



Submission by Wetlands International in the area of ecosystems, interrelated areas such as water resources and adaptation under the Nairobi work programme

In response to the invitation of the Subsidiary Body for Scientific and Technological Advice (SBSTA) at its 44th session.

Building with Nature Indonesia

We demonstrate the potential of Building with Nature as an integral and cost-effective solution for coastal climate change adaptation and mitigation along a 20km eroding coastline in Central Java. The approach may transform the way in which the engineering community addresses erosion problems along mud coasts across the tropics, as an alternative to single-sided traditional mitigation measures such as hard structures.

The Building with Nature solution builds safe and adaptive coastlines to create increased resilience for 70,000 people in Demak district by combining civil engineering with mangrove rehabilitation, integrated water management and sustainable land use. When the approach can be scaled up to the entire coastline of Central Java, it can help millions of people that will in the long term suffer from coastal flooding and erosion hazards in Northern Java.

Case study in summary:

Construction of permeable dam structures as sediment traps and basis for mangrove rehabilitation

Restoring river branches in the area to mitigate saline intrusion and ensure sediment input into the mangrove greenbelt

Introducing measures that reduce subsidence of land

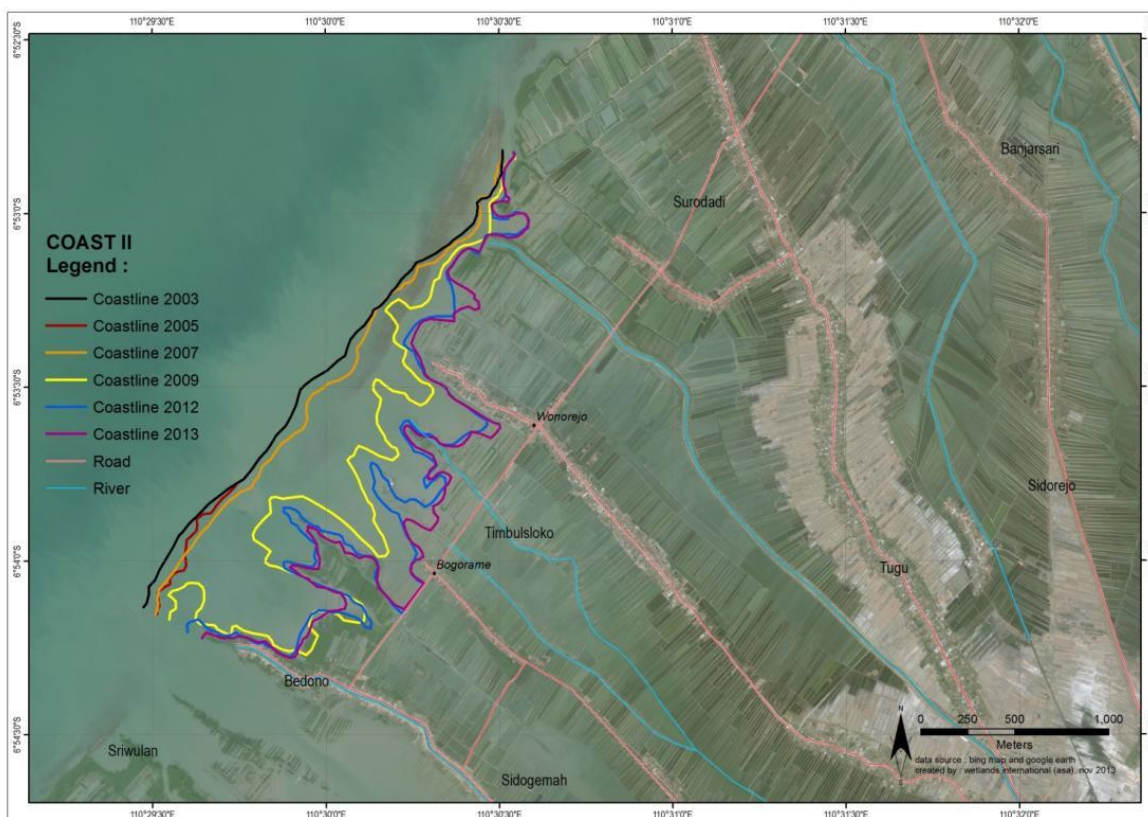
Socio-economic measures to promote sustainable land-use

Policy dialogue to develop governance arrangements for improved coastal zone management

Capacity building on “Building with Nature solutions”, targeted at government officials, private sector, students and local communities

Challenges

Coastal floods are increasing and have destroyed infrastructure and productive land. Salt water intrusion pollutes drinking water, reduces aquaculture profits and affects agriculture. Over the last decade income has decreased for shrimp farmers and fishermen respectively. This decline in well-being, security and self-reliance has been further exacerbated by the collapse of natural resources – timber, fuel, fish – which used to account for more than 50% of their income. Coastal managers typically use “hard” engineered solutions to combat erosion problems and related hazards which do provide important protection but are too expensive and complicated to design along muddy coasts. They do not address the root causes and fail to restore environmental conditions that are crucial for a productive aquaculture and fisheries sector. Large scale mangrove planting efforts have failed, hampered by erosion and wave action. Protection measures are implemented ad hoc without coherent strategy.



Measures:

Construction of permeable dam structures as sediment traps and basis for mangrove rehabilitation

Technical measures to protect the coastline in Demak include restoration of the sediment balance using permeable dams and mud nourishments, alongside mangrove rehabilitation. Grids of permeable dams are put in place to dampen erosive waves and to trap sediments, so that the disturbed soil profile is restored. In this sheltered environment mangrove forests are rehabilitated. The mangroves stabilize sediment, further build up the soil and protect against

salt water intrusion and flooding. In the near future, the dams will be overgrown by the mangrove forests. The dams are thus of a temporary nature and stay in place at least long enough for mangroves to take over. Once a first line of defence has been established, new lines of permeable dams might be created in several consecutive steps until a stable muddy foreshore is restored. This process is reinforced in the most severely degraded sites through sustainable sediment suppletions. Where needed agitation dredging and nourishment of sand banks may help shape the soil profile and shelter vulnerable parts of the coast.

Socio-economic measures to promote sustainable land-use

We develop and introduce sustainable aquaculture and livelihoods diversification (seaweed cultivation, crab & shrimp farming). Community groups are supported through farmer field schools and by providing resources to initiate new aquaculture management practices and livelihood diversification. We focus on increasing average aquaculture productivity, by adjusting pond lay-out and management, by reducing fertilizer and pesticide inputs, by making optimal use of mangrove services like water purification and by diversifying livelihoods activities. Community funds will be established that: i) absorb savings from increased pond productivity (5%) in support of long-term coastal belt maintenance and up-scaling of sustainable land-use management measures beyond the project lifetime; ii) can absorb government support to local communities for coastal protection and sustainable land-use.

Capacity building on “Building with Nature solutions

Enhanced capacity and awareness is required to enable and stimulate target groups to take an active role in planning and implementation of Building measures. Three different training curricula will be developed and delivered, targeting government, private sector, students and communities. Trainings will address technical (e.g. rehabilitation of mangroves, construction of permeable dams), socio-economic (e.g. improved aquaculture; livelihoods diversification) and institutional (Integrated Coastal Zone Management, group organising) matters.

Policy dialogue to develop governance arrangements for improved coastal zone management

Key impediments to sustainable lowland development are the lack of integration of coastal zone management policies and approaches, and limited translation into practice and limited community engagement during design and implementation of plans. The Indonesian government has embarked on various integrated master planning processes and established taskforces and working groups to address these challenges. A large proportion of the solution is dedicated to supporting this policy dialogue process, creating an enabling environment.

At community level, project partners have been invited by the target communities to facilitate the development of 10-year village development plans and regulations that guide resources management. These will define ambitions for sustainable aquaculture and coastal security. Community-village plans will contribute to implementation of the provincial master plan, addressing community priorities and needs. This alignment greatly increases community ownership with regards to decision making and engagement in implementation of development plans. After the project, representatives of all 10 target communities will have actively become involved in government-led planning.

Two new measures that will be developed under the International Climate Initiative in the coming years:

Restoring river branches in the area

By restoring small river branches in the area we promote an optimal distribution of freshwater and sediment in the system to mitigate saline intrusion (enhancing aquaculture) and ensure sediment input into the mangrove greenbelt (enabling them to keep up with sea level rise).

Introducing measures that reduce subsidence of land

We demonstrate and promote measures that reduce subsidence of land, amongst others by improving hydrological infrastructure and putting in place rain water harvesting structures that offer an alternative to deep-well groundwater extraction.

ABOUT BUILDING WITH NATURE (BwN):

Building with Nature (BwN) is an integral coastal zone management approach that provides coastal resilience by combining smart engineering and ecological rehabilitation, while introducing sustainable land-use practice. It offers an alternative to conventional hard-infrastructure approaches to coastal security. Instead of 'fighting' nature with dams and dykes, BwN solutions work with and along the dynamics of nature. The solution could be, for example, allowing river flows and sea currents to reinforce coastlines with sediment. Another solution could be the restoration of ecosystems so that they once more provide protection against extreme events and offer valuable 'natural capital' in the form of shell-fish, timber and recreational opportunities. BwN solutions are climate-adaptive, and are often cheaper to construct and maintain compared to static infrastructure solutions. The environmental benefits enable more productive and multi-functional land-use. Local stakeholders – including disadvantaged communities – are involved in design, construction and maintenance of measures. This renders the approach financially, institutionally, environmentally, technically as well as socially highly sustainable. It also shortens permitting procedures and addresses concerns related to human rights that are often associated with large infrastructure projects.

BwN solutions can be applied in myriad ways. Coastal solutions may consist of levees, lined with wetland foreshores and oyster reefs further down the coast. The key to solving river issues may involve restored floodplains that capture flood waters alongside embanked urban centres.

The case study from Indonesia that is described in this submission forms part of the BwN innovation programme, a public-private partnership that is coordinated by [Ecoshape](#). The programme explores inclusive engineering approaches to promote sustainable coastal development in the Netherlands and abroad.

Lessons learned and good practices on adaptation planning processes addressing ecosystems and interrelated areas such as water resources

- At many places across the world, mangrove-mud coasts are eroding and have been eroding for several decades, with the result that large amounts of sediment have been lost from these coastal systems. Bringing back the sediments by natural processes takes time. Thus, it may take several years, even decades for the mangrove forests to recover. It is therefore essential to adopt a phased, long-term master planning method for BwN projects. Such a plan would typically contain the following elements:
 - A detailed description of the (original) ecosystems and the social and biophysical processes that take place across the coastal landscape.
 - A description of changes that have occurred as a result of anthropogenic disturbances.
 - A description of how natural processes can be used for restoring the coastal system. This includes the identification of appropriate engineering and ecosystem restoration measures in a design and engineering plan.
 - A monitoring plan, which is required as input to the adaptive and learning-by-doing BwN approach.
 - A maintenance plan so that the structures remain functional long enough to have a chance to be effective.
 - A training and capacity building plan to make the BwN approach familiar to authorities and communities as this method is still novel.
 - A socio-economic plan for the sustainable use of the coast after recovery.

- The permeable dam structures to trap sediment as a basis for mangrove rehabilitation are successful: we were able to trap up to 45 cm of mud and there are already *Avicennia* mangrove juveniles of 50 cm tall within 1.5 years. The pilot hence did its job: trapping sediment and the principle of the design is sound. Some of the poles were damaged by shipworms and brushwood is disappearing – leading to the collapse of part of the dams during storm events. Some structures were damaged during the monsoon season. We are now testing the best materials to use, for optimizing our design and providing lessons learned for scaling up. We are developing guidelines on ‘permeable structures’ to trap sediment for mangroves recovery as stakeholders want to replicate the approach, and on system understanding, community planning, fish pond rehabilitation, mud nourishment and ecological mangrove rehabilitation (EMR).

- It is very important to stress that this approach should only be applied as a means to restore the sediment balance along eroding coasts, never to reclaim mudflats, seagrass beds and other ecosystems that are found on the seaward side of natural mangrove coasts.

- Ownership over the hardware that is put in place during and after the project and provisions for maintenance of the permeable structures are formalized during the project in co-management arrangements between communities and the local government. Communities will take full ownership over the structures ensuring their long-term

maintenance. Maintenance costs will be covered via community-managed development funds. Communities also have full ownership over enhanced aquaculture production systems. The reclaimed land will be managed as community-based protected areas (as agreed between communities and the local government), with opportunities for sustainable use of natural resources. The reclaimed mangrove belt will be formally owned by the government as per Indonesian law.

- Another key factor for success is the close collaboration with government partners and other players at different policy levels. The project works with a thorough and participative policy analysis on where and how to embed measures in national and subnational policies and budgets e.g. (spatial) development plans, master plans, coastal zonation plans, mangrove strategies, greenbelt and forest legislation, NDC, NAP, DRR (Sendai Framework) and SDG Community plans. We also facilitate village planning discussions about problems, root causes and solutions.
- The Bio-rights approach is a financial incentive mechanism that is being used in the project to involve local communities in the implementation of the Building with Nature measures. In return for active engagement in conservation and restoration measures, communities receive (financial) support to develop sustainable livelihoods that will generate income. In the case of Demak, this translates into coastal safety activities such as inspection of the BwN structures, small maintenance and monitoring works and support for the development of sustainable aquaculture.

Lessons learned and good practices in monitoring and evaluating the implementation of ecosystem-based adaptation;

- Building with Nature is a no-regret approach as the interventions are reversible. This allows a learning-by-doing strategy, so that interventions can be reversed and changed. Hence, a BwN project is flexible and adaptive and is updated frequently with lessons learned. Of course, this implicitly means that monitoring the results of BwN works and evaluating the recovery of the coastal systems is crucial.
- We apply an adaptive learning-by-doing capacity development strategy that is updated frequently with lessons learned. Monitoring of the recovery of the coastal systems is crucial. Instructions for the design, construction, and supervision of the project implementation are therefore continuously updated.
- Monitoring and Evaluation include in-depth technical monitoring for the Building with Nature measures in Demak. M&E methods include concrete products such as designs, reports, training curricula, as well as measurable impact in the field such as reduced salt water intrusion, decreased erosion rates etc, using proxy indicators.
- The monitoring in the field are as much as possible undertaken by the communities themselves and local partners (UNDIP, Wetlands International Indonesia)

Examples of technical monitoring measures in the field and related methodologies are provided in the table below:

What	How	Units
Coastline change	Satellite images	[m/year]
Sediment accumulation	Settling beacons	[cm/month]
Mangrove rehabilitation	Observations local community	[species], [numbers], [height]
Wave attenuation	Wave transformation ray	[percentage decrease]
Sediment availability	SSC measurements	[sediment content/unit]
Salinity	Conductivity instrument	[‰]
Water quality	Water samples	[organic feed, pro-biotica]
Pond productivity	Structured interviews, sampling	[production/ha/yr]

- Monitoring will be furthermore done through indicators that are specifically about sustainability (e.g. related to impact assessment, gender, sustainable sourcing of materials).
- The PME system also includes and keeps track of risk factors and mitigation measures.

Public-private partnership

The initiative is the leading international case of the “Building with Nature Innovation program” and is strongly supported by the Indonesian government and local communities. The Building with Nature public-private partnership aims to promote sustainable coastal engineering approaches that make use of the natural protection provided by ecosystems like mangroves, and salt marsh habitats. It represents the transition of traditional infrastructure designs that typically fight against nature, towards solutions that work with and alongside nature, which are often more cost-effective, while bringing more prosperity to the local economy such as through enhanced fisheries and carbon storage.

Building with Nature Indonesia is a programme by [Ecoshape](#), [Wetlands International](#), the Ministry of Marine Affairs and Fisheries ([MMAF](#)), and the Ministry of Public Work and Human Settlement ([PU](#)), in partnership with consultancy agency [Witteveen + Bos](#), knowledge institutes [Deltares](#), [Wageningen University & Research Centre](#), [IMARES](#) and [UNESCO-IHE](#), Indonesian NGO [Blue Forests](#), with support from the [Diponegoro University](#), and local communities. The project is financed by the Dutch Sustainable Water Fund, the International Climate Initiative, Waterloo Foundation, Otter Foundation, Topconsortia for Knowledge and Innovation, and Mangroves for the Future.

Building with Nature Indonesia is also supported by the [Partners for Resilience \(PfR\) alliance](#) which promotes Integrated Risk Management to mitigate disaster risk and enhance livelihoods, particularly by addressing climate change and ecosystem management and restoration. PfR is a collaboration between Netherlands Red Cross, CARE Netherlands, Cordaid, the Red Cross/Red Crescent Climate Centre, and Wetlands International.



Downloads

[Brochure: Building with Nature Indonesia](#)

[Report: Design and Engineering Plan](#)

[Brochure: Building with Nature Indonesia: meet the partners](#)

[Video: Building with Nature Indonesia – securing eroded coastlines](#)

For more information:

Wetlands International, susanna.tol@wetlands.org

