Evaluation of Erosion Accretion, Bank Shifting Pattern, and Channel Migration of the Madhumati River

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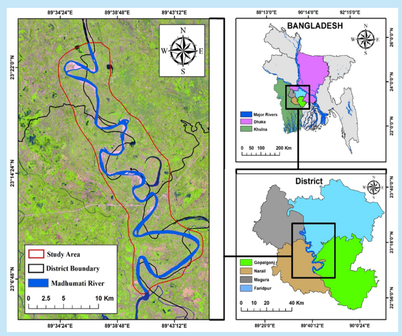
1 Introduction

Bangladesh is known as a riverine country where most of the districts are criss-crossed by several rivers. The rivers in Bangladesh are very dynamic because the huge sediment load carried by the rivers actively influences the river geomorphology. Bend formation, bank movement, and erosion accretion have occurred because of high sediment load, and bend development is active because of the river's rapid current. Moreover, the lateral movement of the river is also the reason for the bank shifting position and bank erosional accretional processes (Zahra et al., 2018).
The research can find out the morphological changes, natural characteristics of a channel, bank position migration, and river wideness at some particular positions from 1988 to 2022.

Study area

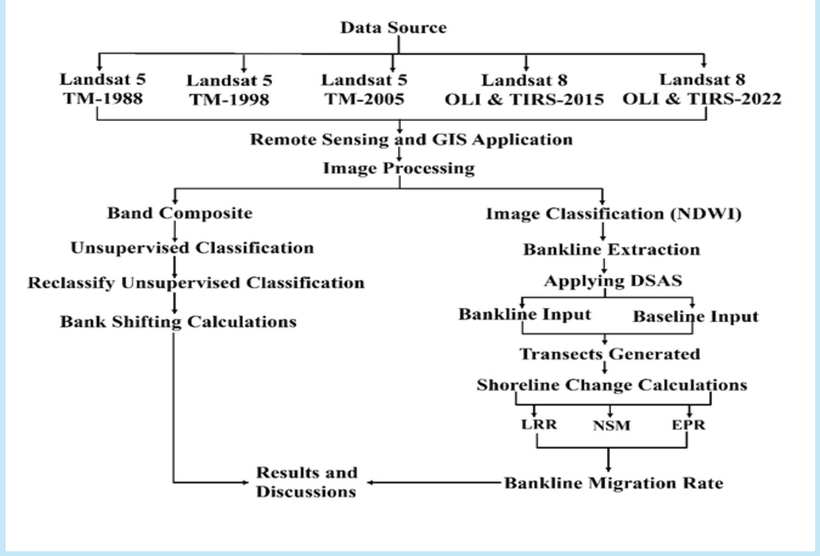
The Madhumati River is a branch of the Ganges-Padma Rivers located in the western part of Bangladesh. The portion of the Area of Interest (AOI) of the Madhumati River flows through the districts of Gopalgonj, Narail, Magura, and Faridpur. The study area is about 237.37 km2 and the flowing direction of this stream is from north to south with an elevation of 120 m when this river originated from its mother river and entered into the district of Kushtia (Biswas et al., 2021). The geographical location of the study area is between the latitude of 23°5'49.91" N to 23°23'46.26" N and the longitude of 89°34'35.10" E to 89°45'2.98" E (Fig. 01). The total length of this river in our AOI is 77.70 km.



2 Objectives

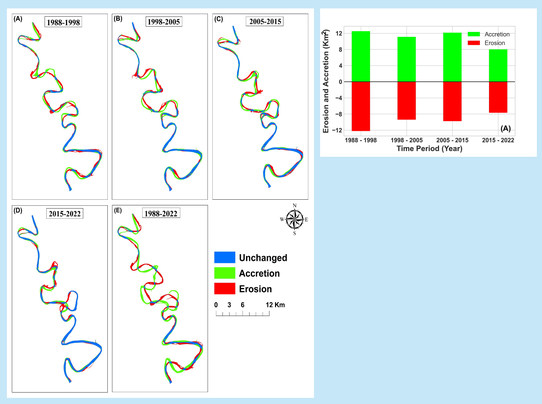
- To Calculate the Erosion Accretion of 34 Years
- To Observe the Bank Migration Rate
- To Identify the Bank Shifting Pattern
- To Apply the DSAS for measuring the Linear Regression Rate, Net Shoreline Movement, and End Point Rate.
- And to Detect the Bank Shifting Direction of the East-West Bank Movement

Methodology



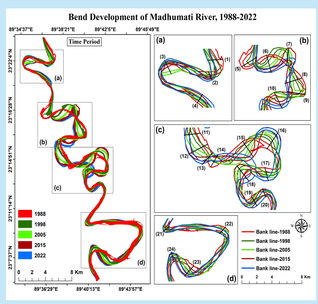
3 Results and Discussions

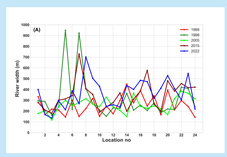
Erosion-Accretion Measurements



The Maximum Erosion and Accretion occurred at around 12.20 km2 and 12.50 km2 between 1998 to 1998.
The Minimum Erosion Accretion was experienced at 7.67 km2 and 8 km2 from the period 2015 to 2022.

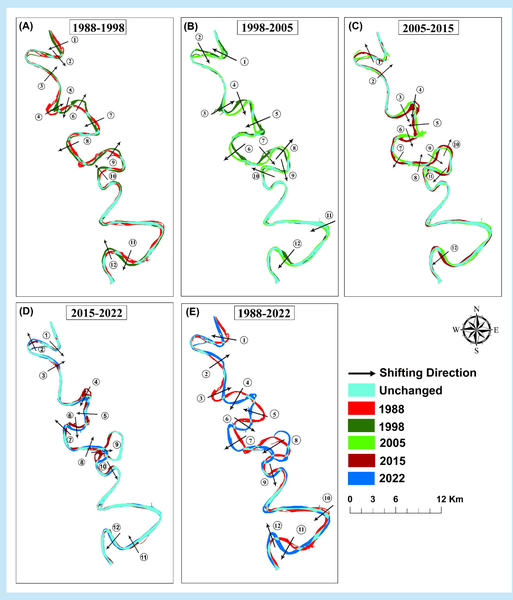
Channel Migration



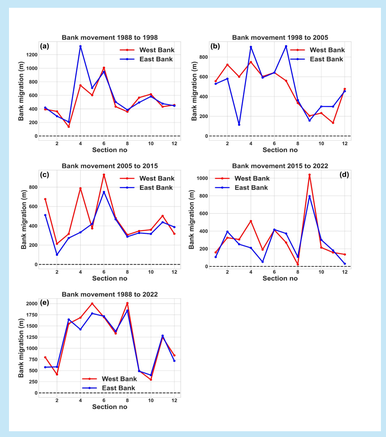


In 1988, the Maximum Width is 450 m at Location 14.
In 1998, the Maximum Width is 949 m at Location 5.
The Maximum Width is 386 m at Section 22 in 2005.
At Section 7, the Maximum Width is 729 m in 2015.
710 m is the Maximum Width in 2022 at Section 8.

4 Bank Shifting Direction and Pattern

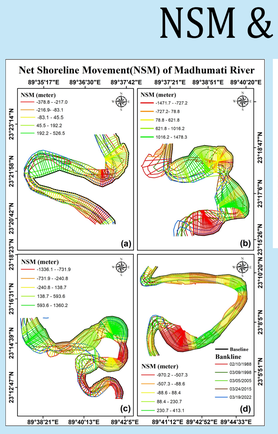


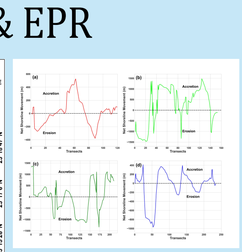
The Maximum Migration of East-West Bank is 1324 m and 1008 m between 1988 to 1998.
Between 1998 to 2005, the Maximum Movement of each Bank is 909 m and 749 m respectively.
Bank is respectively 1844 m and 2011 m.

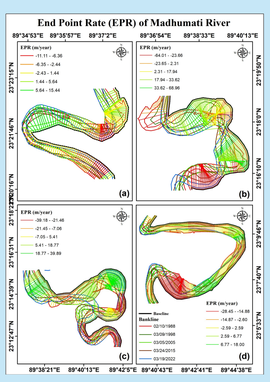


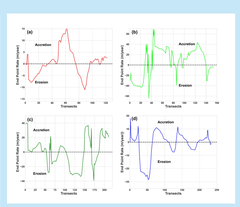
Both Banks have the Maximum Migration is 750 m and 929 m from 2005 to 2015.
From 2015 to 2022, the Maximum Movement is 797 m and 1040 m for East-West Bank.
Finally, between 1988 to 2022, the Highest Bank Shifting over East-West B

5 Applying DSAS for Measuring NSM & EPR

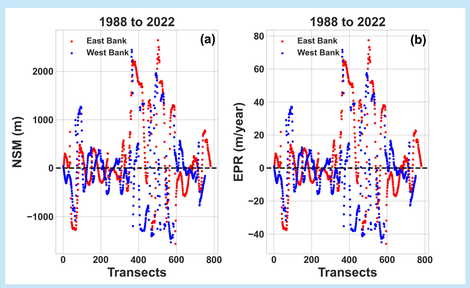




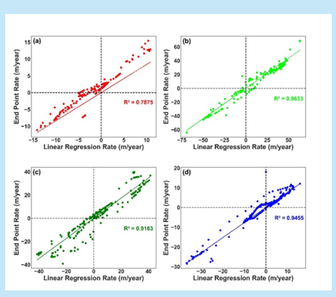




NSM and EPR between 1988 to 2022



The Highest NSM is 2642 m in the East Bank as well as the lowest NSM is 1561 m.
The Maximum EPR is 77.48 m/year and the Minimum is 45.79 m/year experienced in the East Bank.



6 Findings

The Accretion Rate is Dominant over the Erosion Rate.
Channel Migration Rate is Very High.
Most of the Bank is Shifting from NE to NW Direction.
Bend Development is Very Active.
Some Bends are Gradually Abandoned or some bends may form an Oxbow Lake.

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