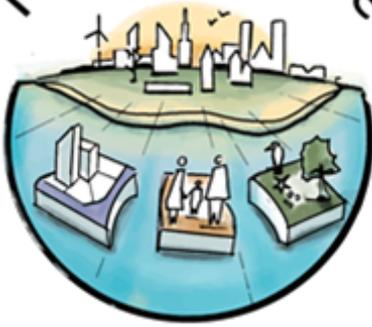


# Floating Future



# Offshore Multipurpose Hub Climate Café

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## Introduction to the case

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**PhD Researchers:** Xiaoyu Wang (TU Delft); Tim van den Bosch (UU, NIOZ); Emma Wolff (NIOZ); Miao Yu (TU Delft); Katherine Alvarez (TU Delft); Vera Hartman (NIOZ); Buddhi Weerasinghe (EUR)



The Offshore Multipurpose Hub case studies the possibility of developing a floating multipurpose hub in the Dutch North Sea. A floating multipurpose hub has the potential to reduce space conflicts, promote efficiency, and make more room for nature conservation by consolidating multiple activities in a single location.

This is a complex and challenging case which requires innovative technological solutions, improved ecological understandings, and novel governance arrangements. Therefore, the interdisciplinary collaboration of PhD researchers in the Floating Future project aims to integrate a variety of insights into a speculative design for an Offshore Multipurpose Hub. Over the last year the case study group has met regularly, including an inspiring trip to the Marker Wadden in October, to develop a shared trajectory.

The case study group has established the following goal:

*By 2028, the case study will result in an integrated sketch design for an offshore multi-purpose hub that promotes biodiversity and maximizes positive ecological impacts, while remaining scalable for future development. The design will*

*foster collaboration among a diverse range of actors; large and small, public and private. It will be rooted in its physical and social environment, and technically viable, laying the groundwork for sustainable and inclusive offshore innovation.*

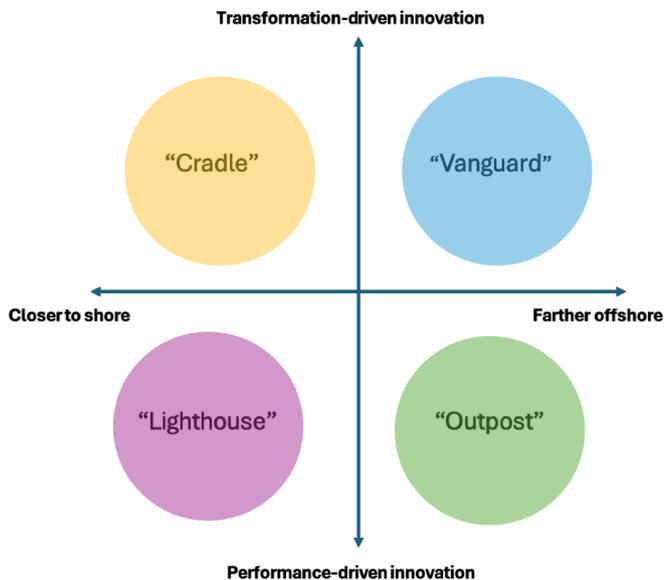
## Aim of the Climate Café

This Climate Café brought together a mix of relevant actors for a North Sea hub, including potential hub users, designers, investors, governmental actors, researchers, and other stakeholders. The participants were divided into four teams and challenged to: (1) formulate their perspectives for a floating hub and (2) build a conceptual design as a physical model which was tested in MARIN's facilities. The aim of the event was to incorporate multiple stakeholder perspectives into the sketch design of the floating offshore multipurpose hub.



## Scenario based designs

The groups were each asked to consider one of four scenarios for the hub's development. These scenarios were collaboratively developed by the case study coordination team, building on qualitative interviews and analysis conducted by Junior Researcher Erika Varik (RUG), with substantial input from PhD researcher Buddhi Weerasinghe (EUR). They are based on a quadrant where the X-axis varies from closer to shore to much further off shore. The Y-axis ranges from a focus on societal and environmental values and innovation to a focus on economic values including improved performance and efficiency. The groups were labelled: *Cradle* (near shore, innovation focus); *Lighthouse* (near shore, performance focus); *Outpost* (far offshore, performance focus); and *Vanguard* (far offshore, innovation focus).



The groups first spent time discussing the functions, services, and applications of the hub in their scenario, before developing a design sketch and building a model to test in the shallow wave basin. Each group produced a substantially different design vision for the hub based on the scenario they were assigned.



*Outpost (left) and Vanguard (right)*

First, in the far offshore context the Vanguard team chose to think about futuristic and speculative possibilities, designing an autonomous permanently inhabited hub which puts nature restoration at the center. The location is a challenge, but also provides opportunities to support research, fisheries, and monitoring of ecology and illegal activities. The Vanguard team's aim was to build something bigger than a pilot as a way to ambitiously show the world the potential for sustainable presence offshore.

In contrast, the Outpost group focused more on supporting existing activities in the North Sea such as defense, search and rescue, and support for renewable energy producers in an unmanned hub. This group designed a hub that was a place of refuge rather than accommodation. Because of its remote location it should be as autonomous and robust as possible.

In the nearer to shore context, the Cradle team designed a sort of innovation campus with space for research and education, small and medium sized enterprises, and tourism alongside shared services for offshore energy production, industrial functions, and the Coast Guard. This group also stressed that the Cradle would provide a space to



*Cradle*

experiment with less mature technologies and ideas which could later be applied in an Outpost-type setting.

The Lighthouse group developed a design which was oriented towards support for existing industries in the offshore environment. They did not want to explicitly include or exclude any functions in the long term, rather focusing on a “plug and play” model which can be adapted overtime. Furthermore, the Lighthouse team envisioned a hub where many activities occur elsewhere, and the hub provides a supporting role in terms of storage, charging, refuge, bunkering, and so on. The design includes a limited amount of temporary housing for personnel directly involved in activities on the platform.

### Reflections

Throughout the Climate Café it became clear that some of the scenarios are deemed more feasible in the short term (Cradle, Lighthouse), while others are seen as a possible next step in the more distant future (Vanguard, Outpost). The prevalence of the nearer to shore options also means that in the future it will be important for the Rotterdam Energy Transition case (in the Port of Rotterdam) and the Offshore Multipurpose Hub case to share insights and work together to connect their designs.

In terms of design, all four groups developed some form of modular design with a floating breakwater.

There were also some recurring ideas that were difficult to incorporate into the designs in the workshop such as temporarily submersible modules or underwater data centers incorporated into the mooring system.

The interdisciplinary nature of the day meant that researchers from multiple work packages were able to learn from each other and stakeholders to inform their future research. For instance, Buddhi Weerasinghe (EUR) was able to better understand possible ownership and governance models for a future hub. These insights give him an inspiring new direction to pursue in upcoming papers. Miao Yu (TU Delft) noted that all groups developed designs with irregular shapes, with implications for her research on hydrodynamics. Xiaoyu Wang (TU Delft) also found it interesting that several groups preferred unmanned platforms, shaping the criteria for his work on floating breakwaters. Furthermore, Katherine Alvarez (TU Delft) learned more about floating breakwaters and how they are connected to the main structure. This is relevant to her work on connectors between elements in a floating structure.





## The way forward

The case study team collected insights from each of the four designs and will use these to inform further development of their sketch design of the OFM. A more elaborate design will be developed in the design workshop (for members of the Floating Future consortium) on 16 April at Erasmus Univeristy Rotterdam. A scale model of this design will be constructed and tested in the MARIN basin in the 4<sup>th</sup> quarter of 2026. The basin tests will be used to yield insights for the technology and ecology focused researchers in order to advance their PhD trajectories.

Observations and insights from the workshop will therefore contribute to multiple academic outputs by the Floating Future team. Elizabeth MacAfee (RUG) will combine observations from this Climate Café with the other cases in her study of the PAR trajectory of the project. Erika Varik (RUG) was able to validate the scenario approach she established based on her interview research. This is an important analytical step that will be included in a paper she will submit about the framing of floating offshore multipurpose hubs in the North Sea.



We will continue to build on these connections and interdisciplinary insights moving forward with the Offshore Multipurpose Hub case study.

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Lighthouse

