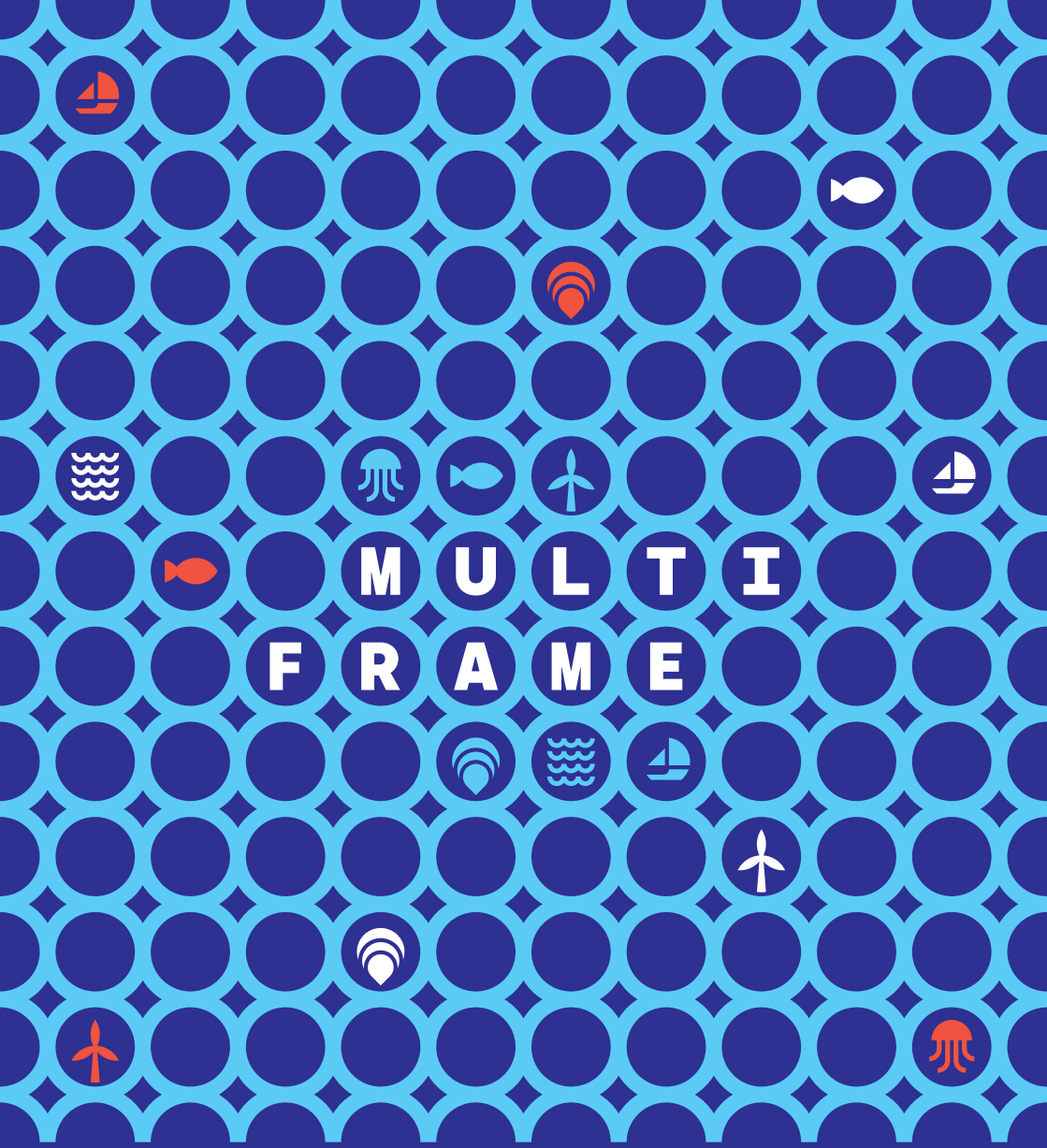
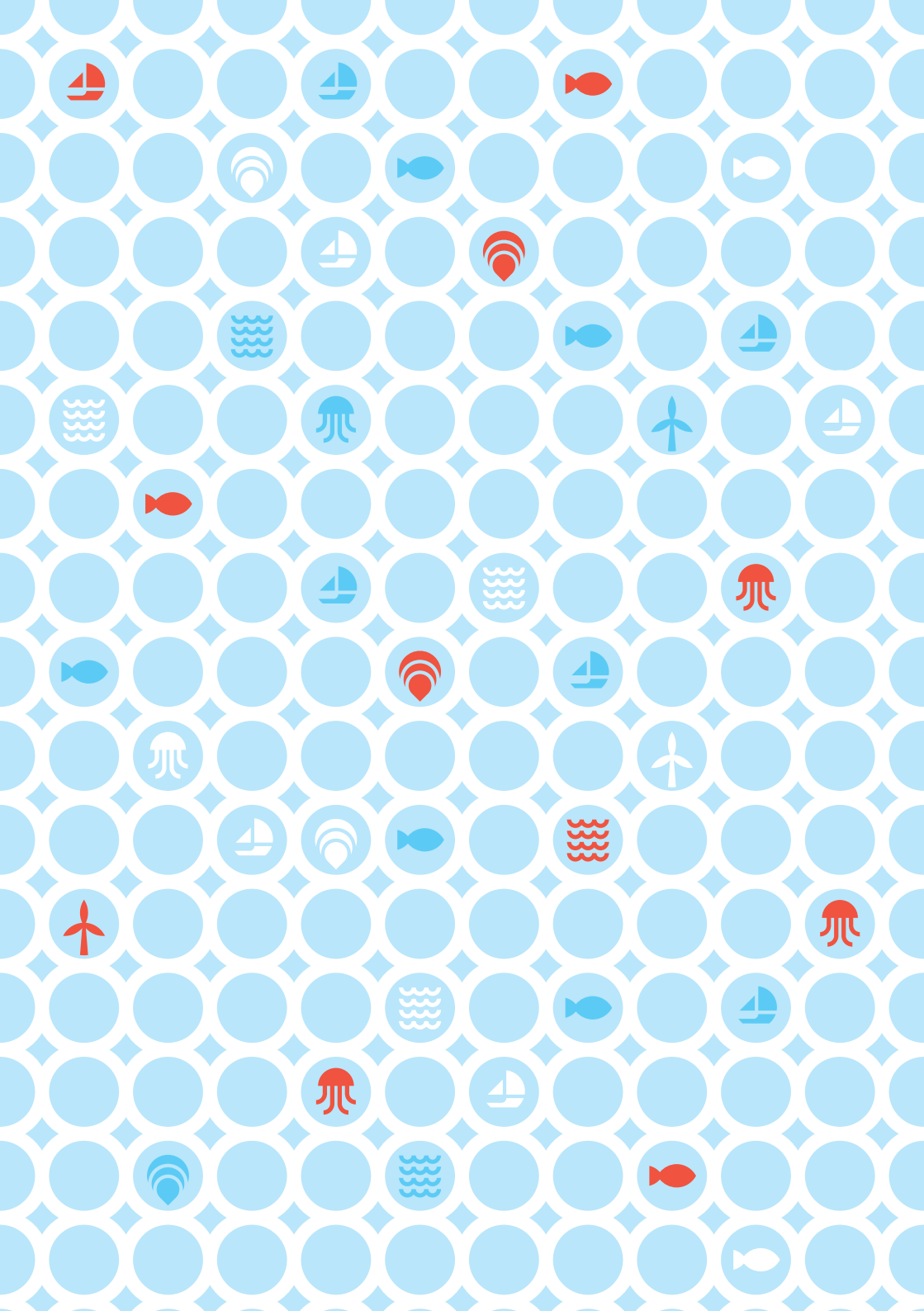


MULTI-USE BLUEPRINT

Nature enhancement in offshore wind farms,
the Netherlands



Location

The combination of offshore wind energy and nature enhancement is being extensively considered and tested in the Dutch North Sea. A first pilot location was in the Eneco Luchterduinen offshore wind farm, 23 kilometers off the coast at Noordwijk aan Zee where, in 2018, cages with flat oysters and reef balls were installed.

The project ran for one year and was the starting point for many other projects. Currently, at least ten different projects of nature enhancement are running in six different offshore wind farm areas.

The following are examples of some of the ongoing nature enhancement projects in offshore wind farms:

1. Borssele Orsted: pipe reefs, lobster and cod tagging
2. Borssele Blauwwind – oyster restoration
3. Luchterduinen Eneco – oyster restoration
4. Hollandse Kust Zuid Vattenfall – nature inclusive design
5. ZeeEnergie Gemini – oyster restoration
6. Buitengaats Gemini – oyster restoration
7. EcoScour Borssele V – nature inclusive design / oyster restortation
8. Hollandse Kust Zuid Tennet – fishhotel
9. Hollandse Kust Noord – Scour protection artificial reefs / Hollandse Kust Zuid Vattenfall – Rock Reefs

Description

The current Dutch North Sea ecosystem is considered degraded, partly because the natural flat oyster reefs have disappeared. Installing wind farms in the Dutch North Sea changes characteristics within the current ecosystem, subject to both localised as well as cumulative effects. In the Dutch North Sea, parts of wind farms act as artificial reefs, with associated changes in species composition and populations not only within the wind farms, but also in the surrounding waters. However, these cannot be seen as substitutes for natural reefs. Nature enhancement in wind farms cannot be seen in isolation from other, potentially negative effects of wind farms on the ecosystem such as turbidity, vibrations and noise pollution. The interpretation of nature enhancement therefore depends on the objectives for enriching the present North Sea ecosystem.

Offshore wind farms in the Dutch North Sea offer opportunities for enhancing North Sea biodiversity by adding hard substrates such as scour protection and excluding benthic disturbance from bottom trawling. In this way, both soft sediment habitats and hard substrate communities are given the opportunity to develop.

A clearly increasing trend can be seen in the number of offshore nature enhancement projects outside and inside wind farms. Knowledge is gathered in the form of practical, often small-scale nature restoration projects, applied research, theoretical research and pilot projects. Monitoring and the development of new techniques as well as (ecosystem) modelling are part of the process. Results can take a long time to materialise because ecological processes can take decades to be observed. Pilot projects are currently underway in several places, the first monitoring results of which are positive (but largely unpublished). In addition, much can be learned from nature enhancement projects outside wind farms. For example, results to date show that it is possible to release flat oysters as a nature improvement measure, with effects such as an increase in biodiversity have been observed.

In the Dutch North Sea, oyster beds have almost completely disappeared due to human impacts such as overfishing, the effects of trawling and diseases. With the addition of hard substrate and a need for restoration sites, deploying flat oyster as a species for nature enhancement in offshore wind farms is a logical choice. Shellfish reefs offer shelter, settlement substrates as well as food to many different species, creating a biodiverse habitat. Currently, several different projects are working on oyster restoration in the Dutch North Sea, including projects in offshore wind farms.

An example of an initiative focusing on nature enhancement in offshore wind farms is “The Rich North Sea” (De Rijke Noordzee). The Rich North Sea program officially started in 2020 initiated by NGOs Stichting de Noordzee (The North Sea Foundation) and Natuur & Milieu (Dutch Nature and Environment foundation). The Rich North Sea runs until the end of 2023 and responds to the opportunities that offshore wind farms offer for nature restoration. The Rich North Sea works to increase biodiversity within wind farms in the North Sea by developing and implementing nature-inclusive measures and creating reefs. Currently The Rich North Sea and its partners have five running projects in offshore windfarms, ranging from nature-inclusive designs to placing artificial reefs or flat oysters.

The Rich North Sea works together with industry partners such as wind farm owners and offshore installation companies. The consortium has purchased the oysters

and are effectively the owners. However, if oysters are deployed without cages or other infrastructure, once submerged they are technically not under anyone's ownership anymore. For The Rich North Sea, the main goal of the programme is nature enhancement rather than commercial use. In the Netherlands, options for multi-use of wind farms are being explored. While active bottom trawling is prohibited within offshore wind farms, passive fisheries (e.g. pots or creels) may be an option in the future.

Enabling conditions and tools

Local regulation

Regulations are not always aligned with nature enhancement. Safety requirements can hamper the location, design and monitoring of offshore projects. For example, the safety zone around a platform could potentially be a good location for enhancement projects, however regulatory restrictions may limit options or entirely prohibit certain measures. One example is the prohibition of diving in offshore wind farms in the Netherlands, making monitoring dependent on remote methods such as video footage and water sampling. Additionally, decommissioning requirements can make installation challenging. The sooner nature enhancement is made part of an offshore wind farm design and installation, the better the alignment will be.

Ideal location

Nature enhancement is being promoted in offshore wind farms through tendering criteria. The latest offshore wind tendering procedure included one tender completely focused on ecology. Multi-use of wind farms is being explored right now with the help of area passports. Nature enhancement and protection outside of offshore wind farms and marine spatial plans is under development, with fully protected areas slowly coming into view. Nature enhancement should always be based on local conditions, habitat, history and future prospects, and thus should be seen as part of a bigger ecosystem.

Suitable technology

When designing enhancement measures, one needs to take into consideration the local environment and the geomorphological conditions. For example, some of the cage types are not suitable for sandy environments. Nature enhancement should always be beneficial for the intended habitat types or species, ruling out or mitigating any negative effects.

NGO leadership and organisational set up

The Rich North Sea had a central role in bringing the approach forward and establishing a collaboration with wind farm owners and developers. The Rich North Sea was one of the first programmes trying to embed nature enhancement in offshore wind farms, both in practice as well as in policy. However, other NGOs as well as commercial companies and governmental bodies are currently involved in nature enhancement within (and outside of) offshore wind farms. In general, willingness to cooperate is high. The wind sector is interested in nature enhancement, due to regulatory obligations and an intrinsic need for sustainable and responsible use of the sea. However, ongoing projects costs are usually shared by all partners.

Access to the wind farm

As access to wind farms is restricted, it always needs to be coordinated with the wind farm operator. Installation and monitoring measures include specific risk assessments and work method statements in order to address any health and safety risks. In the newer projects, most of the reef ball structures are on the scour protection instead of the sea floor. Despite being so close to the turbines, this does not impact turbine operation. Cooperation with the wind farm developer in allocating visiting times is always preferred to reduce costs as well as emissions.

Monitoring plan

Monitoring of environmental restoration needs to be carefully planned. A monitoring plan should be put in place and followed up to adjust if needed in order to ensure optimal outcomes. Monitoring plans are always tailor-made to the specific project and objectives. Examples of monitoring techniques are the use of underwater cameras such as drop-cams or bait-cams as well as ROVs, water sampling for eDNA analysis and abiotic measurements such as temperature, salinity, flow, etc.

Impacts and positive changes

Nature enhancement in wind farms is a relatively recent development, with the first pilot project in 2018. Currently, active nature enhancement measures in Dutch wind farms consist of:

1. Adapted scour protection designs to increase reef function (size, type of material) for nature-inclusive design, potentially resulting in nature restoration or habitat creation, depending on location.
2. Actively adding target species (including flat oysters) for nature restoration or habitat creation, depending on location.
3. Placing artificial reef structures for nature inclusive design/habitat creation.

- **The effects of nature enhancement** measures depend on environmental factors and are linked to the location and conditions. In addition to the circumstances and location, the type of structure on which the measures are taken can also influence the outcome.
- **Only one pilot has so far yielded definitive result:** the 2018/2019 pilot in Luchterduinen with 'Reef Balls' and oyster cages with live flat oysters. During this pilot, an increase in biodiversity was observed compared to the surrounding sandy sea floor, with 19 different taxa detected on the structures. Water quality and food supply were sufficient for the mature flat oysters to reproduce. The construction of the cages did not withstand the conditions on the seabed, which meant that they were partly covered in sand. The oysters covered by sand did not survive. The currently running projects therefore show initial positive results.

Transferability

Offshore wind farms are desperately needed in the fight against climate change. The number of wind farms in the North Sea is expected to grow strongly in the coming years. This large-scale construction of wind farms has far-reaching consequences for both nature and spatial planning in the North Sea. At the same time, offshore wind farms offer opportunities to make a positive contribution to marine biodiversity, in addition to sustainable energy.

The current projects provide a blueprint for underwater nature enhancement in offshore wind farms, which can be applied as a standard in new wind farms to be built in the Netherlands and beyond.

Links

- **The Rich North Sea**
  https://www.derijkenoordzee.nl/en
- **Platte oesters in windpark Eneco Luchterduinen**
  https://www.derijkenoordzee.nl/locaties/eneco-luchterduinen
- **Natuurversterking in windparken op zee Bureaustudie MONS project 51**
  https://noordzeeoverleg.nl/documenten+nzo/HandlerDownloadFiles.ashx?idnv=2230672

Imprint

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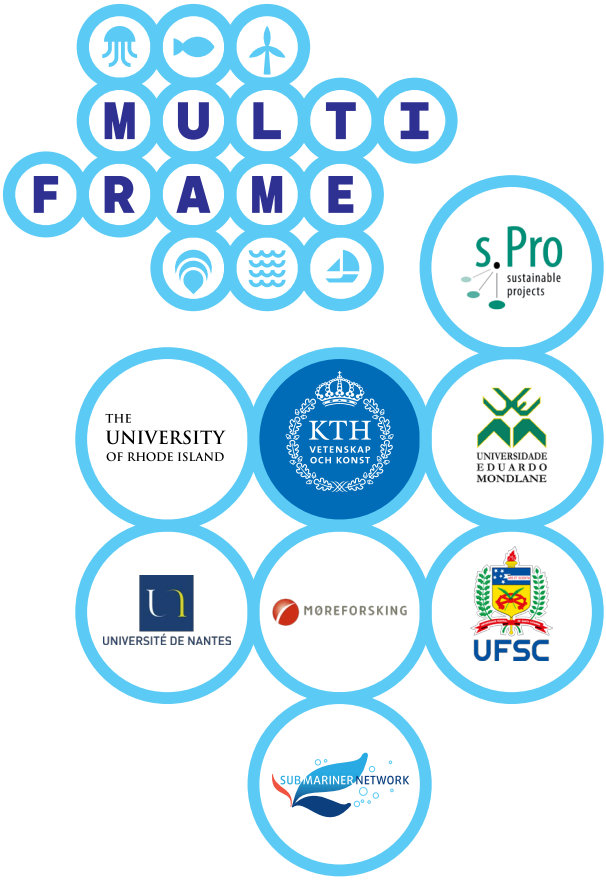

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