Deltares

Enabling Delta Life

Nature Based Solutions are possible everywere

Nature Based Solutions means proactively maximising the use of natural processes to improve life in delta regions. Nature helps to keep coasts, river areas and cities safe and viable. Nature Based Solutions are also referred to as Building with Nature. They are generally implemented in combination with traditional grey solutions, with the proportion of green to grey depending on the system in question.

Wavetank with willows at Deltares. Photo Marco De Swar

Examples of green-grey solutions include: vegetation or salt marshes in front of sea or river dikes; the beneficial use of naturally ripened dredged material for use in civil infrastructure; or the establishment of city parks that are connected to the natural river basin or tidal dynamics. Nature-based solutions are intrinsically multidisciplinary: ecology, biology and sediment sciences interact with financial models and multi-stakeholder analysis. They are therefore intrinsically multifunctional and naturally sustainable, circular and resilient.

Living the good life in the delta

Although they are well understood and firmly embedded in practice, traditional grey solutions are functionally limited and they often disrupt important natural processes or cycles. Dams interfere with the natural flow of sediment, resulting in ecological impacts, sediment starvation and coastal erosion downstream. Long dikes on rivers lead to the dispersion of sediment in the sea, causing subsidence of the surrounding areas and an increase in flood risks.

Modern science and engineering are shifting from building against nature to building with nature. Knowledge and practical experience with nature-based solutions have become increasingly available in recent times. Deltares helps to develop this knowledge for large-scale implementation through basin-wide master-planning, small- and large-scale laboratory experiments, field pilots in living labs, work on numerical and financial tools, and stakeholder involvement. In the Netherlands and abroad, we learn about, and experiment with, nature-based solutions in partnership with governments, industry, consultants, and other research and academic organisations.

Technically sound: water, ecology and sediment as a resource

Water, ecology and sediment play a key integrated role in nature-based solutions in delta regions. Sediment is the foundation of coasts, wetlands and riverbanks, which host vegetations and biota, and are shaped by waves and currents. It is critical to understand these interactions and optimise the use of these processes and natural resources in order to design safe and sustainable nature-based solutions. A sound technical understanding is therefore a major focus of our strategic research programme.

Deltares researches and tests interaction between water, vegetation and sediment at different scales and in normal and extreme conditions. Deltares looks for ways to use sediments beneficially as a resource.

With our research partners, the Royal Netherlands Institute for Sea Research and Delft University of Technology, we investigated how willows can help break waves to protect dikes. We wanted to see how nature-based solutions perform in high-energy events, which are sparsely documented despite the fact that they have the most impact on structural integrity. The tests were performed at full scale in our longest wave flume, the Delta Flume, with life-size waves

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Clay ripener in Delfzijl. Photo Ecoshape

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In the Kleirijperij pilot ("the clay ripener") in Delfzijl, we are looking at how to transform fine, salt, dredged material into clay soil for use on dike upgrades. Although drying dredged sediment is not a new idea, our aim here will be to produce clay that complies with local legislation for use in dikes. Sediment is turned into clay soil by maximising the use of natural processes of ripening and rain for soil washing.

In the Markermeer lake, an island archipelago has been constructed using dredged material (sand and mud) to improve the ecology and water quality of the lake. In this living lab, we are learning how to turn fine sediments into soil and how vegetation and biology develops and modifies the soil properties.

Joint action to accelerate the implementation of nature-based solutions

Technically sound solutions are not enough to ensure effective implementation. Stakeholder alignment, financial models, and adaptive management and maintenance play a critical role in many projects, and even more in nature-based solutions. Our research and project activities place a strong focus on these factors.

In the EU NAIAD project, we are investigating the financial feasibility and insurability of green-grey solutions in partnership with the public and private sector, and in particular companies that provide flood insurance, with the aim of encouraging private investment.

We use evidence-based game theory and special visualisation tools for the evaluation of different scenarios to highlight the various effects of solutions in collaboration with stakeholders. We place specific emphasis on stakeholder engagement to ensure that solutions are co-created with the people who benefit from them directly.

Furthermore, working with international funding organisations such as the World Bank and the Asian Development Bank, we have developed guidelines for masterplans that include building with nature projects. We regularly organise workshops and visit conferences to share our latest insights with different parties, including international high-level government officials. Nature-based solutions can indeed be implemented (and therefore funded) on a large scale if more is known about the benefits in terms of risk reduction and maintenance (in the long term).

We also play a leading or influential role in international initiatives to effectively disseminate knowledge and experience relating to nature-based solutions and to coordinate action with international experts in the field. Deltares is a major consortium partner and management team member of EcoShape – Building with Nature, we chair the CEDA and PIANC Working Group on Beneficial Sediment Use, participate in the SedNet working group on Sediment and Circular Economy, and contribute to the USACE Working with Nature Atlas and the Natural and Nature-Based Features Guidelines book.

Infrastructure of the future

Nature-based solutions are the infrastructure of the future. They are the best response to the sustainable adaptive and resilient strategies demanded by the challenges now faced by society, given rapid human development and climate change. We look forward to working with you to accelerate large-scale implementation today.

Please contact:

Ellis Penning, *Ellis.Penning@deltares.nl*
Luca Sittoni, *Luca.Sittoni@deltares.nl*
Stephanie Janssen, *stephanie.janssen@deltares.nl*

Marker Wadden. Photo Straystone Peter Leenen

Artist impression Nature Based Solutions