2021 2030 United Nations Decade of Ocean Science for Sustainable Development

Flanders State of the Art

Flanders Region in Belgium

Gearing up our blue knowledge

Tackling ocean challenges in the UN Decade of Ocean Science for Sustainable Development 2021-2030

– 2025 edition –

Together we tackle ocean challenges in the UN Decade of Ocean Science

for Sustainable Development 2021-2030

Flemish Government
Department of Work, Economy, Science, Innovation and Social Economy (WEWIS)
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- Flanders Marine Institute - Vlaams Instituut voor de Zee vzw
- Flanders' Blue Cluster - De Blauwe Cluster vzw
- Provinciale Ontwikkelingsmaatschappij West-Vlaanderen (POM West-Vlaanderen)

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The Oval Office.
Photo: Operators on a VLIZ ICOS buoy © VLIZ – Bart De Smet

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DEPARTMENT OF WORK, ECONOMY SCIENCE, INNOVATION & SOCIAL ECONOMY

VLIZ

POM West-Vlaanderen

BLUE CLUSTER

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Editorial

“Flanders’ continued investments in science, technology and innovation are key to a sustainable blue economy with world-wide relevance”

Mr Matthias Diependaele

The Government of Flanders is committed to keep on supporting the blue knowledge and innovation ecosystem.

With the Decade for Ocean Science for Sustainable Development at mid-term (2025), we witness an ever more vibrant marine research and innovation community in Flanders, open to the world. Organisations like Blue Cluster, Ostend Science Park, Flanders Marine Institute play a strong role for all the actors in the marine and maritime R&I ecosystem. All share a drive to work towards the objectives of the Decade, and support knowledge workers conscious of the need to make our maritime activities sustainable.

Within a challenging geopolitical context, the Government of Flanders is deploying a coherent Flemish Plan for Industry, aiming to boost the competitiveness of our companies. It addresses actions and structural measures with respect to energy, innovation, decarbonisation, infrastructure, STEM education, circular economy and licensing.

The creation of Flanders’ Blue Cluster in alignment with the European Blue Growth Strategy is bearing fruit. The blue economy in Flanders accounts for almost 175 000 full-time jobs, representing no less than 5.2% of Flanders’ GDP, which means it is comparable in size to the Flemish food industry or the Flemish chemical and life sciences cluster. Innovation opportunities for businesses are growing both in traditional maritime economic activities and in emerging or developing sectors.

All these activities are in evidence in the relatively small Flemish part of the North Sea, one of the world’s busiest maritime areas. Good overall governance of co-existing uses is ensured by the federal Belgian marine spatial plan. Coastal protection plans are preparing for enhanced sea-level rise. Other threats are addressed with new sophisticated and technologically advanced diagnostics and measures. Now that Flanders’ blue economy is booming and contributing to a blue industrial revolution, we need to be fearless and raise our ambition towards the horizon. And the possibilities are endless! Think of new forms of offshore energy, such as floating solar panels that can withstand the high sea waves and are resistant to salt, or new sustainable breeding techniques for seaweed or shrimp. Training and capacity building embrace new approaches to boost the qualifications of prospective employees and entrepreneurs, such as the Blue Growth Summer School. Supported by the Government of Flanders, it provides international students with shop floor experience in the Blue Economy.

The new blue industrial revolution needs to contribute to sustainable development and rely on solid scientific evidence and support. The regularly updated online Compendium for Coast and Sea of VLIZ documents the vibrant marine research community in Belgium. It consists of many research groups spread over a large number of university faculties and governmental scientific institutes throughout the country. VLIZ provides services to this ‘archipelago’ of marine researchers. It is also mandated to support the blue economy development through scientific knowledge, infrastructure, data and information.

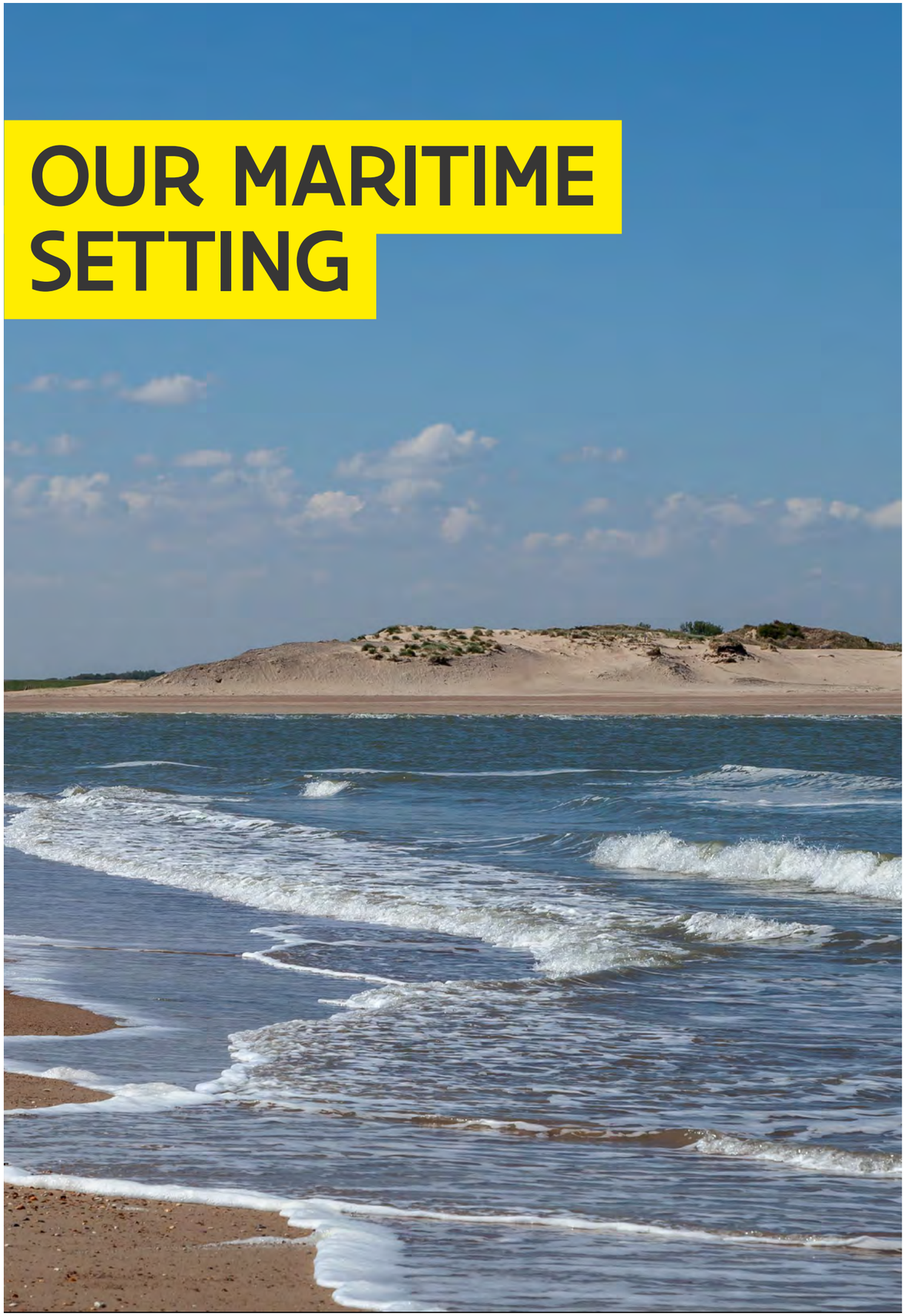
The historic port city of Ostend is an established hub and catalyst for international knowledge-based blue innovation. Teaming up with Blue Cluster, VLIZ and ILVO are key players linked to the wider world in various co-housed international initiatives. Researchers from our internationally renowned academic faculties find modern high-tech research infrastructure at Ostend Science Park, the neighbouring Flanders Hydraulics Research ‘Coastal and Ocean Basin’, and the VLIZ Marine Robotics Centre at Marine Station Ostend. The Government of Flanders gladly supports this favourable wind through operating and project resources. The impact of this Blue Research and Innovation system in the coming years will largely depend on the strength of its cooperation and impactful partnerships. By being complementary, by using each other’s strengths and by joining forces, the impact on our blue economy and on society will be huge. Technology creates opportunities for fast scientific advances, so science and innovation have to go hand in hand.

The UN has declared a Decade of Ocean Science for Sustainable Development from 2021 to 2030. It urges us to reconcile our way of life with the limits of the Earth, in particular those of the ocean and the seas, which have so much to offer. The diversity of all our activities and competences to contribute to the Decade’s objectives are spelled out in this publication. Let’s make the Decade a joint learning experience on how the ocean helps us achieve the Sustainable Development Goals. I invite you to join us in our global efforts towards an Ocean we need for the Future we want!

Mr Matthias Diependaele

MINISTER-PRESIDENT OF THE GOVERNMENT OF FLANDERS, FLEMISH MINISTER FOR ECONOMY, INNOVATION AND INDUSTRY, FOREIGN AFFAIRS, DIGITALISATION AND FACILITY MANAGEMENT

OUR MARITIME SETTING



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Less well-known region with a truly maritime identity

Meet Flanders, a region bordering the southern Bight of the North Sea, shaped by many interactions with the sea. For centuries, its people have largely benefitted from their proximity to the ocean, be it for food, shelter, cultural exchange and trade, defence and even in the continuous struggle to claim the low-lying land from the sea. This relationship has proven fertile ground for the development of maritime competences and a maritime identity that continues to this day and is present in cutting-edge marine research and bold innovations for a maritime economy.

Within the scope of the UN Decade of Ocean Science for Sustainable Development (2021-2030), Flanders builds on its true maritime identity, its broad expertise, long-standing traditions, maritime skills and capacities. It reaches out to share these and shape strong collaborations based on ocean science, knowledge and innovative approaches. Flanders grasps the unique opportunity of the Ocean Decade to join forces in a decade of open international collaboration to guide us in the transition to the ocean we need for the future we want **p.8-9**

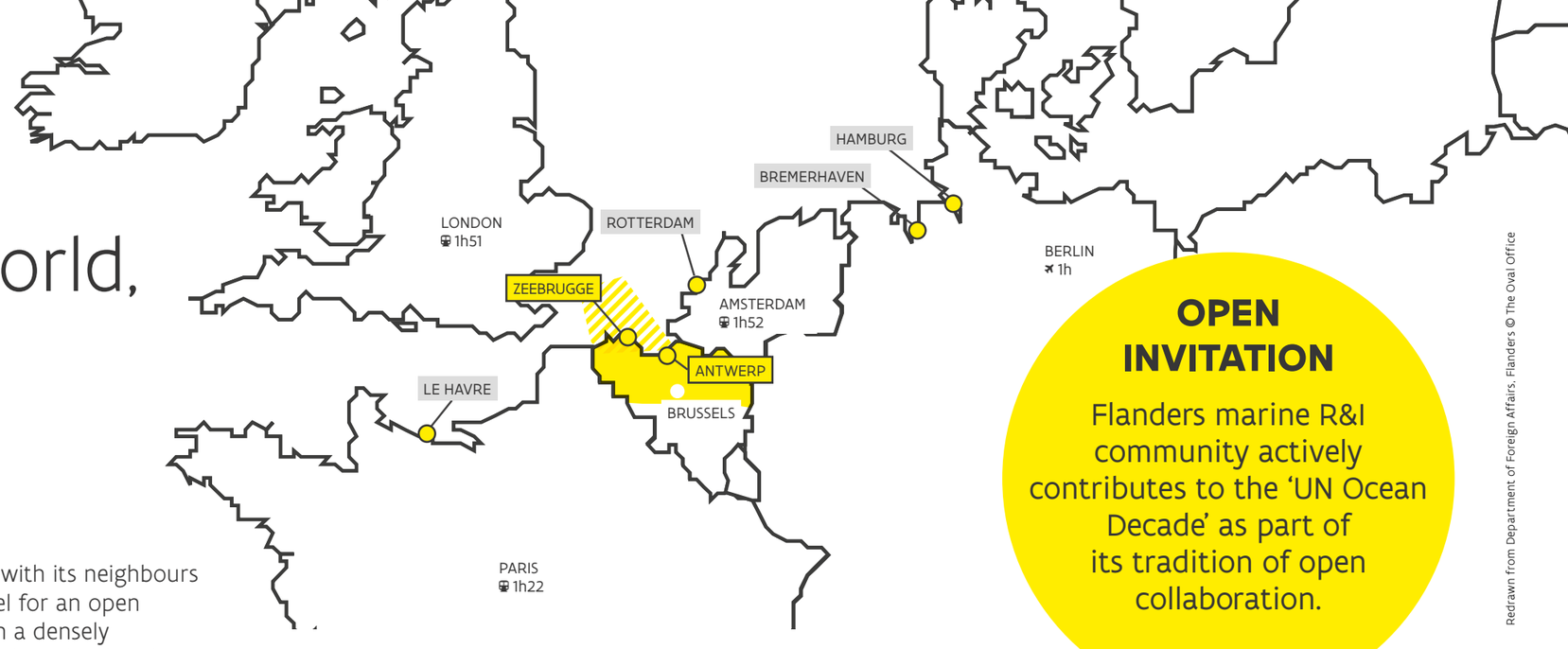
And … the science we need for the ocean we want. Take a bird's eye view of our marine science and innovation landscape, its roots and dense connections in society:

- Flanders' Science, Technology, and Innovation (STI) system embeds and feeds a strong marine and maritime STI system. Discover its key features **p.10-11**, and position in a broader international perspective. **p.12-13**
- Our maritime space is a busy place! A myriad of coastal and maritime users have high stakes in this densely used part of the North Sea. The high density and diversity of demands for space requires a strong and forward-looking vision that guides us in the constant search for synergies. Belgium's marine spatial planning generates opportunities, allowing all actors to move forward together to achieve the societal outcomes we need. **p.14-15**
- In preparing for the Ocean Decade, Flanders' ocean science community actively participated in the discovery of our main strengths and prominent opportunities, which we now shape as solid contributions from Flanders to the Ocean Decade. Our tradition in open science, sharing data and infrastructures, our taste for working in a multidisciplinary environment and our commitment to supporting capacity development for more equitable access to the ocean are the cross-cutting principles in all our contributions. **p.16-17**

Going forward into the Ocean Decade, our preferred model is that of multi-stakeholder cooperation across different actors, with strong connections between education opportunities, basic research, facilitating access to knowledge and fostering innovation for improved societal outcomes. **p.18-19** We continue to invest in infrastructures for marine research and innovation as key enablers that trigger the societal and technological innovation we need for a sustainable use of the ocean. **p.20-21**

Take a deep breath and enjoy an exciting dive into marine and maritime research in Flanders. Get in touch to explore new collaborations!

Flanders: open to the world, connected by the sea, in the heart of Europe



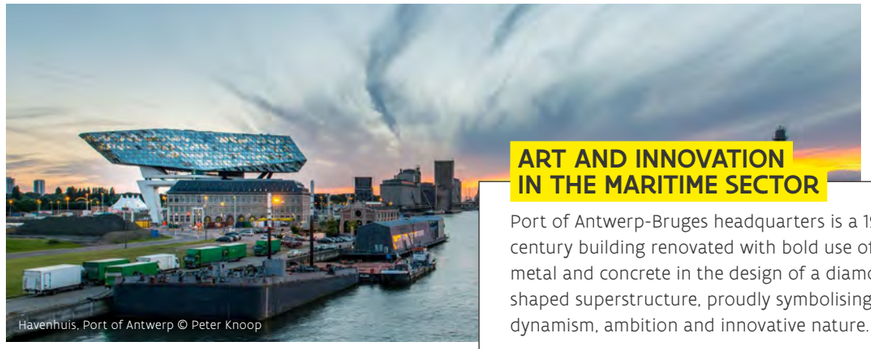
Redrawn from Department of Foreign Affairs, Flanders © The Oval Office

Small but well connected

Flanders has always acknowledged the importance of working with its neighbours in trade, culture, politics, or science. Today the region is a model for an open society with a knowledge-based economy. It is a '*living lab*' with a densely populated coastal area and a challenging demand for space both on land and at sea. Technology and societal innovation help address the challenges these low-lying lands are facing, while driving sustainable development.

OPEN INVITATION

Flanders marine R&I community actively contributes to the 'UN Ocean Decade' as part of its tradition of open collaboration.


Havenhuis, Port of Antwerp © Peter Knoop

ART AND INNOVATION IN THE MARITIME SECTOR

Port of Antwerp-Bruges headquarters is a 19th-century building renovated with bold use of glass, metal and concrete in the design of a diamond-shaped superstructure, proudly symbolising its dynamism, ambition and innovative nature.

EARLY CASE OF 'BLUE INNOVATION'

Science in an oyster-tasting centre, 1843. When Belgian zoologist Pierre-Joseph van Beneden settled his marine station in Ostend, he was unlikely to think of himself as an early adopter of the 'co-design' principles. The saltwater basins and continuous supply of fresh specimens provided an innovative environment for his research and solved the challenge of obtaining fresh samples for his students' seminars.


Oostende oyster farm Valcke-Deknuyt. Source: Hamoir, G. (2002). VLIZ


Marine Station Oostend, VLIZ © Nick Decombel

LONG-STANDING TRADITION IN MARINE SCIENCE

Renowned researchers from all over Europe gathered here to discuss innovative ideas about the functioning of living organisms in their marine environments. Today it is an open lab for science collaboration and hosting specialized research infrastructures. [1]


Cargo in transit in the Western Scheldt © Port Anterp-Bruges

FLANDERS' PORTS, GATEWAYS TO A GLOBAL WORLD

With over 150 000 ships a year crossing its navigation ways, Flanders is situated at one of the busiest shipping routes in the world and seaports are the engine of its economy. The market share of the Flemish sea ports (Ostend, Antwerp-Bruges, North Sea Port (Ghent)) represents 26% of the total transhipment of goods in the Le Havre-Hamburg range. [2]

FLANDERS IS:

- Strategic location in the heart of Europe
- Excellent transport infrastructure
- Tailored incentives for companies
- World-class maritime companies
- State-of-the-art research centres
- Highly skilled work force
- High quality of life

HORSEBACK SHRIMP FISHING: UNESCO CULTURAL HERITAGE

Horseback shrimp fishermen sit in wooden saddles on their Brabant draught horses, dragging large bottom trawl nets. Flanders is the only place left in the world where this 500-year-old tradition of shrimp fishing is still in practice. Thousands of visitors enjoy the 'open air classes', learning about local marine biodiversity and traditional and current fishing practices. [3]


Horseback shrimp fishermen © Westtoer

Powerful research and innovation environment

Flanders invests in Science, Technology and Innovation (STI) with a substantial contribution to ocean science

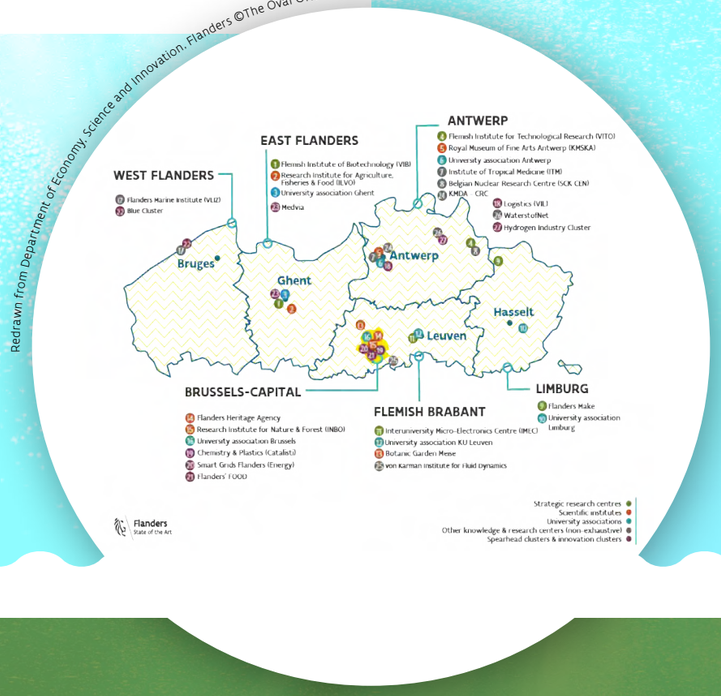
Marine and maritime research and innovation are firmly embedded in a broader and stimulating environment. 'Connectors', such as clusters and hubs, ensure that knowledge and expertise are broadly available to all interested parties.

Key players in the distributed network of coastal and marine research

Flanders Marine Institute (VLIZ) is the coordination platform for marine, coastal and estuarine research in Flanders, and has a complementary research strategy. Most marine research is carried out by the five university associations, the strategic research centres and research performing organisations in specific fields of expertise such as water management, engineering and hydraulics, fisheries and aquaculture, and ecosystem and biodiversity research. Discover marine research groups (MRG) and explore their fields of expertise in the national reporting Compendium for Coast and Sea. [4]

More than 1,400 marine experts across a very diverse range of disciplines are actively involved in marine and coastal research. Around 80% of the marine research is situated in marine waters and coastal areas abroad.

Compendium for Coast and Sea



FLANDERS' MARINE AND MARITIME STI SYSTEM

© De Blauwe Cluster

Growing the blue economy

Blue Cluster is an innovation platform that brings together private companies, seaports, relevant authorities and knowledge institutions to set up innovation projects in different areas of the sustainable blue economy. Boasting nearly 200 members, it strives towards a future where a forward-looking blue economy drives prosperity and sustainability. Within this scope, Blue Cluster aims to connect the economic ecosystem, support emerging technologies, and anchor the cornerstones of the blue economy in Belgium and beyond. [6]

FLANDERS STI SYSTEM

Strong basis in education and science

The backbone of Flanders' research output is shaped by the five universities and university college associations (Antwerp, Brussels, Ghent, Hasselt, Leuven), the four strategic research centres (Flanders Make, imec, VIB, VITO), and knowledge institutes that focus on domains such as marine sciences (VLIZ), tropical health (ITM), agriculture, fisheries and food (ILVO), nature and forests (INBO), hydraulics and engineering (Flanders Hydraulics) as well as in various collective research institutes active in specific fields.

FLANDERS RESEARCH INFORMATION SPACE

An open-source data system informs on all publicly funded research in Flanders. It is a gateway to find researchers, projects, infrastructures, patents, and datasets and supports open science production in Flanders. [5]

CLUSTERS

Flanders Innovation & Entrepreneurship (VLAIO) supports six Spearhead Clusters in the domains in which industries intensify collaborative innovation: sustainable chemistry and synthetics (Catalisti), health tech (MEDVIA), logistics and transport (VIL), agrofood (Flanders' Food), energy (Flux50), and blue growth (Blue Cluster). [7]

Flanders, centre of innovation

Public sector policy for innovation is strongly developed, with pride of place for a renewed cluster policy. A detailed description of this whole ecosystem is updated in the STI in Flanders. [8]

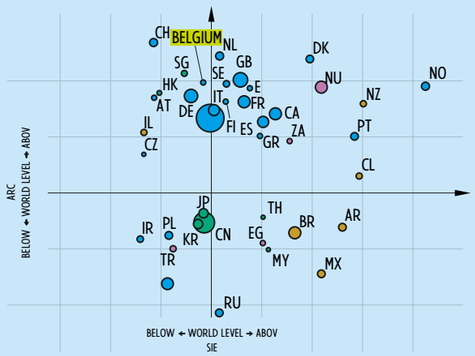
Powerful research and innovation environment

Strong international position of Flanders STI and ocean science

Flanders' (Belgium) marine researchers score far above average in terms of international cooperation and are strongly embedded in international marine networks. Their knowledge is applied widely, from the navigability of the Panama Canal, over understanding environmental effects of deep-sea mining in the Pacific, to monitoring structural health in offshore infrastructures.

Flanders international partnerships in Ocean Sciences

International cooperation is at the core (80%) of Flanders marine research programmes and partnerships. Flanders hosts and supports the International Ocean Data and Information Exchange (IODE) Project Office of the IOC/ UNESCO in Ostend, a worldwide reference for ocean data and information management. As an active contributor to the United Nations 'Ocean Decade', Flanders Marine Institute is endorsed as Decade Implementing Partner. It hosts the National Decade Committee and runs a grant-making facility for the Ocean Decade. Flanders also hosts the Flanders UNESCO Science Trust Fund (FUST) and co-chairs the Global Ocean Science Report of the IOC/ UNESCO. [11]



Relative score for scientific impact (ARC) and specialisation (SI) in ocean science. Belgium scores high on excellence and diversification in ocean science. [9]

© Redrawn from IOC-UNESCO. 2020. Global Ocean Science Report 2020–Charting Capacity for Ocean Sustainability. K. Isensee (ed.). Paris, UNESCO Publishing.

© Compendium Coast & Sea - Indicator Report Marine Research and Innovation 2023

Geographic visualisation of the percentage of joint marine peer-reviewed and VABB publications between 2018 and 2022 of FLemish Marine Research Groups according to country of affiliation of the coauthors. [12]

FLANDERS MARINE AND MARITIME STI SYSTEM

Flemish innovation for globally sustainable blue economy

Blue Cluster is actively engaged in international partnerships and open to joining forces with similar clusters and consortia from abroad. To stimulate innovation and market development, Blue Cluster takes its members and partners on inspiring site visits abroad. It welcomes international delegations in Flanders and is a strategic partner of Flanders Investment and Trade (FIT), the Flemish agency that facilitates investment projects in Flanders and supports Flemish export companies.

OCEAN ECONOMY

The Ocean Economy Group of the OECD-STI promotes the exchange of knowledge to improve the research and innovation policy mix for sustainable ocean management.

Flanders was an active member of this group, which provides decision-makers with evidence on industries, science and innovation to harness the ocean economy's potential in a responsible and sustainable way. The group is developing blueprints for improved measurement of the international ocean economy through satellite accounting.

Flanders also champions the use of public marine data and repositories to generate societal value. [13] An OECD-Flanders cooperation reveals how Flanders' repositories enable the reuse of marine data across a range of sectors, contribute to improved decision making, and generate benefits for wider society. This work is part of the OECD Value Chains of Public Marine Data project and relates to broader efforts to improve understanding of the economics of open data. [14]

© OECD Science, Technology and Industry Working Papers, No. 2024/04, OECD Publishing, Paris.

© OECD (2025), The Ocean Economy to 2050, OECD Publishing, Paris.

FLANDERS STI SYSTEM

Long history of innovative academic excellence

Flanders comes in at fourth place in the world for outstanding higher education and training. Flanders' universities are third in management education and third in math and science education. They rank in the European top 3 as far as the number of scientific papers published per 10,000 inhabitants goes. [10]

Flanders tops the innovation charts

European innovation **leader** region

Best university business accelerator worldwide: Imec.istart

7th-most innovative university in the world: KU Leuven

3 Biotech incubators from Flanders in European top 20

Flanders' reputation as an innovation region

At the top of the charts in R&D, innovation and collaboration between industry, academic and governmental institutions:

- first in Europe when it comes to the proportion of enterprises with innovation activities and for cooperation between science and SMEs
- third-best innovative system in the world
- ninth worldwide for collaboration between industries and universities. [15]

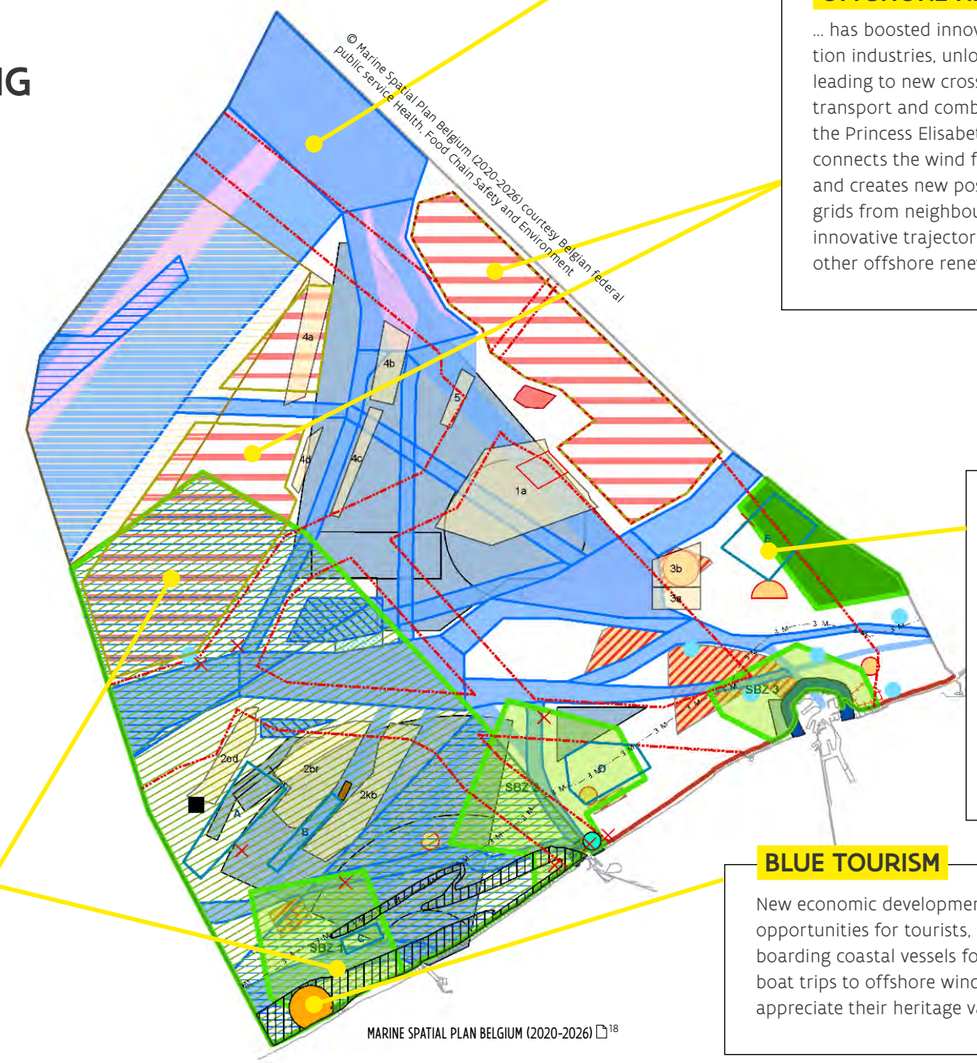
Interconnecting the societal outcomes:

Moving forward together

A living lab in the Belgian part of the North Sea

An early adopter of integrated coastal area management (2002) and pioneer of the first marine spatial planning initiative globally (2003), Belgium has a legally binding marine spatial plan (MSP), which is updated every six years (2014, 2020, 2026). From 2026 onwards, 8-year update cycles will be implemented.

JOIN US IN EXPLORING EXAMPLES IN OUR MARINE WATERS:



MARINE SPATIAL PLAN BELGIUM (2020-2026) [18]

SAFETY PREVAILS

In 2017, through broad consultation, new shipping routes were set out in Belgian and Dutch waters to take account of the current and future development of wind farms without compromising safety at sea.

THE RAPID DEVELOPMENT OF OFFSHORE RENEWABLE ENERGY...

... has boosted innovation in the energy and construction industries, unlocking wider societal innovation, leading to new cross-border infrastructures for energy transport and combined use of space. Construction of the Princess Elisabeth Island started in 2024. It connects the wind farms from the sea to the mainland and creates new possibilities for connecting electricity grids from neighbouring countries. Additionally, innovative trajectories investigate the potential of other offshore renewables, e.g. floating solar power.

SEAFLOOR DISTURBANCE... AND RESTORATION

Five zones are defined for the disposal of dredged materials and are subject to a regulating and monitoring framework to mitigate impact on biodiversity and ecosystem functioning. In other areas, measures are taken to mitigate the impacts from sea floor disturbance from human activities by restoring biogenic and geogenic reefs such as gravel beds and oyster reefs through innovations such as fishing gear with lower seafloor impact. Innovative nature-based engineering techniques are explored to strengthen resilience of coastal zones and mitigate impact of climate change. [16]

NATURE...

... can go hand in hand in conflict. Have a second look: military training activities are allowed outside seasons when protected seabirds dwell and feed in the area. Wind farm foundations provide the conditions for 'artificial reefs'. [17]

AREAS FOR SCIENCE AND TECHNOLOGICAL INNOVATION

In principle, research can take place anywhere in the Belgian part of the North Sea (unless specified otherwise). In addition, specific zones for innovation have been defined, e.g. a test zone to experiment with new technologies and validate pilots, an area for calibration of acoustic equipment and predefined zones for commercial and industrial activities.

BLUE TOURISM

New economic developments and investments create innovative opportunities for tourists, such as visiting aquaculture sites, boarding coastal vessels for shrimp fishing and tasting, making boat trips to offshore wind farms, and diving on shipwrecks to appreciate their heritage value.

From constraint to opportunity

The limited area of the Belgian marine waters (3454 km²) creates a challenge to meet demand by traditional and emerging uses, public and private. This constraint is the ingredient for a new systemic approach: integrating usage in all four dimensions of time and space through marine spatial planning, innovative users' agreements and new economic opportunities. [18]

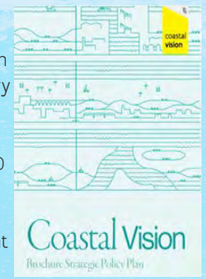
Joining strengths in transdisciplinary approach

Designing solutions in a systemic way requires a deep understanding of ecosystem functioning and jointly building insights on effects of human interventions. Transdisciplinary and sustainability science support this transition.

In 'navigating the future', the European marine science community calls for moving beyond an integrated interdisciplinary approach by including different stakeholders as co-designers, knowledge producers and users. This practice is coined 'sustainability science'. [19]

European Marine Board (2024) Navigating the Future VI: Placing the Ocean within the wider Earth system. Position Paper 28 of the European Marine Board, Ostend, Belgium.

Integrated planning needs breakthrough technologies as well as innovation in governance and cocreation approaches: The Coastal Vision trajectory aims for the long-term protection of Flanders' coast and hinterland from sea level rise. To this purpose, more than 100 stakeholders from Flanders, France and The Netherlands, including the coastal mayors, the governor and the competent ministers, participated in a co-creation process to elaborate a joint long-term vision. [20]



Flanders is taking action in the Ocean Decade and beyond

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

Creating impact for society:

Solutions-oriented research and development

The Decade mobilises resources and technological innovation in ocean science to deliver key societal outcomes towards 2030 and beyond:

Flanders has set 53 sustainability goals to be achieved in 2030. These are the focus of the 'Vizier2030 – Flanders' 2030 target framework' strategy to implement the UN Agenda 2030 and SDGs. [21]

Flanders addresses ocean-related targets on climate, food, energy, economy and safety by contributing to the UN Ocean Decade.

The seven societal outcomes of the Ocean Decade are interconnected and require joint actions by society at large. Flanders' marine research & innovation community contributes via projects, activities and resources. Co-designed and collaborative actions are implemented by multisectoral partnerships **with support of the Belgium National Decade Committee NDC-BE, and VLIZ as Decade Implementing Partner.** [22]

Flanders sets capacity development, training and equitable access to science and technology at the heart of an inclusive approach to the Ocean Decade. Two flagship projects, hosted by Flanders, support the Ocean Decade: the Ocean Teacher Global Academy [23] and the Ocean InfoHub [24], programme components of the IODE Project Office for IOC/UNESCO

One Ocean Puzzle at 2023 VLIZ Marine Science Day © Elsy Verhaeghe

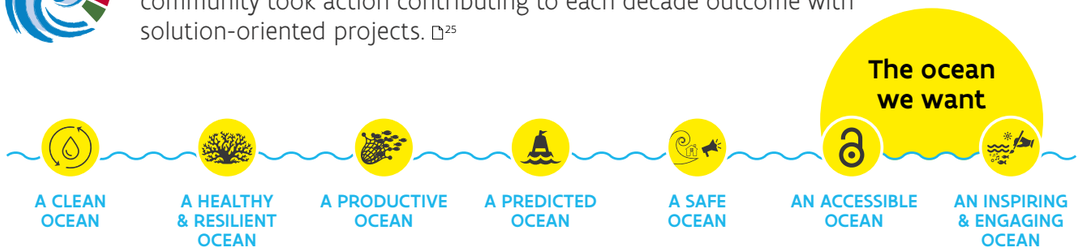
Some highlights of Flanders endorsed Ocean Decade contributions:

The Sea Level Station Monitoring Facility (SLSMF) provides a free online service for a quick inspection of the raw data stream from individual sea-level stations. This data is crucial for the provision of early warning of rapid-onset sea-level hazards. It supports capacity building to ensure equal warning capabilities and enhance resilience of coastal and maritime communities. **Host programme:** The Ocean Decade Tsunami programme

Above and Beyond – Completing the World Register of Marine Species (ABC WoRMS). WoRMS provides a full taxonomic overview of all marine life, supporting everyone who makes use of species names, including science, policy, industry and the public at large. **Host programme:** Marine Life 2030

The Ocean Decade calls to connect science with societal needs: a contribution from Flanders-Belgium

From the input collected between 2018 – 2020, representatives from public and private bodies, young scientists and the wider marine research community took action contributing to each decade outcome with solution-oriented projects. [25]



UN Decade Ocean Science for Sustainable Development 2021-2030 © UNESCO Intergovernmental Oceanographic Commission

Marine Regions, From Global Gazetteer to Global Community, provides an open, global gazetteer of georeferenced marine and coastal place names, locations and features such as bays and seamounts. Marine Regions takes a demand-driven approach by involving various existing and new stakeholders.
Host programme: OceanData 2030

The European Tracking Network (ETN) integrates the aquatic animal tracking community in Europe and globally with the mission to track aquatic animals to better understand, protect and manage them.
Host programme: Marine Life 2030

ECOP Belgium node supports Early Career Ocean Professionals (ECOPs) in their capacity development and work by providing meaningful networking, training, funding opportunities and creating capacity for cooperation and knowledge exchange. **Host programme:** Early Career Ocean Professionals

Innovative Solutions for Plastic Free EU Rivers (INSPIRE) contributes to the drastic reduction of plastic litter flow from European inland and transitional waters to the sea, bringing together 20 technologies and actions to detect, collect and prevent plastic pollution.
Host programme: Ocean Practices for the Decade

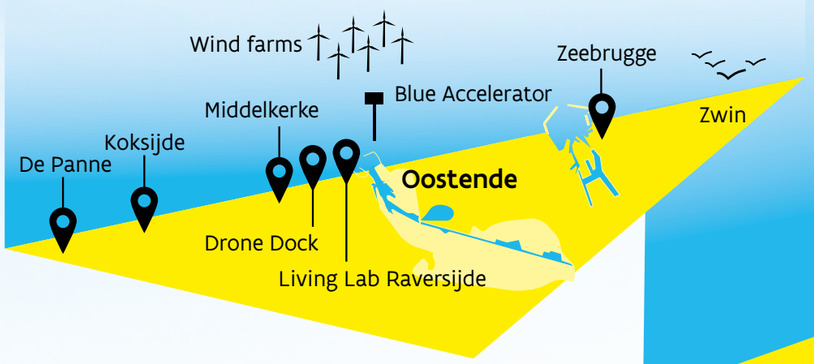
Contributions to joint roadmap between European Commission and IOC UNESCO- Flanders (VLAIO, VLIZ, WEWIS) contributes to the Sustainable Blue Economy Partnership (SBEP), focussing on a sustainable, resilient and equitable ocean economy. VLIZ participates as partner in the European infrastructure for the digital twin of the ocean (EDITO) project. Both SBEP and EDITO are two key pillars for the roadmap liaising EU Mission Ocean initiative with the Ocean Decade. Flemish institutions are working for a joint engagement, for example at the event Ocean Deade meets Mission Ocean.

VLIZ Philanthropy -'The Sea as a Good Cause' is a unique grant-making-facility endorsed by the Ocean Decade, to support contributions and equitable participation to this joint endeavour by the global ocean community.

Members of the National Decade Committee © Juana Jimenez

Ostend Maritime Hub

A local ecosystem with a high density of innovative businesses, cluster organisations, research institutions and public authorities collaborating intensively together for impact ranging from the local to the international level.



OSTEND SCIENCE PARK

A deep tech knowledge hub fueled by Ghent University and supported by Port Oostende and POM West-Vlaanderen, entirely dedicated to marine and maritime research and business. It is the perfect breeding ground to further boost and expand blue innovative businesses and organisations. Research institutions and facilities, public authorities and cluster organisations and businesses - all specialised in blue economy - are closely working together in a vibrant blue community excelling in e.g. offshore wind, maritime safety and surveys.

Bluebridge - based at Ostend Science Park - is the hub for blue economy related events, training activities, co-working and office rent in our region. Blue Cluster, Belgian Offshore Cluster and the Provincial Development Agency's Blue Energy team, Marine@Ugent and businesses are operating from this innovative blue hub. The Reef-Training Lab Blue Energy attracts students with its state-of-the-art infrastructure to prepare the workforce for the future.

INNOVOCEAN CAMPUS

Hosts the UNESCO/IOC Project Office for International Oceanographic Data and Information Exchange (IODE), European Marine Board (EMB), European Marine Observation and Data Network (EMODNet), Joint Programming Initiative Healthy and Productive Seas and Oceans (JPI Oceans), Flanders Marine Institute (VLIZ), Flanders Research Institute for Agriculture, Fisheries and Food (ILVO), Province of West-Flanders Streekhuis Kust and the Coastal Heritage Unit. Physical proximity contributes to fruitful formal and informal exchanges between regional and international organisations. A concrete example is the provision of EMODNet data by VLIZ to The Reef-Training Lab Blue Energy.

MARIFISH.INC

Promotes innovative concepts, start-ups and scale-ups in aquaculture and mariculture and supports the transformation of traditional fisheries by providing housing, coaching and community services. This on- and offshore incubator and living lab – and in particular the entrepreneurs they serve – receives scientific technical advice from researchers at Ghent University, VLIZ and ILVO. For coaching services, they can count on the expertise of the Flanders Chamber of Commerce and Industry (VOKA).

BLUE ECONOMY SCIENCE SUMMIT

A recurring event, co-organised by Blue Cluster and VLIZ, where entrepreneurs and scientists are challenged to collaborate on key marine and maritime topics and jointly develop solutions. The goal is to enhance cooperation and develop a shared vision and strategy for the future of the blue economy. 26

Development and sharing of marine research infrastructure

A sample of recent highlights:

Flanders marine & maritime research and innovation ecosystem actively develops infrastructures and promotes their optimal use within the appropriate networks in Flanders, Belgium, Europe and the world.

OSTEND SCIENCE PARK

Ostend Science Park is a high-tech knowledge hub founded by Ghent University, Port Oostende and POMWVL. It hosts and offers testing facilities for R&D, including a multi-species hatchery, saltwater wave flume, biotechnology-biodiscovery lab, applied ecology lab, The Reef VR and XR lab. It connects with the Coastal and Ocean Basin (COB) and Towing Tank at the Flanders Maritime Laboratory, a collaboration between UGent, KU Leuven, and Flanders Hydraulics Research. [29]

Coastal & Ocean Basin Ostend - Fort Boyard © Groupe ETPO

MARINE STATION OSTEND

The MSO hosts several centres of excellence: Marine Robotics Centre (MRC), Marine Observation Centre (MOC), Ocean Innovation Space (OIS), Ocean and Human Health (OHH) and Coastal Climate Change Centre. The site also offers services and support to VLIZ and external researchers: a berth for scientific vessels, wet and dry labs, biobank, technical spaces and storage capacity. It is complementary to the InnovOcean Campus, where VLIZ, ILVO, Province of West-Flanders and international partners are hosted.

Marine Observation Center © Nick Decombel

Marine Robotics Center © Nick Decombel

RV BELGICA

The Belgian federal state-owned RV “Belgica”, operational since 2022, has an action range from Spitsbergen to latitude 28° north, west from the mid-Atlantic ridge to longitude 36° in the east and including the Mediterranean. It operates in complementarity with the RV Simon Stevin [27]

RV ABBÉ MANN

The RV Abbé Mann (2024) is a multidisciplinary workboat that can carry out a variety of daytrip tasks, ranging from acoustic surveys, scientific diving work, assisting in the deployment of autonomous vehicles to deploying measurement frames. [28]

RV SIMON STEVIN

The Flemish Government and VLIZ have operated the RV Simon Stevin since 2012. This vessel is active in the Southern North Sea. [28]

RV Belgica © Belgian Science Policy Office
RV Simon Stevin © Hans Hillewaert
RV Abbé Mann © anonymous

Blue Accelerator platform © NEMOS

BLUE ACCELERATOR

This infrastructure is a test platform for the blue economy where projects can develop, test and demonstrate innovations in real-life sea conditions. [30]

USV Gobelijn © Eddy Decorte

MARINE ROBOTICS CENTRE

Since 2019, VLIZ operates a Robotics Centre with several robotic devices, greatly enhancing the marine research community’s capabilities. [32]

GLOBAL REFERENCE DATABASES

The World Register of Marine Species (WoRMS) Information Backbone, maintained within the context of LifeWatch ERIC, is consulted worldwide by thousands of users daily and used in over 800 scientific publications each year. Together with Marine Regions, a standard list of marine georeferenced place names and areas, it powers European marine biodiversity information systems such as Eur(OBIS), EMODnet and the global Ocean Biodiversity Information System (OBIS). [31]

OUR FOCUS AREAS

© xxxxxx

Marine science and innovation communities gear up for a sustainable blue economy

The maritime sectors in Flanders represent at least 175 000 full-time jobs (FTE) and 5.2% of the total economy. Flanders puts forward excellence in marine science and innovation to develop a sustainable blue economy. We see the ocean as part of the solution to tackle our many societal challenges. Driven by the research and business communities and supported by a strong policy framework, blue innovation contributes to the transition towards sustainability. This is our response to the UN Ocean Decade's global call to apply all relevant knowledge for sustainable development.

Flanders has developed important expertise contributing to the SDGs. Discover some of the remarkable developments in the focus areas of 'smart sea' solutions, offshore energy, and ecosystem- and nature-based solutions below.

We actively pursue close cooperation between different sectors and disciplines to improve interoperability and integration of data and models, and share knowledge that can harness innovation and create smart solutions. **p.24-25**
Scientists and technology developers have access to the (data) infrastructures to experiment with their wildest ideas. **p.26-27** A smart approach improves our capacity to understand and protect complex ocean ecosystems, while offshore operations benefit from increased efficiency, resilience and safety. **p.28-29**.

Flanders invests successfully in innovative approaches in the energy transition. Flanders-based operators have been pioneers in the installation of wind farms further offshore, stimulating innovation, boosting the export potential of different value chains and co-developing Flanders' knowledge-based economy. **p.30-31**
The upscaling to supersized wind turbines is the driver of innovative approaches with public and private sectors investing in a 'triple helix' collaboration model (e.g. the offshore plug, multiple use applications in offshore wind farms and structural health monitoring). **p.32-33**.
Co-design includes public participation to scrutinise new developments from different users' perspectives. This leads us to using the scarce available maritime space for new technological and societal innovation, including renewable energy production, food production, blue tourism, nature restoration and coastal protection. **p.34-35**

Fully acknowledging that healthy ecosystem functioning needs to be at the heart of a thriving and sustainable ocean economy, strengthening knowledge is the foundation on which to build. Flanders invests in globally connected platforms to unravel marine genetic, species and habitat diversity, and ecosystem modelling, with the aim of unlocking their potential and co-creating shared benefits. **p.36-37**
Researchers and industry are working together to design nature-based solutions for a range of purposes such as coastal protection, blue carbon capture and sustainable large-scale seafood production. **p.38-39**
Ultimately, a sustainable blue economy must fully incorporate biodiversity values and ecosystem services in national accounting and reporting – this includes the value of the ocean for human health. **p.40-41**

These focus areas illustrate how knowledge generation at the heart of the ocean research and innovation community in Flanders can go hand-in-hand with a sustainable blue economy. It is part of Flanders' contribution to the Ocean Decade's societal objectives with a strong commitment to open and international collaboration.

Note: this chapter refers to expertise in Flanders without explicitly referring to individual companies or research performing institutions. We invite you to contact Blue Cluster, which brings together companies involved in the focus areas mentioned in this section and in other domains of the blue economy (bluecluster.be), and the Flanders Marine Institute (VLIZ) for marine and maritime research expertise.

Access to science and technology to harness smart ocean solutions

Never before has there been a better time to gain affordable and valuable insights based on marine data and observations

The Belgian part of the North Sea (BPNS) is one of the most data- and information-dense marine areas in the world. Energised by rapidly evolving technologies, we transition towards a coherent and smart observation system. Close cooperation between different sectors and disciplines enhances our ability to make data interoperable and share knowledge. Ocean data and observations underpin the science and smart technologies that are at the basis of a sustainable and innovative blue economy.

Smart sensors on surfboards © Smartfin.org

INNOVATIVE SAMPLING

Efforts to expand and upscale new technologies are supported by the many platforms of opportunity that are active in the ocean: cargo and ferry lines, cruise ships, recreational boats and even seabirds and fish. Telemetry, acoustic tracking devices, self-contained dataloggers (such as T-PODs) and echodrones are just a few examples of innovative sensor technologies that Flanders marine R&D community is using for monitoring (micro-)plastics, acoustic contamination, species distribution and migration, sediment transport, etc. [33]

SENSORS AND SMART APPLICATIONS

A Video Plankton Recorder (VPR) is an underwater microscope that records images of plankton to determine its distribution, abundance and diversity. The VPR is towed behind a research vessel mounted with a real-time high-resolution underwater video camera that transmits the images of plankton directly to the deck unit. Zooplankton is used as an indicator for ecological quality. Visual identification of zooplankton is time-consuming and expensive, but digital 'zooscan' images make it possible to process and analyse in a semi-automated way. Through machine learning, the zooscan is trained in image recognition, optimising the processing of phytoplankton samples by a factor of ten or more and reducing the cost of analysis substantially. The VPR can carry other sensors to link plankton distribution with abiotic factors, e.g. temperature, turbidity and conductivity. [34]


Video Plankton Recorder © VLIZ

TOWARDS THE INTERNET OF THINGS UNDERWATER (IoTU) FOR THE BPNS


Marine robot AUV Barabas © VLIZ

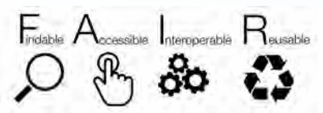
A system of underwater sensors, autonomous and unmanned platforms or robotics aims to communicate seamlessly and send the information to networks above the water. The future VLIZ IoTU includes remote sensing and sensors, on-site surface and depth buoys, offshore marine stations, unmanned vehicles, swarms, underwater drones as well as smartphone users. Applications range from unmanned expeditions and remote monitoring of marine environmental parameters to surveying study sites, remote objects and artificial infrastructures. [39]

From smart sensors and sampling...

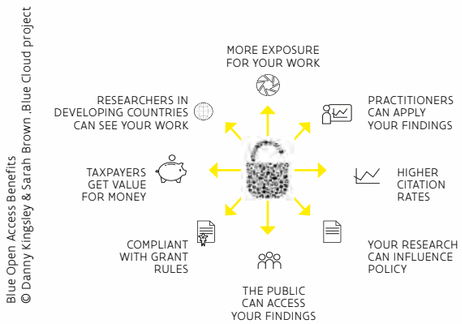
OPEN AND FAIR

DATA AS A DRIVER FOR RESEARCH, INNOVATION AND BENEFIT SHARING

The Flemish Open Science Board unites stakeholders in a shared vision for Open Science and to join forces in the implementation of the European Open Science Cloud (EOSC). The VLIZ Marine Data Centre (VMDC) [35] and the Belgian Marine Data Centre (BMDC) [36] are accredited National Oceanographic Data Centres (NODCs) that have adopted the FAIR Data Principles. [37]



Graphic from Blue Cloud Project ©



Blue Open Access Benefits © Danny Kingsley & Sarah Brown. Blue Cloud project

INTEGRATING STANDARDS AND ADVANCING INTEROPERABILITY

Advancing the ecosystem approach requires integrating data on bio-geochemical properties and human activities. The EOSC Blue Cloud project offers an environment for FAIR data storage, management, analysis and reuse across diciplines. It connects research infrastructures both horizontally and thematically to applications that can harness innovation and create smart solutions. [38]

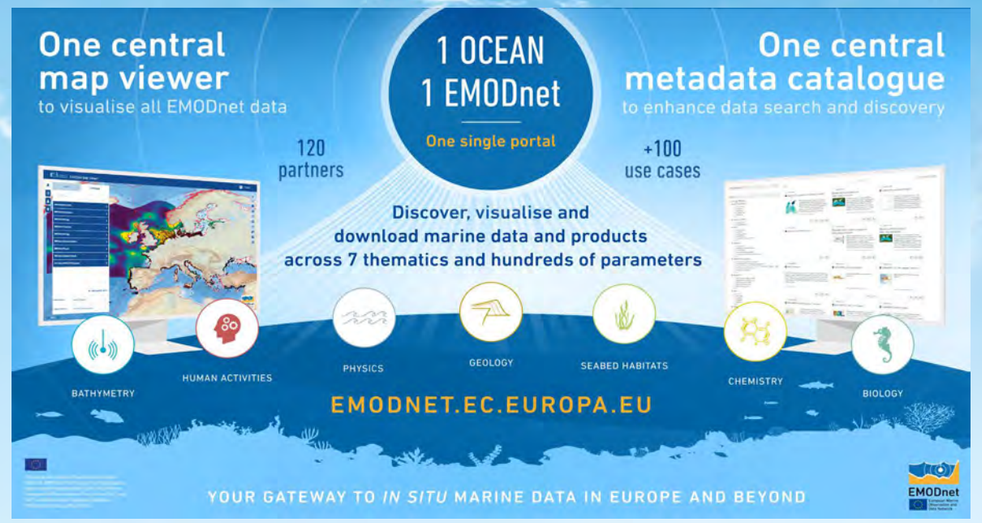
Science and technology to harness smart ocean solutions

Public and private sectors work together to develop and implement technologies across the entire value chain

From smart sensors and sampling...

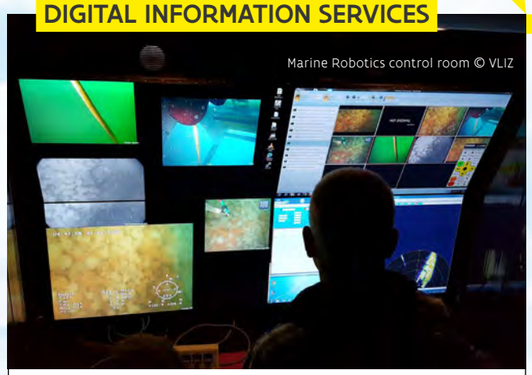
federated and interoperable standards and data systems...

to a coherent and integrated ocean observation system and smart ocean solutions



In 2023, EMODnet federated its seven distinct Thematic Portals—covering Bathymetry, Biology, Chemistry, Geology, Human Activities, Physics, and Seabed Habitats—into a single, unified web portal. The EMODnet Central portal is an operational service of DGMARE that provides continuously updated, reliable, open and fast access to European marine data products.

DIGITAL INFORMATION SERVICES



The marine services sector is rapidly advancing through Big Data solutions, data mining techniques and AI as well as blockchains; e-collaboration services to share knowledge and ideas, facilitating shared protocols and common workflows; and e-learning services. AI capabilities help make sense of the collected data. The industry invests in systems to make complex and challenging marine operations more efficient and safer. Data originating from asset monitoring can become part of environmental monitoring systems; an example is marine mammal detection with Distributed Acoustic Sensing (DAS) technology used for monitoring cables. [39]

EUROPEAN MARINE RESEARCH INFRASTRUCTURES

The ICOS Ocean Thematic Centre, EMBRC and LIFEWATCH host data systems and research services that support pilot applications which are useful for the blue economy, and broader marine knowledge agendas. Flanders' institutions are partner to these pioneering initiatives for integrating standards and advancing interoperability. These ESFRIs contribute to, and integrate with, global systems to develop a systemic understanding of globally connected processes that inform local interventions and policies. [40]

ICOS Flanders
INTEGRATED CARBON OBSERVATION SYSTEM

EMBRC EUROPEAN MARINE BIOLOGICAL RESOURCE CENTRE BELGIUM

LifeWatch BELGIUM

OBIS OCEAN BIODIVERSITY INFORMATION SYSTEM

THE EUROPEAN MARINE OBSERVATION AND DATA NETWORK

EMODnet applies the 'collect once and use many times' philosophy to the benefit of marine data users, policy makers, scientists, private industry and the public. [41] Such an integrated European marine data policy saves at least one billion euros a year, while opening up new opportunities for innovation and growth. EMODnet is a part of the EU's 'Marine Knowledge 2020' initiative of the integrated maritime policy. The Flemish government and VLIZ have an agreement with the European Commission regarding financial support for the EMODnet secretariat and the central portal. EMODnet opens its services for business opportunities through Open Sea Labs, hackatons, workshops and associated business memberships.

Mr J. Hanssens, Secretary-General WEWIS
Mr K. Vella, European Commissioner, DGMARE
© EMODnet

EMODnet Ocean Science Lab hackaton
© EMODnet

Smart innovations to harness secure ocean solutions

Innovation programmes as promoted by VLAIO through Blue Cluster bring solutions in many shapes and forms, which are not necessarily technological by nature or generated in a lab or traditional research environment. The positive impacts of these innovations are strengthened by smart solutions. Data, analytics and digital tools offer a myriad of opportunities to protect the ocean. By connecting these data, models and scenarios, to the Digital Twin of the Ocean, coastal and offshore operations benefit from increased efficiency, resilience and safety and are supported in better informed decision-making.

EUROPEAN DIGITAL TWIN OF THE OCEAN

The public infrastructure of the EU DTO leverages Europe's ocean observing capabilities, data services, scientific expertise, and cutting-edge technologies to democratize access to the best available marine data and cloud-native tools. It enables communities to team up with researchers and innovators at local, national, regional, and international levels to co-develop solutions to the ocean challenges most relevant to them. By fostering a thriving digital innovation ecosystem, it catalyses new services and tools to explore desirable ocean futures and support decision-making. It equips policymakers with science-based insights to craft effective policies for marine biodiversity conservation, climate change resilience, sustainable development of the ocean economy, and enhanced ocean governance. VLIZ and EMODnet are key partners in this endeavor. [42]

A leap in ocean knowledge and sustainable action: the EDITO-Infra programme builds the public infrastructure backbone for the European Digital Twin of the Ocean

EU DTO allows different users to access and generate the information needed to shape effective decisions using 'what-if' scenearios:

CLEAN HYDROGEN PROPULSION FOR SHIPS (CHYPS) PROJECT

CHyPS developed advanced numerical models for ship propulsion using clean fuels such as hydrogen, e-methane and methanol. It focuses on simulating critical components, such as cryogenic fuel tanks and combustion engines, for which no accurate models were available before. Using machine learning, these complex models were converted into faster and more realistic simulations. The results provide valuable insights for different ship types and sailing profiles. [43]

PLASTICS DISPERSION MODELS

A critical knowledge gap exists on the whereabouts of plastics and about their flux towards the marine environment. This information is crucial to fast track cost-efficient plastic remediation measures. PLUXIN developed a two-dimensional-horizontal (2DH) plastic dispersal model. Marine plastics are identified from remote sensing reflectance data through image recognition algorithms 'Machine Learning', resulting in an automated plastic detection method. Combined with in-situ sampling, this information validates the 2DH model and links to the DTO platform. [45]

DTO uses

DATA CONNECTIVITY AND OFFSHORE COMMUNICATION NETWORKS

The industry invests in systems supporting the complex and challenging planning in order to make marine operations more efficient and safer. Real-time risk assessments make use of probabilistic digital twin technology to avoid costly and/or dangerous live testing at sea like in the projects ICONIC, CORE, DDSHIP. [44]

DATABEACH PROJECT

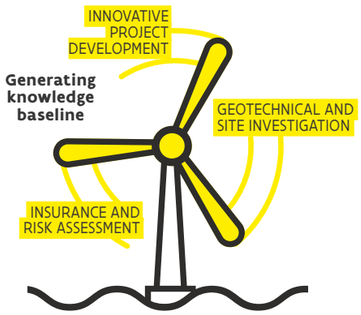
Seeking sustainable and 'soft' measures for coastal protection and improved resilience against storm-related sand loss, the project combines monitoring techniques with machine learning and probabilistic modelling for disruptive innovation in the design of 'soft' coastal protection. Distributed Temperature Sensing (DTS) monitors sand volumes, and a 'CoastSnap-station' involves the public (citizen science) to map the position of the high-water mark in the timeframe of weeks/months. [46]

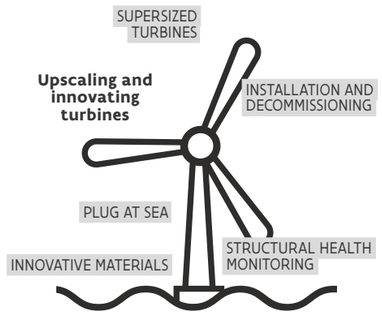
PROTECTING CRITICAL MARITIME INFRASTRUCTURE

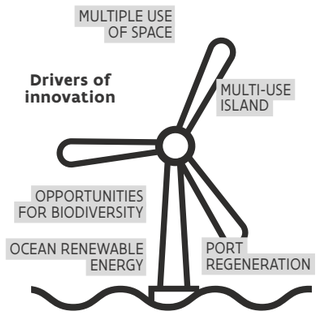
The Belgian North Sea hosts vital maritime infrastructure, including subsea cables, offshore wind farms, and ports. These assets are essential for energy supply, communication, and economic stability. Ensuring the protection of this critical maritime infrastructure against attacks, cyber threats & sabotage, etc. is crucial for (inter)national security and resilience. Together with industry partners, knowledge institutions and policymakers, Blue Cluster wants to accelerate the development of innovative solutions for safeguarding these critical infrastructures, and has developed a roadmap to this purpose. By investing in advanced monitoring, risk management, predictive modeling and secure technologies, we contribute to a stronger, more sustainable maritime economy.

Offshore renewable energy

Our future requires carbon-neutral offshore renewable or blue energy technologies. Belgium is a pioneer in offshore wind energy (OWE), a cornerstone of the sustainable energy transition. OWE has developed at a fast pace in recent years based on the interplay of governments, industry, research & innovation and society to achieve national targets in renewable energy and emissions reductions. This covers the planning, licensing, monitoring, research & innovation, and public funding for innovative approaches and assessment. Technology has allowed a reduction in production costs, resulting in upscaling and increased investment.







Starting from an installed capacity of 30 MW in 2009, 8 OW farms with an installed capacity of 2262 MW are operational since the end of 2020 (see figure). They provide about half of the residential electricity consumption in Belgium (or 2 200 000 households; 8 TWh/year). The current marine spatial plan (2020-2026) provides for new zones to the west (B, C, D) for the development of an additional capacity of 3500 MW. This implies a total wind capacity of 5.8 GW when all zones are operational. [47]


G-Power wind farm
© G-Power nv

PIONEERS OF INNOVATIVE PROJECT DEVELOPMENT

Flanders' industry has pioneered in expertise on far-shore renewables, developing unique know-how on foundation construction, cable laying, wind turbine installation and operations and maintenance. The high ambition to continue investing in new (inter)national projects requires strong partners to Develop, Build, Finance and Manage OW farms. Several companies in Belgium offer and export these highly specialised DBFM services. [48]


Vole au Vent
© Jan De Nul Group

BUILD A KNOWLEDGE BASELINE

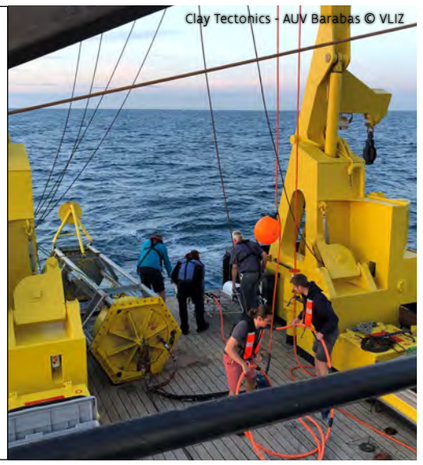
OWE contributes to sustainable development and helps develop Flanders' knowledge-based economy. Environmental impact assessments, surveys and monitoring of the (geo-)physical and biological offshore environment generate an enormous amount of detailed data, leading to new insights and knowledge. Strategic collaboration between the industry, government and research to unlock this new knowledge in the public arena has a knock-on effect for innovation in products and services. Engineering services for the processing and analysis of monitoring and metocean data, increased efficiency and longevity of the technical monitoring infrastructures are all part of the know-how offered by Flanders' renowned consultancy agencies and offshore sector. [49]

INSURANCE AND RISK ASSESSMENT

Collision (during storm events), damage to energy cables from fishing gear and the presence of Unexploded Ordnance (UXOs) are some of the risks and challenges for insurance of OW Farms. There is a large presence of UXOs in the North Sea, which poses a risk to public safety and environmental health, especially during the installation of the foundations and the cables of OW farms. UXO identification and removal is therefore an important aspect during project preparation. The Interreg project REMARCO aims to address the challenges by increasing our understanding of the risks, promoting innovative remediation techniques, and raising public awareness about the challenges facing the North Sea Region. [50]

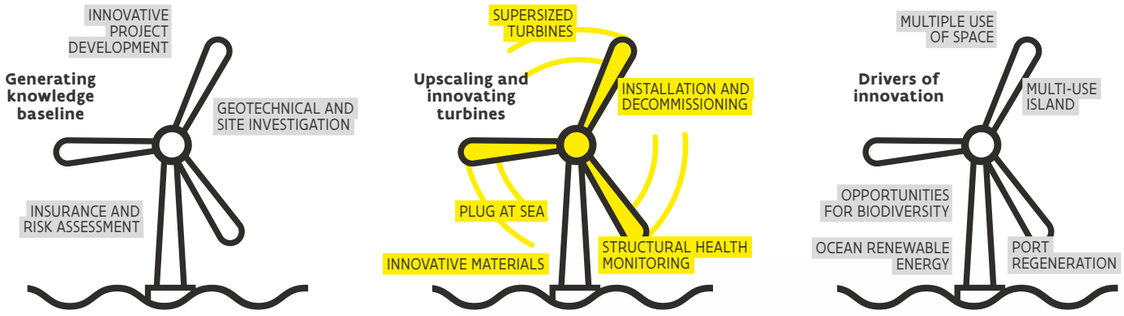
GEOTECHNICAL AND SITE INVESTIGATION

Preliminary geotechnical site investigation covers a wide range of geophysical and geotechnical activities. Site studies provide a detailed view of the seabed conditions prior to construction. Several companies specialise in hydrographic, geophysical and geotechnical surveys: from cable route surveys, scour monitoring and ROV inspections to specialised logistics. Clay tectonic deformations were reported in the subsoil of the newly planned offshore wind farms. These may have a significant impact on the design and installation of the wind turbine foundations. The Clay Tectonics project applies innovative geophysical measurement and processing strategies to map the 3D distribution of these deformations, enabling a thorough geological investigation of the region. Geotechnical analysis of sediment samples allows for the development of a ground model where different installation scenarios can be simulated and tested. The results will provide the relevant guidance for future wind farm developers. [51]


Clay Tectonics - AUV Barabas © VLIZ

The wind is the limit: upscaling and innovating the transition to offshore renewables

Flanders' pioneering innovations contribute to increased performance, safety and predictability of operations, but also to decreasing environmental risks. Operators invest in research and innovation contributing to sustainable development and improve design of future wind farms: new sensors, corrosion protection and remote control, structural health monitoring systems of turbines, insights in wake effects and monitoring of power cables.



INSTALLATION

The fast development of economies of scale in OWE goes hand in hand with an upscaling of the necessary logistics. World-leading companies located in Flanders offer a high-tech fleet, including high-end innovations for cleaner exhaust: multipurpose installation vessels can execute trenching and subsea rock installations, while cable-laying vessels are equipped with a turntable to install high-voltage cables. Offshore jack-up installation vessels are specifically built to install OW farms. They are among the largest of their kind in the world, with a cargo deck space, payload and a lifting capacity of up to 3200 tonnes. Floating offshore heavy lift vessels can lay foundations in deeper waters and in more challenging substrates. [52]


Sea Installer © DEME Group

DECOMMISSIONING

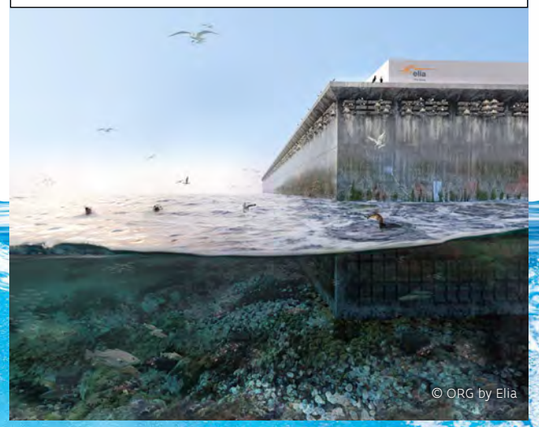
In Belgium, offshore wind farms are expected to be decommissioned from 2034 onwards. Decommissioning brings several challenges such as planning, dismantling, transport and logistics, waste management, and site recovery monitoring spanning technical, economic, environmental, social, and policy dimensions. Critical issues include regulatory frameworks for removal, port infrastructure suitability, the ecological impact of artificial reef effects, the development of removal techniques & recycling techniques and uncertainty regarding the availability of end-of-life value chains. Flemish research institutes, public authorities, and industry partners collaborate to consolidate, visualize, and disseminate knowledge, expertise, and research. In specific, projects like OWiDEX and Ready4Decom address these challenges and work towards a supported and efficient strategy. [52]

SUPERSIZED

The Belgian part of the North Sea hosts leaders in the field of 'new generation' parks of supersized wind turbines. These pose extra challenges in terms of performance and maintenance. The Supersized 5.0 project gathers innovative forces in academia, private sector and public funding to implement sophisticated operation and maintenance strategies. Edge-cloud data processing enables maximising feature extraction while meeting the constraints of data networks connecting offshore wind farms. AI models are optimised to create robust predictions that can identify changes and provide insights into the reliability of the models. This 'digital twin' reduces costs and risks while enhance safety and efficiency in the generation of OWE. [53]

PLUG AT SEA

The wind farms increase in size and are located further away from the existing electricity networks. The Nemo interconnector, which transports electricity between the UK and Belgium, is a best practice example of trans-boundary collaboration in offshore energy.
Energy islands will become the backbone of a new European offshore electricity grid, serving as a central hub for new interconnectors between countries. The artificial Princess Elisabeth island has an innovative design, unique in the world. The hub will serve additional future interconnectors (e.g. Nautilus). [54]


© ORG by Elia

STRUCTURAL HEALTH MONITORING (SHM)

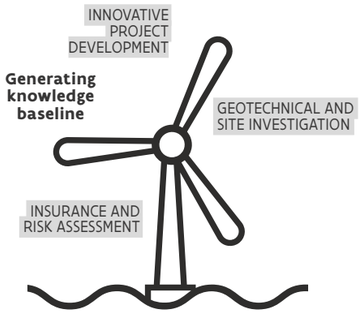
Flanders/Belgium hosts world-class companies and research expertise in the field of SHM. Data acquisition systems, dedicated sensors and analysis services are instrumental to monitor the state of the OW turbine supporting structure and foundation as well as the offshore power cables. They reduce the costs of construction, installations, operation and maintenanc,e and extend the lifetime of offshore structures. SHM covers scour and resonance behaviour as well as early indication of possible structural damages, and offers corrosion and cracks assessment as well as structural assessment after extreme events (storms). SHM builds on expertise in specialised software and (big) data analysis to optimise new concepts and design. [55]

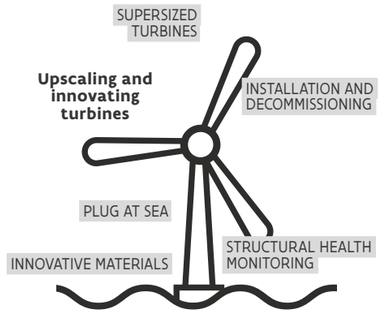
INNOVATIVE MATERIALS

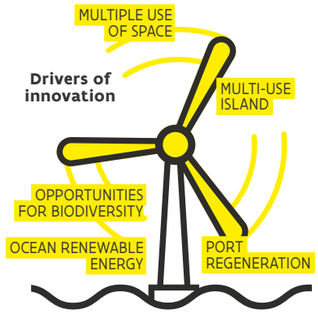
The intricate nature of managing wear and tear on wind farm components poses significant challenges: increased moisture and salinity accelerate corrosion and significantly impact the functionality and lifespan. In the WILLOW project, researchers gain insight in the coating degradation and corrosion dynamics tested on the Blue Accelerator. By introducing advanced digital and physical tools, asset owners will make better-informed decisions for maintenance intervals, extending the lifetime and planning decommissioning of offshore assets. [56]

Drivers of new technology and societal innovation

Combining different sources of offshore renewable energy in a context of multiple use of space, creates synergies, new opportunities and reduces costs and risks. The logistic needs of the offshore energy sector have enabled coastal port development and create new opportunities for blue tourism. Explore our approaches:







FUTURE OF OFFSHORE SYNERGY: MULTI-USE MARINE SPACES

As offshore development expands, it is crucial to use marine space efficiently and create synergies between different activities. While the concept of multi-use is embedded in policies like Marine Spatial Planning (MSP), turning it into reality remains a challenge. To accelerate the sustainable blue economy and meet the goals of the EU Green Deal, the EU Mission Ocean, and global transitions in energy, food, and biodiversity, we need a clear and actionable approach to multi-use implementation. A solution is to designate specific off-shore areas—ranging from co-located activities to fully integrated multi-use business hubs or shared sea spaces. The innovative concept of 'Mariparks' fosters collaboration between industry and researchers by enabling shared infrastructure, governance, security, data management, and monitoring. They reduce costs and risks while unlocking new opportunities in offshore energy, aquaculture, shipping, and research. The concept of Mariparks takes multi-use to the next level by incorporating AI, digital twins, and autonomous systems to boost efficiency and innovation. With an ecosystem-based, nature-inclusive approach, they support the EU Sustainable Blue Economy and Green Deal objectives, making offshore development more collaborative, secure, and cost-effective. The NESBp project brings together all stakeholders to assess this groundbreaking concept. [57]

SMART SYNERGIES: OFFSHORE FLOATING SOLAR AND WIND ENERGY

Integrating offshore floating solar with wind farms presents exciting opportunities, explored in the SWIM project. As the global energy transition accelerates, policymakers, industry and researchers cooperate to unlock the full potential of this emerging technology. Repurposing the existing offshore infrastructure is key: grid components like cables and transformers, which are essential for offshore power transmission, often outlast wind turbines. This difference in lifespan requires strategic planning in renewal and repurposing of infrastructure. Effective asset management extends the lifespan of installations, reduces costs, and strengthens the long-term sustainability of offshore energy projects. [58]

Blue acellerator © Vooraanzicht BA drone

© D4PVesea, ORG, Permanent Modernity

NATURE INCLUSIVE DESIGN

Historically, our subsea landscape consisted of sandbanks with gravel beds, reef habitats, boulders etc., all creating specific habitats. Over time, hard substrate was lost, causing loss of habitat diversity. Through smart design and re-introduction of specifically designed elements to the offshore infrastructure mimicking natural habitats, the lost habitat diversity can potentially be regenerated. Nature Inclusive Design (NID) in developing offshore infrastructure is very promising to accelerate nature restoration in the North Sea. [59]

OPPORTUNITIES FOR BIODIVERSITY

The Institute of Natural Sciences, together with universities and research institutes (ILVO, INBO...) monitors the environmental impacts of the construction and operational phases of wind farms as well as the effects on biodiversity. The information collected offers a baseline for an in-depth understanding of long-term effects on ecosystem components, from benthic invertebrates and fish to birds and marine mammals. It assesses whether OW farms create opportunities for enhancing biodiversity. [60]

PORT OOSTENDE: OFFSHORE WIND HUB

Port Oostende is the OW hub for the southern part of the North Sea. The REBO heavy weight terminal serves as a key base for OW projects. Wind turbine components from around the world are handled, stored, assembled, and transported offshore for installation. A cluster of around 70 companies ensures continuous maintenance of Belgium's current 399 offshore wind turbines, employing approximately 800 full-time workers. [61]


Port Oostende © POM West-Flanders

Working with ecosystems for a sustainable blue economy

Unraveling and unlocking the potential of marine biological diversity for sustainable development – Biodiversity, ecosystem functioning and the development of human activities in a healthy and productive sea are all intertwined in a global and connected ocean. In Flanders, we co-develop knowledge systems on genetic, species and habitat diversity as well as their health conditions in an open and strongly collaborative international environment. We share standards, data and methodological approaches as a basis for a common understanding and fair and equitable access to these 'commons'. This large scientific knowledge base is an important enabler for international data-driven research and a driver for innovative and sustainable developments towards a sustainable blue economy. It supports advanced modelling of the marine ecosystem and the complex functional relations.

Shared understanding of ecosystem functioning

Our understanding of marine ecosystems and how species traits, interactions and evolution contribute to ecosystem functioning is fragmented. Natural ecosystems are complex and work at too large a scale to replicate under controlled laboratory conditions. We need to combine disciplines to gain better insights. Connecting ocean observing and ocean modelling communities improves predictions on the evolution of ocean ecosystems: coupling biogeochemical and ecosystem models forced by modern climate prediction or projection models and verified against standardised in-situ data.

Shared benefits: co-creating sustainable use

Investing in biodiversity research leads to publicly shared benefits. It creates conditions for fair and equitable access to benefits from 'global commons'. The aim is to generate benefits while strengthening marine ecosystems' health. Bioprospecting to unlock the potential of marine biodiversity compounds for new products, developing tools for early detection of harmful species, enhancing seafood production systems by combining favourable species traits, etc. the applications are enormous.

Unraveling marine genetic, species and habitat diversity

Flanders supports the global Ocean Biodiversity Information System (OBIS) and coordinates the European component EurOBIS. The OBIS community is expanding to cover genetic, environmental and tracking data on migrating species. Flanders/VLIZ provides the taxonomic backbone WoRMS of this global database with the support of taxonomic editors worldwide. [62]


Ammophila arenaria, maram grass © VLIZ Leontien De Wulf

UNLOCKING & UNRAVELLING MARINE BIODIVERSITY KNOWLEDGE

The EMODnet biology portal provides free access to data on marine species and habitats from all European sea basins. The World Register of Introduced Marine Species WRiMS develops distribution maps, catalogues, a GitHub repository, an atlas as well as other tools that can inform monitoring, reporting and policy decisions. [63]


Gobius paganellus, rock goby © Misjel Decleer

EDNA OPTIMA

Environmental DNA (eDNA) provides valuable insights into where and when species are present. It enables early detection of non-indigenous species and bio-invasions, and allow us to monitor the impact of our activities on biological diversity. Due to its non-invasive nature, cost-effectiveness, and scalability, eDNA is gaining popularity to support policy and management decisions. However, some challenges remain, especially in complex marine environments. The eDNA-Optima project develops reliable protocols that minimise risks for contamination and improves detection of marine species. [64]

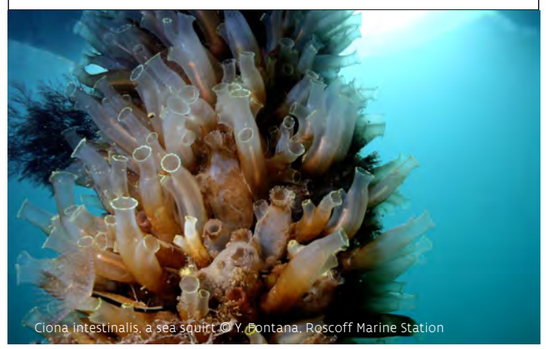
MARINE ECOSYSTEM MODELLING

Genetic techniques greatly enhance the automated collection of large amounts of species traits. Using this information for models enables us to identify key traits and key species in species-rich ecosystems and to identify ecosystem functions. The use of 'omics' data is one of the most important emerging techniques in this area. Understanding how natural systems and processes can be integrated with artificial structures to enhance ecological functions strengthens the ecosystem-based approach. An example is colonisation by ecosystem engineers (mussels and worm reef beds) of shallow natural and artificial habitats for the purpose of coastal protection. [65]


© GEANS, Interreg VB North Sea Region Programme

PROSPECTION FOR BIOACTIVE COMPOUNDS IN THE NORTH SEA

Projects like PROBIO and ENZYMARES are looking beneath the waves, where an abundance of bioactive compounds can be found in sea organisms. These substances are screened on their ability to heal and protect, and to transform industries through innovations in different sea- and land-based applications. [66]


Ciona intestinalis, a sea squirt © Y. Fontana, Roscoff Marine Station

BIOINVASIONS

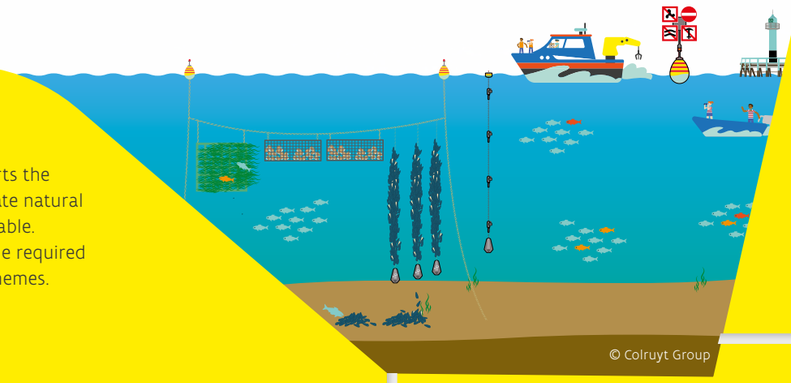
The introduction of non-indigenous species (NIS) and bio-invasions pose a real risk to ecosystems and human health, livelihoods and economic development. The PacMAN project (IOC/UNESCO) develops a monitoring network and early-warning decision support tools for Small Island Developing States. The Belgian Tracking Invasive Alien Species (TrIAS) project supports policy and management in a changing climate. The VLIZ Alien Species Consortium keeps track of a Watchlist for early warning on potential bio-invasions. [67]

Working with ecosystems for a sustainable blue economy

Development of new activities at sea: opportunities to implement the ecosystem approach from the start –There is a clear link between biodiversity, ecosystem functioning and the development of human activities at sea. We aim for an ecosystem approach to make sustainable development happen in the blue economy. In Flanders, the large scientific knowledge base is an important driver for new developments towards a sustainable blue economy in the Belgian part of the North Sea.

Nature-based solutions (NBS)

In this context, NBS refer to the use of natural systems and processes to provide a service that supports the function of coastal protection measures or systems. Coastal protection schemes that carefully integrate natural systems, landscapes and processes as part of the protection system will be more resilient and sustainable. Examples include sediment-stabilising vegetation and erosion-mitigating mussel beds. Flanders has the required knowledge and R&D capabilities to create realistic solutions to integrate NBS in coastal protection schemes.



© Colruyt Group

Reef developed during the Coastbusters project © VLIZ Sven Van Haelst

FLANDERS NBS LIVING LAB

The Coastbusters projects focus on ecosystem creation and/or restoration, using biobuilder species and living organisms to build biogenic reefs. Similarly, Bankbusters is aimed at enhancing tidal marsh land restoration by re-using dredged sediments. The overall goal is to reinforce natural processes and provide coastal zone (Coastbusters) and estuarine/river (Bankbusters) management with resilient and sustainable goals. This makes Flanders a 'living lab' for nature-inspired coastal protection design and is establishing a Flemish network of excellence on NBS.[68]

Coastbusters

© Coastbusters

Bankbusters

BIO-ENGINEERING FOR INTERNATIONAL CLIMATE ACTION

AquaForest is a demonstration project where dredged sediments are reused to create a mangrove habitat in Ecuador. The project advanced knowledge on the conceptual design, eco-engineering and implementation of such NBS, while strengthening engagement of local authorities, communities and nature conservation organisations. A mangrove island was created in 2024 with financial support from the Flanders International Climate Action Programme and IUCN. The island is monitored closely to facilitate efficient upscaling of similar solutions.[69]

Recycling ocean resources

The renewal rate of sand is so low that sand is considered as a non-renewable resource. Demand is nevertheless expected to increase. The recycling of mineral resources, such as dredged material from waterways, has become increasingly important and fits within the ambition of the development of a circular economy in Flanders.

RESTORING KEY MARINE HABITATS

In the BELREEFS project the federal government invests in marine nature restoration to bring back flat oyster reefs in the offshore gravel beds. This includes identification of suitable pilot locations, the remote setting of larvae on suitable substrate, and installation of the growing oysters at sea. The pilot also aims to identify best practices for future upscaling and is a textbook example of close collaboration between science, industry, and authorities. [70]

Sustainable Seafood Production

The ocean is an important source of protein food with aquaculture production surpassing wild catch worldwide. However, aquaculture production is still relatively weak in Europe, and the same holds true for Flanders. The solution lies in its integration in multifunctional infrastructures. For environmental reasons, the focus lies on extractive species. Institutions such as UGent and ILVO have built up a large knowledge base leading to the first pilots in Belgian waters. Companies are now starting to develop full-scale projects based on insights gained.

TOWARDS THE FISHERIES OF THE FUTURE

The Flemish fisheries sector can boast on a long-standing tradition in the North Sea and beyond. In recent years, the sector has significantly invested in innovative technologies to become more sustainable in terms of fuel consumption, seafloor disturbance, ecosystem approach, etc. A clear example is the use of advanced digital tools co-developed by ILVO, equipping fishing vessels with sensors as intelligent data platforms. These systems provide real-time insight into key operational and economic parameters: high-resolution track recording, fuel efficiency, engine load, and even revenue generated-down to the level of individual tows. At the same time they collect valuable environmental data, including salinity, turbidity, and temperature across full depth profiles by installing sensors directly on the fishing gear that passively 'hitchhike' with the net during fishing activities. The research underpinning these developments is primarily focused on creating win-wins–offering tools that benefit both the fishing sector and broader sustainability goals.

OFFSHORE AQUACULTURE AND MULTI-USE OF SPACE

Westdiep Sea Farm is operational since summer 2023, yielding the first commercial mussels harvested from production in the exposed waters of the Belgian Part of the North Sea. It occupies an area of 4.5 km off the western coast. Several projects explore the multiple use of space, to grow food within wind farm concessions. Examples include the production of seaweed and blue mussels. [71] [72]

BLUE BIO-ECONOMY

The GAME project is pioneering innovative aquaculture by cultivating the red seaweed Porphyra, integrating genomics and biochemical insights to ensure sustainable, year-round biomass production for the Blue Bioeconomy. The project thus unlocks new applications in nutraceuticals and agrochemicals.[73]

Working with ecosystems for a sustainable blue economy

Healthy and productive marine ecosystems are the basis for sustainable development. Stimulated by the Blue Growth Agendas, human use of the North Sea is increasing and diversifying. This has a positive effect on employment and economic welfare, but also threatens to increase the pressure on the marine environment. Measures are therefore taken to conserve and improve the North Sea ecosystem's health and resilience. These management measures include mapping, measuring and timely and accurate monitoring of ecosystem health indicators.

Healthy and resilient ecosystems

Adopting an ecosystem-based approach in management is both crucial and challenging. Belgium has initiated a 4-step process for implementation in policy assessment and planning, such as for the Marine Strategy Framework Directive MSFD and its reporting cycles. This includes the development of an assessment framework, assessment of the status of marine ecosystems and an economic valuation of ecosystem services.

Mussel reef © Delcroix Shutterstock

ECOSYSTEM HEALTH AND GENETIC TOOLS

Sustainable Use of Sand in nature-based solutions [74] The SUSANA project focuses on using sand more sustainably in coastal protection and nature-based solutions. It aims to better understand how sand behaves in the marine environment and how it can be used to support healthy ecosystems while reducing coastal risks. By combining scientific research with practical applications, the project helps develop smarter approaches to beach nourishment, dune restoration, and other coastal measures that work with nature to protect both people and biodiversity.

Ocean and human health © Nick Decombel

Ocean and Human Health

Contact with the ocean potentially promotes human health and wellbeing. Interdisciplinary research on 'Ocean and Human Health' improves the understanding of public health benefits from marine and coastal ecosystems, evaluates the 'Blue Gym hypothesis' and unravels the complex relation between the health of marine ecosystems and the impact of the ocean on human health and wellbeing [75]

BLUE HEALTH AND THE EFFECT OF LIVING BY THE BELGIAN COAST

Analysis of data from the Belgian Health Survey has revealed that living near the coast is associated with better health, but the underlying pathways remain unclear. Through meta-analysis of health surveys, we want to understand the underlying mechanisms. Our research integrates new technologies (e.g. eye tracking and VR) into a series of experiments to measure stress biomarkers, complemented with a large-scale survey on coastal and inland residents. This research bridges disciplines, working with clinicians, psychologists, economists, biostatisticians and public health authorities to perform innovative sustainability research. [76]

Ecosystem goods and services (EGS)

The UN Agenda 2030 and the SDGs acknowledge that a sustainable ocean economy builds on healthy and productive ecosystems. The CBD Aichi Biodiversity targets and the EU Biodiversity Strategy targets state that biodiversity values had to be incorporated into national accounting and reporting systems by 2020 at the latest. This requires models to understand, map and monitor ecosystem services.

Walk on the beach © Cernades Flickr

BLUE ECONOMY AND ECOSYSTEMS IN NATIONAL ACCOUNTING

The OECD develops novel approaches to measuring the ocean economy by highlighting the use of ocean satellite accounts. Ocean accounts help to answer specific questions about the value of the ocean, the ocean ecosystems and the ocean economy. The OECD's work, in which Flanders actively participated, examines the ocean-based economy, including ocean observations and modelling communities. [77]

LINKING BLUE ECONOMY WITH MARINE CARBON BUDGETS

BERNARDO is a world pioneer in quantifying a fully balanced carbon budget for the entire Belgian North Sea through innovative monitoring and modelling techniques. The project will assess the impact of Blue Economy activities on this carbon budget and assess its potential for valorisation. This includes developing financing strategies, scenario modelling and marine carbon accounting products and services to support nature-based solutions and nature restoration projects. [78]

Footnote references

OPEN TO THE WORLD

1. www.vliz.be/en/what-we-do/infrastructure-supply/research-spaces
2. https://compendiumkustenzee.be/nl/maritiem-transport-scheepvaart-en-havens
3. https://ich.unesco.org/en/RL/shrimp-fishing-on-horseback-in-oost-duinkerke-00673

POWERFUL R&I

4. Compendium for Coast and Sea: https://dx.doi.org/10.48470/68
5. www.researchportal.be/en
6. www.bluecluster.be/about
7. www.vlaio.be/en/clusterorganisaties/het-clusterbeleid/speerpuntclusters
8. www.ewi-vlaanderen.be/sites/default/files/2024-01/STI in Flanders 2024 CHAPTER 6.pdfhttps://gosr.ioc-unesco.org/home
9. https://gosr.ioc-unesco.org/home
10. https://invest.flandersinvestmentandtrade.com/en/investing-in-flanders/how-flanders-blazes-rd-and-innovation-trail-in-europe
11. https://gosr.ioc-unesco.org/home
12. Compendium for Coast and Sea - Indicator Report Marine Research and Innovation 2023: https://dx.doi.org/10.48470/70
13. OECD Science, Technology and Industry Working Papers, No. 2024/04, OECD Publishing, Paris, https://doi.org/10.1787/da9d7b66-en
14. OECD (2025), The Ocean Economy to 2050, OECD Publishing, Paris, https://doi.org/10.1787/a9096fb1-en
15. https://invest.flandersinvestmentandtrade.com/en/investing-in-flanders/how-flanders-blazes-rd-and-innovation-trail-in-europe

INTERCONNECTING SOCIETAL OUTCOMES

16. Belreefs: www.lifeb4b.be/belreefs and Coastbusters: www.bluecluster.be/projects/coastbusters
17. EDEN2000-studies: https://www.health.belgium.be/en/node/40715
18. www.health.belgium.be/en/marine-spatial-plan
19. www.marineboard.eu/navigating-future
20. Flemish coastal vision: www.vlaanderen.be/en/mobility/flanders-together-in-motion/the-flemish-coastal-vision

CREATING IMPACT

21. www.vlaanderen.be/uw-overheid/beleid/het-vlaamse-beleid-voor-duurzame-ontwikkeling/vlaamse-strategie-duurzame-ontwikkeling/over-vizier-2030
22. www.vliz.be/en/collaborations/ocean-decade
23. www.oceanteacher.org
24. https://oceaninfohub.org/
25. www.vliz.be/en/collaborations/ocean-decade

MULTI-STAKEHOLDER

26. BESS: www.vliz.be/en/events/blue-economy-science-summit-bess

SHARING INFRASTRUCTURE

27. www.belspo.be/belspo/NewRV/index_en.stm#home
28. www.vliz.be/en/what-we-do/infrastructure-supply/research-vessels
29. www.cob.ugent.be
30. www.blueaccelerator.be
31. www.marinespecies.org
32. www.vliz.be/en/what-we-do/infrastructure-supply/robotics

SMART

33. European Tracking Network www.europeantrackingnetwork.org
34. www.lifewatch.be/plankton-imaging-0
35. www.vliz.be/en/what-we-do/data-information/data
36. www.bmdc.be/NODC/index.xhtml
37. FAIR principles:
stands for 'Findable, Accessible, Interoperable and Reusable'
38. https://blue-cloud.org/about-blue-cloud-2026
39. www.lifewatch.be/en/lifewatch-maritime-industry-advisory-board;
DAS technology: https://marlinks.com/das-white-paper-thank-you/
40. ICOS: https://otc.icos-cp.eu and www.icos-belgium.be;
EMBRC: www.embrc.eu and www.embrc.be;
LIFEWATCH: www.lifewatch.eu and www.lifewatch.be;
ESFRI: www.esfri.eu;
www.eurobis.org;
MarineRegions: www.marineregions.org;
www.vlaanderen.be/publicaties/large-scale-research-infrastructures-in-flanders-flemish-participation-in-international-research-infrastructures-2020
41. www.emodnet.eu; https://ec.europa.eu/maritimeaffairs/policy/marine_knowledge_2020_en
42. www.edito.eu/
43. CHyPS project: www.bluecluster.be/projects/chyps
44. Projects ICONIC: www.bluecluster.be/projects/iconic, CORE: www.bluecluster.be/projects/core, DDSHIP: www.bluecluster.be/projects/ddship
45. Pluxin project: www.bluecluster.be/projects/pluxin-plastic-flux-for-innovation-and-business-opportunities-in-flanders
46. Databeach project: www.bluecluster.be/projects/databeach

OFFSHORE

47. Belgian Offshore Platform (BOP):
www.belgianoffshoreplatform.be/en/faq
48. DBFM services: Norther: www.norther.be/;
Parkwind: https://parkwind.eu/;
Otary: https://otary.be/en;
G-Power: www.g-power.be/, and other offshore wind farms
49. IMDC: https://imdc.be/en/field/blue-energy;
Cathie Associates: https://cathiegroup.com/;
Tractebel-engie:
https://tractebel-engie.be/en/solutions/energy#renewables-energies;
Haedes: www.haedes.be/services;
Witteveen+Bos: www.witteveenbos.com/areas-of-expertise/energy
50. REMARCO project: www.interregnorthsea.eu/remarco
51. The Clay Tectonics project: www.bluecluster.be/projects/clay-tectonics
52. www.jandenul.com/expertise/offshore-services;
www.deme-group.com/activities/offshore;
Herbosch-Kiere: https://herbosch-kiere.be/en/our-activities-and-projects/
53. www.deme-group.com/activities/offshore#paragraph-66;
www.deco-subsea.be/projects;
www.jandenul.com/expertise/offshore-services/dismantling-and-hoisting; See Offshore Wind farms in Belgium: Belgian Offshore Platform: www.belgianoffshoreplatform.be/en/projects; SuperSized5.0 project: www.bluecluster.be/projects/supersized-50
54. Energyville: www.energyville.be/en;
CORDOBA project: www.bluecluster.be/projects/cordoba;
NEMO Interconnector: www.nemolink.co.uk/about-us/
NAUTILUS: www.elia.be/en/infrastructure-and-projects/infrastructure-projects/nautilus
55. 24SEA: www.24sea.eu;
Marlinks: www.marlinks.com;
OWI-Lab: www.owi-lab.be;
SuperSized5.0 project:
www.bluecluster.be/projects/supersized-50;
BOPTIC project: www.bluecluster.be/projects/boptic;
SMART GBF: www.bluecluster.be/projects/smart-gbf
56. Magnel Laboratory (UGent) and SmartCast project https://www.ugent.be/ea/structural-engineering/en/research/ projects/allprojects/smartcast,
Blue acellerator: www.blueaccelerator.be and Willow project:
willow-project.eu
57. Edulis project in Belgian offshore wind farms:
www.aqua.ugent.be/edulis;
SYMAPA project: www.bluecluster.be/projects/symapa-synergy-between-mariculture-passive-fisheries;
SEACONOMY project: www.bluecluster.be/projects/seaconomy;
Design4PublicValue project: www.bluecluster.be/projects/d4pvsea-design-for-public-value;
SWEET H2(0) project: www.bluecluster.be/projects/sweet-h2o;
www.bluecluster.be/projects/mpvaqua-marine-floating-pv
EMSP NBSR project: www.bluecluster.be/projects/emsp-nbsr
NESBp project: vasab.org/project/nesbp/
58. SWIM project: www.swimproject.be
Tractebel - Offshore Hydrogen production:
https://tractebel-engie.be/nl/nieuws/2019/400-mw-offshore-hydrogenproduction- takes-system-to-new-levels;
BeHydro Joint Venture: www.behydro.be/;
HYPORT project: www.portofoostende.be/en/news/hyportr-green-hydrogen-plant-in-ostend;
Hyoffwind: https://press.colruytgroup.com/belangrijke-stap-in-uitbouw-waterstofeconomie-plan-voor-eerste-industriele-power-to-gas-installatie-in-ons-land-in-zeebrugge
59. MFiland project: www.bluecluster.be/projects/mfiland-multifunctional-island
60. WinMon cooperation between RBINS, INBO, ILVO, UGhent, monitoring reports: http://odnature.naturalsciences.be/mumm/en/windfarms
61. Port regeneration: REBO: www.reboostende.be

WORKING WITH ECOSYSTEMS

62. OBIS: www.obis.org;
Aphia and WoRMS/WRiMS: www.marinespecies.org;
LifeWatch: www.lifewatch.eu
63. EMODnet-Biology builds on the World Register of Marine Species (WoRMS/WRIMS) and the European Ocean Biodiversity Information.VLIZ coordinates: www.vliz.be/en/what-we-do/data-information/data
64. eDNA Optima: www.bluecluster.be/projects/edna-optima
Alien species in the Belgian part of the North Sea:
www.vliz.be/niet-inheemse-soorten/en
65. GEANS project: https://northsearegion.eu/geans;
CREST project: www.vliz.be/projects/crestproject/en/home-2.html;
COASTBUSTERS projects: www.bluecluster.be/projects/coastbusters
eDNA Optima: www.bluecluster.be/projects/edna-optima
66. ENZYMARES project: www.bluecluster.be/projects/enzymares PROBIO project: www.bluecluster.be/projects/probio-prospection-for-bioactive-compounds-in-the-north-sea
67. PACMAN project (FUST): https://fust.iode.org/en/pacman';
TrIAS project: www.adapt2climate.be/casestudy/tracking-invasive-alien-species-trias/?lang=en
VLIZ Alien Species Consortium: www.vliz.be/niet-inheemse-soorten/en/information
68. COASTBUSTERS projects: www.bluecluster.be/projects/coastbusters, Bankbusters project: www.bluecluster.be/projects/bankbusters
69. AquaForest project https://climate-action-programme.be/projects/restoring-and-developing-mangrove-forests-dredged-material
70. BELREEFS: www.jandenul.com/news/green-light-oyster-bank-restoration-project-belreefs
71. INTERREG project 'Wier en Wind': https://keep.eu/projects/22090; Edulis project in several Belgian offshore wind farms:
www.aqua.ugent.be/edulis
72. North Sea Aquaculture project: www.bluecluster.be/projects/north-sea-aquaculture
73. GAME project: www.bluecluster.be/projects/game
74. SUSANA project: www.bluecluster.be/projects/susana
75. Research topics on Ocean and Human Health at VLIZ: www.vliz.be/en/what-we-do/research/ocean-health-and-human-health;
SOPHIE project: https://sophie2020.eu;
European Marine Board activities on Ocean and Human Health:
www.marineboard.eu/ocean-and-human-health
76. BluePsychology project:
https://vliz.be/en/imis?module=project&proid=5048
77. OECD Ocean economy resources: www.oecd.org/en/topics/sub-issues/ocean.html
78. BERNARDO project: www.bluecluster.be/projects/bernardo;
Biological Valuation Map of marine ecosystems-BWZee:
www.vliz.be/projects/bwzee

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VLIZ strengthens our marine knowledge base and promotes excellence in marine science through sound interdisciplinary research about the ocean, seas, coast and tidal estuaries. We do this in close collaboration with other research groups, citizens, policy makers and industrial partners in Flanders, Belgium, and through international collaboration. VLIZ provides scientific services to the marine research community, educators, the public at large, policymakers and the industry. Discover the interdisciplinary marine research world in the broadest sense of the word on our website:

www.vliz.be/en

Blue Cluster, a membership organisation of innovative private companies active in a wide range of maritime sectors in Flanders, is dedicated to developing and promoting economic activities that are linked to the sea. We believe that enhanced cross-sector partnerships and better cooperation with knowledge centres and government institutions leads to new and innovative investments and projects, ultimately developing solutions for a number of global challenges. Apart from the infrastructural benefits, these solutions create economic return for Flanders by creating new industries, opening up new markets and improving the competitiveness of the companies involved. Explore the BC services and projects:

www.bluecluster.be

POM West-Vlaanderen is a Belgian regional development agency that aims to further develop a sustainable and innovative economy by promoting partnerships between industry & SMEs, knowledge institutions, the public sector and the general public. Five cluster policies are being implemented, in alignment with regional, national and European strategies. One of them focuses on offshore renewable energy, multi-use and multi-source applications in a marine environment. POM supports the blue energy sector by providing innovation infrastructure and by strengthening the innovation ecosystem on topics like decommissioning of wind turbines, blue skills and tests and demonstrations in the field of drone applications, material development and energy conversion.

www.pomwvl.be

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