**Living Polders**

Dynamic Polder Management for Sustainable Livelihoods, Applied to Bangladesh

### Why Living Polders?

In Mid 1960’s polders (earthen embankments) were established to mitigate problems associated with tidal flooding, storm surges, food security etc., around the Bengal Delta, by offering flood protection, reduced salinity intrusion and food production. After 10-15 years of proper functioning, deterioration caused siltation of riverbeds, land subsidence, water logging and drainage congestion, leading to safety intrusion.

“Living Polders” project is funded by NWO, Netherlands Organisation for Scientific Research, aiming to minimize the gaps through physical modeling and designing governance approaches. This project will take TRM a step further by focusing on sediment deposition.

### Research Objectives

1. Developing a decision support model for governing the ‘living polders’ by raising land through establishing cyclic polder re- sedimentation and changing food production schemes.
2. Understanding the institutional boundary conditions for developing a viable business model for optimizing institutional arrangements for deploying Living Polders with sustainable livelihood opportunities.

### Expected Outputs

- Knowledge and Research products:
  - Analyzing and simulating delta and polder developments in time and place (spatio-temporal models, MSc. Thesis, articles, dissemination)
  - Analyzing institutional arrangements at delta and polder level and facilitating participatory decision making and awareness raising (Decision Support System (DSS) in serious game setting)
- Communication & stakeholder engagement
  - Validating the and mismatches identified during the research work (2 workshops with local and relevant stakeholders)
  - Project results: policy briefs, websites, blog posts, articles etc. being communicated to practitioners in Bangladesh and elsewhere.
  - Capacity building and knowledge sharing
    - 1 PhD, 1 Post-Doc, 2 MSc. students are currently trained (Dissertation, MSc. Thesis, Articles)
    - Training of stakeholders, decision makers and end users about using DSS tool
- Monitoring & evaluation: project progress and final outcomes

### Project Innovation and practical values

- Both the natural and human dimensions are considered to devise a successful strategy for sustainable livelihoods;
- The interdependency of local (polder) scale processes and regional (delta) scale processes is considered;
- A Decision Support System will provide stakeholders with the joint design of scenarios and policies for sustainable development of delta communities;
- Provide prospects of a worldwide potential of Living Polders.

Funded by: Netherlands Organisation for Scientific Research

Duration: 2016–2021

### Project Partners

- Utrecht University
- Royal Hasselt University
- Deltares
- CARTHAGO
- eawag
- Arup
- PRIMES
- Telenet
- Nureza Hafiz (Credit:)
- Nazim Uddin Rahi (Credit:)
- Informal Group Discussion in Polder 30 (Credit:)
- Fisheries Condition in Beel Khuksia (Credit:)
- Agricultural Condition in Beel Bhaina (Credit:)

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**Dynamic Polder Management for Sustainable Livelihoods**

By NWO, Netherlands Organisation for Scientific Research

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Expected Outcomes

- Research products will lead to:
  i. Design of spatial-temporal rotation schemes in planning efforts;
  ii. Alignment of local and regional governance arrangements with delta- and polder level physical interactions;
  iii. Participatory decision making, using the DSS, that will lead to legitimate proposals, raised awareness, and empowerment.

- Communication & stakeholder engagement
  i. Co-creation workshops will lead to better research and higher awareness;
  ii. Briefs and website will increase the likelihood that the Living Polders concept will get taken-up, in BD and elsewhere.

- Capacity building and knowledge sharing output will lead to:
  i. Continued use of the DSS in delta and polder planning;
  ii. Future leaders in delta management (PhDs, MScs, in BD and elsewhere);

- Monitoring & evaluation is aimed at improving the project's policy engagement processes to influence change improved.

Impacts

- Sustainable and entrepreneurial polders in Bangladesh by increased food protection and food security
- Increased sustainability in terms of FBTs

- Financial: (i) communities and the national government have less financial expenditures on the polders, and (ii) increased entrepreneurial and innovation enable the development of businesses
- Institutional: Institutional arrangements guarantee good delta-level governance, and sub-national organization
- Environmental: building with nature approach ensures interventions that are in tune with natural processes

- Technological: A national Technological Innovation System (TIS) provides customized solutions to delta problems
- Social: The DSS renders decision making participatory, and empowers end-users to take charge of how they want to live in and with polders
- Enhanced cooperation between Netherlands and Bangladesh
- Delta improvement throughout the world by using the Living Polder concept

Outline of Methodology

- Post Doctoral Fellow (Dr. Sanchayan Nath) is working on socio-hydrological system and polder governance.
- PhD Fellow (Md. Feroz Islam) is designing hydro-morphological models at polder and delta scale.
- Both the physical and institutional part will be combined to design the DSS tool

Physical System Analysis

- Delta-scale: 2D hydro-morphodynamic model is partially designed to investigate sediment movement at different scenarios
- Polder-scale: 2D morphodynamic model has been developed and calibrated to understand the sedimentation process after breaching the dike
- Planned Activities: developing and simulating the scenarios developed
- Examining the response of the river network to sediment trapping inside the tidal basin/polder on the river
- Scaling the model to include the regional river network and adjacent polders

Institutional Analysis

- Currently developing a large-N dataset for political and institutional analysis of polder governance at the regional coastal level
- Understanding the path dependencies in resilience, vulnerability and governance experiments associated with socio-hydrological systems
- Planned Activities: planning to manage tidal rivers in polders, develop innovation systems and understand sustainability transitions in social-hydrological systems
- Integration of hydrology and governance segments

Decision Support System

- The tool for decision support system is being developed for the coastal region of Bangladesh
- It is a data driven model, which will
  - integrate the physical and institutional aspects
  - explore the rotation of flooding the polders
  - assist the stakeholders to visualize the effect of different scenario
  - optimize the polder flood rotation scheme
- The tool is being fed with results of different scenarios
- Optimization of the polder flood rotation scheme and identification of the most suitable rotation scheme is yet to be done

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Project Partners

Utrecht University

Netherlands Organisation for Scientific Research