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European Commission

CORDIS Results Pack on

marine biodiversity

A thematic collection of innovative EU-funded research results

November 2024

Reducing and preventing drivers of marine biodiversity loss

SECOND EDITION

Research and Innovation

Contents

Editorial

The world's ocean, which feeds us, regulates our climate and generates much of the oxygen we breathe, is threatened by human activities. EU-funded projects are therefore working to protect marine ecosystems and conserve their biodiversity.

Europe's seas cover more than 11 million km^2, from shallow semi-enclosed coastal waters to the immense depths of the open ocean. They contain a multitude of coastal and marine ecosystems that provide habitats for the majority of the species found in Europe.

However, our seas are rapidly changing due to human activities resulting in pollution, plastic waste, habitat loss, acidification and warmer seas from climate change. The resulting cumulative impacts have reduced marine biodiversity hence the resilience of marine ecosystems and their ability to recover.

In response, European researchers are investigating sustainable biodegradable alternatives to plastics for packaging, enhanced waste and wastewater management, and improved recycling methods. They are also conducting research into ecosystem health, biodiversity, and coral adaptation, as well as studies on nature-based solutions, algae and oyster reef farms, and sustainable fisheries technologies.

A path to cleaner seas

An ecosystem-based management approach can mitigate the adverse impacts of fishing, extraction and other human activities, especially on sensitive species and seabed habitats. Better protection of marine ecosystems is not just good for our seas, it can also lead to significant health, social and economic benefits for coastal communities.

The goal of the EU Biodiversity Strategy is to effectively protect 30 % of the EU's seas by 2030, including 10 % under strict protection – a major leap from the 1 % of areas strictly protected today, and, through the Nature Restoration Law adopted in June 2024, to put in place restoration measures for at least 30 % of the total area of habitats not in good condition by 2030, 60 % by 2040, and 90 % by 2050.

The strategy is a core part of the European Green Deal and aims to restore biodiversity for the benefit of people, climate and planet. It builds upon several directives such as the Habitat Directive and the EU Natura 2000 network of protected areas to improve the health of our oceans, seas and inland waters through a future-orientated policy approach.

Spotlight on EU-funded research

This CORDIS Results Pack focuses on 13 projects funded under the EU's Horizon 2020 and Horizon Europe research programmes. These prove the need for biodiversity and ecosystem services research to ensure Europe's environmental sustainability, and the relevance of such initiatives for current and future policy objectives.

New tech for net-zero carbon wastewater treatment

An innovative approach comes to revolutionise wastewater treatment with remarkable reductions in carbon emissions, operational energy use and waste production.

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Municipal sewage wastewater is typically treated through a multi-step process that aims to remove contaminants and pollutants and ensure that it can be safely discharged back into the environment or reused for various purposes. It conventionally involves preliminary screening and settling tanks to remove large objects followed by biological treatment with microorganisms to break down organic matter. If it meets the required quality standards, the effluent can be discharged into a river or ocean, or it can be further treated for specific reuse purposes like irrigation and industrial processes.

Wastewater treatment plays a crucial role in addressing biodiversity issues by mitigating the adverse impacts of chemical and organic matter pollution on aquatic ecosystems. Implementation of an efficient and cost-effective wastewater treatment system with minimal energy requirements can preserve and protect our precious natural habitats and the diverse species that rely on them.

Anaerobic digestion of wastewater

Biological treatment in wastewater treatment plants employs aerobic bacteria that require both oxygen and energy expenditure for their metabolic activities.

The AMBI-ROBIC project has developed an innovative technology that removes organic pollution from wastewater using anaerobic digestion. It uses an adapted microbial community that functions at lower temperatures and a specially designed tank to facilitate the processing of psychrophilic granular sludge.

The system does not require heating, aeration or moving parts and has a smaller energy footprint than traditional aerobic systems. It can be used in a number of circumstances, alleviating organic load on other processes, to expand capacity of the existing site or as part of a new wastewater treatment plant.

AMBI-ROBIC technology represents a novel disruptive solution for wastewater treatment that provides an economical and environmentally sustainable alternative to the outdated and energy-intensive sludge process.

"Our vision is to provide self-sustaining, energy positive, zero-carbon solutions," emphasises project coordinator Derren Kinnell.

Our vision is to provide self-sustaining, energy positive, zero-carbon solutions.

Advantages of AMBI-ROBIC technology

AMBI-ROBIC technology offers several advantages that make it an attractive choice for wastewater treatment. Firstly, it contributes to the reduction of greenhouse gas emissions, aligning with climate neutrality and energy-positive objectives. This translates into 88 % less carbon emissions than aerobic-activated sludge.

"By implementing this approach in merely 10 % of the sewage treatment facilities in the EU, the resulting reduction in carbon emissions would be equivalent to removing 282 000 cars from the roads, which is equivalent to 1.3 million tonnes of CO^2," highlights Kinnell.

Additionally, this technology is highly energy efficient, leading to an impressive 80 % reduction in operational energy use compared to conventional methods. This energy efficiency not only helps reduce the environmental impact, it also results in cost savings.

Another benefit is the substantial reduction in waste production, with AMBI-ROBIC technology achieving a remarkable 95 % decrease in sludge generated during the treatment process. This reduces total expenditure due to a decreased need for sludge processing and transportation, disposal infrastructure and operational costs. Moreover, the technology generates high-quality biogas, contributing to the production of sustainable energy and promoting a circular economy.

Overall, the AMBI-ROBIC project is working to revolutionise the wastewater treatment industry, making it more sustainable and cost-effective to treat wastewater. To raise awareness, promote technology benefits and facilitate market acceptance, the project is in the process of reaching out to potential partners and end users across Europe.

PROJECT
AMBI-ROBIC - AMBIent Temperature AnaeROBIC Treatment of Municipal Sewage Wastewater

COORDINATED BY
NVP ENERGY LIMITED in Ireland

FUNDED UNDER
Horizon 2020 - Societal Challenges

CORDIS FACTSHEET
cordis.europa.eu/project/id/101011031

PROJECT WEBSITE
ambirobic.com/

Milky power: Dairy protein breaks the chains of plastic packaging waste

Picture a world liberated from single-use plastics, all thanks to casein – a humble milk protein. EU-funded researchers have harnessed it to develop biodegradable and water-soluble food packaging solutions.

© Lactips

Back in 2007, a teacher-researcher in Saint Etienne, France, embarked on a quest to create a new generation of bio-based and water-soluble plastics. His secret ingredient? Casein, a protein derived from dairy production. With over 150 years of use in various material applications, casein was transformed into a novel plastic pellet through an extrusion process. Together with an entrepreneur, he founded Lactips in 2014, focusing on sustainable innovation.

The first certified natural polymer for a sustainable future

As Lactips approaches its 10th anniversary, the company remains dedicated to preserving nature by enabling the removal of plastic waste.

"Our groundbreaking product, CareTips®, is the first natural polymer based on 100 % bio-based ingredients. Fully biodegradable in all environments, it offers a valuable alternative to improve current plastic solutions in select high-value markets," notes Alexis von Tschammer, CEO at Lactips.

CareTips® proved to be highly effective in biodegradation tests, dissolving and degrading in both hot and cold water without causing toxicity or damage to the environment. The material has also received certifications from TÜV Austria for freshwater biodegradability and OK compost HOME conformity. After a 28-day testing period, the biodegradation rate reached around 80 %.

"By using this water-soluble coating material, waste and microparticles are eliminated. As CareTips® dissolves in water, it enables the pulp to seamlessly filter through without any sticky residues and microparticles, achieving an exceptional 99.75 % paper fibre recovery rate," explains von Tschammer.

A revolutionary food packaging solution

The EU-funded ECOLACTIPACK project, fuelled by Lactips' vision, set out to transform paper-based food packaging. "Our goal was to create recyclable, biodegradable and compostable packaging that meets food preservation standards while reducing plastic waste," remarks von Tschammer. To this end, Lactips developed a unique technology to coat paper with their bio-based material (CareTips®), enhancing its barrier properties and making it suitable for food contact even with recycled paper.

This innovative solution meets the need for sustainable packaging in take-away food, pet food, coffee pods and other daily use packaging heavily consumed and discarded by consumers. "To cater to all types of food packaging, Lactips will implement its material in wet-barrier and long-shelf-life products, where the Lactips layer will be protected from the food by another layer," states von Tschammer.

Plastic has been widely used for a long period to make paper packaging waterproof and sealed. However, they pose a problem as they interfere with the recyclability and biodegradability of cellulose fibres. Plastic Free Paper™ from Lactips eliminates the use of plastics in paper packaging, thereby helping protect marine biodiversity. Being easily recyclable and biodegradable without leaving any microparticles, when ending up in water, Plastic Free Paper™ from Lactips does not pollute neither disrupt delicate ecosystems.

Plastic Free Paper™ is the first fully recyclable and compostable paper packaging solution without plastic or controversial substances.

"Plastic Free Paper™ is the first fully recyclable and compostable paper packaging solution without plastic or controversial substances. This innovative product, made of cellulose fibres coated with CareTips®, a natural polymer based on casein, is the first generation of heat-sealable packaging paper without plastic," highlights von Tschammer. What's more, it provides an effective barrier against grease, oxygen, aromas and mineral oils.

Overcoming challenges and innovating for the future

Implementing the coating technology in large-scale food packaging production required overcoming obstacles such as adhesion, coating uniformity, cost-effectiveness and water solubility. Through ECOLACTIPACK, Lactips made significant progress in addressing these issues.

Remaining challenges include balancing cost considerations with desired performance, end-use requirements and recyclability, and providing a 100 % bio-based coating solution that does not reduce current production outputs with existing solutions.

Lactips is devoted to addressing environmental concerns related to microparticles and adapting their formulations to meet application demands and emerging regulations. The company remains committed to transitioning towards a microplastic-free world by 2030. "Our goal has been to overcome the biggest challenge faced by paper-based food packaging – ensuring food preservation at the same level as plastic multilayers while facilitating its recycling," concludes von Tschammer.

PROJECT
ECOLACTIPACK - A Material to Unlock Plastic-free Paper Packaging for Food

COORDINATED BY
LACTIPS in France

FUNDED UNDER
Horizon 2020 - Health

CORDIS FACTSHEET
cordis.europa.eu/project/id/190151437

Science-based governance of oceans benefits blue economy

Improving observation and forecasting systems in Europe delivers ocean data that is useful for tourism, aquaculture, fisheries and maritime transportation.

The world's oceans control climate, provide food and are the source of livelihoods for 3 billion people. Marine ecosystems are arguably the most important on the planet. In recognition of this, the UN has deemed 2021-2030 the Ocean Decade.

The EU-funded EuroSea project dovetails nicely with this global initiative, as one of the project's overarching goals is to integrate European national ocean observation systems into an international system.

Observation systems foster sustainability

Collecting information about the condition of ocean environments creates a vast amount of data. EuroSea worked to increase the quality of data gathered as well as to improve access and connectivity between stakeholders. One example of how EuroSea facilitated data collection pertains to farmed fishing. According to project coordinator Toste Tanhua: "We were able to create information around aquaculture sites by installing special moorings with instruments and combine this with other data to provide forecast services for the operators."

In addition to helping to improve the data available about specific marine environments, EuroSea did much to facilitate the sharing of information with diverse partners. Tanhua elaborates with an example: "For instance, we were able to support the combination of observations and information from the oceanographic and fisheries communities in both the Atlantic and the Baltic Sea. This way there is a better exchange of information to the benefit of all."

We were able to support the combination of observations and information from the oceanographic and fisheries communities in both the Atlantic and the Baltic Sea.

The oceans contain a multitude of natural resources. Improving observation systems with respect to quality of data and how data is shared is essential to maintaining healthy marine environments. By coordinating communication, EuroSea fosters a global environment in which economic interests can be balanced against the need for environmental protection.

Ocean forecasting strengthens the blue economy

Data gleaned from observations becomes a powerful tool when it is used for predictive modelling. One of the services the project provided was an integrated set of tools to forecast waves, sea levels and temperatures. Researchers combined tide gauge data with satellite altimetry to validate ocean models. They have helped industries to better foresee extreme marine events, such as ocean heat waves or low oxygen levels in the water.

One important climate indicator is carbon measurements. Using autonomous surface vehicles, EuroSea collected data on carbon fluxes and uptake in the Atlantic and the Western Mediterranean. Awareness of trends in climate patterns allows industries to prepare, recognising when ecosystems may be particularly vulnerable and when they are in a more robust state.

EuroSea initiatives range from optimising technologies and information sharing systems to aligning European ocean governance with global best practices and strengthening the European Ocean Observing System. Communication was an important part of bringing together diverse constituencies and ensuring all stakeholders were working towards the common goal of sustainable, science-based ocean management.

The project brought together partners from 16 nations and two UN agencies. Pilot sites in Bueno Ventura, Barcelona and Taranto (Italy) focused on services and improvement for fisheries and aquaculture, ports and coastal communities. EuroSea has received a lot of positive feedback from these stakeholders, and given its focus on observation and forecasting infrastructures, project work is slated to have a sustained positive impact.

PROJECT
EuroSea - Improving and Integrating European Ocean Observing and Forecasting Systems for Sustainable use of the Oceans

COORDINATED BY
Helmholtz Centre for Ocean Research Kiel in Germany

FUNDED UNDER
Horizon 2020 – Societal Challenges

CORDIS FACTSHEET
cordis.europa.eu/project/id/862626

PROJECT WEBSITE
eurosea.eu/

Solutions for a resilient, healthier ocean for the future

Innovative conservation strategies have the potential to tackle the impact of a changing climate on marine ecosystems.

Marine ecosystems are vital to global biodiversity and provide essential services such as climate regulation, food security, and economic and well-being benefits. However, pollution and climate change are threatening them, causing habitat degradation and biodiversity loss. Therefore, there is an urgent need to preserve and restore the natural capacity of marine ecosystems to mitigate the impacts of climate change.

One of the core objectives of FutureMARES was to develop and implement effective conservation and restoration strategies inspired by nature that are resilient to climate change.

Conservation and restoration strategies for marine ecosystems

The EU-funded FutureMARES project aimed to address the effects of climate change on marine ecosystems by developing innovative, nature-based solutions for conservation, restoration, and sustainable management. With input from over 200 scientists across 33 institutions in 15 countries, the project focused on creating climate-resilient strategies.

"One of the core objectives of FutureMARES was to develop and implement effective conservation and restoration strategies inspired by nature that are resilient to climate change," explains project coordinator Myron Peck.

For this purpose, the consortium conducted various experiments to study how marine ecosystems respond to environmental changes, such as rising temperatures, decreasing oxygen levels, and ocean acidification. In Danish waters, for example, knowledge gained from tolerance studies helped improve site selection for eelgrass restoration, a species critical to coastal ecosystems.

In Norway and Portugal, FutureMARES researchers restored kelp forests using climate-resilient donor plants. Similarly, the project addressed concerns about the alarming decline in habitat suitability for seagrass in the Bay of Biscay and the Mediterranean Sea by implementing strategies to protect these meadows. Moreover, marine protected areas helped preserve populations of loggerhead turtles in the Mediterranean Sea by ensuring that critical migration routes and nesting sites remained intact.

Sustainable harvesting strategies

In addition to restoration efforts, FutureMARES also explored strategies for sustainable harvesting, focusing on reducing the negative impacts of overfishing, which exacerbates biodiversity loss. The project explored nature-inclusive harvesting strategies such as sustainable fisheries, marine protected areas and aquaculture, aiming for a more holistic approach to marine ecosystem management.

Ecosystem models enabled the team to predict the outcomes of fishing at maximum sustainable yield and the impact of by-catch under changing climate conditions. Findings showed that nature-based harvesting approaches can mitigate climate risks to species and their habitats. Furthermore, reducing greenhouse gas emissions was critical for rebuilding depleted fish stocks and ensuring aquaculture sustainability.

Marine digital laboratories

A major innovation of the FutureMARES project was the creation of marine digital laboratories, which simulated the effects of climate change and nature-based solutions on marine food webs.

"These decision support tools help stakeholders visualise the benefits of such interventions, as well as the potential ecological and economic trade-offs of management actions," emphasises Peck.

The project also developed novel climate risk assessments for marine species, ecosystem services, and human communities. One of the key outcomes was an online app that allows policymakers, environmental managers, and scientists to explore climate-driven risks in a consistent manner. Furthermore, FutureMARES designed future scenarios that modelled potential outcomes based on varying levels of greenhouse gas emissions and societal factors. These scenarios provide valuable guidance for decision-making in a rapidly changing world.

Looking ahead, FutureMARES will continue its work to ensure that the knowledge and tools developed during the project contribute to policy formation, implementation, and evaluation. A 'Call for Knowledge' initiative has already demonstrated the value of close collaboration between scientists and policymakers, leading to the creation of climate-smart designs for marine spatial planning including the location of marine protected areas.

PROJECT
FutureMARES - Climate Change and Future Marine Ecosystem Services and Biodiversity

COORDINATED BY
Royal Netherlands Institute for Sea Research, part of the Netherlands Scientific Research Institutes

FUNDED UNDER
Horizon 2020 – Societal Challenges

CORDIS FACTSHEET
cordis.europa.eu/project/id/869300

PROJECT WEBSITE
futuremares.eu/

Mapping the Atlantic basin ecosystems improves ocean management

Marine scientists improve data collection and information sharing about ecosystem resilience and climate change drivers in deep and open ocean environments.

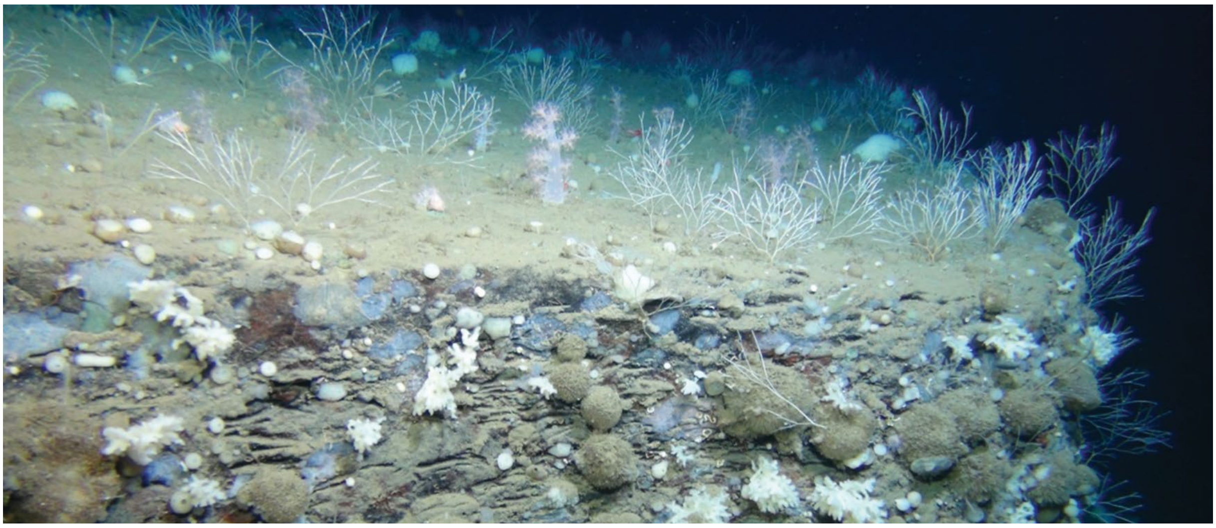
As climate change continues and human activities expand into the deep ocean, scientists strive to provide knowledge that will inform sustainable management of marine resources. The EU-funded iAtlantic project is using new technologies, employing innovative approaches and investing in early-career researchers to give Atlantic ecosystems a health check.

According to project coordinator J. Murray Roberts: "The ocean is at the heart of Earth's life support system, and it is changing faster than ever before. iAtlantic has come up with a unique coordinated approach that doesn't just focus on the science but puts huge emphasis on sharing human and technical capacities."

iAtlantic has come up with a unique coordinated approach that doesn't just focus on the science but puts huge emphasis on sharing human and technical capacities.

New knowledge about the Atlantic basin

The project focused on 12 key zones of international conservation significance in the Atlantic Ocean.



iAtlantic sent over 80 missions to these sites and nearby areas to record data, collect samples and run remote experiments on the deep seafloor.

As well as scientists, iAtlantic worked closely with stakeholders from industry and policymaking agencies to support responsible decision making. The culminating event of the project was the largest symposium ever convened to discuss implementation of the High Seas Treaty, a legal framework to protect the world's oceans.

Experiments in the field and in the laboratory identified ecosystem tipping points in response to physical changes in the environment. The project developed new knowledge with respect to specific stressors, including: temperature rise, deoxygenation, sedimentation, and pollution from deep-sea mining.

iAtlantic developed new knowledge through a host of innovative techniques and technologies. Scientists sampled environmental DNA in the water column, advanced seafloor imaging through machine learning, and showed that shifts in upper ocean systems caused by climate change negatively impact ecosystems underneath. iAtlantic also unlocked important datasets from industry stakeholders that improved mapping coverage of the seafloor, leading to the addition of 571,634 km^2 of bathymetry data being added to the public record.

Planning for the future through iAtlantic fellows

Work on the iAtlantic project spanned four continents and was dedicated to collaboration and information sharing. With over 200 researchers from 36 organisations, the partners created a blueprint for collaborative Atlantic research. The project supported more than 50 iAtlantic fellows from countries all around the Atlantic basin. These early-career researchers formed the backbone of the project, and their collaboration points to a bright future for ocean science.

Project fellows achieved many successful outcomes in their research. These include evidence of the tropicalisation of the South Atlantic, where scientists observed the poleward movement of warm-water species. Fellows worked on identifying the toxic effects of deep-sea mining on important cold-water corals. They also created ecological time series that shed new light on the impacts of climate change on Atlantic ecosystems.

Fellows engaged with one another through online events that included 16 workshops and 27 webinars. According to iAtlantic fellow Beatriz Vinha: "The intergenerational and interregional experience of iAtlantic is essential to help shape a more inclusive and multidimensional next generation of deep-sea scientists."

A fundamental goal of iAtlantic was to provide access to scientific evidence that informs sustainable governance of the Atlantic Ocean. All project publications are accessible via zenodo, and the project's spatiotemporal data is available through the GeoNode platform.

PROJECT
iAtlantic - Integrated Assessment of Atlantic Marine Ecosystems in Space and Time

COORDINATED BY
The University of Edinburgh in the United Kingdom

FUNDED UNDER
Horizon 2020 – Societal Challenges

CORDIS FACTSHEET
cordis.europa.eu/project/id/818123

PROJECT WEBSITE
iatlantic.eu/

Massive clean-up technologies in marine ecosystems

Marine litter is a mounting threat to our oceans' biodiversity. With EU funding, Europe's centres of excellence have mounted a multidisciplinary initiative to counter this – from social efforts to a range of high-tech applications.

Plastic is persistent and toxic, hence its unprecedented threat to ecosystems. Plastic and chemical leakage arises at various points in the life cycle and resulting pollutants are carried round the globe through air and ocean streams.

Marine life can also become entangled in plastic and their digestive tracts blocked, preventing feeding and causing changes in behaviour. In addition, invasive alien species like crabs, molluscs and even fish and can cross the ocean by hitching a ride on or in plastic waste.

A recent study found that 170 trillion plastic particles are afloat in the world's oceans. A total of 17 partners in the project In-No-Plastic have adopted a totally holistic approach to this problem. "Our strategies target not only macroplastics but also microplastics and nanoplastics in different aquatic ecosystems," says project coordinator Ben Alcock. Moreover, he continues, "our processes remove macroplastics as well as micro- and nanoplastics."

Our processes remove macroplastics as well as microplastics and nanoplastics.

Removal of plastic waste reduces pollution, helps protection and preservation of marine habitats, safeguards vulnerable species and promotes biodiversity.

The aim, therefore, is to remove plastic waste to prevent it from accumulating in pollution 'hotspots' and avoid negative impacts on ecosystem function and ecological processes.

To prevent the accidental removal of marine organisms during clean-up initiatives, In-No-Plastic uses environmentally responsible techniques and practices. Implementing proper waste management strategies, such as using selective and non-destructive manned and unmanned collection methods, can help minimise harm to marine organisms.

Social strategy

There are incentives for local populations via a crowdsourcing smartphone app that include financial compensation. Perhaps the greatest incentive comes with the social awareness fostered by workshops and virtual reality-based demonstrations of the benefits to local economies when marine litter is removed from our coastal areas. Businesses, local communities and tourists alike thrive on cleaner, more varied ecosystems.

Engagement of local communities was achieved through social media with voluntary clean-up activities and the testing of marine litter recycling with tangible outputs such as trash bins, trash bags, etc.

Worthy of note is that the Dutch Royals participated in a project workshop on the Caribbean island of Sint Maarten for the In-No-Plastic science fair 'Nature Under Threat', one of the in-field activities organised by partners.

Technical approaches

It's well known that plastics attack the ecosystem at the macro level where they can be ingested or entangled by debris. However, under the influence of solar UV and physical factors such as wind and waves, plastics can break down into microplastics less than 5 mm and nanoparticles less than 100 nm.

"Depending on the aquatic environment and the type and size of the plastic litter, different technologies are applicable," Alcock informs us. "Technical strategies include agglomeration systems to collect nano- and micro-particles, environmentally friendly chemistries to help micro-particles stick together, and filtration systems to remove macro- and microplastics from water."

Additionally, the use of autonomous collection robots for removing plastic litter from beaches and shores has shown great promise. These robots can operate independently, using their vision systems to identify plastic debris and their robotic arms to collect and transport the litter for recycling. Hand picking of litter is also encouraged through social rewards and the use of data-driven monitoring systems.

The importance of monitoring

In-No-Plastic has incorporated a monitoring system to gather data on its activities every 6 months for 2 years. Project protocol includes monitoring the area, the biological activity and its natural assets before taking action. The effectiveness of the new technologies and clean-up activities can therefore be monitored along with the effects on the marine ecosystem.

Important also, a range of biodiversity and ecosystems have been studied in pan-global, iconic testing sites, including Venice, Italy, the Croatian island of Krk, the Caribbean island of Sint Maarten in the Dutch Antilles, and the River Thames in London, United Kingdom.

Already, two popular misconceptions about marine pollution – that tourism is mainly responsible and that macroplastics are the primary problem – have been overturned. "Monitoring also provides a measure of the level of public awareness from citizen science experience," adds Alcock, "and reveals the shocking impact litter has on our shores!"

"As for sustainability, an important factor in maintaining biodiversity, the project aims to allocate private-public funds to continue its activities, ensuring that community engagement is sustained even after the termination of In-No-Plastic," Alcock concludes.

PROJECT
In-No-Plastic - Innovative approaches towards prevention, removal and reuse of marine plastic litter

COORDINATED BY
SINTEF AS in Norway

FUNDED UNDER
Horizon 2020 – Societal Challenges

CORDIS FACTSHEET
cordis.europa.eu/project/id/101000612

PROJECT WEBSITE
innoplastic.eu/

Coastal biodiversity: the guardian of our planet's ecosystems

Climate change endangers marine and coastal ecosystems – but preserving biodiversity with nature-based solutions offers crucial support.

© Ewan TREGAROT

Nearly half of the global population lives within 100 km of marine coastal regions, reaping the invaluable benefits provided by these ecosystems. In addition to human well-being, marine and coastal ecosystems play a pivotal role in supporting diverse economic activities, notably fisheries.

These ecosystems exhibit remarkable resilience and an ability to adapt to environmental changes through various mechanisms. Among these, biodiversity stands out as a crucial indicator of an ecosystem's vitality, encompassing a spectrum of life from animals to microorganisms and plants.

However, these ecosystems face mounting pressures stemming from climate change and human intervention – particularly through overexploitation. This is pushing marine and coastal ecosystems to their limits, leading to shifts in ecological balance and loss of biodiversity. The ecological processes behind the provision of ecosystem services that could help us mitigate the effects of climate change are at risk.

Nature-based solutions against marine and coastal ecosystem degradation

These escalating threats were the driving force for the EU-funded MaCoBioS project to take action. It explored nature-based solutions for the conservation and sustainable management of marine and coastal ecosystems against the impact of climate change. The first step was to understand the relation between climate change, biodiversity and ecosystem services.

"Nature-based solutions aren't uniform; they're context-dependent, demanding tailored approaches," emphasises Cindy Cornet, member of the project's coordination team.

Researchers developed a framework to guide practitioners in selecting the most suitable intervention depending on the societal challenge they want to address, the ecosystems and their ecological condition as well as the services they provide. From marine protected areas to coral restoration efforts, these solutions were designed to safeguard ecosystems while meeting societal needs.

"Central to the implementation of these strategies is the engagement of stakeholders and especially local communities", she continues.

Monitoring ecosystem capacity to cope with climate change

Monitoring ecosystem resilience against climate change requires diverse indicators. By reviewing the literature, the team determined critical thresholds for various ecosystems, such as coral reefs' bleaching temperatures or how much sea level rise mangrove forests can tolerate.

"Employing diverse indicators, including molecular and ecosystem-level variables, provides a comprehensive understanding of climate change impacts," states research fellow Ewan Trégarot.

Moreover, researchers used paleoclimatology to retrace the growth of coral species over multiple decades and centuries in relation to specific stressors. The advantage of this method is that it provides observations at a time scale that is more relevant to climate change. Predictive modelling and machine learning also helped forecast future ecosystem conditions, offering insights into long-term resilience.

Shaping global policies on climate change

MaCoBioS consolidated a suite of tools and frameworks to guide decision-makers. According to Cornet, an integrated theoretical model, designed to answer crucial questions and facilitate implementation of nature-based solutions signifies the most significant accomplishment of the project.

Key project outputs and perspectives on biodiversity and climate change have been presented at the UNFCCC COP27 conference while collaboration with the African Union highlighted the potential of restoring coastal and marine natural habitats for the future of African fisheries. The project's nature-based solutions also align with the EU's mission to restore ocean and waters by 2030.

"Collectively, MaCoBioS is committed to raising global awareness on the transformative potential of nature-based solutions in safeguarding coastal habitats," concludes Pierre Failler, Director of the Centre for Blue Governance at the University of Portsmouth.

Collectively, MaCoBioS is committed to raising global awareness on the transformative potential of nature-based solutions in safeguarding coastal habitats.

PROJECT
MaCoBioS - Marine Coastal Ecosystems Biodiversity and Services in a Changing World

COORDINATED BY
University of Portsmouth Higher Education Corporation in the United Kingdom

FUNDED UNDER
Horizon 2020 – Societal Challenges

CORDIS FACTSHEET
cordis.europa.eu/project/id/869710

PROJECT WEBSITE
macobios.eu/

The role of the MAELSTROM project in addressing the Marine Litter Legacy

Mankind's marine legacy currently weighs in at a staggering 83 million tonnes of plastic waste. The EU-funded MAELSTROM project is working on truly sustainable solutions. Remove, recycle, reuse, repeat!

Plastic litter enters our seas primarily from rivers and ends up in marine ecosystems, where it is widely known to have harmful effects on both wildlife and human health.

Sustainable recovery of plastic from oceans is complex and expensive. Long-term remediation requires the concerted, multidisciplinary research efforts of the 14-strong team of MAELSTROM partners.

Centres of excellence in marine life, AI and robotics, recycling companies and plastics research experts are all key players in the consortium. So are a marketing consultancy company to help sell the recycled products and all media outlets for spreading the latest word on social awareness about the marine litter issue.

MAELSTROM has identified Europe's so-called marine litter accumulation hotspots as the Ave River, Portugal, and the Venice coastal area, Italy. Characteristics of the waste, whether it sinks, and the winds and currents all determine where it will be deposited – as well as the best possible remediation plan.

Bubbles and robots

A bubble barrier in the Ave River is preventing the plastic from entering the ocean. Developed by Dutch partner The Great Bubble Barrier®, the cunning design allows the passage of fish and traffic while directing the waste with a 'bubble curtain' to a catchment system at the riverbank.

For the Venice Lagoon, a robotic seabed cleaning platform has been developed by partners Tecnalia Research and Innovation, CNRS_LIRMM and Servizi Tecnici. The AI system identifies the waste and picks each item off to minimise impact on ecosystems. It has a sucker for small litter pieces and a gripper for larger material.

And after removal...

An AI-driven sorting robot separates the litter, which is then subjected to the most advanced recycling processes. Now able to re-enter the industrial supply chain, the regenerated materials include chemical precursors and polymers. A fine example of the circular economy, shredded fishing nets were transformed into panels and laminates.

So far, both technologies have collected a total of 7 tonnes of marine litter. Some of the material collected in Venice was subjected to low-temperature pyrolysis to produce second-generation marine fuel. This is yet another example of the circular nature of the system as the fuel powers the project's marine litter removal technologies. From collection to integration into other recycled products, the MAELSTROM Traceability App tracks its progress and provides a certificate of 'MarineLitterOrigin'.

To determine the efficiency of removal technologies and estimate the long-term effects on ecosystems, MAELSTROM is performing dedicated monitoring surveys of the sites. Life-cycle assessment based on the international ISO standards 14040 and 14044 is also ongoing to evaluate the environmental impacts of the technologies.

Social awareness

Social awareness has to be the key issue behind stemming the tide of the marine litter problem. Advertised by social media channels, MAELSTROM actively encourages citizens' ocean literacy and engages them in beach and canal clean-ups. The project participated in the 'World's Biggest Butt Pick Up' when challenged with collecting 1 million cigarette butts and adheres to the #EUBeachCleanUp campaign and to the EU Mission Restore Our Oceans and Waters.

All the MAELSTROM technologies developed so far will reach TRL 6. Moreover, collection of marine litter is efficient and has minimal impact on the environment. The project clock stops ticking at the end of December 2024, and MAELSTROM has already taken the first real step towards a zero-plastic waste policy.

PROJECT
MAELSTROM - Smart technology for MArinE Litter SusTainable RemOval and Management

COORDINATED BY
National Research Council of Italy in Italy

FUNDED UNDER
Horizon 2020 – Societal Challenges

CORDIS FACTSHEET
cordis.europa.eu/project/id/101000832

PROJECT WEBSITE
maelstrom-h2020.eu/

Reviving oysters for coastal sustainability

Native oyster farming along the Adriatic coast unveils its transformative potential for a sustainable and thriving coastal ecosystem.

Bivalve aquaculture, also known as shellfish farming, refers to the cultivation and harvesting of bivalve mollusks such as oysters, mussels, clams and scallops in aquatic environments. It is an important sector of the aquaculture industry and a promising avenue for sustainable seafood production as it addresses the problem of overfishing and the increasing protein demand of our population. However, there are environmental considerations associated with bivalve aquaculture that need to be addressed.

Restorative aquaculture of flat oysters

Our main goal was to achieve economic returns while preserving the integrity of the reef and its valuable ecosystem services.

Undertaken with the support of the Marie Skłodowska-Curie Actions (MSCA) programme, the MAREA project proposes to combine native oyster restoration with mussel aquaculture. This will be achieved by reintroducing native flat oyster reefs of the Ostrea edulis species alongside existing mussel culture sites."Our main goal was to achieve economic returns while preserving the integrity of the reef and its valuable ecosystem services," emphasises host project investigator Roberto Pastres.

As a first step, researchers have assessed the current state of restorative aquaculture and the feasibility of growing native oysters under the prevailing conditions, considering environmental factors and water quality.

Particular emphasis has been given to the establishment of a fully localised culture chain by optimising all stages of oyster farming, from hatchery production to harvest. Additionally, researchers have quantified the ecosystem services associated with this approach, with a particular focus on evaluating carbon fluxes and biodiversity impacts. This assessment will provide valuable insights into the positive environmental contributions of the farming activities.

"Involvement of the farmers and citizens will ensure the development of a sustainable supply chain that aligns with the workforce needs and aspirations of the community," outlines the MSCA research fellow Camilla Bertolini.

Satellite-based prediction of collectors

Results show that flat oysters can grow and reproduce under current conditions in the Venice Lagoon pilot site. The team has placed collectors strategically at different sites to provide a suitable surface for oyster larvae (spat) to settle and attach themselves in the aquatic environment. Further investigation of the impact of collector positioning on oyster growth will help improve restorative aquaculture guidelines.

Additionally, researchers have observed reproductive adults throughout most of the year and created a model that uses satellite-derived data to predict where spat will settle based on swarming timing. This modelling approach can be useful for extrapolating findings to other regions. Moreover, it can be used to quantify carbon fluxes associated with shellfish growth, contributing to our understanding of the role of shell calcification in the carbon budget of a farm.

Raising awareness on the role of oysters

The project has achieved a significant milestone by raising awareness among farmers and consumers about the potential role of native oysters in the local economy. This has been instrumental in encouraging a shift towards more sustainable choices. The team

© Camilla Bertolini

also authored a children's book to explain the fascinating life cycle of oysters, which begins as planktonic organisms searching for suitable substrate to settle on.

MAREA has successfully formed connections with international partners, including the Native Oyster Restoration Alliance group, and has identified local partners interested in expanding oyster aquaculture and restoration efforts. Collectively, MAREA activities will pave the way towards the development of a thriving coastal ecosystem.

PROJECT
MAREA – MAtchmaking Restoration, Ecology and Aquaculture

COORDINATED BY
Ca' Foscari University of Venice in Italy

FUNDED UNDER
Horizon 2020 - MSCA-IF

CORDIS FACTSHEET
cordis.europa.eu/project/id/886037

Nature-based solutions to curb effects of climate emergency

Marine biodiversity and coastal ecosystems play a crucial role in safeguarding our planet's delicate balance. However, they face numerous threats, including hydro-meteorological phenomena like river flooding, droughts, landslides, and coastal erosion.

Extreme weather events caused by climate change mean an increase in the severity of hydro-meteorological phenomena. One result is an increase in sediment and pollution from river catchments flowing into the marine environment, threatening ecosystems and the biodiversity they contain.

The EU-funded OPERANDUM project addressed this challenge by harnessing the power of nature-based solutions (NBS) to mitigate negative impacts. Silvana Di Sabatino, project coordinator and professor of atmospheric physics at the University of Bologna, highlights the importance of Open Air Laboratories (OALs) in revolutionising hydro-meteorological risk management.

"The most significant hydro-meteorological phenomena affecting Europe are river flooding, droughts, landslides, and coastal erosion," says Di Sabatino. She explains that OPERANDUM's ambition is to address and overcome barriers through OALs. "The aim of these OALs is to produce innovation, to drive the change in current practices of land planning and improving resilience to hydro-meteorological hazards."

Nine Open Air Laboratories (OALs) were established in seven European countries and China.

Using nature to adapt landscapes

Compared to traditional Living Labs, OALs focus on large regions, such as rural or coastal areas, with the role of NBS at the centre. "The OALs allow us to define the methodological steps that are required to reach the mitigation of the risk starting from data availability, level of acceptance, monitoring equipment, modelling tools, legislation pathways, and maintenance over the long term," says Di Sabatino.

> *In previous projects NBS have been viewed as a potential solution to improve the liveability of the cities and access to more comfortable environments.*

One of the OALs was located in the Elbe valley in Lower Saxony, not far from the site of the 2021 floods that killed more than 220 people in Europe. There, people's lives are now threatened by extreme flooding caused by increasingly frequent and heavy rainfall. In practice, this meant using hydraulic modelling to identify the narrow sections of the Elbe that would overflow during heavy rainfall and should be kept free of tall vegetation to facilitate the drop in water level.

Di Sabatino also pointed to the OAL at Volano Beach that is part of The Po Delta Biosphere Reserve in north-east Italy. The Po delta boasts a unique identity and biodiversity with ecosystems ranging from coastal sand formations, lagoons, fishing ponds, marshes, vegetated dunes, coastal pine forests, brackish wetlands to cultivated land.

This low-lying area is exposed to storm surges related to the Sirocco wind and frequently inundated by the sea, causing coastal erosion that threatens both the surrounding ecosystems and the local community. Project partners are combatting this danger by constructing artificial dunes made up of biodegradable materials –wood logs and coconut geotextile – and sand that mimic natural dunes. These structures are covered with native vegetation that traps sand, stabilising and reinforcing the dunes, which act as a natural barrier between sea and land to mitigate storm surges and coastal erosion, and help conserve biodiversity both on land and in the sea.

Foundation for the future

Among European citizens the central goal was to increase awareness, says Di Sabatino. "In previous projects NBS have been viewed as a potential solution to improve the liveability of the cities and access to more comfortable environments." However, the 26 partners involved in OPERANDUM tackled risks derived from extreme weather events that need to be mitigated.

"This means that an emphasis on testing, verification and validation of the solutions is mandatory. The full impact of NBSs on OALs though is still under evaluation," says Di Sabatino.

But these are only the first steps. The project has provided a science-based methodology, including design protocols, for future scientists and engineers to mitigate hydro-meteorological risks and their impact on marine ecosystems and biodiversity. In the future, up-scaling and replication will be needed to reap the long-term benefits of the NBS.

PROJECT
OPERANDUM – OPEn-air laboRAtories for Nature baseD solUtions to Manage hydro-meteo risks

COORDINATED BY
The University of Bologna in Italy

FUNDED UNDER
Horizon 2020 – Societal Challenges

CORDIS FACTSHEET
cordis.europa.eu/project/id/776848

PROJECT WEBSITE
operandum-project.eu/

Robots detect and collect litter in marine environments

A team of robots empowered by machine learning operates autonomously from the air, underwater and on the surface to identify, map and remove trash from the sea.

Litter is a major and growing threat to marine ecosystems. For many organisms, interaction with litter can lead to suffocation, an inability to feed, entanglement, and changes in behaviour, with impacts on individual species, inter-species relations and assemblages, and the functioning of a whole ecosystem. The most common type of litter is plastic, but other materials include glass, metal, wood and clothing.

The Earth's oceans already contain 26-66 million tons of waste, 94 % of which is located on the seafloor.

Currently most waste collected from maritime environments is retrieved from the surface. Sometimes divers are employed to remove trash from underwater, but the procedure is costly and inefficient. The EU-funded project SeaClear leverages robotic and AI-driven technologies to provide a novel and effective solution to the problem of collecting unseen, underwater trash.

Specialised robots work together

Multiple robots coordinate to collect trash from the bottom of the sea. Aerial and underwater robots scan the water for litter using image and acoustic sensors. A surface vehicle is the hub of the operation, with underwater units and drones tethered to the hub. Tethering enables better communication and addresses the power and computation needs of the robots.

A smaller underwater robot functions as an observation unit, while a second, larger underwater robot is used to collect litter. New technologies have helped in the design of components for the underwater collecting unit. For example, the trash collecting robot is equipped with an innovative grabber and a suction device for picking up litter. A litter-carrying basket, designed to protect marine life, is also lowered in the water. The waste-removing robot can safely dock and release the litter from the gripper into the basket.

While the goals and processes envisioned by SeaClear are easy to comprehend, achieving success with autonomous robots is much more difficult and requires the application of AI. In particular, training robots to accurately identify litter and to avoid misidentifying living organisms is a critical matter. Complicating this endeavour is the fact that some forms of litter, such as a cinderblock on the seafloor, become rich habitats and should not be removed. The SeaClear team seeks an 80 % success rate in litter identification coupled with a 90 % success rate in litter collection.

The consortium aims to introduce the litter-cleanup system to the market, making it accessible for public authorities, coastal organisations, NGOs, tourist resorts and any other businesses that may find this solution beneficial.

Working towards market-ready deployment

SeaClear focuses efforts on coastal areas, as that is where the inflow of litter is concentrated. They demonstrate the efficacy of the multi-robot platform in two case studies. One study focuses on port cleaning and worked with the end user Hamburg Port Authority, Germany. The other site is a touristic area in Dubrovnik, Croatia, with the end user Regional Development Agency of Dubrovnik Neretva County. A follow-up project, SeaClear2.0, has already kicked off. This second project is focusing on trash collection in deeper, darker waters. It will also endeavour to pick up larger debris by equipping the surface robot with a grapple. The follow-up project will include surface litter collection and efforts to raise public awareness and reduce litter input. To learn more about SeaClear2.0, please visit https://www.seaclear2.eu/.

SeaClear has made great strides in collecting litter from the seafloor. According to project coordinator Bart De Schutter: "The consortium aims to introduce the litter-cleanup system to the market, making it accessible for public authorities, coastal organisations, NGOs, tourist resorts and any other businesses that may find this solution beneficial."

The SeaClear consortium includes our two end users, an SME that provides the hardware, four academic institutions to develop the methods, and a marine system integrator to bring everything together. The consortium mirrors the coordinated team of robots in its complementarity. The project's endeavours are making the seas a safer, cleaner place for industry, recreation and marine life.

PROJECT
SeaClear - SEarch, identificAtion and Collection of marine Litter with Autonomous Robots

COORDINATED BY
Delft University of Technology in the Netherlands

FUNDED UNDER
Horizon 2020 - LEIT-ICT

CORDIS FACTSHEET
cordis.europa.eu/project/id/871295

PROJECT WEBSITE
seaclear-project.eu/

Giving fishers technological eyes under the ocean

A new suite of technological innovations aims to improve the monitoring of fish stocks to mitigate the impacts of unregulated fishing and boost harvest sustainability.

Illegal, unreported and unregulated (IUU fishing) is a worsening international problem, one which presents a major threat to marine ecosystems. There is also currently very little data on fish stocks to show which fish are in a certain location at a certain time, and how climatic stressors are affecting their distribution.

"This lack of knowledge makes it difficult to assess the size of the stocks so that we can have a sustainable fishery where the stocks are able to recover," explains Rachel Tiller, chief scientist at SINTEF and SMARTFISH project coordinator.

SMARTFISH gives fishers eyes underwater, power to decide when to pull in a haul, and freedom to not do paperwork on the count, weight and size of the harvested because it is done automatically.

In the EU-funded SMARTFISH project, researchers designed and developed a new collection of innovations for use in the fishing sector, underpinned by advanced technologies to provide monitoring, analysis and assistance in all facets of the fishing sector, in order to mitigate IUU fishing and ensure fisheries harvest that is inside sustainability targets.

"To develop compliance by design, the suite of the technologies developed in SMARTFISH also included the testing of an automatic catch registration system that uses AI and machine learning," says Tiller.

An advanced fish monitoring system

The SMARTFISH technologies can be used in different types of fisheries depending on what species are targeted.

"SMARTFISH gives fishers eyes underwater, power to decide when to pull in a haul, and freedom to not do paperwork on the count, weight and size of the harvested because it is done automatically," Tiller adds. Giving fishers the possibility of monitoring the catch inside the trawl during fishing can also act as a decision support tool, helping them move from a more uncertain experience-based fishery, towards a knowledge-based capture of wild fish.

Harnessing state-of-the-art technology

The SMARTFISH tools benefit from advances in emerging technological developments in machine vision, camera technology, data processing, machine learning, artificial intelligence, big data analysis, smartphones/tablets, LED technology, acoustics and ROV technology.

One tool, for example, the FlashLidar, uses a 3D range-gated camera to accurately estimate fish length of free-swimming fish, with observed length error in the order of just 1 %.

Another, CatchSnap, is a versatile handheld 3D machine vision unit for letting fishers inspect fish quickly without the need for conveyor belts or sorting tables.

"It is not a panacea for fisheries management by any means, but it is a suite of innovations that can help us along the path towards more sustainable fisheries," Tiller notes.

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Testing in the ocean

Each of the technologies developed were tested in at least one regional sea and within appropriate commercial fisheries and systems.

All technologies developed reached higher TRLs than at the project start, and the interdisciplinary research and industry team made great progress towards automatic catch registration and underwater surveillance and monitoring systems.

SMARTFISH can be part of the solution to contributing to the fight against the multiple crises the world faces, Tiller says, including climate change and biodiversity decline.

"We need to highlight that technology and innovation in fact can contribute to helping us solve these crises, and at the same time find solutions that can ensure continued sustainable growth of the fishing industry," says Tiller.

The work continues in another EU-funded project, EVERYFISH, which is further developing AI and machine learning catch registration systems.

PROJECT
SMARTFISH - Smart fisheries technologies for an efficient, compliant and environmentally friendly fishing sector

COORDINATED BY
SINTEF OCEAN AS in Norway

FUNDED UNDER
Horizon 2020 – Societal Challenges

CORDIS FACTSHEET
cordis.europa.eu/project/id/773521

PROJECT WEBSITE
smartfishh2020.eu/

Showcasing the potential of ocean multi-use

Imagine sustainable energy production, tourist activities and aquaculture all operating successfully in the same area. The European UNITED project has developed five pilot sites that demonstrate just that.

As society moves more of our activities to the sea our European waters are becoming busier with an increase in potential conflicts and threats to ecosystems. With EU targets such as developing 60 GW of offshore wind power by 2030 and 300 GW by 2050, goals ensuring that different industries collaborate and share space to conduct their activities is crucial.

Combining several activities in the same marine area can reduce demand on the space needed for different activities, help develop synergies and cost savings for the relevant undertakings, and free more room for protecting biodiversity and keep ocean water pollution free.

In synergy

The EU- and industry-funded UNITED project provides evidence that the development of multi-use platforms or the co-location of different activities in a marine and maritime space is beneficial to all parties involved.

The project aims to provide evidence of the viability of ocean multi-use through the development of five real-life ocean multi-use pilots that combine different combinations of marine activities.

"The project aims to provide evidence of the viability of ocean multi-use through the development of five real-life ocean multi-use pilots that combine different marine activities," says Ghada El Serafy, project coordinator at host company Deltares.

In practice, this means that the same area originally designated for an offshore wind farm can be used for other compatible activities, such as seaweed, mussel or oyster farming. The space between wind turbines provides enough space for sustainable farming and also tourism activities such as boat trips. Another example of multi-use is having diving tours explore fish farming at sea, where people can learn about aquaculture, and also collect data for environmental monitoring and farming operations.

Success in the face of challenging circumstances

The five project models have produced promising results. The German pilot cultivated shellfish and macroalgae at different water depths using different materials, growing medium, and designs within a difficult, exposed offshore site with many technical challenges such as waves of 16 m and currents of 1.5 m/sec.

"Despite the patchy growth, the success of the seeded areas exceeded expectations," says El Serafy. "The successful seaweed and mussel harvest serves as a testament to the unwavering dedication and technical, biological and logistical expertise of the German pilot. Their innovation and sustainable and safe offshore practices has earned them well-deserved recognition within the offshore industry."

Two additional pilots explored seaweed and mollusc farming in dynamic offshore wind parks, the Dutch and Belgian pilots. The Belgian partners have simultaneously progressed with restoring oyster beds within wind parks with the ambition to have these natural beds seed oyster farming activities.

Oyster reefs provide several ecosystem services, including enhanced water quality through their filtering capacity, improved sediment stability and carbon sequestration. These oyster reefs are dually important as breeding grounds, food sources and resting or refuge places for a wide spectra of biodiversity. A recent harvest of several seaweed nets at the offshore Belgian pilot site represents the first time that seaweed has been successfully cultivated and harvested within an active offshore wind farm in Europe.

Seaweed farms, particularly within wind parks, stand to provide a refuge and shelter for various marine species, as an extractive aquaculture method can be a manner through which excess nutrients from onshore activities can be removed and remediated. Combining oyster aquaculture and seaweed farming can therefore offer a sustainable way of performing aquaculture and purifying the surrounding water from excess nutrients.

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Benefiting local communities

The pilots showed that multi-use platforms or co-location of different activities in a marine and ocean space is economically, socially and environmentally viable for European maritime industry and that they can operate sustainably in healthy local ecosystems, while supporting, safe, socially accepted sustainable businesses.

"The ultimate beneficiary is society at large given the fact that the project, and specifically its pilots, are looking into the socioeconomic benefits of the ocean multi-use concept implementation," El Serafy sums up. This means that the multi-use of offshore sites is expected to yield economic benefits and stimulate job creation through the integration of activities such as aquaculture and tourism.

PROJECT
UNITED – Multi-Use offshore platforms demoNstrators for boostIng cost-effecTive and Eco-friendly proDuction in sustainable marine activities

COORDINATED BY
STICHTING DELTARES in the Netherlands

FUNDED UNDER
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Water: quality and security

In Episode #24 of the CORDIScovery podcast we travel from the high Himalayas and delve into the secret lives of freshwater snails to explore water cycles and the latest techniques for monitoring pollution.

Tune in and enjoy: **cordis.europa.eu/article/id/443090**

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