

A Study on Determining Effective Width for the River Training of the Jamuna River in Bangladesh

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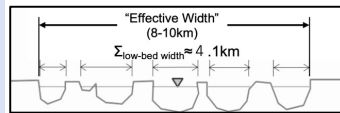
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Key message

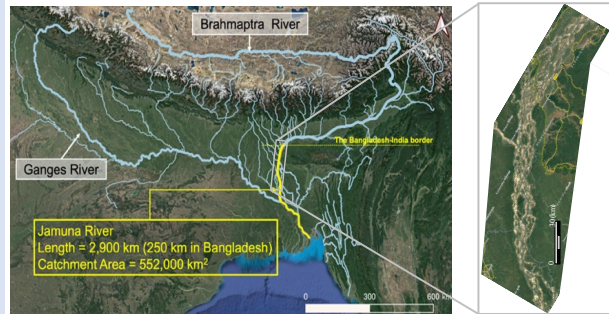
The Jamuna River does not converge toward a single width.



It operates within a stable width envelope (8-10km).
 “Effective Width”

Introduction

The Jamuna River is the world's largest braided river, resulting in loss of vast land due to bank erosion



Land loss mechanism

intense monsoon floods ($>100,000\text{m}^3/\text{s}$)
 +
 fine sandy bed material ($D_{50} \sim 0.2\text{mm}$)
 rapid channel migration with scour on the order of tens of meters (50-160m/year)



Challenge

- In addition to the river bank protection works, attempts to narrow the channel to a few kilometers have not achieved morphological stability.
- A new physically meaningful definition of relatively stable river width is required.

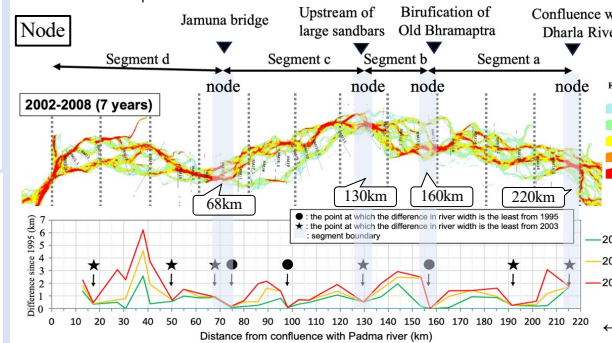
Aim

- Determination of river width, which can be an indicator of river stability

Methodology

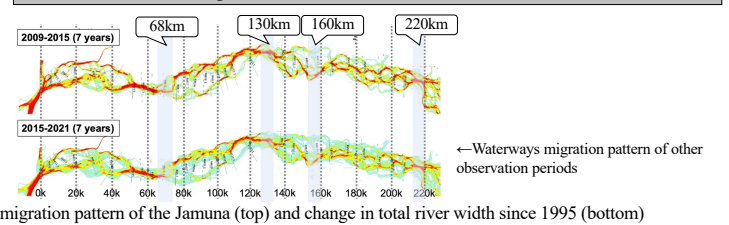
Integrated data analysis in the absence of precise and comprehensive data: satellite imagery, cross-sectional survey data, and hydrological records

Results

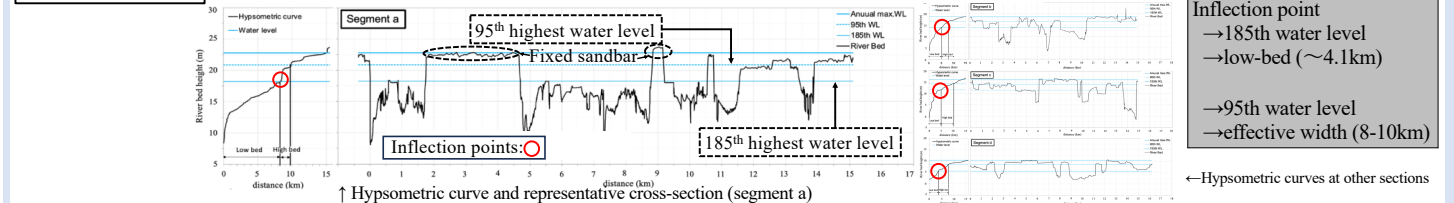


Point Where channel widening takes place along the Jamuna River?

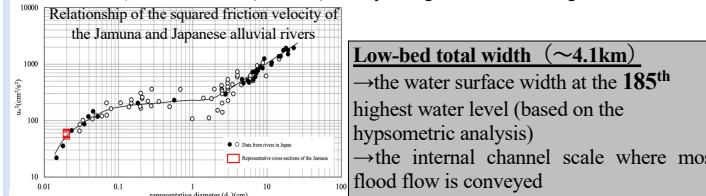
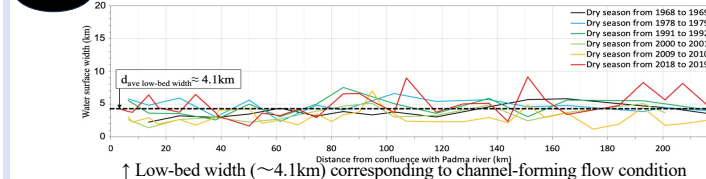
Persistent nodes organize channel change during three of the observation periods
 → Channel widening and severe bank erosions are concentrated between nodes.



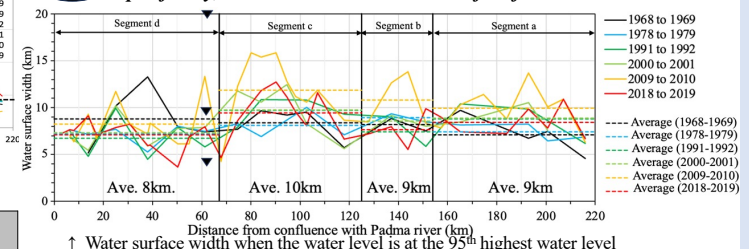
Hypsometric analysis a common structural basis for defining both low-bed and high-bed width and “Effective Width”



Point How wide should the low-bed width be?



Point However, this does not capture the full functional width of the Jamuna! Specifically, movable small sandbars are often formed and diminished.



Effective width (8-10km)
 → the water surface width at the 95th highest water level (based on the hypsometric analysis)
 → the functional flood-stage width, including movable sandbars

- The Jamuna River does not converge toward a single width, operating within a quasi-stable width envelope (8-10km).
- River stability in large braided rivers should not be evaluated by convergence toward a single channel width.
- Stability emerges from the persistence of a characteristic width envelope defined by the interaction between flow, small sandbars, and channel geometry.
- The Effective Width provides a physically meaningful indicator for river training that reflects the inherent morphodynamics of the river system.