Stabilisation of the main rivers in Bangladesh

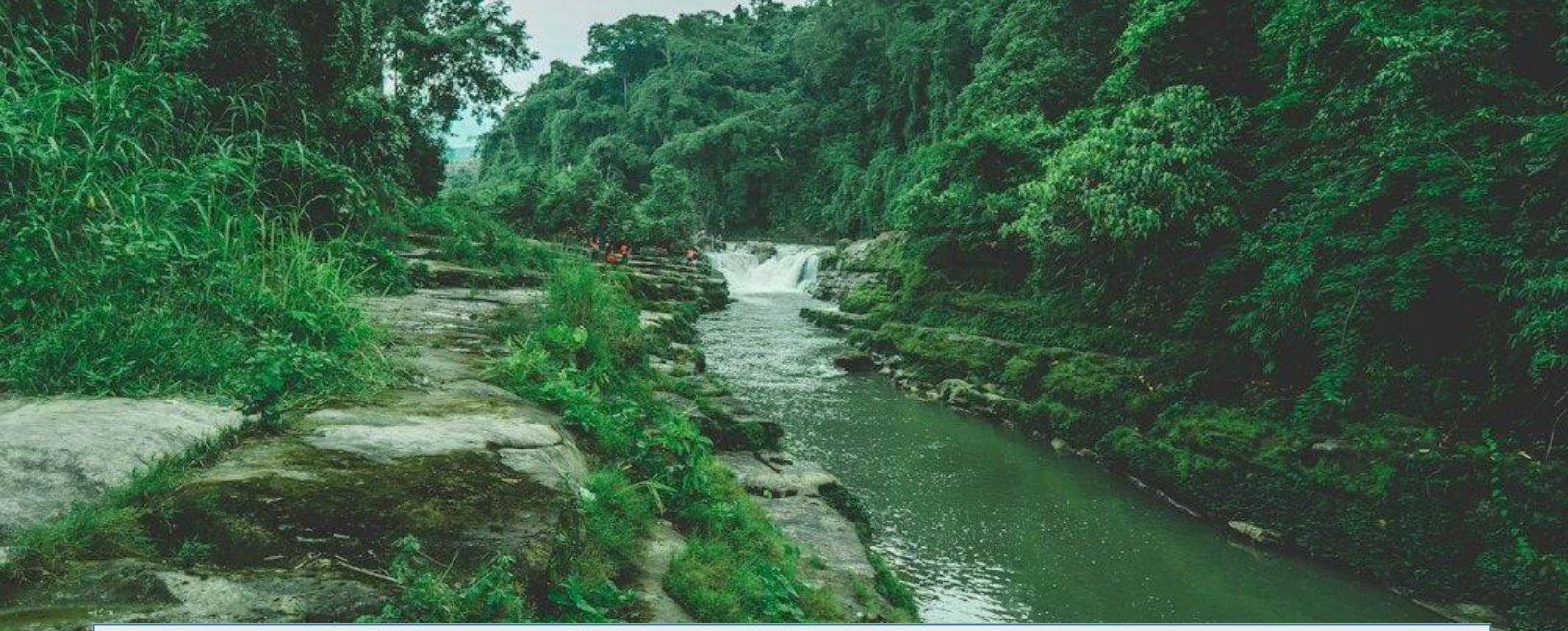
SESA justifies the desired future width of the river

Case study



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Key message

The Bangladesh river stabilisation case shows how SESA assesses and compares several alternative future river widths of the Jamuna River ranging from four to eleven kilometres and justifying the selection of the preferred alternative aiming for an average river width of seven kilometres.

Case description

The Ganges-Jamuna-Padma-Meghna river system in Bangladesh ranks globally as the third largest river system in terms of water discharge. Especially the Jamuna-Padma River is characterised by flooding and loss of agricultural land affecting the livelihoods of millions of people living along this river. This is caused by two main factors.

First, the Jamuna-Padma River is strongly meandering because it has a sandy bed making it one of the world's most unpredictable in terms of morphological behaviour responding due to fluctuating sediment loads. Second, the river is mainly fed by rainwater and therefore the peak flow is high during the monsoon whilst low discharge during the winter period might cause drought in the adjacent areas used for agriculture. The width of the Jamuna has increased from about eight to about twelve kilometres between the 1970s and 2010. The widening was caused by the discharge of a large amount of sediment and tthat was the result of one of the largest earthquakes recorded, taking place in the Indian Himalaya in 1950. As a result the loss of land in this period increased towards on average 3000 hectares per year.

Since 2018, national policies in Bangladesh have increasingly acknowledged the need for SESAs to achieve sustainable development. Until today Bangladesh has no SESA legislation and applies SESAs on a voluntary basis. In general, International Finance Institutes are funding these SESAs.



Strategic planning of water resources

The Bangladesh Delta Plan 2100 (BDP 2100) was developed between 2011 and 2018. The Government of Bangladesh, with support from the Government of the Netherlands, began formulating the plan in 2011-12 as a long-term strategy for managing water, climate change, land use, food security, and sustainable development in Bangladesh. The importance of river stabilisation of the main rivers was acknowledged in this plan. The BDP2100 was not subject to SESA.

The Flood and Riverbank Erosion Risk Management Investment Programme funded by the Asian Development Bank (ADB) has a long-term horizon of 25 years (2015-2040). The long-term objective of this programme was to stabilise the Jamuna and the Padma River in 2040. Due to uncertainty and risks of stabilisation of these large rivers the concept of adaptive management was adopted.

A plan is therefore made and implemented for periods of five years. The results are monitored and lessons learned will be integrated in the next plan. The first five-year plan was the River Stabilisation Plan (2016-2020) funded by the ADB. The plan defined the following five objectives:

- Reduction of flood risk;
- Recovery of lost floodplain land (potentially reclaiming 150.000 hectares);
- Improvement of the navigability of the main rivers;
- Year-round distributary flows;
- Restoration and conservation of the river floodplain exchange.

Except for the last objective, those are driven by social and economic factors rather than environmental considerations.

Strategic alternatives assessed

In the plan three alternatives were described:

A.Business as usual alternative: This alternative can be considered as the reference situation because Bangladesh decided to stabilise the rivers.

B.Primarily capital dredging alternative: The capital dredging alternative consisted of large-scale dredging and developing concrete riverbanks. As a result, the river width would be narrowed to a width of 4 to 6 kilometres. This alternative was driven by the prime minister at that time, mainly motivated by the opportunity to secure contracts for local dredging companies. Early in the planning process this alternative was not taken into consideration anymore because it was not feasible and the environmental and social costs were estimated to be very high.

C.Structural river training alternative: [1] including nature-based solutions and capital dredging on a much smaller scale. This was the preferred alternative but during the development of the plan a variety of options of the river width ranging from 7 to 11 kilometres were studied. Mitigation measures were only assessed for this alternative.

These alternatives did not originate from the SESA but were developed through several technical river engineering and planning studies from diverse international institutes since the 1990s.

[1] River training is a civil engineering practice that uses physical structures and channel modifications to guide, stabilize, and control a river's flow, course, and sediment transport.

Preferred alternative river training

The preferred alternative aims for an average river with of seven kilometres through river training. This means managing the river behaviour through (i) preserving ideal channel alignments, safeguard sensitive areas and (ii) strengthening riverbanks by applying large numbers of geo-textile revetments (bags filled with sand). Natural sedimentation processes create land recovery and stabilisation areas.

This natural process of sedimentation is intended to be accelerated through systematic sediment harvesting using indigenous reed plantation technique to create “natural levees”. Depending on the quality of the accumulated sediments, the land can be used for various purposes, such as industrial development, settlements, or agriculture.

SESA evaluated the alternatives

This plan was subject to the first SESA applied in Bangladesh by the water authorities. Because Bangladesh has no legislation this SESA can be considered as a voluntary SESA. The ADB recommended to conduct the SESA and funded it. The SESA was initiated by the consultant team who was involved in this process for more than fifteen years. Several draft versions of the SESA were reviewed by the Netherlands Commission for Environmental Assessment on request of the Bangladesh Water Development Board. In total the preparation of the SESA took four years. The preparation of the SESA was guided by ADB standards on SESA and the UNECE SEA guidelines of 2012.

The SESA was developed in parallel to the RSP and is intended to be updated every five years in line with the planning cycle. The SESA primarily assessed the positive and negative environmental and social effects of the proposed main alternatives B. and C. In the last version of the SESA report several options of alternative C were assessed as well.

The RSP was characterised by considerable uncertainty regarding the river's morphology, which made it difficult to assess the impacts in the SESA. The assessment was a qualitative evaluation based on expert judgement, literature, baseline analysis, and stakeholder input and applied a normative, objective-oriented approach by evaluating the impacts on pre-defined objectives and using a criteria-based comparison.

Although it is recognised that natural processes can significantly reduce the need for dredging and maintenance, costs, and negative environmental impacts and those interventions can have several co-benefits and long-term impacts, such as enhanced groundwater recharge, reduced water pollution, and increased economic advantages for communities this approach also had to be abandoned because the river had widened again.



Although, the unstable river morphology only allows predictions one or two years into the future the SESA still tries to cover different time horizons according to the adaptive management logic, which are short-term 2030, medium-term 2040, and long-term 2100. Furthermore, different social groups based on the location are considered, including vulnerable groups such as small farmers, sharecroppers, and landless labourers on chars and floodplains. The spatial scale of the plan is the whole Jamuna-Padma catchment also considering impacts of upstream basin activities, which are partly happening in India and China. However, no transboundary consultations took place as it is seen as outside of the mandate of the consultancy doing the SESA.

Nevertheless, transfer of knowledge and technology takes place through the ADB which is supporting similar projects in the same river named Brahmaputra in India.

It was recognised that the assessment of cumulative effects on various population groups, ecosystems or economic sectors is crucial. However, the report states difficulties, and a knowledge gap and shifts the integration of those effects to the next update of the SESA. It is acknowledged that healthy ecosystems have social and economic benefits for local communities, which is also reflected in the statements from char dwellers indicating river erosion as the most severe problem affecting their livelihoods. A char is a natural island located in the river.

Public participation

The preparation of the SESA was accompanied by public consultation. Focus group discussions were conducted with 10 – 15 people affected by the project in 25 different locations within the planning area. Three main groups of affected (vulnerable) people were identified, namely people living on younger unstable chars, people living on older and more stable chars, and people living in the floodplain. The aim of these discussions was to inform the participants on the proposed interventions and changes, and to ascertain their opinions and their living conditions. All included people were reportedly unanimously in favour of the proposed interventions. The participation can be classified as consultation as it mainly took place after the alternatives were developed to assess people's opinions about it. It was not an ongoing process but took place as a one-time event during the SESA. The residents of the chars know how to live with the river, but they could not contribute to technical solutions due to limited knowledge. The technical discussions were mainly conducted by international experts. Therefore, no evidence of real influence on objectives, alternatives or outcome was found because of public participation. These residents had expressed the stability of the river as the most important factor for their livelihoods which was the main objective of the plan.

Influence of the SEA

The direct influence of the SESA on the development of the plan alternatives and options was limited for two reasons. Firstly, the SESA process started one year later then the development of plan. Secondly, the SESA was prepared in parallel to the development of the plan and therefore there was limited exchange between the teams developing the plan and the SESA. Therefore, the SESA process can be characterised as being re-active and evaluative, justifying the decisions that were made already instead of being pro-active and contributing to the development of the plan and the design of measures. However, the SESA process of four years has still resulted in some changes and raised awareness amongst the authorities, experts and consultants involved in the development of the plan. It was decided that the present SESA will be updated jointly with the plan for the next planning period of five years. This is particularly important given the unpredictability of the river system, which means that flexibility, adaptability, and learning by doing are crucial. One of the main objectives of the next planning period is re-connecting the tributaries of the Jamuna and Padma rivers, starting with the Old Brahmaputra and Ichamati rivers, that were disconnected around 2000 to avoid the risk of flooding of the hinterland.



SESA key contributions

SESA contribution 1:

Evaluating and justifying decisions made

Due to the late start of the SESA and the development in parallel to the River Stabilisation Plan the influence of the SESA was limited to justification of the choice for the preferred alternative that was made in the planning process, namely the river training alternative including the 'natural levees' contributing to accelerate natural sedimentation.

SESA contribution 2:

Acceptability of the decisions made by the affected people

Public consultation was part of the SESA but did not meet good practice of participation. Despite these limitations the preferred alternative was supported by most of the stakeholders consulted and therefore the SESA contributed to the acceptability of the proposed measures.

SESA contribution 3:

Awareness raising on the added value of SESA

The authorities, consultants and IFIs engaged in the development of the river stabilization plan and the SESA all stated that they have learned from the SESA process, in particular the importance of natural processes and biodiversity. As a result, the Bangladesh Water Development Board decided that the next five-year plan will be subject to SESA and the lessons learned will be applied hopefully resulting in a more pro-active SESA that contributes to decision-making on the tributaries, the stabilisation of the chars and navigation through meaningful participation.

This case demonstrates that SESA can act as an awareness raising mechanism for professionals engaged in plan development, mainly engineers to think and act differently in the next phase of planning. The SESA process showed the importance of an integrated and long-term approach to river stabilisation and meaningful participation of affected stakeholders. This case also shows that it takes time to use the potential of SESA in a country that has limited experience with strategic and environment inclusive integrated planning.

Sources

- Benthem & Giesen, 2020 Benthem, W., & Giesen, W. (2020). Strategic Environmental and social assessment (SESA) of River Stabilization. Institutional Strengthening and Project Management Consultant (ISPMC).
- Chadni, S. A., Anwar, M. A., & Mahmud, A., Atosi, T. T. (Eds.) (2023). A Review in Sustainable River Training Strategies in Bangladesh. https://www.researchgate.net/publication/374842798_A_Review_on_Sustainable_River_Training_Strategies_in_Bangladesh
- NCEA. (2020, September 28). Review of the Preliminary Social and Environmental Strategic Assessment of the River Stabilisation Plan: Bangladesh. Advisory report. https://www.eia.nl/en/project-database/sesa-for-river-stabilisation-plan-bangladesh/
- Oberhagemann, K., Haque, A. M. A., & Thompson, A. (2020). A Century of Riverbank Protection and River Training in Bangladesh. Water, 12(11), 3018. https://doi.org/10.3390/w12113018
- Rahman, M. M [Md. Munsur], Shampa, Haque, A., Nakagawa, H., Zhang, H., Rahman, A., Dustegir, M., Hossain, M., Hussain, M. M., Islam, J., & Hore, S. K. (2024). Sediment management using bandal-like structures as nature-based solution. Environmental Fluid Mechanics, 24(4), 757–787. https://doi.org/10.1007/s10652-023-09945-x

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Netherlands Commission for
Environmental Assessment

Mr. Arend Kolhoff
Senior advisor environmental
and social assessment

akolhoff@eia.nl

www.eia.nl