Type
PhD research

Duration
October 2019 – September 2023 (4 years)

Persons involved:
ir. Rik Gijsman, University of Twente (PhD Candidate)
dr. ir. Erik Horstman, University of Twente (Daily Supervisor)
prof. dr. Kathelijne Wijnberg, University of Twente (Promotor)

Funding
University of Twente

Summary of the research
Mangrove forests can grow in the intertidal area of (sub)tropical shorelines. By attenuating storm energy, they reduce storm impacts on many coastal communities. Mangrove forests do not only reduce flood risk, but they also mitigate shoreline erosion, are able to recover from storm impacts and can adapt to changes in environmental conditions. These capacities result from positive feedback between biogeomorphological processes in the forests, which make them a promising nature-based solution for coastal protection.

In this research proposal, a study is outlined that aims to improve our understanding of how these biogeomorphological processes and feedbacks develop on longer timescales. In particular, the response of these feedbacks to variations in hydrodynamic forcing will be studied. To do this, field measurements of biogemorphological and hydrodynamic processes will be conducted in contrasting mangrove forests and, to capture variations due to seasonality as well as extreme events, on the timescale of one year.

Firstly, these measurements will serve a study on how the bed of the forests is affected by the hydrodynamic forcing. Secondly, observed relations between hydrodynamics, sedimentation and erosion of the bed and the growth and decline of the trees will be implemented in a biogeomorphological process-based numerical model. The obtained knowledge and developed model support the assessment of the longer-term resilience of the mangrove forests in a changing environment as well as their contribution to adaptive coastal protection management.

Keywords
mangrove; mangrove forest; coastal protection; nature-based solutions;
biogeomorphology; resilience; field measurements; process-based modelling