Greening EU COOPERATION
Integrating environment & climate change

Building with Nature: coastal protection that benefits people and nature

STORIES OF TRANSFORMATIONAL CHANGE

Inspirational examples highlighting transformations towards greater environmental and climate sustainability

The Building with Nature Indonesia initiative builds a stable coastline by integrating mangrove restoration with small scale hard-engineering, in combination with climate smart productive land use and aquaculture best practices.

Addressing coastal degradation and climate change

This case starts with coastal degradation, loss of livelihoods and increasing vulnerability to climate change. It ends with a restored coastal ecosystem that provides a safe and prosperous future for its inhabitants. The transformation was created by using both the forces of nature and people.

The coastal management challenge

Coastal managers are facing challenges to reconcile interests of economic development with care for the environment, while at the same time coping with sea level rise, land subsidence and climate-induced extreme natural events. A sustainable way to achieve this balancing act is through *Building with Nature*, an approach combining ecosystem-based adaptation with 'hybrid engineering'. The Building with Nature concept started in the Netherlands where sea level rise, land subsidence and coastal erosion - aggravated by climate change - leave many traditional sea defenses below safety standards. The coastal maintenance strategy is not based on hard infrastructure works, but on soft sand and the natural power of wind, waves and currents to redistribute sand to places where and when it is needed for coastal protection. An added value of this approach is the restoration of degraded ecosystems or the creation of "new nature", thus enhancing biodiversity with recreational opportunities, and, as an added bonus, at a relatively low cost. Thus, several coastal defense projects have been implemented, replacing hard outdated infrastructure, by a resilient and flexible nature-based solution. The EcoShape consortium, combining contractors, NGOs, knowledge institutes and government agencies, has introduced the Building with Nature concept around the world[1]. Advanced results can be seen in Indonesia.

[1] 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.

"Work on climate adaptation should continue to influence public and private investments, including on nature-based solutions."

The European Green Deal[2]

20 km
of coastline under restoration

70 000
vulnerable people protected through coastal resilience measures

Sustainable aquaculture practices are developed and implemented in collaboration with communities, boosting the local economy.

Building with Nature in Indonesia

Indonesia is one of the first countries that embraced the Building with Nature approach to address severe coastal erosion in Northern Java, the most densely populated island of Indonesia. Problems largely resulted from the removal of mangrove belts for aquaculture development, unsustainable coastal infrastructure, and land subsidence caused by groundwater extraction. With no action, in the long term, over 30 million people across 3000 villages were facing the risk of losing their houses, roads and arable land by catastrophic flooding and erosion.

Hard structures like dams and sea walls have proven to be ineffective as a single solution along rural mud-coasts. They often intensify erosion, tend to be unstable, expensive and incapable of adapting to climate change. Furthermore, they fail to provide the vital economic, environmental and social services that healthy mangrove belts provide. The *Building with Nature Indonesia* initiative builds a stable coastline with reduced erosion risk by integrating mangrove restoration with small scale hard-engineering, in combination with climate smart productive land use, and a mechanism to secure long-term maintenance of the mangrove belts.

Simply replanting mangroves does not work since ecological conditions in the eroded area have dramatically changed. This is the reason why in many places mangrove planting often results in failure. A collection of recent experiences around the world (for example Guinea-Bissau) convincingly shows that restoration of the right ecological conditions can lead to spontaneous natural regeneration of mangroves, at lower cost than planting, with higher biodiversity values.

In a collaboration between local communities, Building with Nature and local contractors, ecological conditions are restored by building temporary semi-permeable barriers from locally available poles and brushwood to dampen the waves and capture sediment. (This technology is already used for over a century in restoring tidal salt marshes in the Netherlands). Once the nearby shore bed level has risen enough, mangroves regenerate naturally, developing a natural defense that protects the hinterland from further erosion. Where the coastline has not yet been eroded, the conversion of aquaculture ponds into mangrove forests is encouraged.

Over the last decades, expansion of unsustainable aquaculture has been a serious cause of mangrove deforestation. Sustainable aquaculture practices are developed and implemented in collaboration with communities. These activities give a boost to the local economy, allowing communities to restore and sustain the greenbelt they rely on for coastal safety. A targeted outreach campaign

[2] European Commission: Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions on The European Green Deal, December 2019, COM(2019) 640 final, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1588580774040&uri=CELEX:52019DC0640

and national policy dialogue contributes to the integration of the approach in Indonesian national policies, thus ensuring replication in urban and rural areas.

Impact: enhanced physical, ecological and social resilience

Inspired by pilot results in 2013, EcoShape members and donors pledged funding and the pilot project has been scaled up to the entire 20 km coastline of the Demak district, complemented with aquaculture revitalization measures. The initiative aims to enhance coastal resilience and security for 70,000 vulnerable people in Central Java and to provide them with a long-term perspective for sustainable economic development.

Immediate results in the Demak district include:

- EcoShape built 4.5 kilometers of permeable barriers that trap sediments to restore conditions for mangrove development; another 4.5 km has been built by Indonesia. Ownership and maintenance have been officially transferred to the communities.
- Best aquaculture practices were implemented by farmers on 422 hectares of ponds, leading to a tripling of incomes.
- Mixed mangrove-aquaculture was introduced, optimizing aquaculture productivity while maintaining or restoring mangrove ecosystem services.
- There has been recovery of coastal fisheries along restored mangroves, providing additional income.
- Village development plans and regulations on land use rights, protected areas and coastal zone management were adopted by 10 communities, leading to government budget allocation.

Upscaling in Indonesia and beyond:

- The Ministry of Marine Affairs and Fisheries funds about 25 km of Building with Nature coastal restoration throughout Indonesia.
- The Ministry of Public Affairs and Housing has tested permeable structure designs, a requirement for uptake by the Ministry. They secured funds for impact monitoring and produced a national guideline on Hybrid Engineering.
- The Ministry is developing guidelines on nature-based solutions for rivers (ADB support).
- Eight knowledge institutes and universities integrate Building with Nature in their curriculum.
- The Indonesian government together with Wetlands International, EcoShape and the Global Centre on Adaptation, initiated 'Accelerating Adaptation through Building with Nature in Asia', announced at the 2019 Climate Summit in New York. The Philippines, Malaysia, Thailand, India, and China expressed interest.
- The Indonesia case was introduced in the West Africa Coastal Areas Management programme (World Bank).

25 km of Building with Nature coastal restoration across Indonesia

9 km
of permeable barriers built to trap sediments to lead mangrove growth

422 hectares
of ponds using best aquaculture practices

300 %
increase in farmers income

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Building with Nature Indonesia is a programme by Wetlands International, EcoShape, the Indonesian Ministries of Marine Affairs and Fisheries (MMAF), and of Public Works and Housing (PU), supported by the Dutch Sustainable Water Fund and the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

Conditions for transformation

Interdisciplinary knowledge broker.

Wetland International successfully bridged the gap between government partners, researchers, contractors, engineers, ecological experts and local communities. They actively brought actors together to share knowledge, facilitate dialogue, broker solutions, advise governments on policy adjustments and enable local community participation (more info).

Adaptive management.

Adaptive management and monitoring was applied to cope with the dynamics and uncertainty of Nature based Solutions. By embracing this dynamic nature (costly) over-designing is prevented and the design can be adapted to (unexpected) changing (climate) conditions.

Financial incentive.

An important success factor in Demak was the application of the BioRights approach. This innovative financing mechanism enables local communities to invest in sustainable practices in return for active involvement in environmental conservation and restoration. Micro-credits are converted into grants upon successful delivery of conservation services. Economic activities by community groups set aside some of the profits into a group savings fund that is used for mangrove rehabilitation.

Local and government ownership.

The measures are rooted in village development plans and supported by a Coastal Field School. Villages felt a need for better internal communication and for a collective movement; this resulted in an ocean management forum (Bintoro) to network with government and to secure government funding. Initially, local contractors carried out the construction and maintenance of permeable structures. In 2018, ownership was transferred to the communities. Placement of new structures and maintenance are now carried out entirely by the community. What's more, the community attitude has changed from passively accepting regular floods and low productivity to embracing hopeful, creative and collaborative methods.

The future of Building with Nature

The Building with Nature approach demands profound site-specific understanding of the natural, socioeconomic and institutional systems. It is a no-regret approach: through adaptive management, the infrastructural design can be aligned with changing environmental conditions. By creating conditions for nature to regenerate by itself, projects are often less expensive on a life-cycle basis than traditional engineering solutions. Extra benefits such as biodiversity conservation and enhanced incomes for local inhabitants through sustainable aquaculture are created.

There are barriers of course. Bringing environmental and engineering experts together with government administrators is not easy. Their outlooks and expectations can be very different. And while engineering solutions usually have measured outcomes, nature can be less predictable. Convincing pilots, active stakeholder ownership, successful upscaling and continuous learning provides a way forward.

The Building with Nature approach can be applied to most hydraulic engineering challenges. Working with nature and not against it provides opportunities to address water management problems, using interactions and materials present in nature, while at the same time creating better conditions to address an uncertain future. This is what resilience is about.