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The Murshidabad River System: Water Dynamics, Issues, and Management Approaches

Sayoni Chatterjee[1], Basundhara Mondal[2] and Tanisa Baral[3]
[1]State Aided College Teacher-II, Department of Environmental Science,
Berhampore Girls' College, West Bengal, India
Email id: sayonimoon@gmail.com
[2]State Aided College Teacher-I, Department of Geography,
Berhampore Girls' College, West Bengal, India
Email id: basundhara.geo@gmail.com
[3] M.Sc Student, 2ndSemester,Department of Environmental Studies,
Visva-Bharati University
Email id: baraltanisa89@gmail.com

Abstract:
The Murshidabad river system, mainly consisting of the Bhagirathi, Padma, and Jalangi rivers, is vital for the region's geography, economy, and ecology. These rivers are key sources for agriculture, transportation, and local industries, particularly fishing and silk production. Nonetheless, the system contends with issues such as frequent flooding, riverbank erosion, sediment accumulation, and pollution, all of which adversely affect water quality and biodiversity. The study of the Murshidabad river system focuses on understanding hydrological dynamics, sedimentation, and the effects of water quality on the area. Additionally, it aims to evaluate the socio-economic impacts and investigate sustainable management strategies for the rivers. The area's diverse aquatic and riparian ecosystems are endangered by human activities like industrial waste disposal and deforestation. To sustain ecological balance and promote sustainable growth, effective river management measures—including flood control, sediment management, pollution reduction, and biodiversity preservation—are essential. This chapter examines the dynamics of the river system, the challenges it faces, and the initiatives undertaken for its conservation and management.

Keywords: *River Systems, Murshidabad, Biodiversity, Ecosystem, Conservation and Management.*

1. Introduction:

The river system in Murshidabad district mainly includes the Ganga and its distributaries, with the Bhagirathi, Jalangi, and Bhairab being the most significant. Due to the area's geographical features, most rivers in Murshidabad are both snow-fed and rainfed, linked to the Ganga's strong flow. While these rivers once had a robust current, they now primarily serve as overflow channels for the Ganga, capable of carrying floodwater during the monsoon season but displaying a very slow flow during the rest of the year. They struggle to transport large amounts of silt, leading to shoal formation that obstructs navigation. The rivers in the eastern part of the district maintain some water levels during the dry season due to inflow from the Ganga. ("River System of Murshidabad District," n.d.) However, since the construction of the Farakka Barrage in the northern part of the district, there has been a significant change in river courses in recent decades. Combined with heavy monsoon rains, this has resulted in frequent flooding and the destruction of homes and agriculture due to the shifting river streams.

2. Objectives of the Study:

I. To assess the extent and impact of sedimentation and river bank erosion of Murshidabad River system.

II. To evaluate the human footprint on the Murshidabad river Eco system.
III. To investigate the socio- economic impact of Murshidabad river eco- system degradation on Local Livelihoods.
IV. To propose sustainable river management and conservation strategies of Murshidabad River System.

3. Methodology:

This study adopts a qualitative research Design to investigate the environtal Shift, Historical changes, and socio- economic challenges within Murshidabad River system. The data for this study is compiled from a combination of primary field observations and extensive secondary literary sources. Non- participant field observation and Semi structured interviews conducted with stakeholders, including long-term residents, farmers, fishermen, and local community leaders. to gather narrative histories regarding past flood events, shifting river streams, and livelihood displacement.

Literatre Review:

- Rudra (2008) emphasized that the Bhagirathi, once the main course of the Ganga, now functions as a spill channel with reduced lean-season flow, leading to shoal formation and impaired navigability.
- Mukhopadhyay (2010) analyzed post-Farakka Barrage impacts, noting significant changes in discharge distribution between Bhagirathi and Padma, altering sediment load and flow regimes in Murshidabad.
- Chakraborty & Das (2017) documented progressive narrowing between Ganga/Padma and Bhagirathi near Fazilpur, from 2.86 km in 1996 to 1.34 km, raising concerns of channel capture and flood risk.
- Banerjee (1999) reported that between 1931-1977, 26,769 ha of land were lost, with towns like Dhuliyan completely submerged in 1952-53.
- Parua (2009) linked high sediment influx from upstream Ganga and bank material composition to severe erosion downstream of Farakka Barrage, displacing 14,236 families during 1988-1994 alone.
- Ghosh et al. (2020) using GIS and remote sensing confirmed continued bankline migration in Akheriganj and Dhanghora, attributing it to meander dynamics, poor sediment management, and human interventions.
- Sanyal & Sinha (2015) examined how urbanization in Berhampur and Jangipur increased impervious surfaces, enhancing surface runoff and flood peaks in tributaries like Jalangi and Bhairab.
- Bandyopadhyay & Rudra (2012) detailed the dependence of local silk industry and fisheries on riverine health, with siltation and pollution directly reducing productivity.

4. Study Area:

Located between 23°43'N and 24°52'N latitude and 87°49'E and 88°44'E longitude, Murshidabad is in the centre of West Bengal, with its headquarters located at Berhampur. It is 5316.11 sq. km in total area**.** (ResearchGate, n.d.)

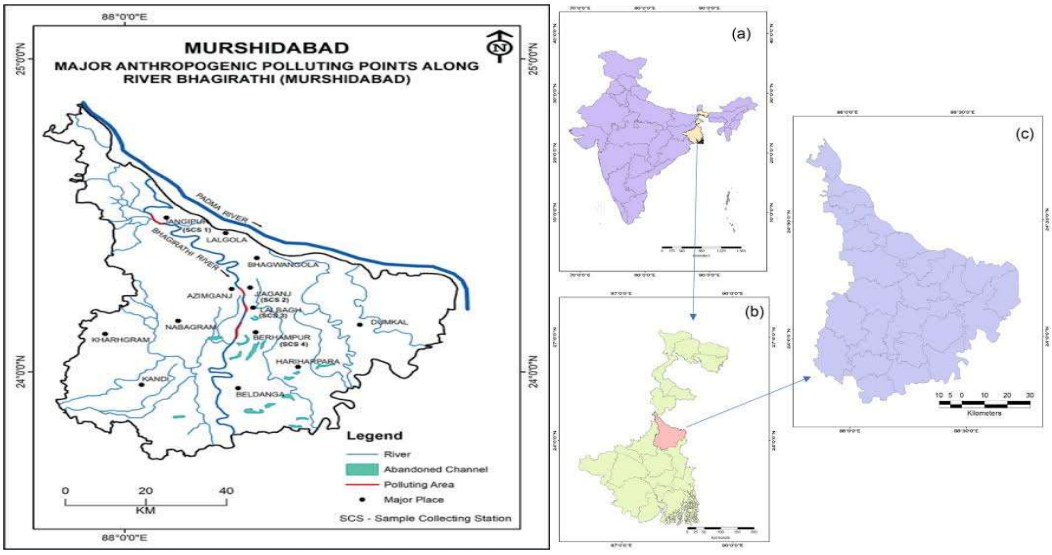

Fig: Study Area(Murshidabad), SOURCE:(ResearchGate, n.d.)

4.1 River Systems of Murshidabad:

- **Rivers Ganga, Padma and Bhagirathi:**

The Ganga, also known as Padma, enters Murshidabad district at its northernmost point and flows southeast, forming the eastern border with Bangladesh. Its tributaries include Bhagirathi, Jalangi, and Bhairab, along with the Mahananda estuary at Lalgola. ("River System of Murshidabad District," n.d.)Each year, the Ganga reshapes the land along its route through consistent changes in alluvium and diluvium, leading to the formation of large islands within its channel, some extending for several kilometres. The Bhagirathi River branches off from the Ganga at Nurpur, approximately 25 kilometres from Farakka, and flows south after paralleling the Ganga for around 2 kilometres. For about four months of the year, Bhagirathi functions as a full-fledged river, but for the remaining eight months, it resembles a diminishing stream meandering through sandy terrain. ("River System of Murshidabad District," n.d.) During the rainy season, the Ganga's overflow enters the Bhagirathi, although this merging is often obscured by significant silt deposits. The Bhagirathi River effectively divides the district into two nearly equal halves, known as 'Bagri' to the east and 'Radh' to the west. Important towns like Jangipur, Jiaganj, Berhampur, and Beldanga are located on the eastern bank. The Bhagirathi exits the district at the northern part of Plassey, which is in Nadia district. The Ganga, taking the name Padma, then crosses into Bangladesh, forming both the eastern boundary of the district and the international border between India and Bangladesh. ("River System of Murshidabad District," n.d.)

- **Rivers Jalangi, Sialmari and Bhairab:**

The Jalangi River starts from the Ganga and flows west of Hangordaobah, then east near the Bangladesh border, and south along the boundaries of Nadia and Murshidabad districts. The Sialmari River, a branch of the Padma, joins the Jalangi, causing floods during monsoons. ("River System of Murshidabad District," n.d.) The Bhairab River meets theJalangi, losing its name, and the combined flow goes zigzag for about 20 miles before heading south across Nadia. The old Bhairab begins from the Ganga in Lalgola, joins the Jalangi in northern Nadia, and fades from view after that. The Bansloi is a tributary of the Bhagirathi, entering from Birbhum at Husainpur and flowing east to meet the Bhagirathi north of Jangipur. ("River System of Murshidabad District," n.d.) The Dwaraka and Babla rivers enter from Birbhum near Morgram, flowing east and southeast, forming Kandi Sub-division's eastern boundary, and

joining with the Mayurakshi and Kuiya rivers. The Brahmani, Mayurakshi, and Kuiya originate from the Birbhum hills, flow westward, and merge with Dwaraka, with significant silt deposits affecting their depth. ("River System of Murshidabad District," n.d.)

4.2 Sedimentation and Course Changes in the River System of Murshidabad:

1. **Heavy Silt Deposition:**
   The rivers, mainly the Bhagirathi, Padma, and Jalangi, carry high sediment loads from the upstream Ganges, leading to silt accumulation.
2. **River Course Shifts:**
   Due to continuous sedimentation and erosion, the river courses have changed over time, affecting navigation and land use.
3. **Impact on Agriculture and Settlements**:
   Changing river paths result in the loss of fertile land and displacement of communities living along the riverbanks.

4. **Reduction in Navigability**:
   Increased siltation reduces water depth, hindering boat transport and economic activities like trade and fishing.

4.3 Human impact on River Systems in Murshidabad:

1. Urbanization: An increasing amount of land is being developed as urban areas grow in the UK, including on flood plains. ("Human Activity in River Landscapes," n.d.) Surfaces that used to absorb water have become hard like concrete, preventing water from soaking in, which increases surface run-off. This leads to more water quickly reaching rivers, causing a rise in river discharge. With more water entering rivers in a short time, they have more energy, resulting in more erosion and transportation. Rivers are also more prone to flooding, prompting humans to manage them to lower flood risks. ("Human Activity in River Landscapes," n.d.) Building river defences can significantly affect rivers and their landscapes.

2. Agriculture: Farming affects rivers and their landscapes in several ways. Water is taken from rivers for irrigation, which reduces the water volume and its ability to erode and carry materials. ("Human Activity in River Landscapes," n.d.) This can lead to more deposition. Intensive farming removes vegetation like hedgerows, which increases surface runoff. Ploughing erodes more soil during rain, adding sediment to rivers, causing more deposition downstream. Drainage systems on farms quickly transfer water to rivers, increasing discharge, erosion, and transportation.

3. Industry: The development of industry, like urbanization, leads to an increase in impermeable surfaces and therefore greater surface run-off. ("Human Activity in River Landscapes," n.d.) Chemical weathering can increase in river landscapes due to air pollution from factories and vehicles making rainfall more acidic.Numerous industrial zones are situated near rivers since they can be accessed by ships. To keep channels deep enough for vessels, dredging may take place. This process enhances water flow and leads to increased erosion. Additionally, dredging lowers the chances of flooding by expanding the river channel's capacity. ("Human Activity in River Landscapes," n.d.)

4.4 River Bank Erosion along the Ganges in Murshidabad Districts:

Between 1931 and 1977, erosion caused the loss of 26,769 hectares of land, submerging many villages and forcing thousands of people to leave their homes. From 1988 to 1994, 206. 60 square km of territory experienced erosion, resulting in the displacement of 14,236 families.

(Wikipedia contributors, 2025) The town of Dhuliyan was entirely wiped out during 1952-53, and in the mid-1970s, approximately 50,000 people were left homeless as the river eroded 50 mouzas and 10,000 hectares of land. (Wikipedia contributors, 2025) In August 2020, erosion struck the region once more, damaging homes, temples, schools, and orchards in villages such as Dhanghora and Dhusaripara. (Wikipedia contributors, 2025)The Report on the Effects of the Farakka Barrage highlights serious erosion in Murshidabad, particularly in Akheriganj.Downstream of Jangipur Barrage, the Ganga/Padma river is approaching the Bhagirathi river at Fazilpur, now merely 1. 34 km apart, in contrast to 2. 86 km in 1996. (Wikipedia contributors, 2025) If Ganga/Padma joins with Bhagirathi, it could lead to floods and calamities in the Bhagirathi basin. In dry seasons, the water level of Bhagirathi is higher than that of Ganga/Padma, and this merging would permit water from the feeder canal to enter Padma, affecting the objectives of the Farakka Project. (Wikipedia contributors, 2025)

4.5 Importance of River Systems:

People have cultivated land close to rivers since the inception of agriculture. In the Fertile Crescent of the Middle East, especially adjacent to the Euphrates and Tigris rivers, individuals began to cultivate food rather than rely on hunting. These rivers overflow and deposit nutrient-rich soil, rendering the land suitable for crops.("Rivers and Agriculture," 2023) Rivers also facilitate easy access to water, which is critical for agricultural practices. Irrigation enables crops to flourish in arid regions that would not be able to sustain farming otherwise.("Rivers and Agriculture," 2023) This can be beneficial since the growing season is extended in those areas, allowing farmers to reap two harvests in a single season without the threat of early frosts.("Rivers and Agriculture," 2023)

- **Rivers form an important part of any economy mainly due to the following reasons:**

1.Freshwater source: All civilizations in human history typically flourished alongside rivers. This was mainly because of the easy availability of freshwater for daily activities and the fertile land available for agriculture.(Mundkur, 2017)

2. Irrigation: India, with its huge population, needs water resources to sustain the agricultural output necessary to support such a large population.

3. Dams: Many hydropower projects are built on rivers. This enhances energy generation, as well as managing floods and the regulation of river systems. (Mundkur, 2017) This, in turn, becomes important for driving other industries.

4. Tourism:Rivers play a crucial role in India's tourism sector. The Ganga River, for instance, is an important destination for spiritual tourism. In the mountainous regions, rivers provide opportunities for adventure activities.(Mundkur, 2017)

5. Management Strategies of River Systems:

River water quality management in Murshidabad includes controlling pollution through wastewater treatment, managing industrial and agricultural runoff, and regulating sewage disposal. Regularly monitoring water quality assesses contamination levels for safe drinking and irrigation.("Water Resources in India," n.d.) Planting trees along riverbanks and conserving wetlands support natural filtration, while community awareness programs encourage responsible waste disposal. Sustainable policies for water management, like efficient irrigation and controlled sand mining, help keep the ecosystem balanced and protect river health.("Water Resources in India," n.d.)Some policies are,

1. Integrated River Basin Management: Embrace an integrated approach to river basin management that considers the entire river ecosystem, from its source to its outlet, while engaging all relevant stakeholders.

2. Legislation and Regulation: Create and enforce comprehensive laws and regulations aimed at safeguarding rivers and water resources.

3. Monitoring and Evaluation:Establish strong monitoring and evaluation systems to assess the success of conservation initiatives.

4. Water Recycling and Reuse:Recycling and reusing water are crucial for the preservation of water resources. This technology enables the treatment of wastewater, allowing it to be repurposed for activities like irrigation and industrial use.("Water Resources in India," n.d.) Smart irrigation systems utilize technology to maximize water efficiency in agriculture, adjusting watering based on climatic conditions and soil moisture. Moreover, advanced water treatment techniques are vital for guaranteeing clean and safe water.

5. Community-Led Initiatives:Communities are essential in the effort to conserve water resources. Engaging local populations fosters more effective and sustainable practices. ("Water Resources in India," n.d.)Initiatives like Jal Sanchay Jan Bhagidari prioritize community involvement and ownership, empowering residents to manage their water resources. Examples of such community-led initiatives include:

- Rainwater harvesting projects
- Educational campaigns on water conservation
- Local cleanup activities for water bodies

6. Conclusion:

The intricate river system of Murshidabad, characterized by rivers such as the Bhagirathi, Padma, and Jalangi, is crucial for the area's economy, agriculture, and biodiversity. Nonetheless, it confronts serious issues like sediment buildup, flooding, pollution, and erosion, which endanger the livelihoods of local populations and disrupt ecological balance. Despitethese obstacles, effective river management strategies—including flood control, sediment management, pollution reduction, and efforts to conserve biodiversity—have shown promise in alleviating some adverse effects. For the region's sustainable development, it is important to maintain a strong emphasis on comprehensive river system management, community engagement, and the enforcement of policies. The future of Murshidabad's rivers depends on finding an equilibrium between human requirements and environmental conservation to ensure the river ecosystem remains resilient and healthy for future generations.

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