D6.3 Restoration Demo at Wadden Sea

29/03/2024

WP6

Lead beneficiary: Deltares

Author/s: Sonja Wanke, Albert Vos, Evelien Meinders, Andreas Wurpts, Pushpa Dissanayake

REST-COAST

Large Scale RESToration of COASTal Ecosystems through Rivers to Sea Connectivity

This project receives funding from the European Union's Horizon 2020 research and innovation programme, under Grant Agreement 101037097

Prepared under contract from the European Commission
Grant agreement No. 101037097
EU Horizon 2020 Coordination and Support Action

Project acronym:	**REST-COAST**
Project full title:	**Large Scale RESToration of COASTal Ecosystems through Rivers to Sea Connectivity**
Start of the project:	01.10.2021
Duration:	54 months
Project coordinator:	Prof. Agustín Sánchez-Arcilla, Universitat Politècnica De Catalunya (UPC)
Type:	Restoring biodiversity and ecosystem services
Call:	H2020-LC-GD-2020-3
Deliverable title	Restoration Demo at Wadden Sea
Deliverable n°	D6.3
Nature of the deliverable:	Report
Dissemination level:	Public
WP responsible:	WP6
Lead beneficiary:	PENSOFT
Citation:	Wanke, S., A. Vos, E. Meinders, A. Wurpts & P. Dissanayake (2024). *Restoration Demo at Wadden Sea*. Deliverable D6.3. EU Horizon 2020 REST-COAST Project, Grant agreement No 101037097
Due date of deliverable:	Month n°30
Actual submission date:	Month n°30

Deliverable status:

Version	Status	Date	Author(s)
1.0	Draft	1 March 2024	Sonja Wanke (Deltares)
2.0	Revisions	28 March 2024	Albert Vos (Province of Groningen)
3.0	Final	29 March 2024	Sonja Wanke (Deltares)

Table of Contents

Preface

REST-COAST is dedicated to demonstrating the potential of scaled-up coastal restoration as a sustainable, low-carbon solution for climate adaptation and disaster risk reduction in vulnerable low-lying coastal systems. By enhancing biodiversity and ecosystem services (ESS), the project aims at tackling key technical, social, financial, and governance challenges impeding restoration endeavours. Through the "Restoration Revolution" concept, REST-COAST aims at dismantling obstacles such as limited stakeholders' engagement,economic uncertainties, and fragmented governance, thus facilitating extensive connectivity and the creation of climate-resilient habitats. REST-COAST seeks to showcase the benefits of coastal restoration by illustrating how active restoration measures contribute to supporting the increasing of biodiversity and delivering Ecosystem Services (ESS), referring to the valuable contributions that ecosystems make to human well-being (Potschin and Haines-Young, 2016).
Through a variety of dissemination and exploitation tools, WP6 "Dissemination/exploitation and socialtransformation tools" strives to ensure that all relevant socioeconomic sectors are provided with the necessary information to participate in and benefit from coastal restoration efforts.
This deliverable D6.3 describes the restoration interventions implemented in the Wadden Sea pilot site. Through proactive communication efforts, each pilot site aims at producing and disseminating demonstrative materials, reports on ongoing restoration activities, and targeted promotional videos to diverse audiences, ensuring an effective communication of the importance and benefits of a widespreadcoastal restoration.

Summary

The Ems-Dollard Estuary, straddling the Netherlands-Germany border, is a globally significant tidal region known for its diverse habitats, including sandflats, mudflats, and coastal salt marshes. Human activities since the Middle Ages, such as dike construction and peatland drainage for agriculture, alongside gas extraction, have significantly altered its landscape, leading to habitat loss and soil subsidence. The estuary faces challenges like deteriorated water quality due to deepening, dredging, and industrial settlements, extreme fine sediment accumulation, and disrupted ecological connectivity, exacerbated by farming practices and gas extraction.

In response, the Ems/Dollard2050 programme, launched in 2016, aims to deepen understanding of this complex system, with the Dutch launching various pilot projects and the Germans focusing on solving turbidity problems within the Masterplan Ems 2050 framework. Both countries are collaborating on a future-proof ecological sediment management strategy.

The estuary's challenges include climate-induced shifts in species distribution and reproduction timing, invasive species potential, navigation impacts, land reclamations, excessive sedimentation, habitat loss, and accelerated sea level rise. Addressing these requires a comprehensive, multi-scale approach that considers both local actions and broader environmental dynamics.

Planned restoration activities aim to enhance water quality, restore wetlands, and adapt to climate change, balancing ecological recovery with economic development. Despite the ports' economic significance, efforts are made to minimize dredging impacts and explore innovative sediment management solutions.

Demonstrative material highlights the benefits of ecological restoration, economic development, social and cultural benefits, and transboundary collaboration. The activities demonstrate the value of community engagement, strategic land acquisition for buffer zones, innovative land use, and climate adaptation measures, showcasing scalable and adaptable solutions for coastal restoration.

The demonstration value includes community engagement, strategic land acquisition, and innovative land use, with replication potential in scalable solutions, evidence-based decision-making, and integrated coastal zone management.

List of Abbreviations

ED2050	Eems-Dollard 2050
EU	European Union
ICZM	Integrated Coastal Zone Management

1 Introduction to the Pilot Site

The Ems-Dollard Estuary (Fig.1) is a globally unique estuary straddling the Netherlands-Germany border. This area is one of the world's largest tidal regions and is celebrated for its diverse habitats, including sandflats, mudflats, and coastal salt marshes. Human activities since the Middle Ages, such as dike construction and peatland drainage for agriculture, have significantly altered its landscape, leading to reduced estuary size due to sedimentation and salt marsh reclamation. Gas extraction also triggered soil subsidence.

There are many challenges facing the estuary. Human activities like deepening, dredging and industrial settlements have deteriorated the water quality in the estuary. Furthermore, the estuarine reach upstream of Dollart suffers from extreme fine sediment accumulation.

Meanwhile, farming practices and gas extraction have exacerbated land subsidence and peat oxidation. This is adding more greenhouse gasses to the atmosphere while making the polders more vulnerable to salinization. These practices both inland and along the coast have disrupted ecological connectivity between the sea and inland waters and removed gradients in the coastal landscape. The gradients that persist in the form of salt marshes are threatened by sea-level rise at the seaward side and the need for dike expansion on the landward side.

In response, the Ems/Dollard2050 programme was initiated to deepen our understanding of this complex estuarine and coastal system. Launched in 2016, this knowledge-driven initiative has seen the Dutch launch various pilot projects. On the German side, efforts are being spent on solving the turbidity problem in the upstream reach of the estuary within the Masterplan Ems 2050 framework and also pilots in the Ems-Dollart-part are in preparation. Both countries are working together on a future-proof ecological sediment management strategy.

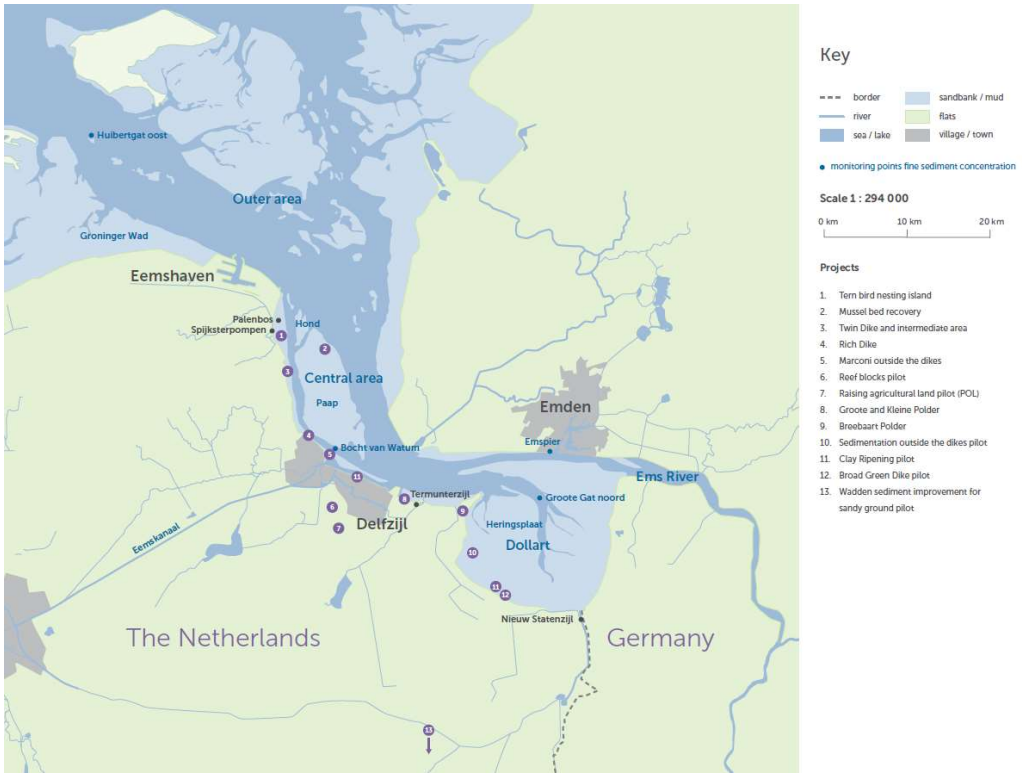

Figure 1. Ems Dollard estuary including restoration activities within the ED2050 programme.

1.1 Threats and Challenges to the Emd-Dollard Estuary

The Ems-Dollard Estuary, integral to the Wadden Sea's health and vitality, faces numerous threats, some of global scale and beyond local management control. The rising temperature and extreme temperature events have led to shifts in the geographical distribution of species, a shift in depth to cooler areas, and the timing of migration and reproduction of birds. Alien species could potentially become invasive and alter trophic regimes and habitats of the Wadden Sea.

1.1.1 Environmental and Climate Change Impacts

Rising temperatures and extreme weather events have led to significant ecological shifts within the estuary. Species distribution is changing, with marine life seeking cooler waters and birds altering their migration and reproduction patterns. The introduction of alien species threatens to disrupt existing trophic regimes and habitats. Moreover, accelerated sea level rise exacerbates flooding risks, and coastal erosion, and leads to the salinization of freshwater resources, posing a threat to both natural habitats and agricultural productivity.

1.1.2 Human Activities and Natural Processes

Human-induced changes, such as navigation impacts from port construction and fairway deepening, have altered the estuary's hydrodynamics, increasing water turbidity and disturbing marine sediments. Land reclamations have reduced ecosystem diversity and affected tidal dynamics. Additionally, excessive sedimentation and habitat loss due to both natural processes and anthropogenic activities are causing the estuary to silt up, diminishing food sources for fish and birds, and leading to a decrease in biodiversity.

1.1.3 Socio-Economic and Ecological Considerations

The estuary's challenges are further compounded by socio-economic factors, including soil subsidence accelerated by gas extraction and the need for maintenance dredging to support navigation and economic activities. These issues necessitate a balanced approach that considers the ecological, economic, and social dimensions of estuary management.

The Ems-Dollard Estuary's challenges are multifaceted, involving climate change, land use changes, and internal ecological shifts. Addressing these issues requires a comprehensive, multi-scale approach that considers both local actions and broader environmental dynamics.

1.2 Planned Restoration Activities

The strategies for enhancing the estuary system share common goals across both Dutch and German approaches, reflecting a unified vision for environmental improvement and sustainable development. These strategies are meticulously designed to address key environmental challenges while also considering the socio-economic context of the region. The primary objectives include:

1. **Enhancing Water Quality in the Estuary and Reducing Turbidity:** This goal focuses on improving the overall health of the water system by mitigating factors that contribute to poor water quality and high turbidity levels (Fig. 2 and Fig. 3). Efforts are directed towards reducing pollutants and sedimentation, which are crucial for supporting aquatic life and ensuring the clarity of water, thereby fostering a healthier ecosystem.
2. **Restoring Wetlands within the Estuary and Beyond Existing Flood Defences:** A significant emphasis is placed on the restoration of wetlands, aiming to rejuvenate these critical habitats by reintroducing

natural dynamics and creating new ecological niches. This initiative not only benefits biodiversity by providing habitats for various species but also enhances the estuary's resilience to environmental stressors. The restoration projects seek to balance ecological recovery with the preservation of the area's natural beauty and biodiversity.

3. **Adapting to Climate Change with an Emphasis on Enhancing Quality of Life:** Recognizing the imminent challenges posed by climate change, these strategies prioritize adaptive measures that safeguard the region against adverse impacts, such as sea-level rise and extreme weather events. By strengthening the estuary's natural defences and infrastructure, the initiatives aim to protect communities and ensure a sustainable quality of life. This approach integrates environmental stewardship with efforts to enhance social well-being, highlighting the interdependence of ecological health and human prosperity.

Figure 2. Inlet Double Dike under construction, as benchmark for Groote Polder.

Figure 3. Turbid water in front of the dike in the Eems-Dollard estuary.

While these environmental and ecological restoration efforts are underway, it is acknowledged that the ports within the estuary play a pivotal role in the regional and national economy. Therefore, maintaining the operational capacity of these ports is essential. This necessitates the continued dredging of shipping channels to ensure they remain navigable for commercial and industrial activities. The challenge lies in balancing the imperative of economic development with the commitment to environmental sustainability. This involves implementing dredging practices that minimize ecological impact, exploring innovative solutions to sediment management, and engaging in continuous monitoring to adapt practices as needed. Through a holistic and integrated approach, the aim is to foster a harmonious coexistence between economic activities and environmental conservation, ensuring the estuary's vitality for future generations.

1.3 Demonstrative Material of Restoration Benefits

1.3.1 Ecological Restoration

- Biodiversity Increase: The restoration of natural habitats such as salt marshes, mudflats, and transitional zones is expected to enhance biodiversity, providing habitats for a wide range of species. The Eems-Dollard has not that much diversity in species, but what there is must be conserved. In the current situation, the amount of birds, fish of certain species, seagrass, estuary related habitats and alge are under pressure.
- Water Quality Improvement: Efforts to manage sediment and reduce turbidity will improve water clarity, enhancing conditions for photosynthesis and supporting aquatic life. The aim is to extract 1 mln tons dry sediment per year for ten years with stricktly monitoring. The effect on the turbidity and the ecological conditions will be determined within the same ten years. In the end, the aim is to reduce the turbidity in the middle of the estuary with 20-50 %.
- Resilience to Climate Change: The program aims to create a more resilient estuary capable of adapting to climate change impacts, such as sea-level rise, through the restoration of natural processes and habitats.

1.3.2 Economic Development

- Sustainable Growth: By addressing ecological challenges, the program supports sustainable economic growth in sectors like agriculture, fisheries, and tourism.
- Innovation and Employment: Projects within the program can drive innovation in areas such as sediment management and ecological engineering, potentially creating new job opportunities.
- -Crossborder alignment of economic developments related to nature restoration

1.3.3 Social and Cultural Benefits

- Community Engagement: Involving local communities in restoration projects can enhance social cohesion and provide educational opportunities.
- Recreational Opportunities: Improved ecological health and water quality can boost recreational activities such as bird watching, hiking, and water sports, enhancing the quality of life for residents and attracting tourists.
- -The improvement of the Eems-Dollard estuary by using the surplus of sediment for low-lying agricultural land will be a longterm perspective for the farmers in the region
- -Including sitespecific knowledge within the upscaling by collaborating with the citizens. Giving the opportunity to improve the liveability of the citizens, on top of the aims of the program

1.3.4 Transboundary Collaboration

- Cross-Border Environmental Management: Collaboration with German partners aims to ensure a cohesive approach to managing the estuary, recognizing its ecological connectivity across national borders.
- Exchanging sediment related measurments
- -Intensivising knowledge exchange within the northern region of Germany and the Netherlands
- -Joint investigation to dredge in a more effective way, also related to spreading
- -Crossborder collaboration with knowlegde institutes, governments and NGO's

2 Wadden Sea Video(s)

The Wadden Sea video project is structured into two distinct segments to cater to varying audience interests and information needs. This approach ensures that the content is accessible and engaging for both general and specialized audiences.

2.1 Overview of the Video Segments

Short Film

The initial segment is a concise film designed to provide viewers with an overview of the challenges facing the Wadden Sea area. The primary objective of this short film is to foster awareness among the local communities and the general public about the ongoing efforts to address these challenges. It is crafted to be accessible, avoiding technical jargon to ensure comprehensibility for a wide audience. This film is an invitation to the viewers to gain a preliminary understanding of the project's goals and activities without delving into the complexities. The language of this segment is Dutch, emphasizing its aim to engage and inform the local communities directly.

Planned Extended Film

The second segment is planned to be an extended film that offers a deeper dive into the project, focusing on the technical aspects and the detailed workings of REST-COAST. This film is intended for viewers who seek a more comprehensive understanding of the project's scope, methodologies, and objectives. It will provide an in-depth exploration of what REST-CPAST entails the rationale behind the project's strategies and actions. To accommodate a broader audience, this film features both Dutch and English languages, with subtitles ensuring accessibility for non-native speakers.

2.2 Production of Pilot Site Video(s)

The primary goal of this short film was to create a narrative that resonates with the local community's experiences and concerns. It is crucial that the audience finds the content relatable and engaging, without the barrier of technical jargon or bureaucratic tone. At the same time, the film is committed to delivering content that is both accurate and impartial, ensuring that viewers receive trustworthy information. Through the combination of Roelf de Vries' local insights and Maarten Kleinhans' expert analysis, the video aims to inform, educate, and inspire action within the community.

Roelf de Vries, a dedicated volunteer with Groninger Landschap, has spent his entire life in the vicinity of the project site. His role involves guiding tours around Polder Breebaart, one of the pilot sites, where he shares his deep passion for and knowledge of the local natural environment. The decision to feature a volunteer like Roelf in the video was strategic, aiming to foster a genuine connection with the audience. His local roots and volunteer status help bridge the gap between the project and the community, offering a perspective that residents can easily relate to. By incorporating Roelf's narrative, the video not only highlights the significance of Polder Breebaart as a pilot site but also embodies the community's connection to their environment.

Professor Maarten Kleinhans, from the University of Utrecht, brings a wealth of knowledge to the project, especially regarding the Eems-Dollard area. His expertise is invaluable in discussing environmental challenges and proposing evidence-based solutions. As an independent expert not directly associated with any project partners, his contributions ensure the information presented is unbiased and credible. Filming his segment at the university further underscores his independence, providing a scholarly perspective on the issues at hand.

To enrich the visual narrative and provide viewers with a unique perspective of the Wadden Sea's breathtaking landscapes, additional aerial footage was captured last summer using drone technology (Fig. 4). This drone footage offers a bird's-eye view of the expansive natural beauty, highlighting the intricate ecosystems and the dynamic interplay between land and water that characterizes the Wadden Sea area. The inclusion of these aerial shots not only enhances the visual appeal of the video but also serves to underscore the vastness and ecological importance of the region. By integrating this footage, the video aims to deepen the audience's appreciation of the area's natural heritage (Fig. 5) and the critical conservation efforts underway, making the viewing experience both informative and visually captivating.

Figure 4. Drone footage Nieuwe Statenzijl area © ED2050.

Figure 5. Bird breeding island © Rijkswaterstaat.

3 Demo Activities

3.1 Hands-on Restoration Actions

3.1.1 Enhancing Resilience and Biodiversity: The Vision and Objectives of Eems-Dollard 2050 (ED2050)

In the Netherlands, REST-COAST has been integrated into the Eems-Dollard 2050 (ED2050, Fig. 6) program, a comprehensive effort aimed at enhancing the Eems-Dollard estuary's water quality, ecological value, and climate resilience. The ED2050 program encompasses fourteen projects and pilots, some of which are ongoing, targeting the estuary's improvement through various innovative measures. The program is structured around three primary objectives:

Figure 6. Eems-Dollard 2050 (ED2050, 2024)

1. **Improving the Estuary's Water Quality:** This involves reducing the water's turbidity by extracting 1 million tons of dry sediment annually from the estuary, thereby clarifying and revitalizing the water system.
2. **Expanding the Estuary:** The creation of brackish and salt marsh zones within the coastal area aims to enlarge the estuary's habitat, enhancing its biodiversity and ecological significance.
3. **Addressing Climate Change:** The program places a strong emphasis on making the coastal zone more adaptable to climate change, ensuring its resilience against future environmental challenges

Contribution Waddensea / Ems-dollard to REST-COAST

Work packages	It is about:	Deliverables:	Connected to:
WP 1	Hands-on restauration in pilots and study upscaling potention recovery ecosystem services (ESS)	Experiences from pilots, projects and pillars of scaling up	Groote Polder
WP 2	Risk assessment package with parameters hydro morphology and climate	Upscaling potential growing coastal zone in the modelling	Solutions perspectives: Pillars of scaling up
WP 3	Financial arrangements for the upscaling steps	Develop a financial model for the upscaling potential (Coastal zone fund?)	Solutions perspectives: Pillars of scaling up
WP 4	Develop adaptative pathways for the upscaling (with input from WP1,2,3)	Strategy for an adaptive upscaling approach, including the ecological quality of the coastal zone	Solutions perspectives: Pillars of scaling up
WP 5	Governance / regulations approach for large scale coastal zone recovery	Input for assessments and the SWOT	
WP 6	Exploitation instruments for public and private parties		
WP 7	Develop demonstration tool for demonstrating the feasibility		
WP 8	Ethic requirements		

Since its inception in 2016, ED2050 has marked several achievements, demonstrating the effectiveness of its targeted interventions. However, the journey towards fully realizing the program's core objectives—restoring the natural environment of the estuary and its surroundings(Fig. 7 and Fig. 8)—necessitates further efforts. Although the pilots and smaller projects have been instrumental in accumulating valuable insights on optimal improvement strategies and identifying prime locations for interventions, there remains a gap in knowledge and practical approaches for scaling up these restoration efforts. Addressing these challenges is crucial for advancing the program's mission to rejuvenate the natural coastal zone.

Figure 7. Expanding the estuary © ED2050 Geert Job Sevink.

Figure 8. Migrating birds © ED2050.

In the Netherlands, a comprehensive approach to coastal zone management and resilience is being advanced through strategic land acquisition, stakeholder engagement, and innovative land use planning. This multifaceted strategy not only aims to mitigate the impacts of climate change and industrial expansion but also to foster a collaborative environment for sustainable development. Here's an expanded overview of the key initiatives:

3.1.2 Strategic Land Acquisition for Buffer Zones

Approximately 200 hectares of land are being strategically acquired to serve dual purposes: firstly, to create buffer zones that mitigate the environmental impact of industrial sites on nearby villages, enhancing the quality of life and environmental health of these communities. Secondly, this land acquisition provides flexibility in land management practices, such as the opportunity to exchange agricultural land during the mechanical elevation of other low-lying areas. This proactive approach to land management is crucial for adapting to the changing landscape and ensuring the long-term sustainability of the region.

3.1.3 Governance and Stakeholder Meetings

- **14th of March 2024 Governance Meeting:** An informal session was organized to engage council members, representatives, and board members of the regional water authority. This meeting aimed to foster open communication and collaboration among local governance structures, ensuring that decision-makers are well-informed and aligned with the strategic objectives of coastal zone management.
- **25th of March 2024 Webinar on Scaling Potential (Investigation VLOED):** This webinar targeted a broad audience, including stakeholders, community members, and experts, to discuss the challenges facing the coastal zone. The session focused on the investigation of measures to address these challenges, emphasizing the need for a paradigm shift from a traditional coastline approach to a more integrated coastal zone management strategy. This includes considerations for land use, environmental conservation, and sustainable development practices.
- **2nd of April 2024 Meeting with Inhabitants:** A pivotal meeting was held with the local inhabitants to openly discuss the findings of the investigation VLOED and the proposed design of the Groote Polder. This session marked the first step towards upscaling the project, with a strong focus on community engagement and input. By involving the community in the early stages of planning and design, the initiative aims to ensure that the proposed measures align with the needs and expectations of those directly impacted by the changes.

These activities (Fig. 9 and Fig. 10) highlight the importance of engaging a wide range of stakeholders in the process of coastal zone management. By prioritizing strategic land acquisition, fostering open dialogue with governance bodies, and actively involving the community in decision-making processes, the Netherlands is setting a precedent for sustainable and resilient coastal zone development. Through these efforts, the country aims to achieve a balanced integration of environmental conservation, social well-being, and economic viability, ensuring a sustainable future for its coastal regions.

Figure 9. Guided tour to the seal viewing wall © ED2050.

Figure 10. Explanation of the mudflat seaweed © ED2050 Geert Job Sevink

3.1.4 Revitalizing the Ems Estuary: Strategies and Goals of the Masterplan Ems 2050

The Masterplan Ems 2050 (Fig. 11), initiated in 2014 on the German side, represents a strategic and comprehensive approach to revitalizing the Ems estuary. This initiative is driven by a series of ambitious goals aimed at addressing both ecological and economic challenges within the estuary, ensuring its sustainability for future generations. The primary objectives of the Masterplan Ems 2050 include:

Figure 11. Masterplan Ems 2050 (Masterplan Ems 2050, 2024)

- **Resolving the Fluid Mud Issue:** Targeting the reduction of fluid mud in the Unterems region upstream of Dollart to improve water flow and quality.
- **Enhancing Ecological Status:** Aiming to achieve favourable conservation conditions in the tidal reach by reducing the transport of upstream sediments, thus improving the overall ecological health of the estuary.
- **Habitat and Species Enhancement:** Focused on creating and enhancing estuarine habitats to support a diverse range of species, contributing to the biodiversity of the region (Fig. 12).
- **Bird and Habitat Protection:** Dedicated efforts to safeguard avian species and their natural habitats, ensuring their preservation and the maintenance of biodiversity (Fig. 13).
- **Maintaining Transportation Efficiency:** Ensuring the Ems remains a vital and efficient transportation route, supporting the economic activities of the Ems ports and related industries (Fig. 14).

Figure 12. Nature conservation area for natural habitat at Vellage (close to old Ems-Estuary) © Thorsten Kuchta.

Figure 13. Tide polder (at the right side: black-polygon) at Coldemüntje (close to Weener) © Thorsten Kuchta.

To support these overarching goals, several pilot projects aligned with a joint ecological sediment management strategy are slated to commence in 2024. These projects are meticulously designed to:

- **Promote Mudflat and Foreland Growth:** By implementing measures that encourage the natural expansion and stability of these critical habitats.
- **Enhance Seagrass and Salt Marsh Quality:** Focusing on the restoration and proliferation of seagrass beds and salt marshes, vital for the estuary's ecological balance.
- **Fine Sediment Management:** Strategies for the removal or stabilization of fine sediments to reduce turbidity, thereby improving water clarity and quality.
- **Protect Protected Areas:** Implementing sustainable measures to safeguard existing conservation zones, ensuring their ecological integrity (Fig. 15).
- **Coastal Zone Elevation Using Fine Sediments**: Utilizing dredged fine sediments as a resource to elevate and reinforce coastal zones, enhancing their resilience against erosion and sea-level rise.

The Masterplan Ems 2050 emphasizes a holistic approach to sediment management, focusing on reducing fine sediment accumulation in the inner estuary. This strategy not only aims to improve the ecological status of the estuary but also ensures the compatibility of environmental objectives with the economic functions of the Ems as a crucial transportation corridor. Through these integrated efforts, the Masterplan Ems 2050 seeks to foster a balanced coexistence between human activities and the natural environment, contributing to the long-term sustainability and health of the Ems estuary.

Figure 14. During a test-run for tide control at EMS-flood barrier: situation closed doors © Thorsten Kuchta.

Figure 15. Fish-lock facilitating to bypass fish at Herbrum – Papenburg © Thorsten Kuchta

3.2 Demonstration Value and Replication

3.2.1 Demonstration value

- **Community Engagement and Stakeholder Involvement:** The activities exemplify a participatory approach to environmental restoration, where stakeholder engagement is central. By involving local inhabitants, governance bodies, and other stakeholders in discussions and decision-making processes, the activities demonstrate the importance of building consensus and ensuring that restoration measures resonate with the community's values and needs. This approach enhances the likelihood of successful implementation and long-term sustainability of the project outcomes. A list of stakeholders in the Wadden Sea region can be found in Annex I.
- **Strategic Land Acquisition and Buffer Zones:** The acquisition of approximately 200 hectares for creating buffer zones between industrial sites and villages illustrates a proactive strategy for mitigating environmental impacts while promoting ecological restoration. This aspect of the demo highlights the potential for integrating land management practices with conservation goals, serving as a model for other regions facing similar challenges.
- **Innovative Land Use and Climate Adaptation Measures:** The activities showcase innovative approaches to land use planning and climate adaptation, such as the mechanical raising of low-lying lands and the creation of brackish/salt marsh zones. These measures not only contribute to ecological restoration but also enhance the area's resilience to climate change, demonstrating scalable solutions for coastal zones globally.

3.2.2 Replication (Upscaling) Potential

- **Scalable and Adaptable Solutions:** The restoration activities within this demo are designed to be scalable and adaptable, allowing for their application in diverse geographical and socio-economic contexts. The insights gained from the pilot projects, such as the effective management of fine sediments and the enhancement of estuarine habitats, provide valuable lessons that can inform larger-scale restoration efforts in other coastal areas.
- **Evidence-Based Decision Making:** The demo provides a framework for evidence-based decision-making, where the outcomes of pilot projects and investigations (e.g., VLOED) inform the design and implementation of upscaling efforts. This approach ensures that restoration activities are grounded in scientific research and practical experience, enhancing their effectiveness and efficiency.
- **Integrated Coastal Zone Management (ICZM):** The demo underscores the importance of adopting an Integrated Coastal Zone Management approach, which considers the interdependencies between land use, ecological conservation, and socio-economic activities. By demonstrating the benefits of ICZM in achieving sustainable coastal restoration, the project paves the way for its replication in other regions seeking to balance environmental, social, and economic priorities.

4 References

ED2050. (2024). Retrieved from Why this programme?: https://eemsdollard2050.nl/english/why-this-program/

Masterplan Ems 2050. (2024). Retrieved from https://www.masterplan-ems.info/en

Wadden Sea World Heritage. (2023). Retrieved from Beyond World Heritage: https://www.waddensea-worldheritage.org/beyond-world-heritage

Annex I – Wadden Sea Cross-Border Stakeholders

As the Wadden Sea is part of three countries, it is governed on different levels. National, federal (Germany) and regional levels with its regulatory framework differing in each country. Since all three countries are part of the European Union, they have to conform to EU Directives, such as the Habitats and Birds Directives and related Natura 2000 sites, the Marine Strategy Framework Directive and the Water Framework Directive. To preserve the "biological, scenic and scientific importance of the Wadden Sea" the three countries bordering the Wadden Sea agreed to cooperate on protecting it and established the Trilateral Wadden Sea Cooperation (TWSC, Fig. 16) (Wadden Sea World Heritage, 2023).

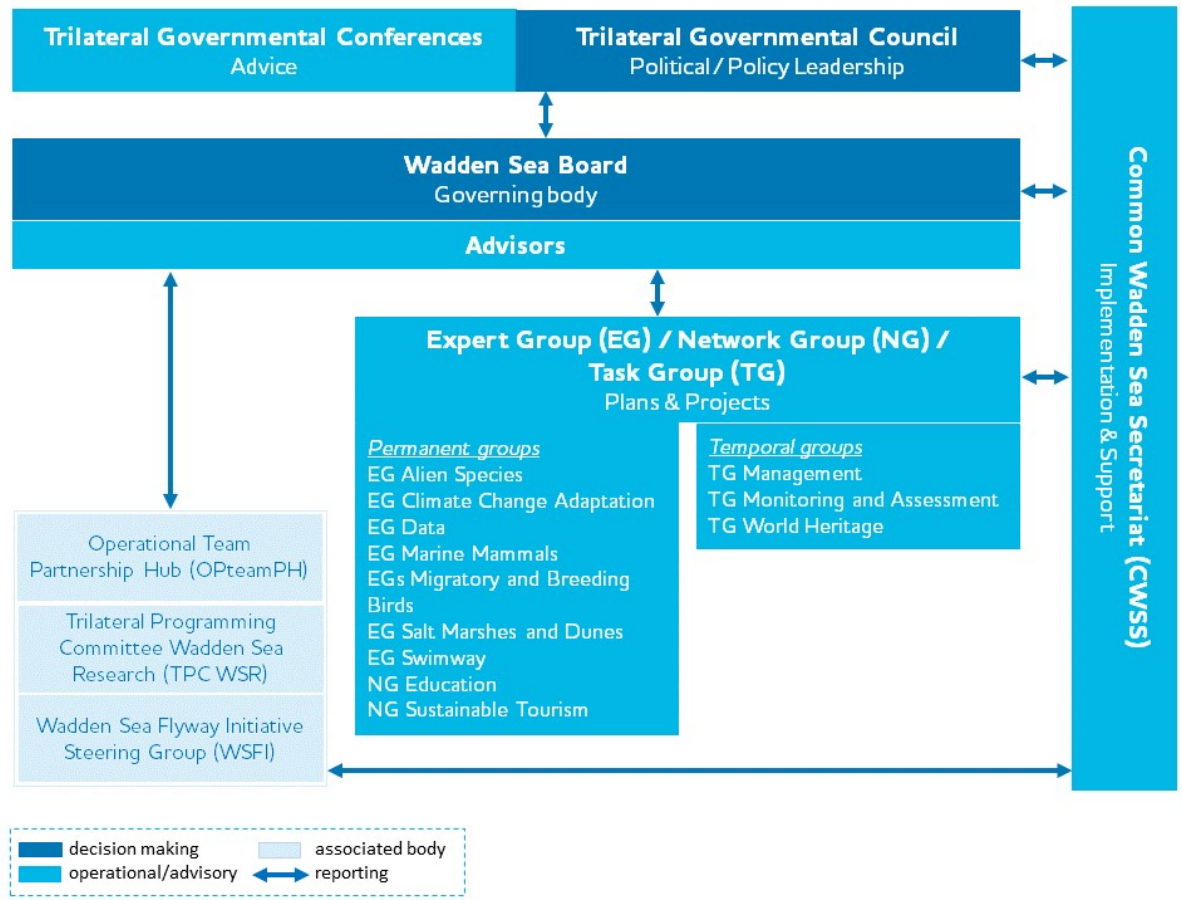

Figure 16. Trilateral Wadden Sea Cooperation (TWSC) governance structure.

The TWSC works with numerous stakeholders in the Wadden Sea Area as well as external organisations such as UNESCO, IUCN and other natural World Heritage sites. The following organisations, however, are those which form the cooperation. They actively shape the Wadden Sea conservation as members of and advisors to the Wadden Sea Board.

Netherlands

- Ministerie van Landbouw, Natuur en Voedselkwaliteit
- Ministerie van Infrastructuur en Waterstaat
- Ministerie van Economische Zaken en Klimaat
- De Waddeneilanden
- Waddenzeegemeenten
- Provinces: Fryslân, Groningen, Noord Holland

Supporting organisation: Rijkswaterstaat

Germany

- Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz
- Bundesamt für Naturschutz
- Behörde für Umwelt, Klima, Energie und Agrarwirtschaft Hamburg
- Ministerium für Energiewende, Landwirtschaft, Umwelt, Natur und Digitalisierung des Landes Schleswig-Holstein
- Niedersächsisches Ministerium für Umwelt, Energie und Klimaschutz

Supporting organisations: Nationalparkverwaltung Schleswig-Holsteinisches Wattenmeer, Nationalparkverwaltung Niedersächsisches Wattenmeer, Nationalparkverwaltung Hamburger Wattenmeer

NGOs

- Wadden Sea Forum
- Wadden Sea Team (currently represented by Danish Ornithological Society, It Fryske Gea & WWF Germany)