MANABAS COAST | Interreg North Sea

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Evaluation of pilot experiences for upscaling & mainstreaming approaches

MANABAS COAST
NATURE-BASED SOLUTIONS

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How to Ecology in MANABAS

About this two-pager

This two-pager summarizes the pilot experiences from MANABAS Coast in overcoming the barriers to upscaling and mainstreaming Nature-based Solutions (NbS) in coastal regions. These barriers exist in three systems: social, natural and governance. The results of the NbS pilots (WP2) have been reflected upon in “How to” group meetings. From this reflection, several key points of best practices have emerged for other coastal stakeholders to upscale or mainstream NbS. It also provides input for the regional, national and/or international upscaling and mainstreaming strategies of NbS, linked to our project partners' pilot areas. This paper evaluates the results of the WP2 "*How to Ecology*" group. The *How to Ecology 2-pager* consists of this document, the *Summary Framework How to Ecology* (appendix 1) and the How to Ecology checklist (appendix 2).

Introduction

In coastal protection strategies, NbS are more and more becoming common practice globally (Seddon et al., 2020). In the Netherlands, there is an increasing interest in NbS. The large Dutch program *NL2120* (Netherlands 2120), which was recently drawn up, aims for the implementation and export of NbS (budget 110 M EUR). It combines a national knowledge program on NbS with the experience gained from local projects in different landscape types (*Https://Www.Nationaalgroeifonds.Nl/*, n.d.).

When implementing NbS, conserving biodiversity is not only an objective but also a prerequisite, as it is a crucial component of functioning ecosystems, which are essential in delivering ecosystem services.

It is widely recognized that merely being inspired by nature is not sufficient to classify an action as an NbS. This can be seen in the definitions of NbS that have been adopted by various institutions. The European Commission stresses that any NbS must be supported by nature, and both the United Nations Environmental Assembly and the IUCN emphasize the need for NbS to provide the benefits that biodiversity offers (EC, 2015; IUCN, 2020; UNEA 2022). As such, innovative interventions must not only draw inspiration from nature but also involve functioning ecosystems to resolve societal and ecological problems effectively. In addition to meeting the criteria for being considered an NbS, enhancing the biodiversity increases the contributions from ecosystems, as well as the resilience and ecosystem services that they can offer (Cardinale et al., 2012; Tilman et al., 2012; Oliver et al., 2015; Benkwitt et al., 2020; Seddon et al., 2021). As such, addressing biodiversity, which impacts both species and human well-being, is essential for the efficacy of NbS.

In coastal protection, traditional grey infrastructure measures are known to negatively impact coastal ecosystems by degrading habitats and causing biodiversity loss (Van Slobbe et al., 2013; Gittman et al., 2016; Moosavi, 2017; Laurino et al., 2022). To comply with the high standards for the flood protection works along the coasts, it is not always possible to solely build with NbS involving only sediment. Except for dunes, nature-based measures cannot (completely) replace traditional grey safety measures (Hofstede, 2024). There are strict requirements (e.g., high standards) for nature-inclusive flood protection works along the coasts (Sella et al., 2022; Schoonees et al., 2019). This is why concrete blocks are used for revetments as part of flood protection works (grey solutions) along the coasts, such as with dikes. Nevertheless, ecological enhancements can be added by roughening the concrete blocks and/or adding pools and bulges. This results in benefits to biodiversity by providing a suitable substrate for attachment and growth. Ecological enhancements can offer additional benefits, such as for the environment, ecological habitats and society, as well as improved well-being (Suedel, 2021). However, such an approach must prioritize ecology as a key component.

Ecosystems that have deteriorated and lost their natural species assemblages are less robust, stable and resilient than intact ecosystems, making them less capable of delivering the essential ecosystem services that many coastal communities rely on (van Wesenbeeck et al., 2013). Van Leeuwen et al. (2021) demonstrate through the example of Lake Markermeer in the Netherlands that when the created ecosystem is imbalanced, it will degrade over time and eventually lose the capacity to provide these ecosystem

services. To solve the problem of poor water quality (excess turbidity) in Lake Markermeer, small islands were built to increase the land – water transition gradients and the heterogeneity in the water depth. By adding the missing elements that are typical for a natural lake, the aim was to increase the primary production while decreasing the turbidity. Similarly, research by Silliman and Bertness (2002) and Gittman and Keller (2013) highlight that ecological imbalances can lead to the degradation and loss of saltmarshes, along with the valuable ecosystem services that they offer, such as coastal protection. This highlights the importance of ecology within NbS to ensure its integrity and sustainability.

In planning NbS, the systematic involvement of diverse expertise and stakeholders, including ecologists , in the planning, co-design and implementation process is widely recognized as a key success factor (Steiner et al., 2013; Nesshöver et al., 2017; Calliari et al., 2019; Albert et al., 2020; Seddon, 2022; Suedel et al., 2022). Borsje et al. (2011) and Lavorel et al. (2014) highlight the critical role of ecological factors, such as plant diversity and the influence of ecosystem engineers, keystone species or functional groups, in maintaining ecological functions. Consequently, involving ecologists who, in addition to complying with the legislation and regulations, also look for opportunities for nature development at every stage of NbS projects, is essential for their success. The effectiveness of NbS ultimately depends on the ecological functions provided by the ecosystem (Nesshöver et al., 2017).

Question at hand '*What is in it for nature?*' is the main question that came up in the "How to ecology" group.

Main findings

Using the experiences gained by ecologists in the myriad of MANABAS Coast pilots, a comprehensive framework has been developed to guide the inclusion of "for ecology" measures in the future. These lessons learned were gathered using the structured framework that, by means of a questionnaire, assesses the effectiveness of implemented beneficial measures for ecology and biodiversity, explored opportunities for additional actions and the identification of obstacles. This was done by considering the key factors such as the resources, contracts of the commissioner and the contractor, policies and stakeholder involvement (see Appendix), the results of which are presented below.

What is interesting is that the implementation of ecological values differs per country whereas the most northern country (Sweden) prefers a more holistic approach in which the ecosystem is seen as the foundation that needs to be strengthened, while other counties try to produce a more-natural environment by creating breeding grounds, facilitating the development of diverse vegetation types and/or habitats or by increasing the opportunity for fish to migrate (e.g. the Netherlands). There is also compensation of site-specific losses of habitats and/or the preservation of (rare) species. The effect of national policies and regulations often dictates monitoring obligations and mitigation and compensation measures in favor of soft, more-natural solutions. Most measurements are taken during the planning phase, but in the realization phase, opportunities for ecology have also been found. What is remarkable is that soft solutions are considered to be the same as implemented measures for increasing biodiversity. While the inclusion of nature by the organizations can certainly be improved, the awareness of the benefits of ecosystem services is growing.

The project contract is the key element in the realization of projects and it can be used to add additional measurements for ecological enhancements. Additional knowledge about the possibilities on how the contract itself can offer more for biodiversity is essential. There are also not always sufficient, or the necessary, ecological measures taken into consideration during the planning phase. Additional, but non-obligated, ecological measures and monitoring should be standardized within those contracts, which can ultimately increase the opportunities for ecological enhancement.
Subsidies are available for the implementation of measurements for natural development, but are not always used. The upscaling to N2000 or an EU LIFE-project might help increase the access to subsidies.

In general, there are no clear financial barriers, but there are some concerns about future management of nature areas due to possible restrictions on national budgets concerning nature management.
In addition, there are some knowledge gaps regarding new techniques being applied due to a lack of experience and specific environmental circumstances. In terms of social or cultural factors, natural development seems to be highly accepted. The main exception is regarding giving land back to nature, which is still a sensitive topic due to scarcity of land.
All participants have described that during the end phase of their project site, additional interventions should have been applied for enhancing/increasing biodiversity or ecosystem services.

Experiences and lessons learned

Concerning the current knowledge gaps, 50% of the project sites could use additional data. Although this knowledge is often externally available at universities or from nature managers, it is not always incorporated into the projects. Implementation of this knowledge seems to either be restricted or is not considered to be of high importance to begin with. The inclusion of an ecologist during all project phases, from start to finish, is also a key factor. Resources that might aid in the process for the implementation of additional measures for ecology are identified to be: additional funding; positive results from existing projects used as examples; the recognition of the importance of biodiversity; implemented examples with low costs and high benefits; the guidance to cover the new projects, including permits and available designs.
At most project sites, there was a lot of attention dedicated to the communication with different types of stakeholders.

Checklist for coastal managers / professionals

Table 1: Checklist for managers (see also the appendix)

STEPS	DESCRIPTION
STEP 1	Involve an ecologist from start to finish
STEP 2	Restore ecological functions
STEP 3	Explore the possibilities for ecological enhancements[1] Make use of the N2000 Management Plan.
STEP 4	Explore ways to reduce disturbance to nature
	Arrange funding for ecological development, biodiversity, nature and climate change
STEP 5	Check existing databanks for protected species Arrange finance for ecological development, biodiversity, nature and climate change
STEP 6	Make use of the IUCN Red List of Threatened Species https://iucn.org/resources/conservation-tool/iucn-red-list-threatened-species#:~:text=Species%20are%20classified%20into%20one,to%20be%20threatened%20with%20extinction.
STEP 7	Define target species/habitat(s)
STEP 8	Include monitoring (e.g., sediment samples)
STEP 9	Use lessons learned as a reference
STEP 10	Make use of the knowledge from N2000 management plans
STEP 11	Include (funding for) maintenance
STEP 12	Restore ecological functions
STEP 13	Consider if rewilding is possible

[1] Make use of the N2000 Management Plan

Future directions

- How can the inclusion of ecology in an NbS become standardized?
- How do national and international regulations and policies effect building with nature projects?
- How can new techniques or insights that are beneficial to biodiversity be included?
- How can the MANABAS website and the Storymap(s) be updated following the conclusion of the MANABAS project?
- How can ecological enhancements more easily be included in project contracts?

The different elements of the 'How to ecology" group: the MANABAS checklist, the Storymap, the visits to the project sites, the increased knowledge and improved awareness about possibilities for ecological enhancements at the different pilots sites and the collaboration with other ecologists make it more feasible to include ecological enhancements within the project pilots for both the present and in the future. Even after the "How to ecology" group is finished, the information gathered can continue to be used as a resource. In this way, MANABAS will continue to be a plus for nature and biodiversity even after the project has concluded. Building sustainably, with and for nature, is the ultimate goal of the MANABAS "How to ecology" group.

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Summary Ecological Enhancements Analysis Framework

The components of the analysis framework for ecological improvements are as follows:

- to reflect on (to be) implemented additional measures for ecology,
- to explore what additional measures can be taken for ecology,
- to identify possible obstacles,
- to identify supporting factors.

The framework was filled in by ecologists from the different MANABAS pilots. This gave us information on how ecology was being implemented in the different pilots. From this reflection, several key points in terms of best practices and lessons learned have emerged for coastal managers and professionals to help them include ecology and biodiversity within their projects. We are convinced that water safety and biodiversity can complement each other in the projects.

- Assessment of (to be) implemented additional measures.

What is interesting is that the implementation of ecological values differs per country. Whereas the most northern country (Sweden) prefers a more-holistic approach by using or strengthening existing ecosystem services, other counties try to produce a more-natural environment by creating breeding grounds, facilitating the development of diverse vegetation types and/or habitats or by increasing the opportunity for fish to migrate (e.g. the Netherlands). There is also compensation of site-specific losses of habitats and/or the preservation of (rare) species. Most measurements were taken during the planning phase, but in the realization phase, opportunities for ecology have also been found. What is remarkable is that soft solutions are considered to be the same as the implemented measurements for increasing biodiversity. The inclusion of nature by the organizations can certainly still be improved, but the awareness of the benefits of ecosystem services is growing. Subsidies are available for the implementation of measurements for natural development, but are not always made use of. This is probably because the measures are sometimes financially negligible in comparison with the whole project budget. There are also projects in which limited funding is a restriction to the implementation of additional measures for ecology. Monitoring was applied at all project sites, but there is often no links made with prior monitoring data (pre-project data/the ecological value of the project site from decades ago). Therefore, there is not always a reference with the original state of those species/habitats (baseline). This can make it difficult to conclude anything about the true and current ecological value of interventions applied for enhancing/increasing biodiversity or ecosystem services.

- Exploration of additional measures for ecological enhancements

All participants have described that during the end phase of their project site, additional interventions should have been applied to increase biodiversity. Concerning the current knowledge gaps, 50% of the project sites could use additional data. Although this knowledge is often externally available at universities or from nature managers, it is not always incorporated into the projects. Implementation of this knowledge seems to either be restricted or is not considered to be of high importance to begin with. The project contract is the key element in the realization of projects, and it can be used to add additional measures for ecological enhancements. Additional knowledge about the possibilities on how the contract itself can offer more for biodiversity is essential. There are also not always sufficient, or the necessary, ecological measures taken into consideration during the planning phase. Additional, but non-obligated, ecological measures and monitoring should be standardized within those contracts, which can ultimately increase the opportunities for ecological enhancement. At most project sites, there was a lot of attention dedicated to the communication with different types of stakeholders.

- Identification of obstacles

In general, there are no clear financial barriers, but there are some concerns about future management of nature areas due to possible restrictions on national budgets concerning nature management. The budget for nature conservation in Sweden, for instance, only takes part of the needs of the present situation into account. There is no additional funding to address the effects of future climate change. In addition, there are some knowledge gaps regarding new techniques being applied due to a lack of experience and specific environmental circumstances. In terms of social or cultural factors, natural development seems to be highly accepted. The main exception is regarding giving land back to nature, which is still a sensitive topic due to scarcity of land. The prioritization of nature within the organizations can still be improved, but the awareness of the benefits of ecosystem services is growing, overall. The resistance from one or more stakeholders, often landowners, is limited. The cooperation between these stakeholders or project partners has often

resulted in a common goal. Nature organizations are sometimes critical about certain projects. Investment in transparency and communication can overcome such conflicts. However, technical challenges, such as with the project design, within the projects have not been identified.

- Identification of supporting factors

Resources that might aid the process for the implementation of additional measures for ecology are identified to be: additional funding; positive results from existing projects used as examples; the recognition of the importance of biodiversity; implemented examples with low costs and high benefits; the guidance to cover the new projects, including permits and available designs. The inclusion of an ecologist during all project phases, from start to finish, is also a key factor. Perhaps there are subsidies available, which have not been identified. The upscaling to N2000 or an EU LIFE-program might help. The latter is the only EU funding program dedicated to environmental, climate and energy objectives. It is divided into sub-programs, including ones focused on the restoration of nature and biodiversity and climate change mitigation and adaptation. Political support for biodiversity and the implementation of laws that encourage nature conservation and development are policy changes that can facilitate better outcomes for biodiversity. The effect of national policies and regulations on ecology often dictates monitoring obligations and mitigation and compensation measures in favor of soft, more-natural solutions.
The collaboration between project partners can be improved through better cooperation between the commissioner and the contractor(s), researchers or other institutes, NGO's, volunteers and/or coupling with similar goal-oriented projects, such as the EU ResiRiver project. This should also be undertaken with coastal communities to create more transparency. Increasing awareness, through education (of future generations), can also be a supporting factor in creating a better understanding about managed realignments or the need for a reduction in disturbance to the natural environment (e.g.,reduction of disturbance). The different elements of the ‘How to ecology” group include: the MANABAS checklist, the Storymap, visits to the project sites, better knowledge about possibilities for ecological enhancements in the different pilots and the collaboration with other participants on ecology to make it more feasible to include ecological enhancements within the project pilots. And this work will continue after the “How to ecology” group is finished. In this way, MANABAS delivers a positive contribution for biodiversity even after the overall project has concluded. This is the goal of the MANABAS “How to ecology” group.

How to Ecology Checklist

It is highly recommended to make use of this checklist during all stages of a MANABAS project to ensure that natural development of ecosystems, biodiversity and ecosystem services are taken into account within every MANABAS project. Additionally, the greenwashing of "soft solutions" can be prevented by applying this checklist.

- Involve an ecologist from start to finish to ensure that knowledge about biodiversity, species and ecosystem services are include during all project stages and the opportunities for embedding are explored.

- Restore ecological functions as part of the project. These functions often go hand in hand with increasing water safety and (local) biodiversity, as well as other topics such as creating a more attractive area for recreation.

- Arrange finance for ecological development, biodiversity, nature and climate change to make sure that natural development is part of the project. Most measures are relatively cheap, especially when considering the entire project budget as a whole. Moreover, these measures could have a very positive impact on the ecosystem as a whole and/or specific species.

- Check existing databanks for protected species to investigate which specific ones the project might have a positive or negative influence on. In case of a negative impact, mitigative or compensating measures could then be implemented, as needed.

- Make use of the IUCN Red List of Threatened Species to implement measures for the protection of threatened or endangered species. The project site might be an important future habitat for those species. MANABAS project pilots can actively be designed as a suitable habitat for the protection and conservation of these species.

- Define target species/habitat(s), the latter of which is often critical for the said species. If they can survive in a certain area, the habitat is often also suitable for other less critical species, in general. This target species can also be used as a means of communication to stress the importance of a habitat, for example.

- Include monitoring to learn from the implemented measures. Did they have the desired effect? At a minimum, include monitoring for the sediment (because of the relation between the ground and the flora and fauna) and/or the environmental landscape (for other initiatives).

- Use the lessons learned as a reference to further improve, work more cost effectively and make it easier to implement the measures elsewhere. In addition, the present state (e.g., current or latest data) of the species is often a bad reference to use as a baseline because in many cases, lots of species are already showing a decline or may even have completely disappeared from a certain area. Therefore, we need to also incorporate data from the past and use these numbers as a reference and for comparison with the present situation, to test whether the natural development is strong and/or resilient.

- Make use of the knowledge from the N2000 management plans and use the N2000 target species as a starting point. In that way, the MANABAS project pilot sites can increase the value of N2000 areas, which might even help expand these areas in the future.

- Include (funding for) maintenance in the projects

- Restore ecological functions

- Consider if rewilding is possible