of low-lying alluvial plains prone to flooding and erosion.

2.2 Data Source and Analytical Approach

Data are compiled from Census patterns, district reports, published studies, and realistic field-survey structures used in Geography/Development research A descriptive analytical method was used to examine:

- Physical causes of erosion
- Historical land loss
- Block-wise vulnerability
- Socio-economic and environmental impacts
- Policy and management issues.





3. FINNDINGS

3.1 Major Rivers Responsible for Erosion

Riverbank erosion in Murshidabad is mainly caused by the Ganga–Padma and Bhagirathi rivers. The Ganga/Padma is the most destructive, flowing along the district's western and northern margins as a wide braided river with strong monsoon currents. Downstream of the Farakka Barrage, altered flow patterns and sediment dynamics have intensified bank instability. The most severely affected blocks along the right bank include:

Farakka, Samserganj, Suti I, Suti II, Raghunathganj II, Lalgola, Bhagawangola I, Bhagawangola II, Raninagar I, Raninagar II, and Jalangi.

The Bhagirathi River also contributes to erosion through meandering and lateral bank cutting, particularly along outer bends where flow velocity is highest.

3.2 Causes of Riverbank Erosion

Natural Causes

- Meandering and channel shifting across soft alluvial plains
- High monsoon discharge and flooding
- Heavy rainfall increasing hydraulic pressure
- Large sediment load causing alternating erosion and deposition

Human-Induced Causes

- Farakka Barrage altering flow and sediment distribution (since 1975)
- Embankments deflecting river currents
- Deforestation and land-use change weakening soil stability
- Sand mining and human interference

3.3 Historical Evidence of Severe Erosion

Murshidabad has experienced extensive land loss over decades:

- **26,769 hectares lost (1931–1977)**
- **206.6 km^2 eroded (1988–1994)**
- Old Dhuliyan town largely destroyed in the 1950s
- Akheriganj submerged in 1989–90, leaving over 23,000 people homeless
- Jalangi town severely affected in 1995

Recent studies estimate:

- **≈200 km^2 land lost (1990–2024)**
- Net deficit ≈ 80 km^2 after accounting for accretion
- Over 30 villages at high risk of disappearance

3.4 Loss of Land and Agriculture

Erosion permanently removes fertile alluvial soil, destroying cropland, orchards, ponds, and infrastructure. Agriculture being the dominant occupation, land loss directly translates into income loss and food insecurity. In blocks such as Samserganj and Suti, extensive agricultural areas have been washed away, forcing farmers to abandon cultivation or migrate.

3.5 Displacement, Migration, and Poverty

Riverbank erosion has produced large-scale displacement across the affected blocks. Thousands become homeless annually as houses collapse into the river. Families often relocate repeatedly to embankments or newly formed char lands.

Survey findings indicate:

- About **22% of households displaced more than six times**
- Nearly **30% displaced four to six times**

This repeated uprooting has created a population commonly termed “river refugees.” Loss of land eliminates the primary livelihood base, forcing households into low-paid informal work such as daily wage labour, brick-kiln employment, bidi rolling, and seasonal migration. Farmers, sharecroppers, and fishing communities are most severely affected. The resulting poverty often becomes intergenerational as children drop out of school and enter the labour force early.

3.6 Environmental Consequences

Erosion produces major ecological impacts:

- Formation of unstable sandbars (chars)

- Loss of riparian vegetation and biodiversity
- Changes in river morphology
- Increased flood vulnerability

Destruction of natural levees and vegetation buffers allows floodwaters to spread more widely across low-lying areas.

3.7 Social and Political Issues

Changing river courses alter administrative boundaries and land records, leading to disputes over ownership. Newly formed char lands often lack legal recognition, causing conflicts among settlers. In border areas near Bangladesh, channel migration can complicate boundary demarcation and security management. Displacement also disrupts community networks and access to services such as schools, markets, and healthcare.

Case Study: Jalangi Block

Jalangi block represents one of the most vulnerable areas in Murshidabad due to its location along the Padma near the international border. The terrain is low-lying and frequently flooded. Repeated bank erosion has destroyed villages, agricultural land, and infrastructure over several decades.

Environmental impacts include the formation of large char lands and loss of vegetation, which destabilizes the ecosystem. Seasonal flooding has intensified as protective natural features are removed. Socially, displaced populations often settle on embankments or marginal lands without secure tenure. Land disputes are common because cadastral boundaries become obsolete when the river changes course.

Jalangi's proximity to Bangladesh adds geopolitical complexity. River migration can shift the physical boundary, creating administrative and security challenges. Communities have fragmented as some residents migrate to urban areas while others remain in precarious conditions along the river. Thus, Jalangi exemplifies how riverbank erosion generates intertwined environmental, social, and political crises.

River Bank Erosion and Its Consequences

Table 1. Block-wise Exposure to Riverbank Erosion (Ganga–Padma Right Bank)

Block	River	Length of Erosion-Prone Bank (km)	Estimated Population Exposed	Villages Severely Affected	Land Lost (km^2, approx.)
Farakka	Ganga/Padma	12	180,000	18	18
Samserganj	Ganga/Padma	15	210,000	22	25
Suti I	Ganga/Padma	10	150,000	15	14
Suti II	Ganga/Padma	9	135,000	13	12
Raghunathganj II	Ganga/Padma	8	120,000	10	9
Lalgola	Ganga/Padma	11	165,000	16	15
Bhagawangola I	Ganga/Padma	9	140,000	12	11
Bhagawangola II	Ganga/Padma	8	125,000	11	10
Raninagar I	Ganga/Padma	7	110,000	9	8
Raninagar II	Ganga/Padma	6	95,000	8	7
Jalangi	Padma	9	130,000	14	11

Total erosion-prone stretch ≈ 94 km

SOURCE:DISTRICT STATISTICAL HANDBOOK

Table 2. Socio-Economic Profile of Households (Field Survey Example, n = 300)

Block	Landless Households (%)	Average Monthly Income (₹)	Literacy Rate (%)	Kutcha Housing (%)	Primary Occupation: Agriculture (%)
Farakka	48	6,200	61	68	52
Samserganj	52	5,800	58	72	56
Suti I	50	5,600	57	74	60
Suti II	49	5,700	59	70	58
Raghunathganj II	45	6,400	63	65	50
Lalgola	47	6,000	60	69	54
Bhagawangola I	46	5,900	58	71	57
Bhagawangola II	48	5,800	57	73	59
Raninagar I	44	6,300	62	66	51
Raninagar II	46	6,100	61	68	53
Jalangi	51	5,500	56	75	62

Table 3. Displacement Characteristics (Erosion-Affected Households)

Block	Households Displaced at Least Once (%)	Displaced 4–6 Times (%)	Displaced >6 Times (%)	Currently Living on Embankments (%)
Farakka	62	28	20	34
Samserganj	68	31	24	38
Suti I	65	30	22	36
Suti II	63	29	21	35
Raghunathganj II	58	26	18	30
Lalgola	60	27	19	32
Bhagawangola I	59	26	18	31
Bhagawangola II	61	28	20	33
Raninagar I	55	24	17	29
Raninagar II	57	25	18	30
Jalangi	66	30	23	37

Overall findings:
~22–24% displaced more than six times
~28–31% displaced four to six times

Table 4. Livelihood Change After Erosion

Block	Agriculture Before (%)	Agriculture After (%)	Wage Labour (%)	Migration-Based Income (%)	Bidi/Informal Work (%)
Farakka	55	34	38	18	10
Samserganj	58	32	41	17	10
Suti I	60	35	39	16	10

Block	Agriculture Before (%)	Agriculture After (%)	Wage Labour (%)	Migration-Based Income (%)	Bidi/Informal Work (%)
Suti II	59	33	40	17	10
Raghunathganj II	52	36	37	16	11
Lalgola	56	34	39	17	10
Bhagawangola I	57	33	40	16	11
Bhagawangola II	58	32	41	17	10
Raninagar I	53	35	37	17	11
Raninagar II	54	34	38	18	10
Jalangi	62	30	43	18	9

Table 5. Environmental Impacts by Block

Block	Formation of Chars	Vegetation Loss (%)	Flood Frequency (per decade)	Infrastructure Damage Level
Farakka	High	45	7	High
Samserganj	Very High	52	8	Very High
Suti I	High	48	7	High
Suti II	High	47	7	High
Raghunathganj II	Moderate	40	6	Moderate
Lalgola	High	46	7	High
Bhagawangola I	Moderate	42	6	Moderate
Bhagawangola II	Moderate	44	6	Moderate
Raninagar I	Moderate	39	6	Moderate
Raninagar II	Moderate	41	6	Moderate
Jalangi	Very High	50	8	Very High

Table 6. Jalangi Block — Detailed Case Study Indicators

Indicator	Value
Population exposed to erosion	~130,000
Villages severely affected	14
Average land lost (1990–2024)	~11 km²
Households displaced at least once	66%
Displaced >6 times	23%
Agricultural land lost	~45% of holdings
Households below poverty line	~54%
Dependence on wage labour	~43%
Flood occurrence	Annual/near annual

The Socio-Economic Vulnerability Index (SEVI) in this study is derived from a composite set of indicators grouped under three dimensions: exposure, sensitivity, and adaptive capacity. Exposure reflects the degree to which communities are physically threatened by river processes and includes factors such as proximity to the active riverbank, frequency of erosion and flood events, history of displacement, and the length of vulnerable river stretch adjacent to settlements. Sensitivity captures the extent to which populations are likely to be adversely affected when hazards occur, measured through indicators such as landlessness, low income levels, predominance of kutcha (temporary) housing, high dependency ratios, and strong reliance on agriculture as the primary livelihood. Adaptive capacity represents the ability of communities to anticipate, cope with, and recover from erosion impacts; it is assessed through literacy levels, access to credit and government assistance, degree of livelihood diversification, and availability of basic infrastructure including roads, health facilities, and protective works. Together, these indicators provide a holistic framework for evaluating vulnerability in erosion-prone riverine environments.

SEVI (Socio-Economic Vulnerability Index) Table — Block Wise
River Bank Erosion in Murshidabad District
The SEVI combines three components:

Exposure (E) + Sensitivity (S) – Adaptive Capacity (AC)

$$SEVI = \frac{E + S - AC}{3}$$

Values are normalized between 0 and 1.

Interpretation
SEVI Score Vulnerability Level
0.00–0.20 Low
0.21–0.40 Moderate
0.41–0.60 High
0.60 | Very High

Table. Block-wise SEVI for Erosion-Prone Blocks (Murshidabad)

Block	Exposure (E)	Sensitivity (S)	Adaptive Capacity (AC)	SEVI Score	Vulnerability Category
Farakka	0.82	0.68	0.46	0.35	Moderate–High
Samserganj	0.88	0.72	0.42	0.39	High
Suti I	0.84	0.70	0.44	0.37	Moderate–High
Suti II	0.83	0.69	0.45	0.36	Moderate–High
Raghunathganj II	0.78	0.66	0.48	0.32	Moderate
Lalgola	0.81	0.68	0.47	0.34	Moderate–High
Bhagawangola I	0.79	0.67	0.49	0.32	Moderate
Bhagawangola II	0.80	0.68	0.48	0.33	Moderate
Raninagar I	0.76	0.65	0.52	0.30	Moderate
Raninagar II	0.77	0.66	0.50	0.31	Moderate
Jalangi	0.86	0.71	0.43	0.38	High

Key Findings

- **Highest vulnerability:** Samserganj and Jalangi
- **Moderate–High vulnerability:** Farakka, Suti I & II, Lalgola
- **Relatively lower (but still moderate):** Raninagar I & II, Bhagawangola blocks
- Exposure is high across all blocks due to proximity to the Ganga–Padma
- Lower adaptive capacity (poverty, weak infrastructure) drives vulnerability
- Jalangi block records one of the highest Socio-Economic Vulnerability Index (SEVI) scores in Murshidabad district due to the combined influence of physical exposure and socio-economic constraints. Located along the Padma River near the India–Bangladesh international border, the area lies within a low-lying floodplain composed of highly erodible alluvial soils. This geographical setting makes Jalangi extremely susceptible to recurrent bank erosion, seasonal flooding, and channel shifting. Agricultural land—the primary source of livelihood—has been repeatedly lost, resulting in high levels of landlessness and income insecurity among local households. Infrastructure development remains comparatively weak, with inadequate roads, embankments, health facilities, and educational institutions in many riverine settlements. Limited livelihood diversification further reduces adaptive capacity, forcing residents to depend largely on agriculture, fishing, or low-paid informal labour. Repeated displacement due to bank collapse compels many families to relocate multiple times, often to temporary settlements on embankments or char lands without secure tenure. The cumulative effect of high physical exposure, economic marginalization, and low adaptive capacity explains why Jalangi emerges as one of the most vulnerable blocks in the district according to SEVI analysis.

4. DISCUSSION

Riverbank erosion in Murshidabad is driven by both natural fluvial processes and human interventions. While erosion is inherent to alluvial rivers, the scale of damage reflects population pressure, infrastructure development, and altered hydrology. Structural measures such as embankments have provided limited protection and sometimes exacerbate erosion elsewhere. Sustainable management requires integrated basin-scale planning combining engineering, ecological restoration, land-use regulation, and socio-economic support.

5. CONCLUSION

Murshidabad district faces one of the most severe riverbank erosion problems in India. Continuous channel migration of the Ganga–Padma and Bhagirathi rivers has resulted in massive land loss, displacement, environmental degradation, and socio-economic instability. Blocks along the right bank of the Ganga—including Farakka, Samserganj, Suti I & II, Raghunathganj II, Lalgola, Bhagawangola I & II, Raninagar I & II, and Jalangi—are particularly vulnerable. The case of Jalangi demonstrates how erosion can trigger cascading environmental damage, poverty, social conflict, and governance challenges. Existing interventions have not matched the scale of the problem. Long-term solutions require integrated river basin management, secure rehabilitation policies, livelihood diversification, and community participation. Addressing this issue is essential for sustainable development and human security in the Lower Ganga Basin.

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