

Hydro-morphodynamics in the fluvio-tidal regime of GBM Delta

Md. Wasif-E-Elahi¹, Md. Maruf Dustegir¹, Mahmida Tul Urmi¹,
¹Institute of Water and Flood Management,
 Bangladesh University of Engineering and Technology

Summary

The Ganges-Brahmaputra-Meghna, one of the largest and the most populous delta in the world, encompasses approximately 100000 km² in Bangladesh-India and drains 1 billion ton sediment and 1.18 trillion m³ water volume into Bay of Bengal each year. This delta incurs huge morphodynamic changes due to the huge amount fluvial outputs. The tidal ranges gradually decrease proceeding to the east but due to geographical feature at Cox's Bazar, the tidal range increases. From Landsat image analysis of 2000-2015, it is evident that most of the sub-estuarine systems of the GBM delta are facing huge erosion except some small sub-estuarine systems. Lower Meghna, Tentulia and Hoogly systems are facing huge erosion compared to others. But sediment concentration in the coastal regions of delta is almost unknown due to enormous constraints. In this study, measured data, landsat image and two dimensional morphodynamic model is used to portray hydro-morphological regime of GBM Delta.

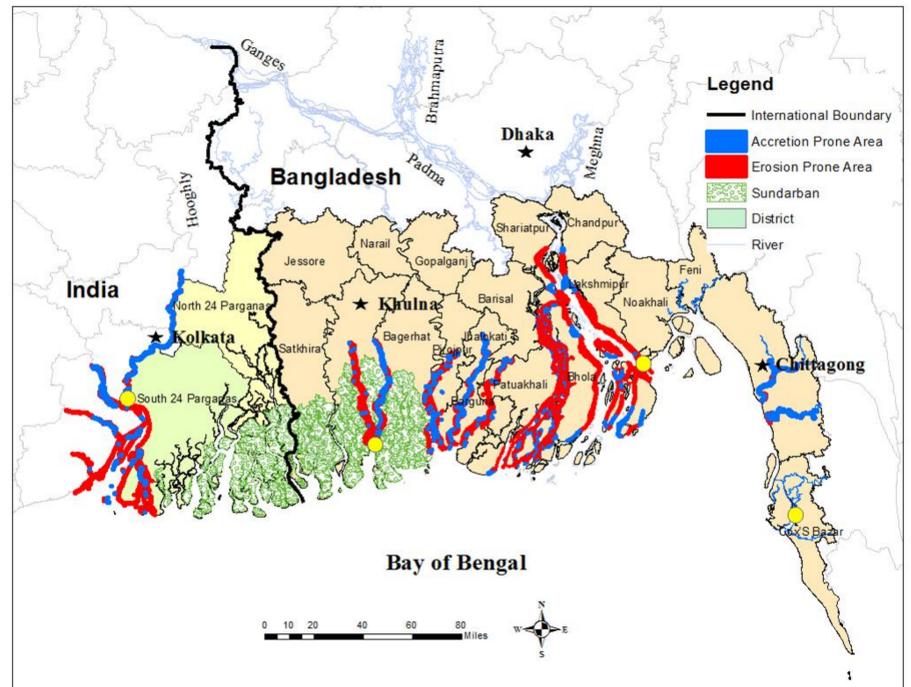


Figure 5. Erosion accretion locations of the Delta From Landsat image

Tidal range (m)	Diamond Harbour		Hiron point		Charchanga		Cox'sbazar	
	Dry	Monsoon	Dry	Monsoon	Dry	Monsoon	Dry	Monsoon
Maximum	4.91	5.24	2.79	2.89	2.55	2.55	5.20	5.22
Minimum	3.77	3.78	2.11	2.10	1.95	1.90	3.58	3.52
Average	1.74	1.68	0.80	0.87	0.77	0.87	1.02	1.05

Figure 1. Tidal Range at different locations

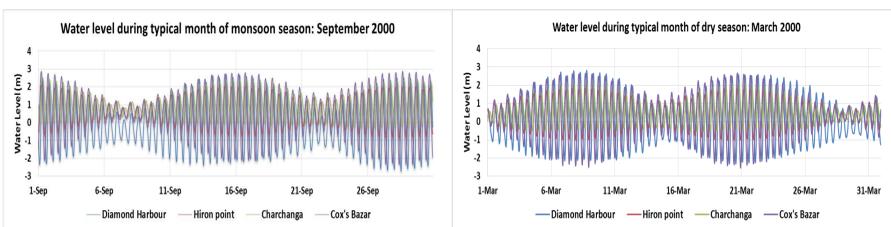


Figure 2. Water level at different estuaries of the delta during monsoon and dry season. Locations of the water level stations are shown in Figure 5 as yellow marked circle.

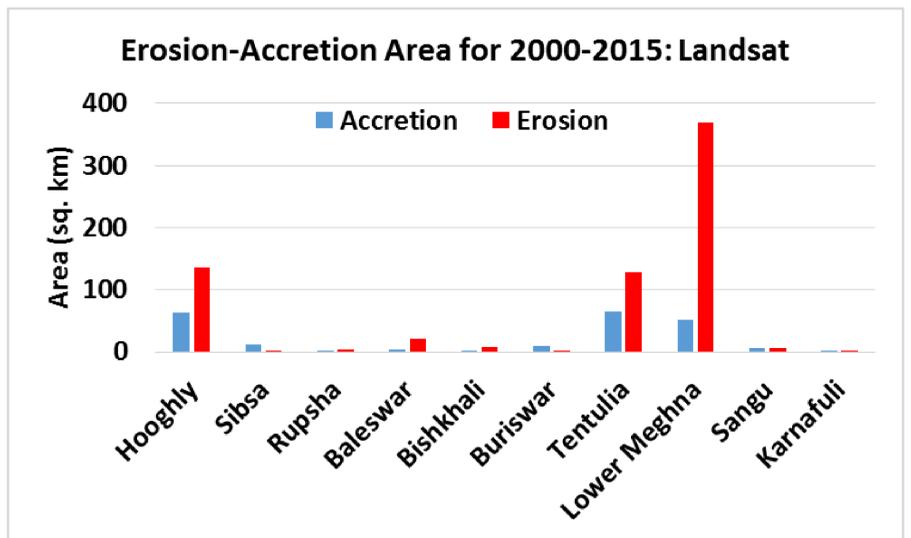


Figure 6. Erosion-accretion area of different estuaries of the delta

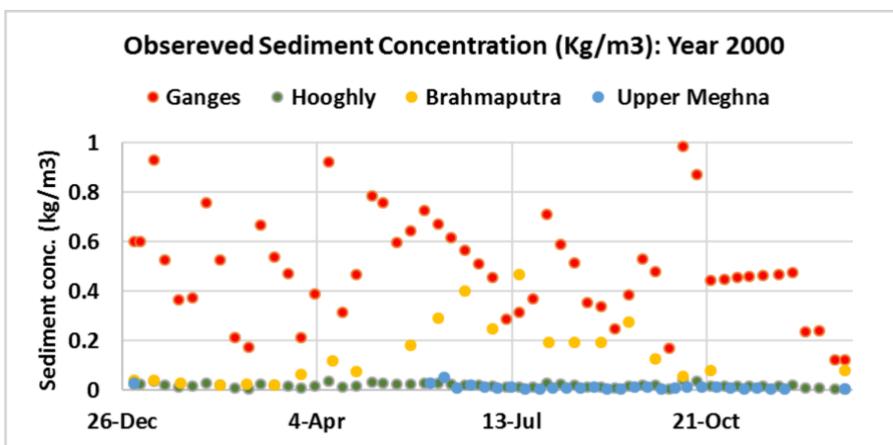


Figure 3. Sediment concentration at major rivers of the delta

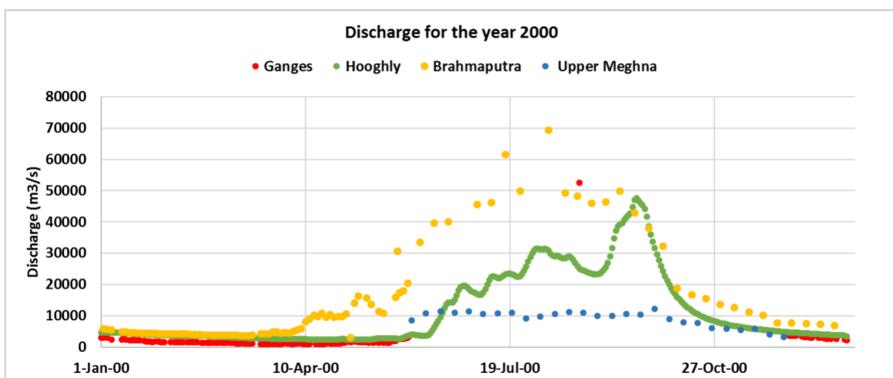


Figure 4. Discharge at major rivers of the delta

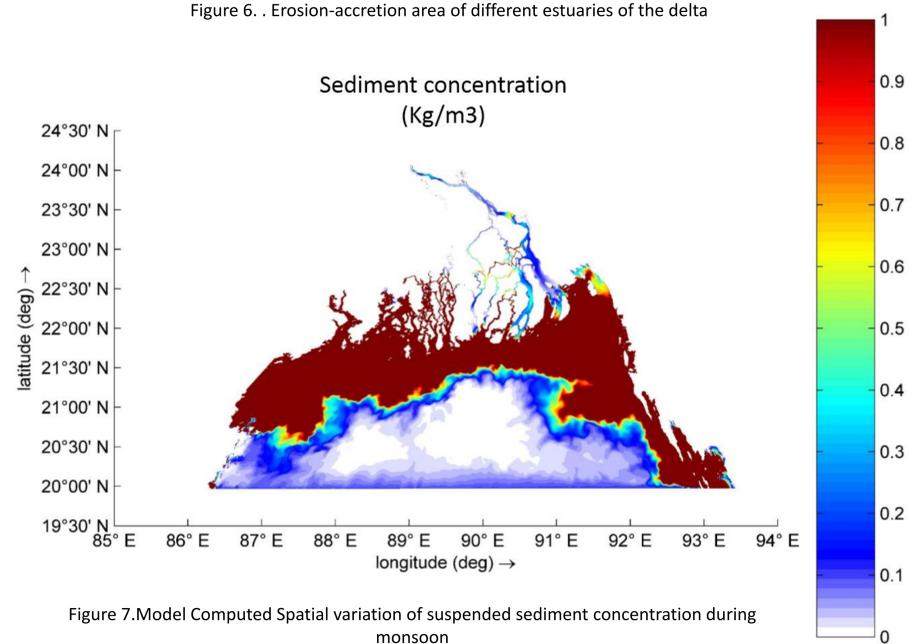


Figure 7. Model Computed Spatial variation of suspended sediment concentration during monsoon

Conclusions

Though huge fluvial flux drains out through Lower Meghna, the stream velocity is so high that the cumulative erosion at Meghna Estuarine System is higher than the cumulative sedimentation. On the other hand, Hooghly, a distributary of the Ganges, incurs higher erosion due to less sediment flux compared to Meghna Estuarine System.

Contact

CONTACT INFORMATION

Md. Wasif-E-Elahi
 Institute of Water and Flood Management
 Email: wasifeelahi@gmail.com

Acknowledgements

This work was carried out under the Collaborative Adaptation Research Initiative in Africa and Asia (CARIIA), with financial support from the UK Government's Department for International Development (DFID) and the International Development Research Centre (IDRC), Canada. The views expressed in this work are those of the creators and do not necessarily represent those of DFID and IDRC or its Board of Governors.
 Website: www.deccma.com

