Tidal River Management in the Lower Bengal Delta

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The Bengal Delta – the largest and most inhabited deltas of the world – has a geological history of more than a million year. However, the delta attained its present shape during the last 10 to 11 thousand years.
Human settlement started in the Bengal Delta from around 3 thousand years before present – mostly by premature reclamation of virgin lands.
Some One Thousand and Six Hundred years later – during 1776 – Major James Rennell – an English Geographer – mapped the river systems of Bengal in detail.

Earliest illustration of the delta was compiled by Ptolemy during 150 AD and named as Gangaridai.
Afterwards the Bengal Delta has been mapped many times elaborately. There was striking change in the river courses during the last few hundred years.
The Himalayan rivers – the Ganges, Brahmaputra – deposits more than a billion ton of sediments yearly into the delta that supports the seaward extension of the delta front into the Bay of Bengal. The Ganges-Brahmaputra river system in the third largest sediment dispersal system globally after the Amazon and the Huanghe rivers. At least 10% of the sediments deposits on the Lower Bengal Delta as return flux during tidal processes.
The efforts of water management in the Lower Bengal Delta before 1960s were in the form of construction of small-scale low-height embankment during winter – provides enough space for sediment deposition in the tidal floodplain during monsoon.
These embankments were high enough to protect the *aman* crop-field, but low enough for flooding and sediment deposition in the tidal floodplains during June to October – the monsoon months.
The earthen embankments protects the monsoon rice *aman* from saline invasion during monsoon.

The tidal floodplains were good for a single rice crop.
Flooding of the crop field was a common occurrence during June to October – the monsoonal months. The low-height earthen embankments were not enough to protect the crop-fields from devastating floods.
There were local and international efforts to cope with natural hazards and management of water resources of the Lower Bengal Delta.
The Water and Power Development Board (WPDB) of then East Pakistan with technical assistance from the United Nations compiled a report during 1957 commonly known as Krug Mission Report the form the basis of Coastal Embankment Project (CEP).

TECHNICAL ASSISTANCE PROGRAMME 1957

EPWAPDA


VOLUME-I
An area of 540,000 hectare was enclosed within 123 *polders* by constructing around 4,000 km of embankment along the river channels.
Polder is a piece of low-lying land that is enclosed by embankments.
Drainage of rainwater out of the *poldered* lands were facilitated by 780 sluice gates in the Lower Bengal Delta.
Poderization offered an immediate relief to the community by facilitating road network
Poderization protected the coastal floodplains from saline water invasion as well.
The land was good for even three crops in a year.
Apparently the *poldered* community were happy.
With time the *polderization* has delimited the movement of sediments into the coastal floodplains.
Sedimentation was vigorous in front of the sluice gates. Meters of sediments has to be dredged out of the canals. Soon the sluice gates were ineffective in draining the tidal water.
Floodplains were starving of sediments and the river bed becoming the prime location of silt deposition.
While the colossal earthen embankments were good for the time being as a protection from tidal floods – in the long run they have imprisoned the river flow within the river valley. The river bed silted up, narrowed and river speed and flow reduced
The once mighty rivers of the Lower Bengal Delta turned to tiny quiet streams. The rivers started to die as the flow and flood dynamics were heavily modified.
Drainage congestion initiated

Waterlogging became a formidable problem in the tidal floodplains since the river bed – due to siltation – were at higher elevation, and monsoon waters could no longer be flushed out from the low-lying polders.
Silt starvation and subsidence of the coastal floodplains continued and further enhanced waterlogging. One million people are directly affected by the waterlogging with 10 million soon to be impacted due to further drainage congestion and climate change.
But life has to be lived with

The community started seeking alternative ways of living

Shrimp aquaculture by constructing *gheers* stated. *Gheers* are shrimp ponds, physically isolated water bodies linked to the canals or rivers for supply of brackish and saline water during high tide.
The *gheers* for shrimp culture requires inflow of brackish and saline water from the tidal rivers – further accelerated drainage congestion and ensued waterlogging and increase in salinity within the *polders*. The physical barrier to the natural flow of water by *gheers* also blocked the inflow of sediments into the coastal floodplains.
Conflicts over how to use the tidal rivers and adjacent lands continued.
The community of Beel Bhaina – one of the largest wetland on the floodplain of Hari river in the Lower Bengal Delta – were suffering from prolonged drainage congestion and waterlogging – reacted

A portion of the community decided to relink the river channel to the floodplain by breaching the embankment through a pre-existing silted-up natural link canal.
Breaching of embankment has restored movement of tidal sediments and waterflow into the tidal floodplain in no time.
Water laden with suspended sediments finds way to the floodplain
Within few years the floodplain of *Beel Bhaina* has accreted enough and the land become good for cultivation.
The wetland community then opined to replicate the experience in other locations of the Lower Bengal Delta.
With local persuasions, this exercise has been replicated in Pakhimara – a wetland on the floodplain of the Kapatakhaw river.
The link canal to the main channel carries enough silt to the floodplain that elevates the floodplain within 4 to 5 years – thus restore the sediment delivery to the floodplain – that was earlier not occurring due to embankments.
This process of reactivating tidal rivers and natural distribution of sediments on the floodplain in now-a-days known as Tidal River Management (TRM)
TRM helps in regeneration of floodplain good for cultivation. The flow-dynamics inherent in the process of TRM scours the river bed – thus river depth increases – offering opportunities for fish and several other aquatic species to thrive. The flow along the link canals renews the water of the wetlands frequently.

Thus the TRM minimizes the adversarial consequences of rapid changes in the climatic pattern such as sea level rise and waterlogging by offering elevated floodplain and securing natural drainage respectively in deltaic environment.
Tidal River Management has proven to be an effective strategy for restoring the sediment delivery to the floodplains and regenerating the dynamics of mighty tidal rivers of the Lower Bengal Delta.
However, implementation of TRM may be difficult as most community concern moves round the process of acquisition and requisition of land – and compensation for the produces of the land – that to be under water for few years.
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The stakeholders need to find a common ground for a rewarding and bright environmental and livelihood future—on restoration of sediment delivery to the floodplains of coastal rivers through a natural sustainable way.
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