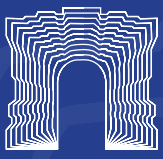
Roma Italia EXPO 2030

World Expo 2030 *Candidate*

RUS

EXPO 2030 ROMA FOR HEALTHY OCEANS

A PRIORITY FOR SIDS AND THE ENTIRE WORLD



Roma
Italia
EXPO 2030

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EXPO 2030 ROMA
FOR HEALTHY OCEANS
A PRIORITY FOR SIDS
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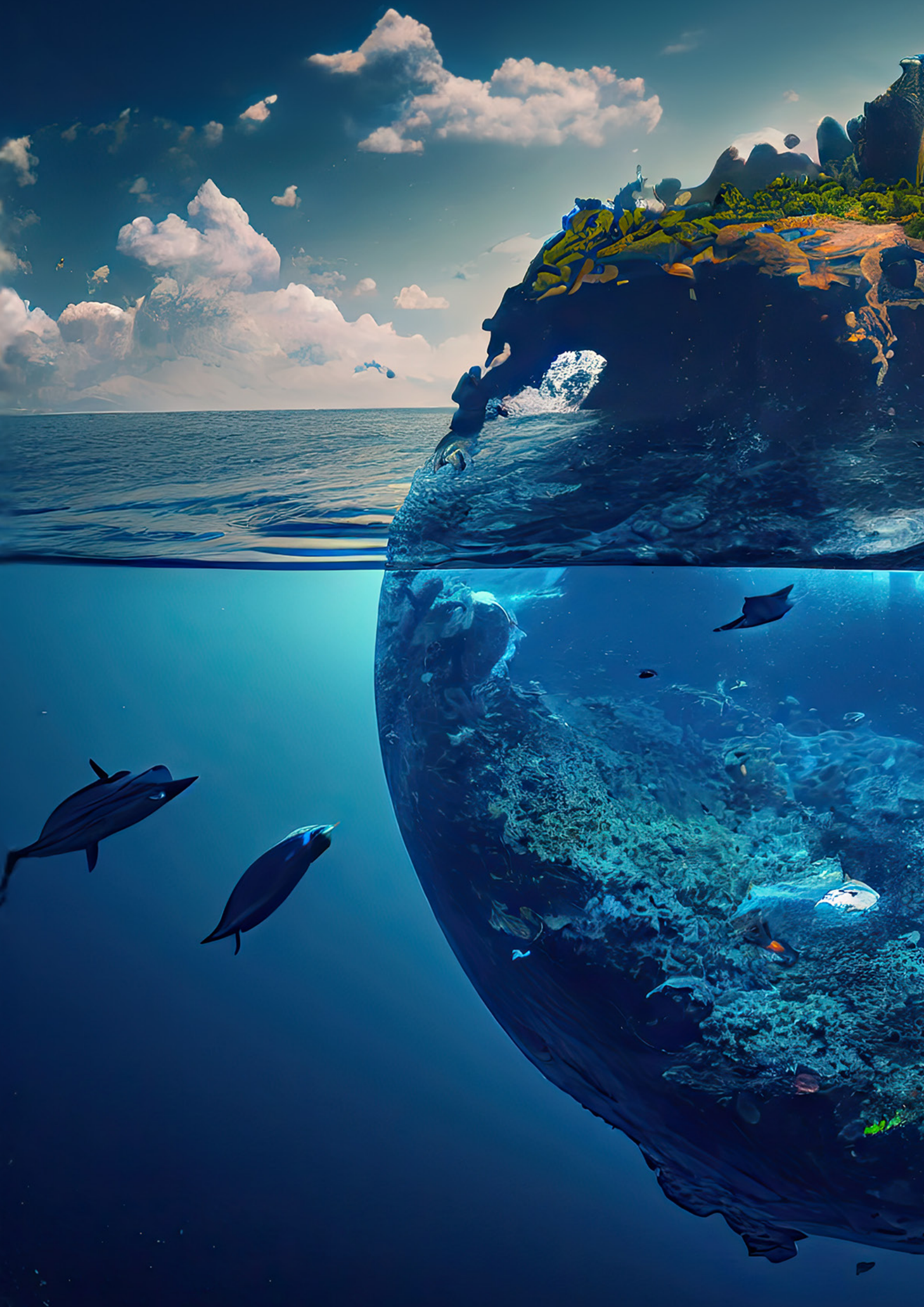

MESSAGE FROM THE EXPO 2030 ROMA BID COMMITTEE

Nowadays, addressing the health of the Oceans means discussing one of the most significant challenges for our Planet. Humanity is facing the need of an important turning point related to the relationship between People and Territories. The ecological impact of humanity is causing a radical change of the natural basis of life on Earth, and this is a crisis that affects almost every aspect of our lives.

The UN Agenda 2030 has set the goal of protecting 30% of the Oceans by 2030 to regenerate the natural capital as a common good of humanity. The UN has also launched the call "Ocean Science for a Sustainable Development" for the decade 2020-2030, dedicating this decade to the "Ecosystem Restoration".

Oceans and Seas genuinely play a crucial role for humanity, providing ecosystem goods and services and supplying food to an important portion of the global population: over 3 billion people depend on food from the sea as a principal source of nutrition, and 1 billion and three hundred million people depend on marine resources for their livelihood. At the same time, Oceans are subjected to the increasing impacts that are altering their bio-chemical functions, seriously threatening the biodiversity of ecosystems and leading environmental degradation.

In an increasingly interconnected global society, Oceans health issues are not merely related to the health and survival of certain populations but affect the entire world. Climate change and oceans pollution are widely observable in many parts of our planet and affect our health, our livelihoods, the quality of social relations, our economy, technology, politics and law.
The different forms of marine pollution are one of the most serious environmental emergencies of the modern era and there is a clear urgency in adopting new approaches to combine sustainable use of ocean resources with effective ocean protection.
It is urgent to recognize that the Oceans represent a common heritage of humankind and that the whole of humanity have the right to a healthy and biodiverse ocean.
Moreover, the Oceans can become a cornerstone of the global clean energy transition by using renewable energy from wind, water, waves and the sun, thus ensuring energy equity.

THE URGENT NEED FOR A TURNING POINT IN THE RELATIONSHIP BETWEEN PEOPLE AND TERRITORIES

The value of sustainability is the cornerstone of the Expo 2030 Roma project, through which it will be possibile to develop and realize tangible projects for the preservation and protection of the Oceans, especially in the most vulnerable States.
To this end, The Expo 2030 Roma Bid Committee is strongly committed to supporting the importance and necessity of an effective protection and safeguard of the Oceans and is honoured to be part of the Italian contribution to the preparatory process for the "Fourth International Conference on Small Island Developing States (SIDS)" of the United Nations.

Expo 2030 Roma is not meant to be a simple Universal Exposition but a true inclusive project, a unique platform for the implementation of international collaborations and the experimentation with new technologies.
Expo 2030 Roma is designed from the outset to become an "Open and Collaborative Knowledge Park for Sustainable People and Territories", in which the Participating Nations will have their own research garrison to implement joint projects during the Post-Expo and where the excellence of the Italian academic and scientific world will merge with the expertise and knowledge of the countries facing environmental, oceans and marine issues.

Within this framework, the initiative "Healthy and Protected Oceans. For a Sustainable, Equal and Prosperous Future" aims to promote a sustainable use of oceans resources based on a sustainable "blue economy". The challenge is to implement projects to regenerate the natural capital and to develop new opportunities for "blue tourism" in the countries that see in Oceans and seas their primary asset. Protecting the Oceans and their life is one of the main strategy to develop a sustainable, resilient, regenerative and healthy economy, able to grow in harmony with Nature and to cope with the need of energy equity and healthy seafood. There is no true development if it is not equally shared by all. The protection of the Oceans is indeed a priority to ensure an inclusive and prosperous future for the present and future generations.
For this reason, the Expo 2030 Roma Bid Committee expresses its great pride to be part of this initiative and thank the Italian academic and scientific world and the RUS Network for their relentless commitment to research and innovation towards the safeguard of our Planet.

Bid Committee Expo 2030 Roma

THE CONTRIBUTION OF THE ITALIAN SCIENTIFIC AND ACADEMIC WORLD

The Italian Network of Universities for Sustainable Development (RUS) is proud to support the Expo 2030 Roma Bid Committee and to be engaged in the implementation of the international dialogue "Healthy and Protected Oceans. For a Sustainable, Equal and Prosperous Future", organized on July 25 at FAO's Headquarters in Rome, on the occasion of the UN Food Systems Summit to be hosted by Italy this year.

The Dialogue initiative represents Italy's contribution to the preparatory process for the "Fourth International Conference on Small Island Developing States (SIDS)" to be held in 2024 by the United Nations, with the desire to focus political and scientific attention on the negative effect caused by rising temperatures and global warming, especially on the most vulnerable States.

The oceans make the planet habitable for all forms of life and have always been an opportunity for uniting peoples, a way of exchanging cultures, and sustaining human civilisations all over the world; they cover more than 70% of the Earth's surface, comprising more than 95% of the biosphere and 98% of the planet's water, produce 50% of the oxygen for living organisms, and absorb about 40% of the planet's total carbon emissions.

However, marine ecosystems today are under heavy pressure from a variety of sources with significant impacts on an important number of 'human communities' and life forms.

The health of the oceans faces some of the most important challenges of the third millennium: from the sustainable use of natural resources, to ecosystem restoration and rehabilitation, to climate change, to the conservation and protection of the environment and biodiversity, to the preservation and enhancement of the planet's blue natural capital stock.

The oceans present us with enormous opportunities and responsibilities, from which citizens, policy makers, societies and scientific communities can no longer shirk and promote a truly sustainable and regenerative use of marine resources.

Italian universities, aware of the role they can play in promoting and strengthening the knowledge and involvement of communities towards the sustainability goals, in particular SDG 14, with the results of their research and projects aspire to contribute to the development of global and local communities .that can be strongly influenced by the way academic institutions operate and implement environmental and social sustainability policies.

THE RUS NETWORK

In order to pursue systematically and "in an integrated manner" the goals of environmental protection, the well-being of society and inter- generational equity, Universities can gain mutual benefit by pursuing sustainability policies 'together', as a model of good practice that can also be extended to other areas of public administration, education and society in general. At international level, there are several examples of networks that specifically address the issue of sustainable development of universities. In Italy, the Network of Universities for Sustainable Development RUS (Rete delle Università per lo Sviluppo Sostenibile) is the first experience of shared coordination between Italian universities committed to environmental sustainability and social responsibility.

RUS has been officialized by The Conference of Italian University Rectors (CRUI) since July 2016 and currently involves more than eighth hundreds delegates working around eight different working groups on education, food, mobility, energy, climate change, resources, social justice and inclusion and university for industry, developing guidelines and exchanging good practices and replicable examples.

The network is able to increase the positive impact in terms of environmental, ethical, social and economic actions, which are currently implemented by each university, in order to contribute to the achievement of the SDGs and to strengthen the value of the Italian experience on an international level.

The Italian Network of Universities for Sustainable Development and the Expo 2030 Roma Bid Committee have worked in the past months so far to complement the Dialogue with ad hoc scholarships and educational projects inspired by the theme of the sea. The current publication collects and enhances the contribution of Italian universities in the field of the protection and regeneration of marine and coastal environments. The contributions presented highlight the commitment and capacity of universities in the direction of action-research aimed at defining regenerative and resilience strategies, from the perspective of a development model based on People, Planet, Prosperity, Peace and Partnerships that are the pillars of the UN Agenda 2030 and to envisage solutions for resource conservation and enhancement; accessibility/navigability; clean energy production; and implementation of new devices and technologies.

I would like to express my sincere gratitude to all the contributing universities and the Expo 2030 Roma Bid Committee for the effort posed to this strategic and collective action for the benefit of our country and for the future generation.

Patrizia Lombardi
President of the RUS Network


UNIVERSITY
CONTRIBUTIONS

Alma Mater Studiorum Università di Bologna

Expertise

Founded in 1088, the Alma Mater Studiorum - University of Bologna (UNIBO) is recognized as the oldest university of the Western world. Nowadays, UNIBO is the second largest university in Italy and one of the most important institutions of higher education across Europe. UNIBO in numbers: 5 operating sites and a permanent headquarter in Buenos Aires; 32 Departments; 5 Schools; 12 Research and Training Centres; about 90,000 students and 6,000 permanent staff. In Horizon 2020, UNIBO has been involved in 352 funded projects (98 as coordinator). So far, in Horizon Europe, UNIBO is involved in 145 funded projects with more than 70M€. University of Bologna can offer multidisciplinary skills and expertise for research, applied studies and technology transfer in the thematic area of blue growth, including healthy and protected oceans, divided in three main research lines, defined below. UNIBO hosts the Decade Collaborative Centre for Coastal Resilience (DCC-CR) that is an action endorsed by the United Nations Decade of Ocean Science for Sustainable Development. DCC-CR aims to facilitate the promotion and implementation of innovative science solutions to the challenges posed by a changing climate in global coastal areas, by mobilizing resources, engaging stakeholders, raising awareness and catalysing new Decade actions.

Proposed project lines 01

Marine biodiversity

Marine biodiversity is a relevant research theme for UNIBO. Many international projects have been active or are still active at UNIBO in this field. Specific research lines are focused on conservation and restoration of biodiversity. For example, UNIBO is coordinating the LIFE project NatuReef (Nature-based reef solution for coastal protection and marine biodiversity enhancement) project and it has been partner in the H2020 MSCA ITN SeaChanges (Thresholds in human exploitation of marine vertebrates). NatuReef aims to apply at demonstration level the best practices available to restore native oyster and sabellariid reefs, seeding the native species in a rare non-urbanized coastal stretch. SeaChanges investigated the ecological/evolutionary impacts of humans on European marine vertebrates through to recover degraded ecosystems and depleted fish populations and maximise their productivity in-line with historical levels. Scientific knowledge and results of these projects and UNIBO expertise can be transferred to research programmes focusing habitats and biological resources of tropical and subtropical oceanic coastal areas (including Ocean islands) to prevent/mitigate the wide-ranging and far-reaching effects of the exploitation of marine ecosystems.

Target countries

All UN SIDS countries: conservation and restoration of biodiversity can involve many different marine species and habitats in all oceans.

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Proposed project lines 02

Sustainable aquaculture and fisheries

Aquaculture and fisheries are strategic research themes at the university of Bologna for the development of a sustainable Blue Economy. Several projects have been active or are still active at the university of Bologna in these fields. For example, the university of Bologna currently coordinates one Horizon 2020 project (NewTechAqua) and is partner in other H2020 (FutureEUAqua) and Horizon Europe (FishEUtrust) projects mainly focused on aquaculture and related technologies. These projects are working on the sustainable expansion and diversification of the organic and conventional production of finfish, mollusks and microalgae, to meet future challenges with respect to the growing consumer demand for high quality and on the sustainability and delivery of solutions for a transparent and traceable seafood supply chain. Two coordinated Interreg projects are mainly focused on fisheries: SUSHI-DROP, on the use of drone technologies to monitor and plan fisheries, and PRIZEFISH which achieved ecocertification schemes, environmental-friendly fishery technologies and tools and market systems for the benefit of fishery small medium enterprises. Scientific and technological outputs from these projects can be transferred to bioeconomic research projects on oceanic and coastal aquaculture and fisheries.

Target countries

All UN SIDS countries: in particular, tropical and subtropical areas whose blue bioeconomy is based on small-scale fisheries and coastal aquaculture.

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Proposed project lines 03

Coastal resilience, climate change and sea pollution

Coastal resilience, climate change and sea pollution are the focus of activities of the Decade Collaborative Centre for Coastal Resilience (DCC-CR) hosted by UNIBO and of several currently running research projects. For example, UNIBO is involved in two Horizon Europe projects (EuroSea and EDITO-Model Lab) that aim at developing the Integrated European Ocean Observing System, with ensemble methods for ocean forecasting interfaced with coastal storm surge models, and on emergency response to pollution events. UNIBO is also involved in three INTERREG projects (Adria-Clim, CASCADE and MARLESS) that support the development of regional and local adaptation plans based on meteorological and oceanographic information, that improve the assessment of the quality and vulnerability of inland, coastal and marine ecosystems, and that tackle the problem of marine litter considering the different sources of pollution with multi-actor approaches. The methodologies developed by these projects can be adapted and replicated in other areas and Ocean islands to transfer research activities and innovative science solutions to face the problems derived by sea pollution and climate change with interdisciplinary and innovative approaches.

Target countries

All UN SIDS countries: Coastal resilience, climate change and sea pollution are important topics in all oceans.

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Links

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DCC-CR
https://centri.unibo.it/dcc-cr/en

Luiss
Università di Roma

LUISS
University - Rome

Expertise

Located in the heart of Rome, Luiss specializes in the Social Sciences and educates over 10,000 students, in a diverse and international learning environment.
Ranked among the top 50 universities globally, Luiss combines academic excellence with stakeholder engagement and trains students and practitioners through executive education.
As stated in our Sustainability Plan, Luiss has adopted the UN Agenda 2030 framework since 2015.

In 2021, according to the three dimensions of sustainable development (economic, social and environmental), Luiss gave further impetus to the implementation strategy of Agenda 2030 through initiatives directly related to one or more SDGs. In addition to including content related to Sustainable Development within degree programmes and courses and making it the core of research by its faculty, in 2021, the core faculty produced 124 research publications pertaining to the SDGs and 37 research projects, including funded projects and research commissions.
Luiss is also an active part of the international project SEA02-CDR. Strategies for the Evaluation and Assessment of Ocean-based Carbon Dioxide Removal (SEAO2-CDR) is an EU-funded project that unites scientific, economic, legal, political, social and ethical researchers to develop the mechanisms, tools and guidelines required to ensure that ocean-based carbon dioxide removal techniques can be evaluated and implemented in a responsible and transparent manner.

Proposed project

Executive Programme in Ocean Management and Sustainability

This executive programme intends to train civil servants from all the countries that hold a crucial stake in the viability and sustainability of the oceans.
The programme will focus on the political, economic, legal and biological dimensions of Ocean Management and Sustainability policies. The key challenges in terms of international affairs, international law of the seas, and the blue economy will be addressed together with the crucial environmental issues related to the rise of the sea level and water pollution in order to shape the most effective public policies.
The curriculum includes an online component (20 hours) and an on-campus component (5 days in Rome). The 5-day in-person module will have individual daily modules involving analytical and practical modules (e.g., simulations games), as well as structured meetings with practitioners, experts and also ocean-related UN institution policy-makers
Upon completion of the academic teaching and final exams, participants will receive the final title of “Executive Program in Ocean Management and Sustainability”. In particular, participants will receive: 1) The final diploma, issued by Luiss Guido Carli, a fully recognized Italian university, and 2) an Academic Transcript with the indication of 7 ECTS.

Target countries

Marshall Islands Nauru, Palau, Samoa, Bahamas, Barbados, Belize, Dominican Rep., Haiti, Suriname, Comoros, Maldives, Mauritius, Seychelles, Cape Verde, Guinea-Bissau, Bahrein.

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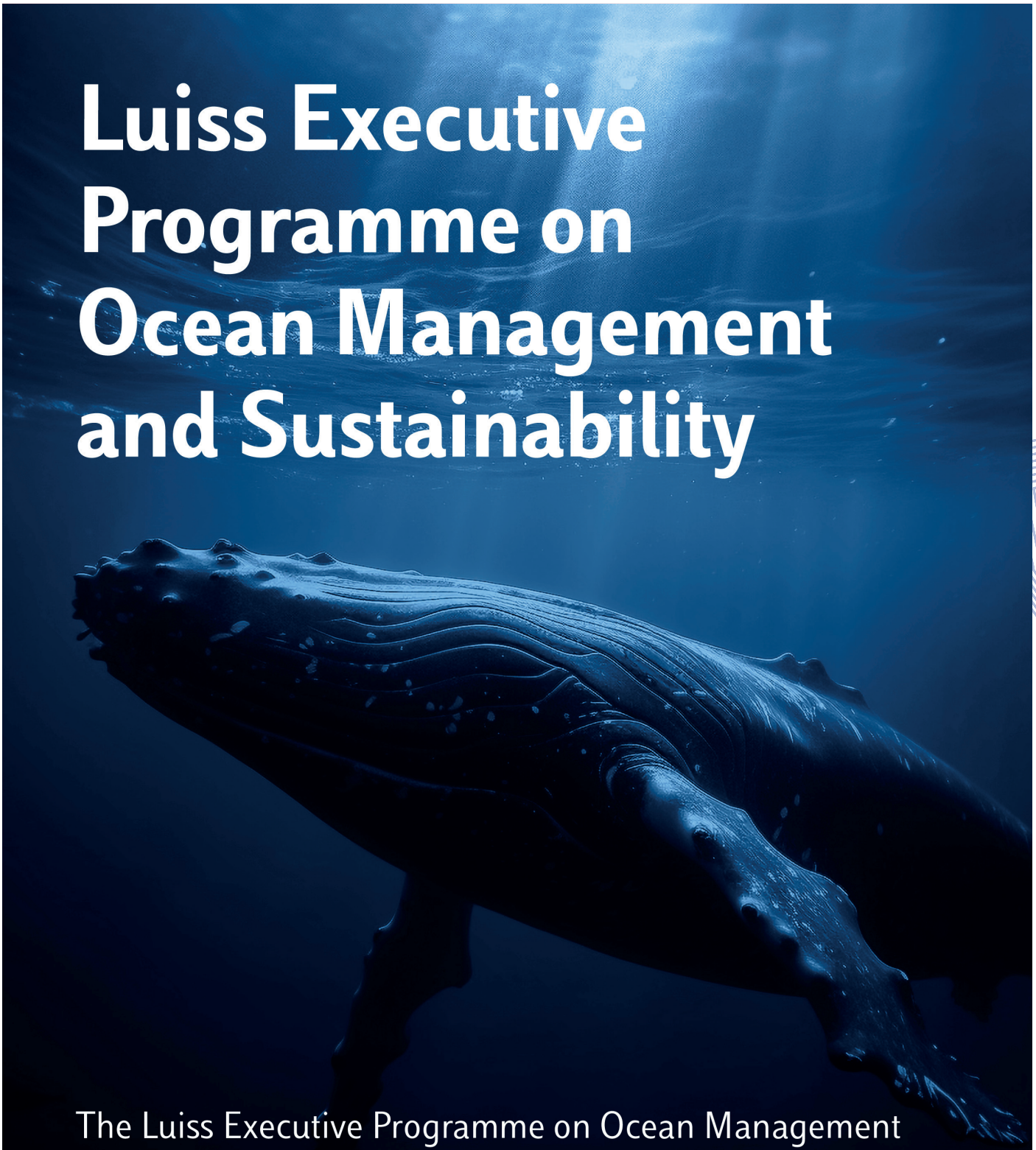
www.luiss.edu
https://seao2-cdr.eu/

Luiss Executive Programme on Ocean Management and Sustainability



The Luiss Executive Programme on Ocean Management and Sustainability supports the development of a sustainable ocean economy by creating bridges with a wide array of stakeholders and providing operators in the sector with a deep understanding of the environmental and societal dimensions and the managerial skills needed to identify and implement bold solutions for ocean health.

Politecnico di Bari

Politecnico di Bari

Expertise

The Polytechnic University of Bari, established in 1990, is an Italian public and autonomous University whose aims are cultural progress in the scientific, technological, humanistic, and economic-social fields, higher education, and technology transfer, in the fields of Engineering, Architecture and Design.
The University adopts a management and organizational model attentive to sustainability and respect of the environment and the territory, directing actions aimed at increasing scientific and technical knowledge in the areas of sustainable development and technological innovation linked to evolution production processes and digital transformation (cfr. Statute, art1-c16).
Amongst its 5 departments, the DICATECh Department, is the most devoted to the «HEALTHY AND PROTECTED OCEANS», with research areas related to coastal engineering, environmental monitoring and chemistry, marine pollution control, marine ecology and conservation, maritime safety, and renewable energy generation from ocean resources. Several PhD programs are specialized on Risk, Environmental, Territorial and Building Development, Sustainable Land Management, as well as classes in the first National PhD school on Sustainable Development and Climate Change.

Proposed project 01

A metamaterial-based device for attenuating surface gravity waves for coastal erosion protection

The objective of the present proposal is to design and test in a relevant environment a device that has been recently patented (European Patent EP19185446.2) by the PI of the present proposal. The device has the goal of attenuating surface gravity waves; its direct application is the coastal protection from beach erosion (24% of the world's sandy beaches are eroding at rates exceeding 0.5 m/yr). The device is based on the concept of MetaMaterials, i.e., materials that are usually arranged in repeating patterns at scales that are smaller than the wavelengths of the phenomena; those materials alter the wave propagation properties and may attenuate the wave energy transmitted. In the present study, we will consider a system of buoyant submerged and inverted pendula which are anchored at the sea bottom and interact with surface gravity waves. The project is mainly experimental, and it will exploit the experimental facilities (2D wave channel and 3D wave basin) at the Coastal Engineering Laboratory (Polytechnic University of Bari). The array of pendula will be designed and tested.

Target coun-

All the countries where sea pollution due to micorplastic could be evident, such as Europe, Maldives, Mauritius, Cape Verde, Jamaica

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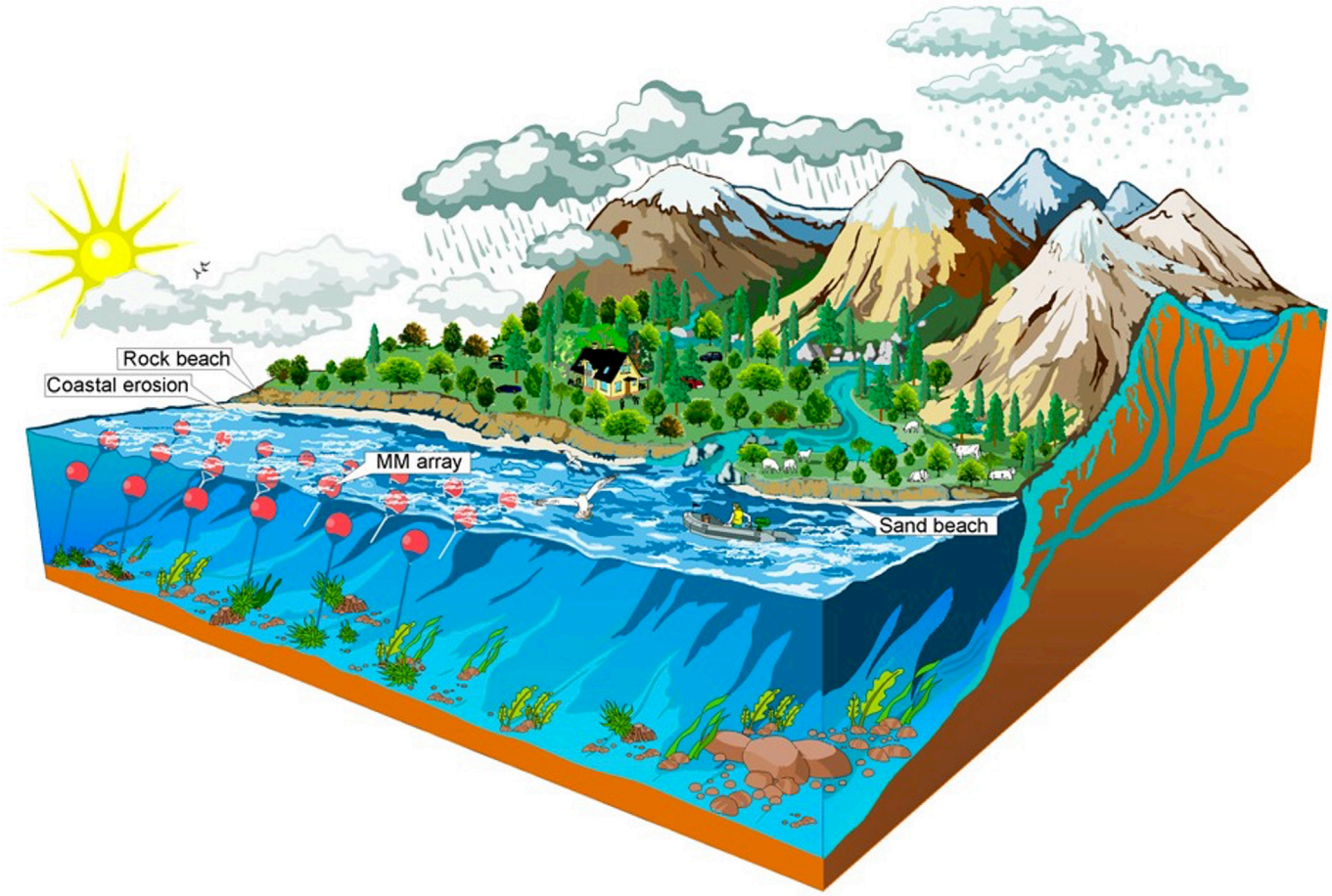
Rock beach
Coastal erosion
MM array
Sand beach

Politecnico
di Bari

Politecnico
di Bari

Proposed project 02

Monitoring for Resilient COastal Environments

ReCOE - Monitoring for Resilient COastal Environments
ReCOE aims to address the pressing challenges and threats faced by coastal regions, from erosion, flooding, sea-level rise, more frequent and severe storms, population growth, economic development, and urbanization, which are actually reducing the quality of the coastal environment and the resilience to disasters and climate change, that are posing significant threats to the coastal ecosystems, human settlements, and economic activities. Comprehensive coastal monitoring will be developed for defining common robust framework for sustainable coastal management, enabling proactive decision-making, effective resource allocation, and improved resilience against future environmental risks, by empowering stakeholders and administrations to make informed decisions and take proactive measures to address coastal challenges. The project is focused in implementing and innovating marine monitoring approaches for understanding of coastal dynamics, urbanization impacts, water and sediment quality, and harbor conditions, adaptive coastal risks management enabling a correct tackle of the complexity and dynamism of the marine ecosystem.

Target countries

All the countries where coastal erosion could be evident, such as Italy (Europe).

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Links

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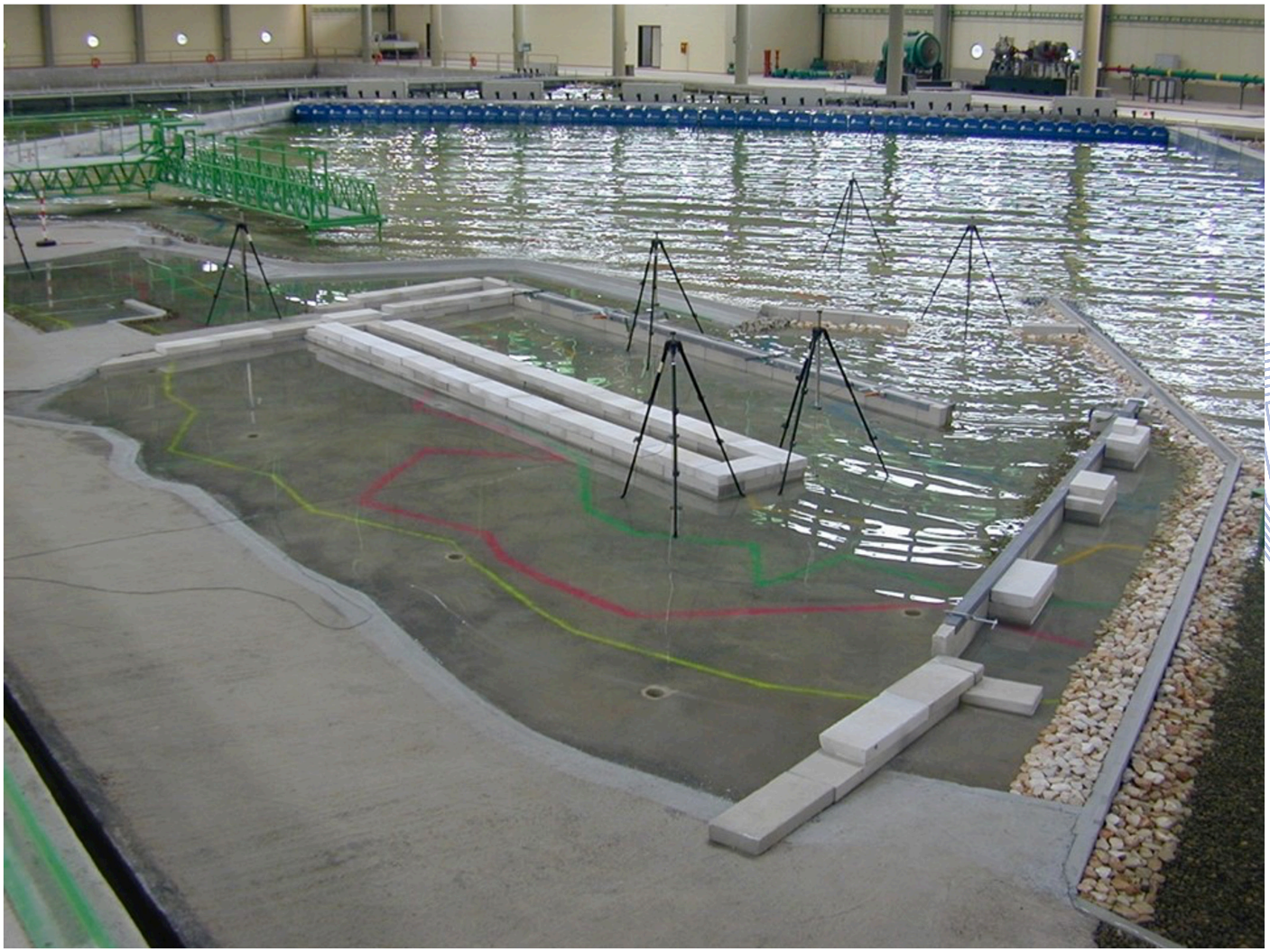

3D wave basin of the LIC.

Politecnico
di Bari

Politecnico
di Bari

Proposed project 03

GREENLIFE4SEAS

Green engineering solution: new life for Sediments and Shells is aimed at demonstrating the technical feasibility, full safety and commercial viability of breakthrough solutions for in-situ recovery and reuse of dredged harbor sediments and mussel shells, valorizing as secondary raw materials for the realization of sustainable by-products by means of an optimized mixing technology. The project is based on two main pillars: on one side the realization, at the real scale, of four innovative by-products (i.e., shell powder of multipurpose uses, paving blocks, breakwaters, stabilized mass) for the building sector mainly made by the reuse of shells and dredged sediments (after decontamination, if polluted) directly produced in-situ by an original mixing technology and on the other side, development of a sound and viable business model for the in-situ collection and treatment of mussel shell and dredged sediments based on the proto-typal technology of a mobile plant producing the new by-products (paving blocks, breakwaters, stabilized mass). This project will lay the foundation of a third pillar of the circular economy related with CO_2 capturing technologies, defining reliable algorithms aimed to evaluate the rate of CO_2 captured by shells.

Target countries

All the countries where sea pollution due to wastes could be evident, such as Europe, and other related sea Countries such as Brazil.

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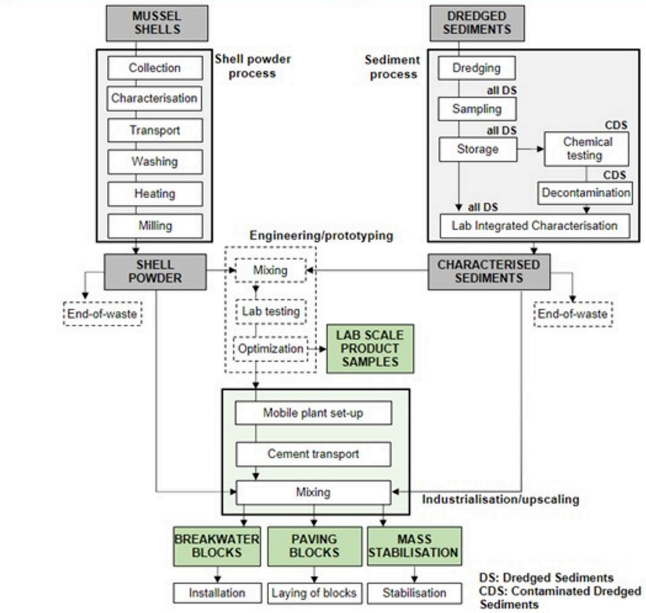
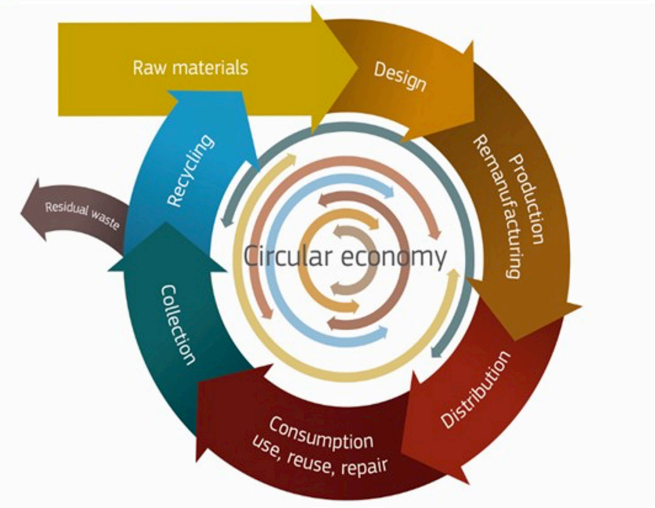
Politecnico di Bari

GREENLIFE4SEAS – Green Engineering Solutions: New life for Sediments and Shells

SHELLS
CER (EWC) 020103 - WASTES FROM AGRICULTURE, HORTICULTURE, **AQUACULTURE,** FORESTRY AND FISHING

DREDGED SEDIMENTS
CER (EWC) 170505
WASTES FROM DREDGING ACTIVITY - SLUDGES





Politecnico di Milano

Expertise

The Polytechnic of Milano is a scientific-technological university which trains engineers, architects and industrial designers. The University has always focused on innovation, developing a fruitful relationship with business and productive world by means of experimental research and technological transfer. The Civil and Environmental Engineering Department has developed activities in multidisciplinary fields, concerning the sustainable use and management of environmental resources, and the prevention and control of environmental pollution. In the last 5 years the activity, also in collaboration with international research centres (e.g. Centro Tecnologico Naval, Spain; Hellenic Centre of Marine Research, Greece), was mostly focused on: management of underwater noise and of the cumulative pressures affecting the marine environment, environmental impact assessment of Marine Renewable installations; Marine Spatial Planning. Recent projects are:

- *eWHALE* (2023 ongoing) funded on a BIODIVERSA+ call
- *Ocean liming in European seawater* (2023 ongoing with University of Milano Bicocca)
- *QuietMED* (2019-2021) and QuietSEAS (2021-2023) funded by the EU DG Environment as support of the MSFD implementation;
- 2016 - 2019 MED Interreg – *AMAre, Actions for Marine Protected Areas*

Proposed project 01

Enhanced Ocean Alkalinization (EOA) to contrast ocean acidification in tropical ecosystems

Ocean Alkalinization (OA) allows to contrast ocean acidification by favoring bio-calcifiers and to enhance the dissolution of atmospheric CO2 as a co-benefit. The logistic feasibility of this technique depends on the proper trade-off between an economically sustainable transport and the needed caution in performing EOA. Local pH peaks may have minor effects on marine ecosystems. Tropical regions, particularly coral reefs, are highly vulnerable to ocean acidification. Alkalinization could potentially help mitigate the acidification process, which negatively impacts coral reef ecosystems. However, the natural buffering capacity and high alkalinity levels in these regions, coupled with potential ecological and logistical challenges, contribute to the uncertainties surrounding its applicability. Still some macro-regional simulation studies suggest that EOA may 'buy some time' before ocean acidification induces physiological stress and ecological shifts. Extensive research, experimentation, and careful consideration of environmental and societal impacts are needed before such large-scale interventions are considered. In this respect mesocosms studies of the kind performed in the Mediterranean Sea may significantly contribute to improve our knowledge about the expected environmental benefits of EOA in tropical coral reef ecosystems.

The project will assess:
1) the potential local benefit of EOA for coral reef ecosystems;
2) the response of biota (e.g. plankton abundance, photosynthetic efficiency and diversity) to EOA in short-term experiments in mesocosms;
3) To assess the EOA effect on coral calcification processes and its capability to maintain the integrity of coral reef structures, as their ability to provide habitat for diverse marine life.

Target countries

Fiji, Marshall Islands, Samoa, Solomon Islands, Tonga, Bahamas, Barbados, Belize, Cuba, Jamaica, Guyana, Haiti, Comoros, Maldives, Mauritius, Seychelles

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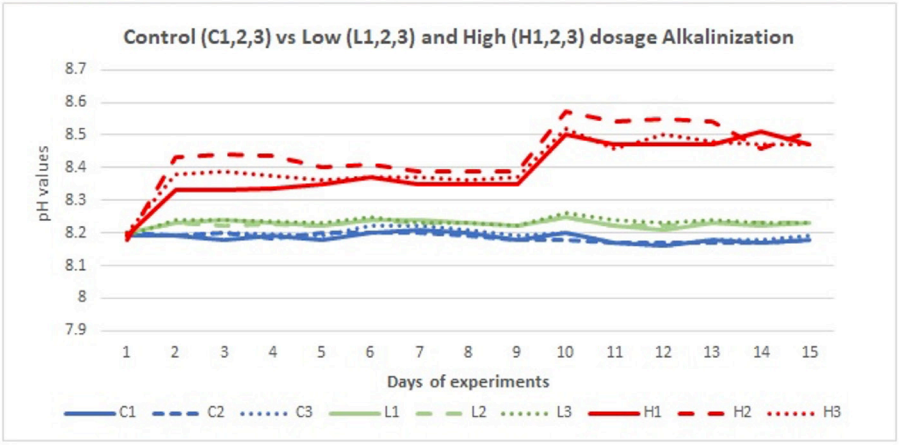

Ocean Alkalinization mesocosm experiment at the HCMR Cretacosmos facility in Crete, Greece

Politecnico
di Milano

Proposed project 02

Marine Spatial Planning

In tropical regions, the management of marine resources and the preservation of the associated ecosystems are of utmost importance. These regions boast diverse and valuable marine environments, including coral reefs, mangroves, and seagrass beds, which provide essential habitat for numerous species and contribute to global biodiversity. Proper management is needed to ensure the sustainable use of these resources, supporting the livelihoods of coastal communities, and maintaining the ecological balance. Science-based approaches for stakeholder engagement and integrated decision-making may safeguard these precious tropical marine ecosystems for future generations. The challenge lies in effectively addressing the diverse and sometimes conflicting demands placed on these resources, such as: **a)** allocation of **fishing zones** (setting catch limits and regulations to ensure sustainable fishing practices), **b)** identification of suitable areas for **aquaculture**; **c) sustainable tourism** development (siting areas for recreational and tourism facilities while avoiding environmental degradation and conflicts with other uses); **d)** optimal siting of **renewable energy** projects (e.g. offshore wind farms, tidal energy installations, marine-based solar energy systems etc.) considering potential impacts on marine ecosystems and other activities; **e) shipping** management (identification of shipping routes, port locations and areas for maritime transportation while considering navigational safety, protection of sensitive habitats and minimizing conflicts with other uses); **f) designating marine protected areas** (MPAs), reserves or other conservation zones to protect ecologically significant areas, critical habitats and vulnerable species; **g)** managing **coastal development** (e.g. infrastructures, urbanization and land reclamation) to minimize impacts on coastal ecosystems, maintain shoreline stability and preserve natural coastal processes.

Target countries

Fiji, Bahamas, Barbados, Cuba, Jamaica, Comoros, Maldives, Mauritius, Seychelles, Cape Verde

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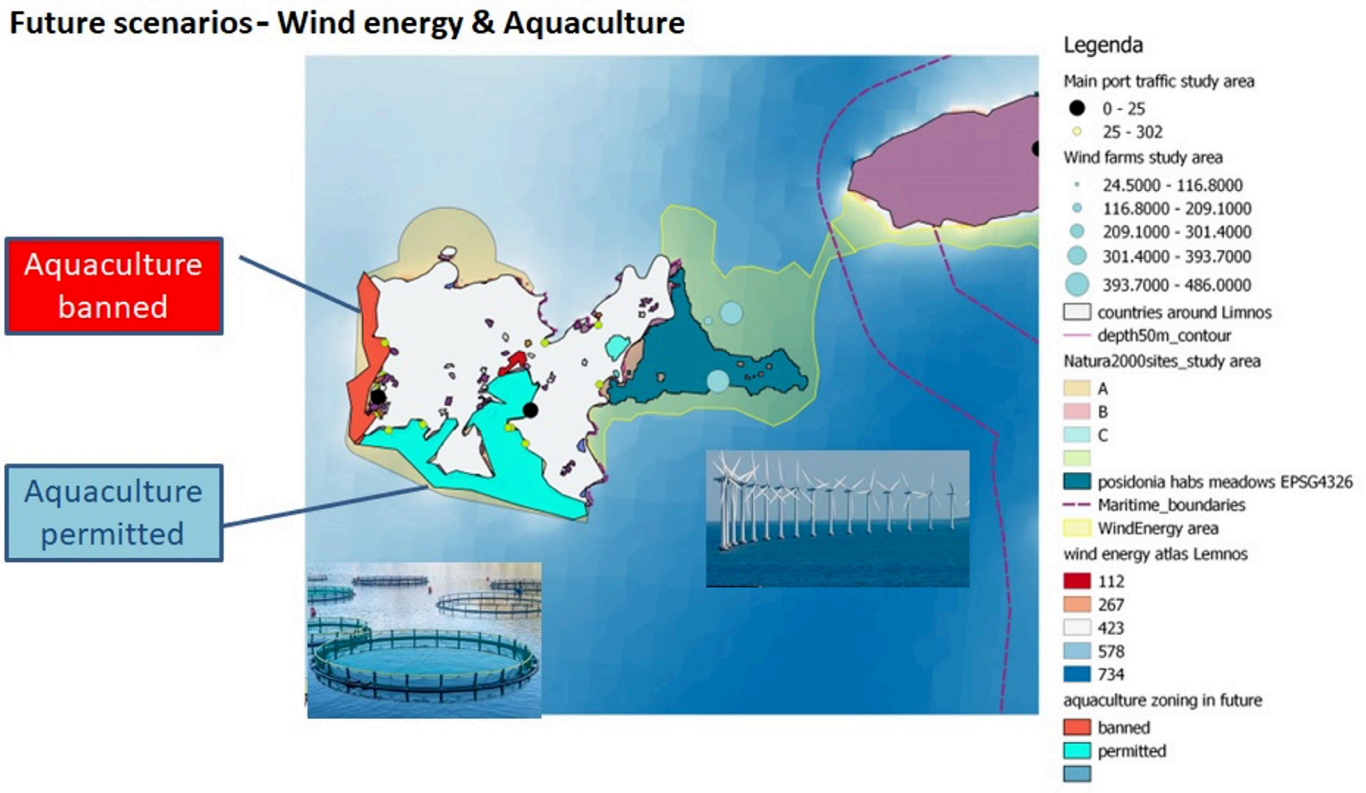

Knowledge-based Marine Spatial Planning of the wind energy and aquaculture sectors around the Island of Lemnos, Greece.

Politecnico di Torino

Politecnico di Torino

1859

Expertise

Established in 1859, The Polytechnic of Torino (POLITO) is the oldest technical University in Italy and one of the most prestigious public institutions in Italy for education and research in engineering, architecture and design. Ranking among the first forty technical universities in the world, it is globally recognized as a high quality centre for education and research. At POLITO around 1,000 Professors and Researchers carry out research and provide education to 37,000 students, of which 5,000 international from more than 120 countries, on a wide catalogue of degree courses including 16 PhD courses and 30 MSc courses, of which 60% in English. Its international education network features 1,000 agreements with EU and non-EU universities and international campuses in China and Uzbekistan. POLITO's experience in European projects is in research as well as international mobility and cooperation in programmes such as Horizon 2020, FP6-7, Erasmus+, LLP, Erasmus Mundus, TEMPUS, EuropeAid. Throughout the years POLITO has proved to be one of the top Italian universities for volume of international collaborations and quality of the results achieved.

In response to the EU initiatives addressing climate change in the maritime context, innovative solutions are being explored such as the Marine Offshore Renewable Energy Laboratory (MORE lab), within the Department of Mechanical and Aerospace Engineering (DIMEAS) at Politecnico di Torino, as a research center that focuses on the development and analysis of Offshore Energy Technologies and Building Solutions.

Within MORE lab, the research group SEAform, comprising architects and engineers, explores waterborne living solutions through innovation and technology. The goal is to develop functional and eco-friendly floating platforms as an alternative for vulnerable coastal communities.

Proposed project 01

FloatScapes: a floating adaptive pavilion

The name FloatScapes derived from a combination of the words "floating" and "landscapes." Unlike most buildings, FloatScapes floats above the water's surface, adapting to waves, tides, and sea-level changes. The main concept behind FloatScapes is to serve as a prototype for floating architecture, showcasing activities that could potentially take place on water in the future. This includes various aspects such as food production and food processing, energy production, water storage, and water management.
To achieve sustainability and innovation, FloatScapes incorporates renewable energy production, the use of green and low-impact materials, prefabricated components, modular design, and innovative systems and technologies. Additionally, resource and waste management play crucial roles in creating a positive and functional aura around the pavilion.
This project delves into the maritime context, exploring the untapped potential of the marine and aquatic environments as alternatives to carbon-based systems. It aims to experiment with offshore infrastructure and floating communities, contributing to urban and coastal society resilience. These experiments offer new opportunities for food, energy, and water production while also addressing the goal of creating safer cities.
The ultimate objective is to raise awareness about coastal risks and establish best practices for offshore and floating projects. This assessment of good practices can serve as a reference for future endeavors and act as a catalyst for further developments. By making a personal contribution to the battle against climate change, FloatScapes aims to make a significant impact in shaping a sustainable future.

Target countries

Seychelles, Palau, Maldives, Fiji, Tonga, Mauritius, Antigua and Barbuda, Tuvalu, Kiribati.

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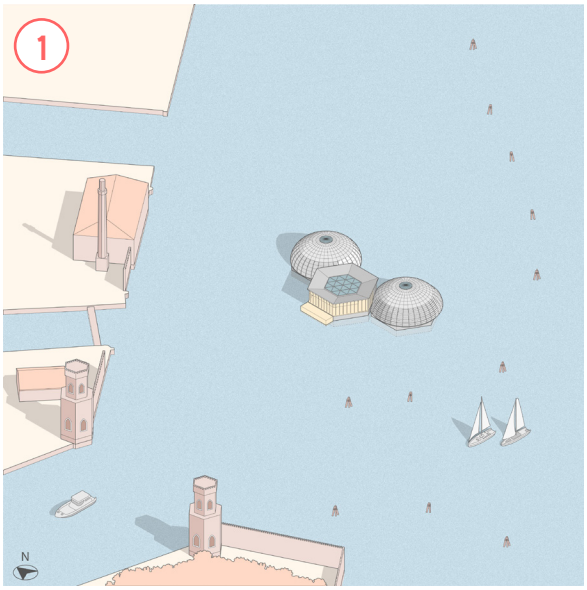

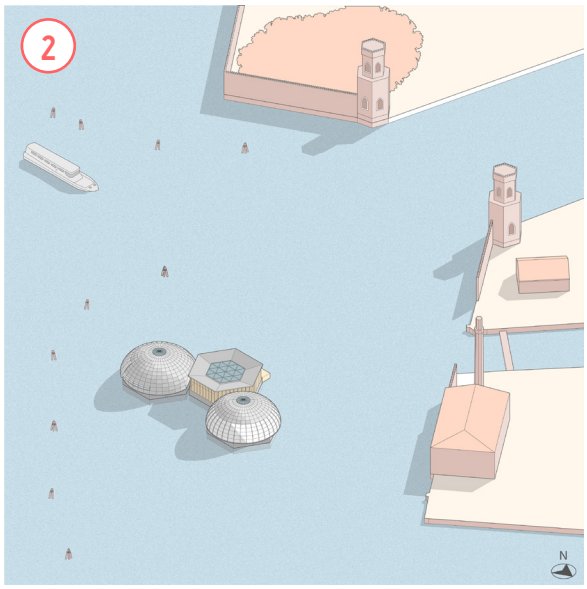

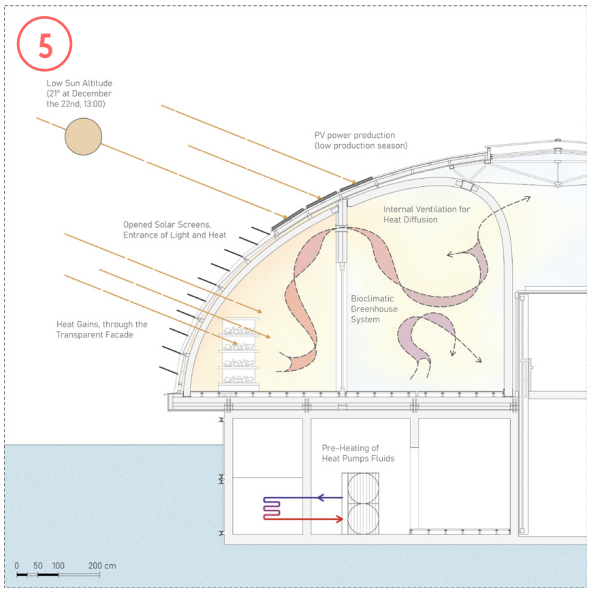

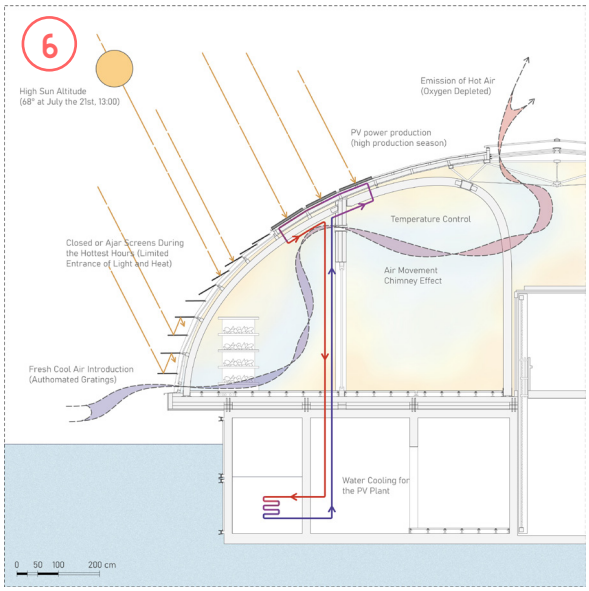

1. **FloatScapes Pavilion bird's view.**
2. **FloatScapes Pavilion bird's view.**
3. **FloatScapes food experience central space.**
4. **FloatScapes greenhouse interior.**
5. **FloatScapes bioclimatic section in winter season.**
6. **FloatScapes bioclimatic section in summer season.**

Politecnico
di Torino

Politecnico di Torino

Proposed project 02

Blue energy for the clean energy transition

The Ocean is a vast and delicate environment to be protected, but it can also sustain and drive the energy transition of the human communities living nearby. This is particularly true for small isolated energy systems, not connected to a wider electricity grid, e.g. small islands, where the majority, if not the totality, of the energy consumption is met with polluting diesel generators. The Marine Offshore Renewable Energy Lab (MOREnergy Lab) of Politecnico di Torino is engaged in guiding the energy transition from both the planning and technological points of view.

The MOREnergy Lab is the national representative of the Clean Energy for the EU Islands Secretariat, monitoring and planning the decarbonization of 6 small islands in the Mediterranean Sea via the production of Energy Transition Agendas, i.e. concrete action plans based on thorough technical and policy analysis, as well as stakeholders engagement and participated processes.

The MOREnergy Lab also provides proprietary technology for innovative offshore renewable energy and clean water production, including ISWEC (Inertial Sea Wave Energy Converter) and WEPA (Water and Wave Energy Point Absorber), already being tested and installed, as well as site selection and project assessment for floating offshore wind plants.

Target countries

Islands in particular, but also all countries with access to the Sea/Ocean.

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Floating water, wave, solar and wind energy converter installed in Sardinia, on the left. Inertial wave energy converter installed in Sicily, on the bottom right. Proprietary offshore simulation tools on the top-right. Clean energy for EU Islands affiliation on the mid-top

Sapienza Università di Roma

Expertise

Sapienza University of Rome is the largest university in Europe. Within the context of the Healthy and Protected Oceans dialogue, Sapienza University actively engages in promoting sustainable ocean practices, protecting marine ecosystems (collaboration with Underwater Pro Tour association of the Giglio Island for the protection of the island seabed or joint studies with ISPRA for the evaluation of the underwater noise level produced by ships, which cause serious disturbances to marine fauna), participating in oceanographic studies and exploration (collaboration with AtlantECO project to study the geographical distribution of marine microorganisms in relation to the threats of climate change and microplastic pollution), raising awareness and educating future generations on the importance of healthy and protected oceans (Ocean World Day initiative).
Within the PhD course in chemical sciences, the definition of chemical profiles of persistent contamination in the seas and oceans of the planet is studied.
Finally, it is worth mentioning that Sapienza University of Rome is the host institution of Michela Ravanelli's postdoc fellowship funded by AXA & UNESCO's Intergovernmental Oceanographic Commission launched in the context of the Ocean Decade.

Proposed project 01

ALTRUIST (totAL variomeTry foR tsUnamI hazard eStimaTion)

Timely and reliable tsunami early warning systems (TEWS) are of critical importance for coastal areas and communities located close to earthquake-prone and tsunamigenic areas. The last 15 years failures of TEWS highlight the necessity to open new paradigms in oceanic monitoring and tsunami hazard estimation to support and confirm classic observational techniques. Earthquakes and tsunamis can trigger acoustic-gravity waves that can reach ionospheric heights perturbing the total electron content (TEC), retrievable through the GNSS signal.
In this framework, the ALTRUIST (totAL variomeTry foR tsUnamI hazard eStimaTion) project is developed; it aims at improving the reliability and accuracy of real-time TEWS leveraging the GNSS Total Variometric Approach (TVA). TVA allows for the simultaneous estimation of ground shaking, coseismic displacements and TEC disturbances, using the same real-time GNSS data stream.
Namely, the goals of the project are the TVA refinement and the development of a real-time tool to tsunami warning systems to be implemented in the Institut de Physique du Globe de Paris Guadeloupe (Caribbean) observatory.
The most relevant and challenging long-term objective is to export the system to other GNSS networks placed in tsunamigenic zones: lesser Antilles countries (e.g., Dominica, Martinique, Grenada) and to Haiti, Dominican Republic where other warning systems are spotty or not even present.
This is also possible since it can leverage existing GNSS networks without building complex infrastructures in coastal areas.
Additionally, the ALTRUIST goals perfectly fit into Ocean Decade Outcome 5 aiming at a safe ocean where life and livelihoods are protected from ocean-related hazards.
Michela Ravanelli leads the ALTRUIST project, a 2-year postdoc at Sapienza University of Rome funded by the AXA Research Fund and the IOC-UNESCO Joint Call for Projects on Coastal Livelihood in the UN Ocean Decade.

Target countries

Haiti (high risk for earthquake), Dominican Republic and lesser Antilles (Martinique, St Kitts and Nevis, Dominique, Granada, St. Lucia, Barbados)

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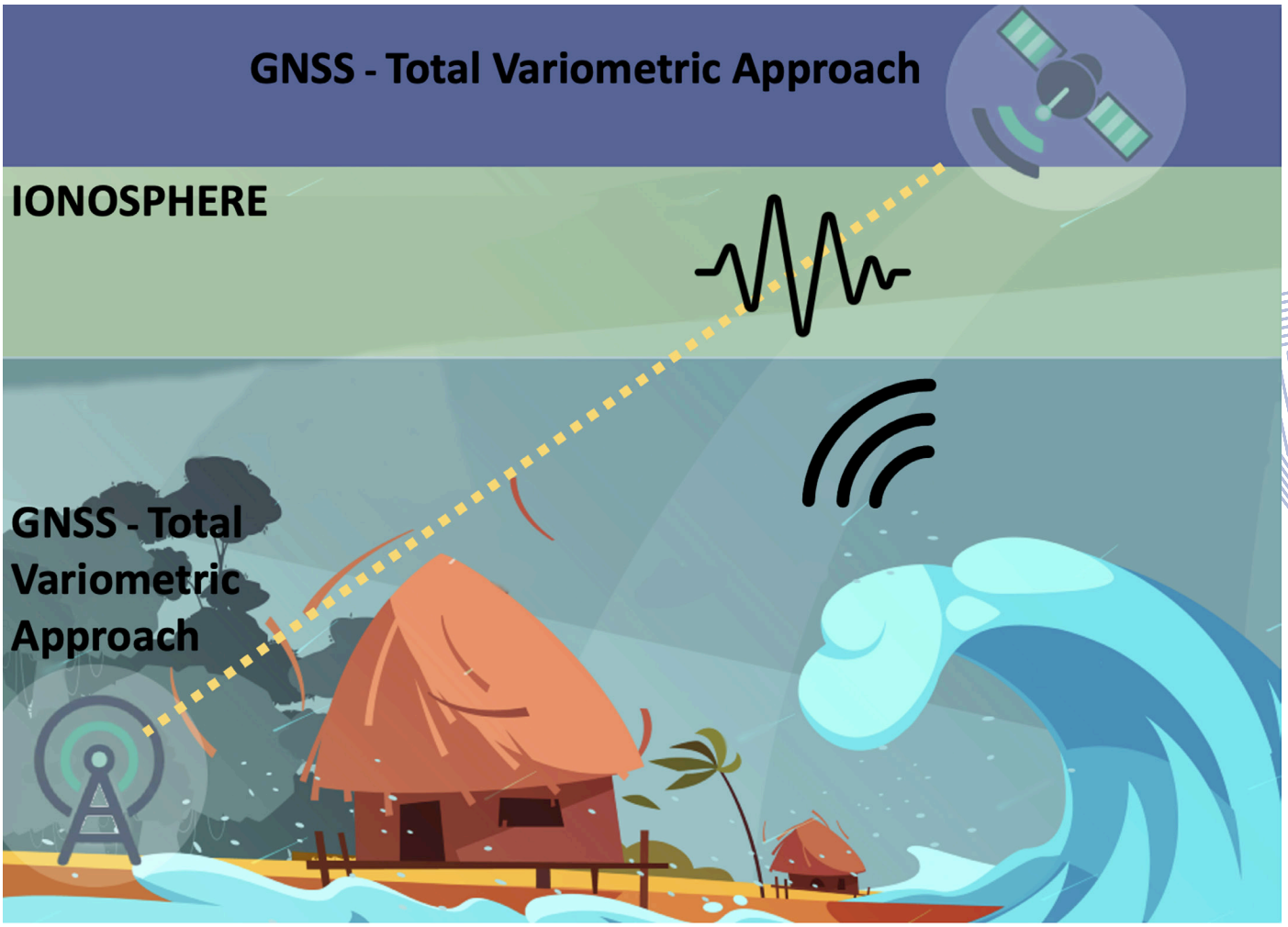
https://oceandecade.org/actions/mitigating-tsunamis-threat-and-destructive-impact-on-coastal-communities-through-enhanced-navigation-satellite-system-to-tsunami-early-warnings/



The Figure represents the physical mechanism that allows to detect tsunami induced perturbation in the ionosphere. Tsunamis can produce waves able to travel across the atmosphere, reaching the upper part of the atmosphere, called ionosphere, and these waves can perturb the ionospheric composition, the electrons. This perturbation is hence detectable through the GNSS signal. We used the Total Variometric Approach to detect tsunami induced perturbation with the final aim to enhance tsunami early warning systems.

Sapienza
Università di Roma

SAPIENZA
UNIVERSITÀ DI ROMA

Proposed project 02

Identification, classification and characterization of microplastics from marine environment by innovative technologies

Microplastic particles were first found on the sea surface in the early 1970s and their dispersion in both aquatic and terrestrial ecosystems has become nowadays one of the main environmental emergencies, considering that every year around 8 million tons of plastic end up in the ocean. Microplastic monitoring in marine environment is a fundamental step in order to identify the source of pollution and to plan mitigation actions. Currently, there is not a standardized method for microplastics identification and classification, furthermore the most common adopted techniques are very expensive, tedious and labor-intensive, as for example Fourier Transform InfraRed (FT-IR) spectroscopy or Raman spectroscopy.
In this view, the "Raw Materials Engineering" research group has acquired a wide experience in the application of innovative, non-invasive and non-destructive sensing strategies, based on hyperspectral imaging (HSI) working in the short-wave infrared range (SWIR: 1,000-2,500 nm), coupled with chemometric and machine learning strategies, for simultaneous and fast identification and classification of microplastics collected from different marine environments (i.e.: sandy beaches, seawater, sediments etc.).

The objectives of the research activity are:
• to monitor microplastic pollution in different marine environments,
• to identify polymer types constituting microplastics using HSI, a new, rapid, and non-destructive technology in this field, coupled with the implementation of different classification approaches,
• to carry out an automatic morphological and morphometrical characterization of the identified microplastics (i.e. measurement of the main particle shape and size parameters),
• to compare the results with those obtained by conventional spectroscopic techniques (i.e. FT-IR), and
• to propose a standard protocol for microplastic characterization.

Target countries

All SIDS Countries

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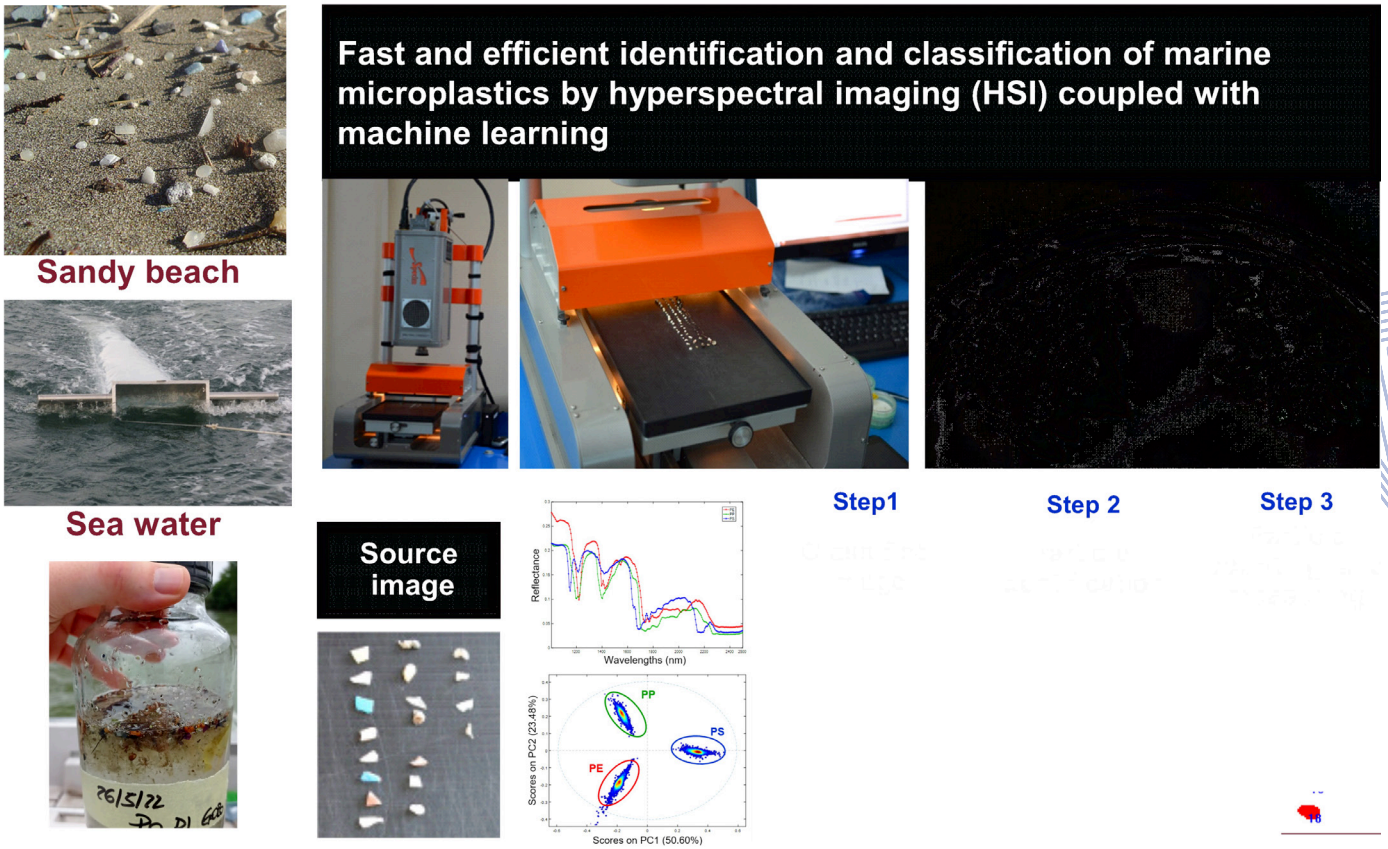

Graphical abstract of the project

Università Ca' Foscari di Venezia

Ca' Foscari University of Venice

Expertise

Ca' Foscari University of Venice is the Partner of several international projects. Many of them are related to coastal environment and renewable resources management, with the implementation of an ecosystem approach.

Main research lines are:
- Implementation of the Ecosystem Based Approach to the fisheries management, aiming to reduce the unsustainability related to the fishing activities.
- Ecosystem Services assessment, in aquatic and terrestrial environments.
- Study of trophy, macrophytes and the ecological status of aquatic environments.
- Development, optimization and validation of advanced analytical methods for the determination of organic and inorganic compounds produced by natural and anthropogenic sources.
- Environmental Risk Assessment associated with chemical contamination as well as climate change environmental impacts.
- Study of the physics of climate, with reference to the mechanisms that generate variability in the ocean and atmosphere.

PhD programmes
Environmental Sciences, Science and Management of Climate Change, Science and Technology of Bio and Nanomaterials.

Master's Degrees
Biotechnologies for Sustainable Development and the Environment, Environmental Sciences, Science and Technology of Bio and Nanomaterials, Environmental Humanities.

Proposed project 01

RESISTANCE

The RESISTANCE project aimed to share acquired knowledge and experiences about the sea, as well as about coastal and river environments by capitalizing the results of the previous Interreg projects ECOMAP, ECOSS, Net4mPLASTIC, SOUNDSCAPE, DORY, SASPAS and ML-REPAIR. The project aimed to support the development of Guidelines and methodologies of Maritime Spatial Planning (MSP) at local and regional levels , as well as to contribute to improve the environmental quality conditions of the sea and coastal area by use of sustainable and innovative technologies and approaches, and EUSAIR Pillar and Flagship promotion of sustainable growth of the Adriatic region by sharing knowledge and good practices between Italian and Croatian partners and relevant stakeholders for MSP. The main results were: 1) Integrated methodologies and tools for marine monitoring relevant for MSP and contribution to Quality level of coastal bathing waters (dir.2006/7/CE) and EUSAIR Pillar 3 - Environmental quality; 2) Synergies between the involved projects and related stakeholders to support decisions within MSP; 3) Increased environmental awareness among policy makers, local and regional communities, NGOs, general public, by implementing activities leading to a sustainable coastal development.

Target countries

All SIDS Countries

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Proposed project 02

Reuse of waste from the fishing in view of a circular economy

This project has two main objectives:
(a) to reuse the waste produced by the processing of shellfish and fish from both fishing and farming, using physical, chemical and biotechnological treatments, in order to obtain processed products with high added value (waste to resource approach).
b) to include this activity within a circular economy pathway (sustainable blue industry) that can create new products and also involve already well-established productions.

Target countries

Cuba, Dominican Rep., Fiji

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Proposed project 03

Safer Food

New technologies based on ORGAN-ON-CHIP are being developed to assess the biological/molecular toxicity of pollutants, allowing the prevention of health issues for consumers.In particular, the project is focused on possible critical issues arising from microplastics in marine organisms.

Target countries

Cuba

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Università degli Studi "G. d'Annunzio" di Chieti - Pescara

Expertise

"G. d'Annunzio" University of Chieti-Pescara (Ud'A) has different research groups active on the health and the protection of oceans. Recent studies addressed the impact of ocean contaminant like micro and nano-plastic on human health, including sampling of ocean water, identification and delivery of contaminants to human cells for in-vitro analysis. Other research focus on the maintenance and management of coastal environments, reuse and characterization of marine sediments.
PhD Courses in Ud'A include programs such as *Geoscience* and *Science and Technology for sustainable development* where the research topics are also focused on protection of the ocean environment. Degree Courses on *Eco-sustainable techniques and environmental toxicology*, *Sustainable Habitat Sciences and geology* also analyse ocean ecosystems, infrastructure, and environment protection.
The research center UdA-TechLab promotes research activities also related to the ocean monitoring.
In 2019 Ud'A coordinated the project PLAMAR3 aimed at the collection, characterization and recycle of marine litter.
It has also been organizing for several years an important Summer school on geomorphology, ecology and marine biology.

Proposed project 01

Sargassum algae monitoring and remediation

The Atlantic Ocean is being invaded by sargassum algae that have increased at an impressive rate in recent years, fueled by human activities which discharge into water nitrogen and phosphorus, nutrients that can promote its growth. The huge masses of sargasso damage marine wildlife by profoundly altering their ecosystem and blocking light on the seabed. Moreover, these algae can cause damage to infrastructure facilities and their decomposition could be harmful to human health.
The objective of this project is to monitor sargassum algae to understand their evolution using satellite data and to test some technique for remediation in terms of circular economy: the algae could be recycled as biodegradable packaging in substitution of plastic. Other applications of valorization of algae, previously tested by Ud'A research group, can include the applications in cosmetics and pharmaceutics and finally as fuel. Besides the monitoring and remediation activities, the team will work to transfer Ud'A knowledge and expertise in term of remote sensing and circular economy to local partners.

Target countries

Cape Verde, Guinea-Bissau, São Tomé and Príncipe, Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Palau, Samoa, Solomon Islands

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Progetto PLAMAR
https://www.unich.it/node/15587

The Posidonia Tower in the Adriatic Sea where UdA installed research instruments – Author Ud'A

Università degli Studi "G. d'Annunzio" di Chieti - Pescara

Proposed project 02

Beach plastic collection and recycling

Plastic litter is a worldwide problem for ecosystems, tourism, and for human health. The University "G. d'Annunzio" of Chieti-Pescara, in collaboration with universities and institutions of other countries, could develop a project on the collection and classification of litter on the beaches. By using a simple scanner, it is possible to categorize litter, divide plastic from other material and start activities to recycle plastic. This in-situ activity can be supported by applications of satellite observations, for example using the Copernicus that include a constellation of satellite to observe land and ocean to monitor the plastic distribution for collection but also for security and emergency issues.
A platform that put together in-situ data and Satellite data will be developed to help the construction of a database for monitoring the distribution of sea litter and plastic.
Moreover, in this project Ud'A plan to carry out training and dissemination activities to promote the correct use of plastic materials and the protection of the marine environment. Local actors will be involved in all the activities of the project.

Target countries

Antigua & Barbuda, Bahamas, Barbados, Belize, Cuba, Guyana, Haiti, Suriname, Cook Islands, Fiji, Solomon Islands, Tonga, Comoros, Maldives, Mauritius, Seychelles

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Proposed project 03

Health and well-being

From the Covid pandemic we learned that a simple virus can be lethal but at the same time can stop completely our lifestyle and our well-being. Unfortunately, the Sars-Cov-2 is just one of the huge numbers of virus and bacteria that we are facing and in the future we will have to take on this new challenge. The University "G. d'Annunzio" of Chieti-Pescara developed different projects to detect people infection due to virus and bacteria, to control the air quality for well-being and to manage and improve unhealthy environments. Moreover, Ud'A defined a system to collect and identify virus and bacteria dispersed in the air to directly quantify the load of infection that can be found in the atmosphere and can be potentially inhaled by people.
The objective of this project is to monitor outdoor and indoor environments and to develop tools and actions to sanitize indoor environments in order to enhance the well-being in areas where the mortality due to virus, bacteria or other issues is still a problem. Ancillary activities such as sensibilization of students and citizen on the importance of good practices to avoid contamination and to keep indoor areas healthy, will be part of the project.

Target countries

Antigua & Barbuda, Bahamas, Barbados, Belize, Cuba, Dominica, Grenada, Jamaica, Guyana, Haiti, St. Kitts & Nevis, Suriname, East Timor

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Progetto PLAMAR
https://www.unich.it/node/15587

A fisherman involved in the PLAMAR3 project – Author Ud'A

Litter collected in the Adriatic Sea by fishing vessels during the PLAMAR3 project – Author Ud'A

Università degli Studi dell'Aquila

UNIVERSITÀ DEGLI STUDI DELL'AQUILA

Expertise

The University of L'Aquila and the natural environment

The commitment of the University of L'Aquila for the protection of the natural environment is manifested above all in a set of initiatives within the University, aimed at reducing energy consumption, and in particular the use of fossil fuels, and at reduction and correct management of waste generated by its activities.

A serious commitment to the environmental sustainability of the University's activities makes its initiatives to contribute to the policies for the protection and enhancement of the natural heritage of the territory, carried out by the competent institutions and local bodies, more credible.

All of this is in line with the University's strategic vision, which considers the protection of the natural environment as a fundamental requirement for the sustainability of economic growth and as an obligation of justice towards future generations. Various training, research and social cooperation programs of the University, detailed in its Strategic Plan, aim to contribute to this objective.

A specific program for the protection of marine resources and the environment has been agreed with the local body responsible for managing the "Torre del Cerrano" Marine Protected Area, to which this project refers.

Proposed project

Co-design and monitoring of coastal and marine protected areas

The topic of the research idea is the co-design and monitoring of coastal and marine protected areas. The final goal of the proposal is to gain insight from past experiences to (co-)improve existing or to (co-)design new coastal and marine protected areas in the islands involved in the project.

The Marine Protected Area of "Torre Cerrano" (Central Italy, Adriatic Coast, hereinafter referred to as "AMPTC") will be one of the project's main partners. The experience of AMPCT is meaningful. Indeed, (i) historic and cultural heritage, (ii) relationship with anthropogenic pressures, (iii) biodiversity, (iv) coastal flooding are only a few of the aspects that characterize the area.

The project assumes that planning and management strategies for coastal and marine protected areas zone must rely on the knowledge of natural processes: a paradigm shift from Nature-Based Solutions to Nature-based Strategies. Then, the co-design approach will be the core. It will be implemented in the definition of effective long-term strategies by enhancing the sharing of (i) the understanding of natural processes, (ii) the understanding of social and economic systems. Hence, attention will be paid to the sharing of the project goals and potentialities for local economics with local authorities and communities. Indeed, the coastal and marine coastal areas may be a successful action only if social aspects are considered along with the environmental aspects. In order to enhance the sharing processes and to highlight the needing for protected areas specific monitoring approach will be defined and implemented in the practice. In particular, the monitoring will focus on the biodiversity. Indeed, biodiversity monitoring has received considerable attention during the last decades and the needing of low-cost, autonomous, and automatic networks is still challenging. The project will aim to define a common architecture of biodiversity monitoring network to be implemented in all the involved partners in order to measure and estimate the ecosystem services related to the introduction of new protected areas or to highlight the role of existing ones. The architecture will be designed also based on the physical knowledge of the monitored areas. First, a specific procedure will be defined and then implemented for each of the considered areas. The procedure will be aimed to gain insight into the physical health of the areas (i.e., morphodynamics and hydrodynamics features), their environmental features (i.e. quality of the coastal waters, quality of air), the (initial) features of biodiversity (i.e. by standard monitoring and analysis activities), to the assessment to long-term climate change (i.e. to the increase of mean sea level, to the long-term variation of statistical features of storms, cyclones and storm surge events).

The outcomes of the project can be summarized as follow. The knowledge and experience of AMPTC will be shared with the involved partners and a common approach to (co-)design and monitoring of new or existing marine protected areas will be implemented to highlight similarities and differences among the different geographical areas. The (co-) design and monitoring of the areas will be based on specific (and site-dependent) analyses performed on the basis of common procedures, aimed to highlight the enhancement of ecosystem services (and hence to highlight the social and economic effects) due to the protected areas.

Target countries

All SIDS Countries

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Links

https://www.torredelcerrano.it/

Specific features of the Marine Protected Area "Torre del Cerrano". The historical tower (upper and lower pictures), the coastal dune (middle picture), the sandy emerged beach.

Università degli Studi della Campania "Luigi Vanvitelli"

Università degli Studi della Campania *Luigi Vanvitelli*

Expertise

For several years, the Ateneo Vanvitelli has been dealing with Marine Renewable Energies thanks to its participation in various national and international research projects. The research is developed thanks to a national unicum: the marine laboratory MARELAB (Marine Renewable Energy Lab) for testing marine energy converters located at the port of Naples. The wave energy conversion system (OBREC) and an innovative floating wind turbine platform (Hexafloat by Saipem) are in operation. The laboratory and research activities are co-managed with the Institute of Marine Engineering of the National Research Council (CNR-INM).
A research doctorate is active which deals, among other things, with the problems of engineering and marine science (PhD in Science and Engineering for the Environment and Sustainability).

Proposed project

Marine Renewable Energies

Develop a strategic research excellence center on marine renewable energies.
The research group will continue to develop technologies in synergy and cooperation with the CNR-INM within national and international projects. The main companies in the sector will be involved. All companies that intend to develop devices for the exploitation of marine renewable energies need field testing through prototype structures. These experiments at the MaRELab will allow an advancement of the TRL (Technology Readiness Level), the improvement of the design criteria and therefore a reduction of costs (Levelised Cost of Energy - LCOE). In the future there will be more and more applications of floating wind foundations, necessary where the depths are high as occurs for islands all over the world.
CNR and the University of Campania also aim at a long-term specialist training strategy, to invest in young talents, financing, also with contributions from industries and SMEs in the sector, scholarships for research doctorates (PhD in Science and Engineering for the Environment and Sustainability), which will form the lifeblood of the development of innovative research. This will generate a new class of scientists and engineers, highly trained and highly specialized, able to create a strong link between the world of research and that of companies in the marine renewable energy sector.

Target countries

Pacific Countries: Fiji, Kiribati, Marshall Islands, Nauru, Palau, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu
Caribbean & Americas Countries: Antigua & Barbuda, Bahamas, Barbados, Belize, Cuba, Dominica, Dominican Rep., Grenada, Jamaica, Guyana, Haiti St. Kitts & Nevis, St. Lucia, St. Vincent & The Grenadines, Suriname
Indian Ocean Countries: Comoros, Maldives, Mauritius, Seychelles
Atlantic Ocean Countries: Cape Verde, Guinea-Bissau, São Tomé and Príncipe
Middle East & Eastern Asia Countries: East Timor

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PhD in Science and Engineering for the Environment and Sustainability
https://www.ingegneria.unicampania.it/didattica/dottorato-in-scienze-e-ingegneria-per-l-ambiente-e-la-sostenibilita)

https://www.ingegneria.unicampania.it/ricerca/gruppi-di-ricerca#renewable-energies-in-civil-engineering-energie-rinnovabili-nell-ingegneria-civile

Prototype “OBREC” wave energy conversion system at the MaRELab (Marine Renewable Energy Laboratory)

Prototype “Hexafloat” (Saipem floating wind turbine) at the MaRELab (Marine Renewable Energy Laboratory)

Università degli Studi della Tuscia

Expertise

Tuscia University (UNITUS, Viterbo, Italy) is highly committed in innovative processes and technological transfer in the fields of environment, climate change and green technologies.
UNITUS is specialized in marine ecology and biology. At the Dept. of Ecological and Biological Sciences (DEB), researchers work at interconnected disciplines within a "One Health" approach: innovative aquaculture for coastal species recovery; sustainable fish stock management; coastal monitoring including e-DNA methods; molecular and behavioral ecology of marine organisms; marine micro-organisms, algae and fungi biology; molecular parasitology; food security and human health.
CISMAR-DEB Experimental Marine Centre is the main research structure. It hosts indoor and outdoor tank systems for experimental aquaculture, complemented by laboratories of molecular ecology and parasitology, physiology, behaviour, ecotoxicology and microbiology, besides two boats equipped for scientific sampling.
A complete educational pipeline is dedicated to Marine Ecology, with a bachelor's degree in Environmental Biological Sciences, an international master's degree in Marine Biology and Ecology (in English) and an interdisciplinary PhD course in Ecology and Sustainable Management of Environmental Resources.

Proposed project 01

Sustaining coastal fisheries through adaptive restocking

Fisheries depend on marine biodiversity that is highly depleted by both ocean warming and local impacts. Restoring populations of species suffering of reduced recruitment due to these impacts is an efficient strategy. However, many species of conservation or economic interest are new for aquaculture, requiring developing specific techniques to obtain individuals with fitness and performance like their wild relatives.

European and Italian funded projects allowed our scientists to develop such know-how on several crustaceans (lobsters, prawns), urchins and seahorse species by implementing a set of molecular, behavioral and physiological tools allowing to:
- identify the genotypes closer to the receiving population,
- individually genotype the specimens released,
- grow specimens developing "natural-like" behaviors (e.g., short reaction times for preying or finding a shelter)
- obtain specimens with healthy body conditions.

A combination of genomic and transcriptomic approaches is now being developed to identify climate-adapted genotypes that could be released to improve populations' adaptive capacity under climate change. Our competence and tools set up for Mediterranean species may be positively translated to other species from seas experiencing warming and acidification.

Target countries

Cuba, Fiji, Samoa, Bahamas, Barbados, Dominican Rep., Jamaica, Grenada, Haiti, Tonga, Solomon Islands, Guinea Bissau

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https://www.unitus.it/en/dipartimento/deb
https://www.youtube.com/watch?v=78ZgWR7s4VM

A young European lobster reared at CISMAR-UNITUS facilities is released at sea.
Photo credit: Dr. G. Grignani, CISMAR-UNITUS

A brood of seahorses reared at CISMAR-UNITUS facilities.
Photo credit: Dr. P. Cipriani, CISMAR-UNITUS

Università degli Studi della Tuscia

Proposed project 02

Environmental DNA of marine parasites for monitoring coastal Eco-Health in the Anthropocene

Coastal ecosystems are recognized as hotspots of marine biodiversity. However, increasing anthropogenic impacts pose significant threats to the resident biodiversity. To safeguard these ecosystems, it is crucial to employ methodologies that can rapidly, cost-effectively and non-destructively, monitor changes in species composition, abundance, and trophic relationships. Parasites with complex life cycles have emerged as potential ecological indicators of food-web integrity and the well-being of marine ecosystems. However, conventional methodologies require expert dissection, detection, and sampling of host organisms, demanding intensive work.

This project aims to develop and apply environmental DNA (eDNA) based methodologies to detect helminth parasites, with final scope to use them as 'sentinels' for monitoring anthropogenic stress in coastal ecosystems. The project seeks to assess the parasite communities in selected coastal areas with low or high anthropogenic impacts over a spatial scale. The use of eDNA will enable the detection of target helminths without the need for invasive sampling methods, minimizing disturbance to the ecosystem. Parasites will be considered as important natural early signals of ecosystem disturbance.

Target countries

Cuba, Guinea Bissau, Maldives

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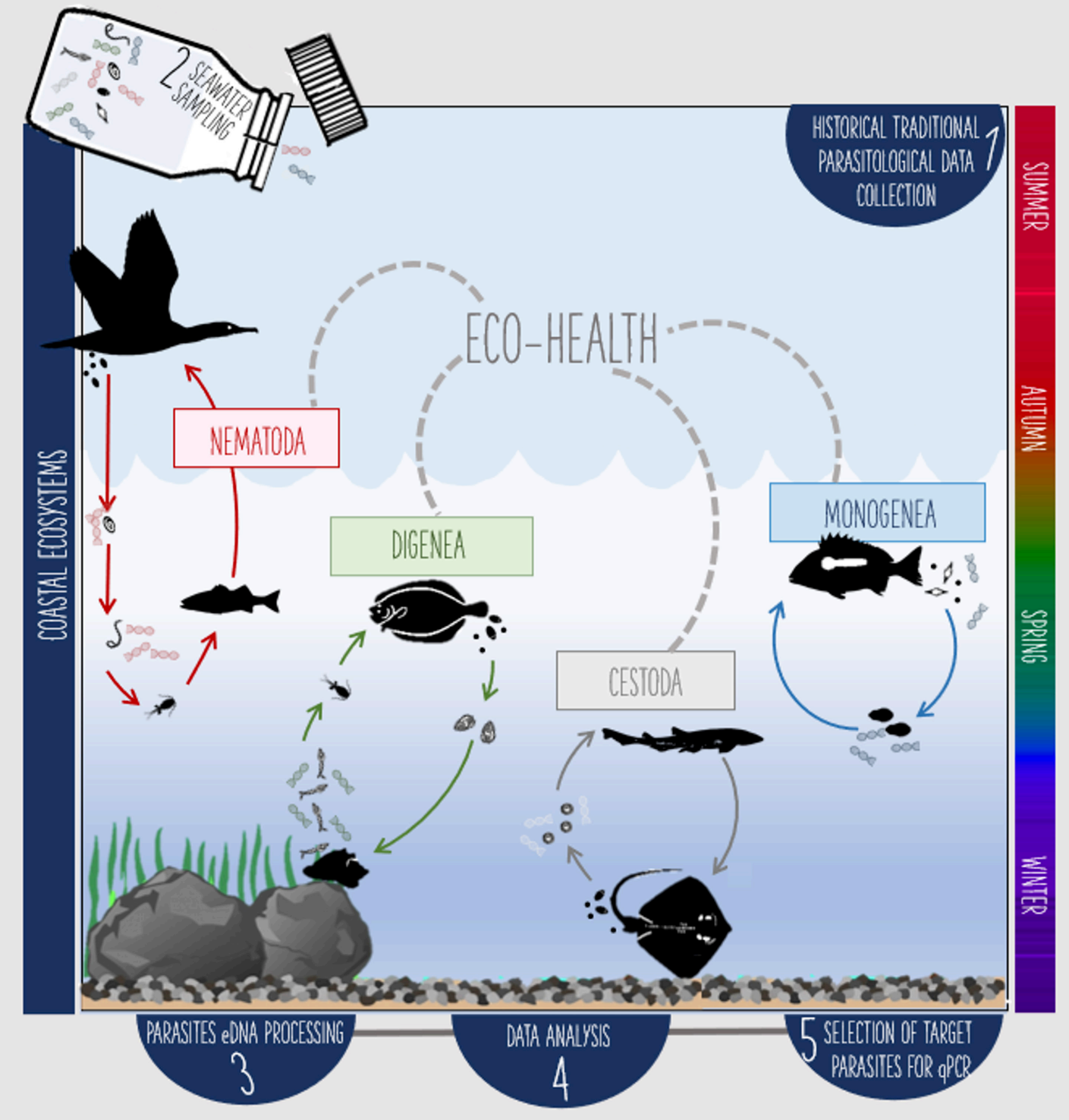
https://www.youtube.com/watch?v=78ZgWR7s4VM



Schematic representation of the project.
Image created by Marialetizia Palomba.

Università degli Studi della Tuscia

Proposed project 03

Monitoring secondary bacterial infections in coral bleaching

Corals represent valuable indicators of climate change that, by the increasing ocean warming, and together with an increased anthropogenic impact are much more frequently subject to severe bleaching (whitening). Bleaching, which is enhanced by the synergistic effect of multiple stressors, proceeds after the loss of coral endosymbionts (dinoflagellates) and is a fast-spreading process along the coral colonies. The possible extinction of a broad part of the reef ecosystem will strongly contribute to altering the ocean status and the biogeochemical cycle equilibrium, representing a menace for the whole planet.

Bleached corals are subject to various secondary microbial infections (Viruses, bacteria and fungi). This project would monitor the occurrence of microbial infection along coral bleaching in different areas of coral reefs. Coral microbiotas will be sampled in different phases of bleaching and the structure and composition of the microbial communities analyzed by high throughput methods. The study will allow profiling the eubiotic and dysbiotic coral communities, to deepen the knowledge of these important organisms and evaluate possible restoring strategies.

Target countries

Cuba, Maldives, Fiji, Samoa, Bahamas, Barbados, Dominican Rep., Jamaica, Grenada, Haiti, Marshall Islands, Tonga, Solomon Islands

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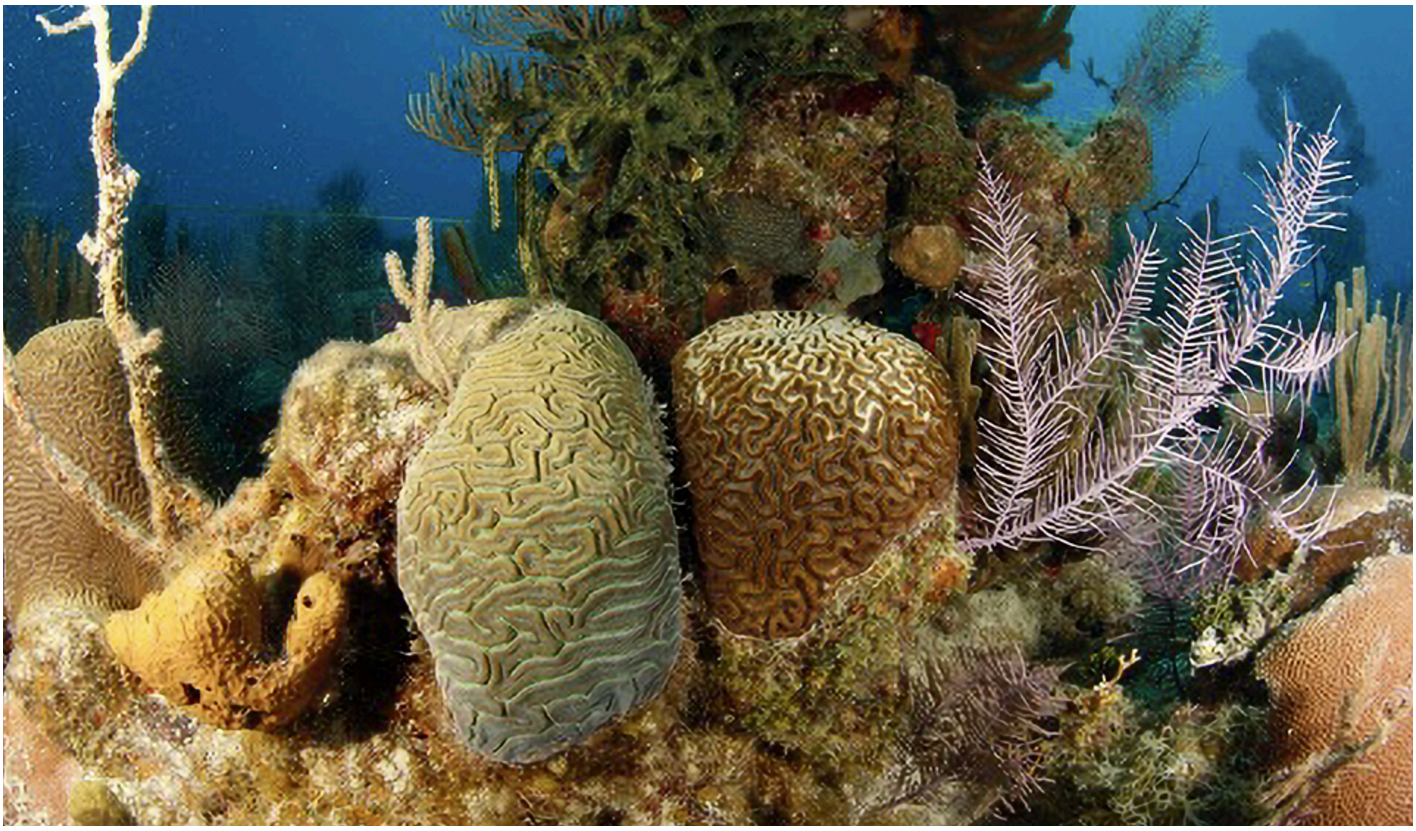
https://www.youtube.com/watch?v=78ZgWR7s4VM

Bleaching of *Siderastrea sidera*



Other corals of the Cuban reef: *Diploria laberinthyformis* and *Pseudodiploria strigosa*

Università degli Studi di Brescia

UNIVERSITÀ DEGLI STUDI DI BRESCIA

Expertise

The University of Brescia (UNIBS) is highly committed on SDGs as indicated on https://sostenibile.unibs.it/
Although the topics of Healthy and Protected Oceans is not in the core of the UNIBS research activities, some projects related to Climate Change Impact and Adaptation are linked to this theme. For instance the adaptation of water resources management (Red River 2 project) to combat saline water intrusion in coastal aquifers, or the monitoring of glacier's melting (Greenland, Alpine and Karakoram glaciers) accelerating sea level rise confirm the relevance
In the context of Healthy and Protected Oceans, the University of Brescia is developing projects focused on understanding and mitigating the impacts of plastic pollution. Specific research lines are focusing on the development of innovative solutions to address oceanic challenges, ultimately contributing to the preservation and well-being of our oceans. The "Chemistry for Technology" Research Group (https://chem4tech.unibs.it/) has gained experience in the field of micro- and nanoplastics since several years, participating as partner in national research projects (SIRIMAP, Sistemi di rilevamento innovativi per il monitoraggio dell'inquinamento marino da plastiche e successivo recupero e riciclo - PON "R&I" 2015-2020 – Azione II – D.D Prot. n. 2059 del 02/08/2018) and international (microONE, Microplastic Particles: A Hazard for Human Health? – FFG, Austria; LIFE-CASCADE Closed-loop wAter Systems in textile industrial distriCts: multimodal orchestrAteD rEmoval of emerging pollutants from textile wastewater - LIFE22-ENV-IT-LIFE - CASCADE), and by chairing the COST Action PRIORITY (https://ca-priority.eu/).

Proposed project 01

Development of a monitoring of a decision support platform for the management of the Red River water basin (Red River 2)

General objective of the project is to provide a decision support platform (DSS) for the regulation of the seven reservoirs (dams) in the Red River (Northern Vietnam) to meet flood control, irrigation demand, hydropower generation and the effect of Sea Level Rise (SLR) on Saline Water Intrusion (SWI) in aquifers in coastal areas.

After setting up the hydrological model of each sub-basin, a 1D-hydrodynamic model of the MIKE-11 family was used to route water downstream the main hydraulic node in Son Tay, aiming to forecast effects of reservoirs operation on downstream structures in flood and drought conditions.
This hydrodynamic model included also a 1D-water salinity module, to address the rising concern about the projected sea level rise as an effect of global warming and its effect on the saline intrusion in the Red River delta.
The problem of saline water intrusion (SWI) as a consequence of sea level rise (SLR) has already generated concern in the Mekong river delta in Southwestern Vietnam, as well as in many other coastal areas worldwide, including small islands in the Oceans which are threatened by the Sea Level Rise resulting from global warming
This modelling module is considered for the hydraulic simulation in the dry season to assess the potential benefit of water release from reservoirs to increase discharge at the So Tay node and reduce salinity in the Red River Delta.

Target countries

Fiji, Samoa, Belize, Cuba, Dominican Republic, Jamaica, Guyana, Haiti, St. Lucia, Suriname, Mauritius, Seychelles, Cape Verde.

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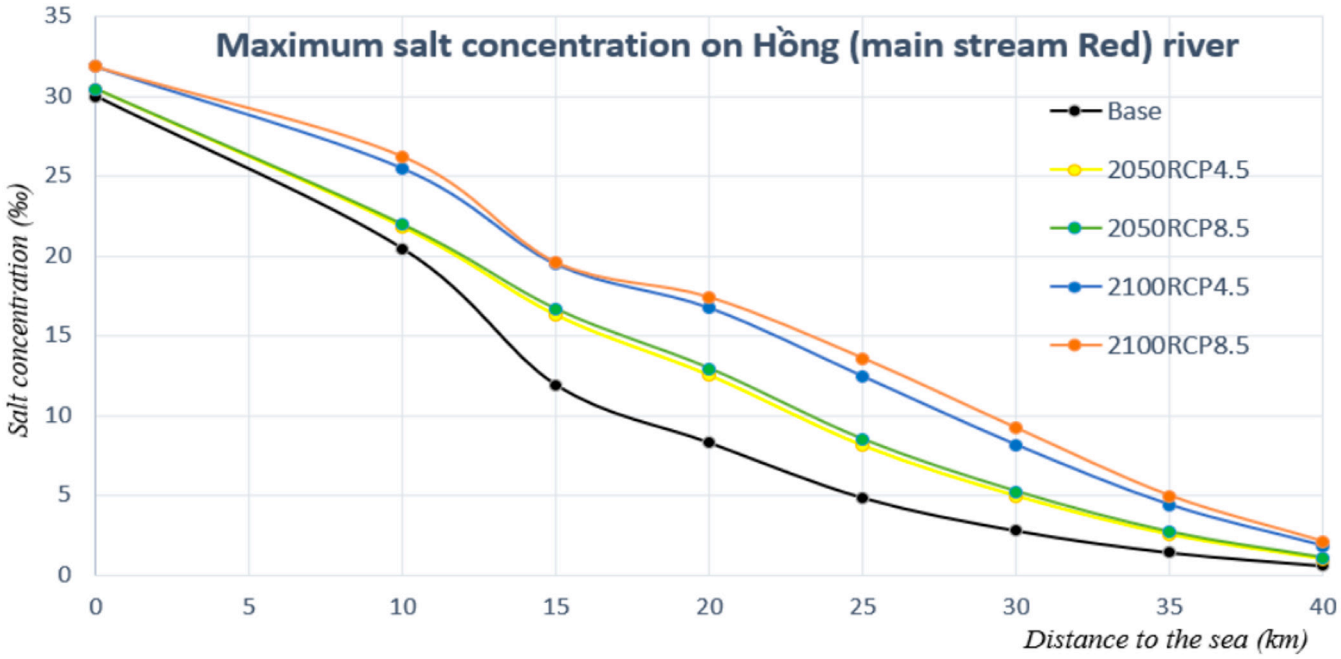

Project 01 Salt concentration along the Red River under the climate change scenarios (Nguyen, T. H., Nguyen, H. Y., Balistrocchi, M., Cat, V. M., & Ranzi, R. (2020) Salinity dynamics under sea level rise scenarios in the Red–Thai Binh River delta, Vietnam. Proceedings of the 22nd IAHR-APD Congress 2020, Sapporo, Japan)

Proposed project 02

COST Action CA20101 PRIORITY Plastics Monitoring Detection Remediation Recovery

PRIORITY stands for 'Plastics monitoRIng detectiOn RemedIaTion recoverY'. PRIORITY is a science and technology research network focused on developing, implementing, and consolidating strategies to tackle the global challenges of micro- and nanoplastics in the environment.
This COST Action combines expertise in chemistry, physics, life science, engineering, standards, economy, and law. The network creates a robust infrastructure for scientific communication, exchange, and collaboration to foster new research activities and citizen science.
PRIORITY aims to enhance the technical standards for sampling and analysis of micro- and nanoplastics in the environment, to develop a more reliable assessment of exposure and biological effects, and to advance activities in terms of environmental remediation and recovery.
The Action will support the harmonization of European regulation associated with microplastics. It will assist the European Commission in critical aspects of environmental and ecosystems protection, food safety, and life science.
The overarching aim of PRIORITY is to create and coordinate a transnational and multidisciplinary team of scientists and experts to address the challenges in the field of environmental nano- and microplastic pollution. This aim will be achieved through collaboration, sharing of know-how, discussions and training activities.

Target countries

UN SIDS

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https://ca-riority.eu/
https://www.cost.eu/actions/CA20101/

Università degli Studi di Cagliari

UNIVERSITÀ DEGLI STUDI DI CAGLIARI

Expertise

The University of Cagliari (UniCa), the largest university in Sardinia (the 2nd largest island of the Mediterranean Sea), has accumulated >40 years' experience in the study and management of marine ecosystems and their renewable resources, as well as in the assessment and facing of anthropogenic disturbances. With such a basis of expertise, the interrelated teams of researchers belonging to several departments of UniCa (e.g., Dept. of Civil-Environmental Engineering and Architecture; Dept. of Life and Environmental Sciences) have, since a long-time, put a large effort in addressing issues related with the impact of different manifestations of climate change (sea warming and level rise, frequency and intensity of extreme episodic events like marine heatwaves and floodings) and pollution (including marine litter and microplastics) and in providing local stakeholders and policy-makers with the establishment of adaptation strategies. The multidisciplinary researchers' team at UniCa has accumulated a consolidated experience on the assessment and restoration of marine habitats (including coralligenous mounds) in the Mediterranean Sea, in relation with anthropogenic impacts including, among the others, marine litter, microplastics and abandoned fishnets.

Proposed project

Adaptation of tropical marine animal forests assessment, restoration and management under climate change in a plastic-polluted ocean

The oceans are experiencing unprecedented rates of change that pervade all hierarchical levels of ecological organization. More than 40% of the oceans is exposed to multiple stressors, including litter and microplastic pollution. Concurrently, climate change (CC) is severely impairing marine ecosystems integrity and functioning. While investigating how CC will modify marine ecosystems, we need also to identify sustainable solutions to counteract, wherever possible, or adapt oceans' management to CC-induced modifications and litter and microplastic pollution. This is a priority for the societal survivorship of Small Island Developing States (SIDS), which, despite their population represents <1% of the world's one, base their economy on the resources of their surrounding seas. Because of the large vastity of SIDS' Exclusive Economic Zones, when compared to their total surface, and according to the UN "Biodiversity Beyond National Jurisdiction" Treaty (aimed at protecting the ocean, tackling environmental degradation, fighting climate change, and preventing biodiversity loss), the put-in-place and implementation of strategies of adaptation of seas' management to climate change and pollution represents a challenging and urgent task.

Based on the matured expertise on strategies of marine ecosystems' adaptation to CC at the regional level and on the analysis of multiple anthropogenic threats (including litter and microplastics) on oceans' life, the multidisciplinary team of researchers at Unica, including zoologists, ecologists, and environmental engineers, is available for assessing and testing the effectiveness of a concerted science-based protocol for identifying risks, vulnerability and resilience of animal forests to CC and its potential manifestations (e.g. sea warming and level rise, heat waves, extreme weather-marine events) as well as to litter and plastic pollution.

More in details, the UniCa team is available, in tight collaboration with local scientific, academic and governmental experts, for: i) the description of animal forests (i.e., species composition, distribution, etc); ii) the identification and characterization of the life traits of selected species in different scenarios of oceans warming (including marine heatwaves), ocean level rise and level of exposure to marine litter and microplastics; iii) the description of predicted CC-induced changes in abundance/biomass and/or spatial distribution of the target species; iv) the assessment of impact chains aimed at providing local stakeholders and policy makers with the basic information and the best tools and practices for establishing sustainable strategies of adaptation of consumable and non-consumable marine resources exploitation under different (IPCC) CC scenarios and marine plastic pollution levels.

These objectives will be pursued by a combination of literature-based (systematic reviews) correlative analyses and field and laboratory manipulative experimental activities, according to the following steps: a) species composition of animal forests; b) species selection and literature-based identification of key life traits vulnerable to CC and plastic pollution; c) choice of distributional models and identification of species-specific ecological performance curves across different climate conditions and levels of microplastic pollution; d) assessment of predicted changes in the distribution of the selected species in plausible (IPCC based) future climate scenarios and different levels of plastic contamination; e) creation of the impact chains – based on selected ecological and socio-economic indicators, providing the needed steps for the assessment of risks, impact and solutions to counteract or mitigate the consequences of CC and plastic pollution on SIDS seas.

Target countries

The wide applicability of the project outcomes can be of interest to all SIDS, with preference for the Pacific, Caribbean, and South America ones.

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UniCa website
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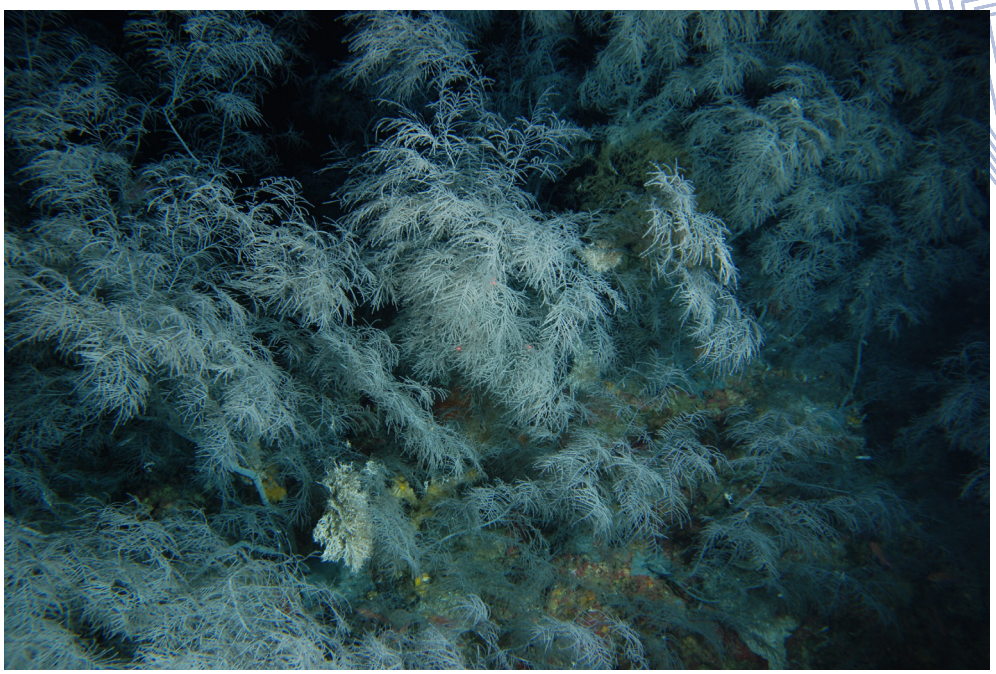
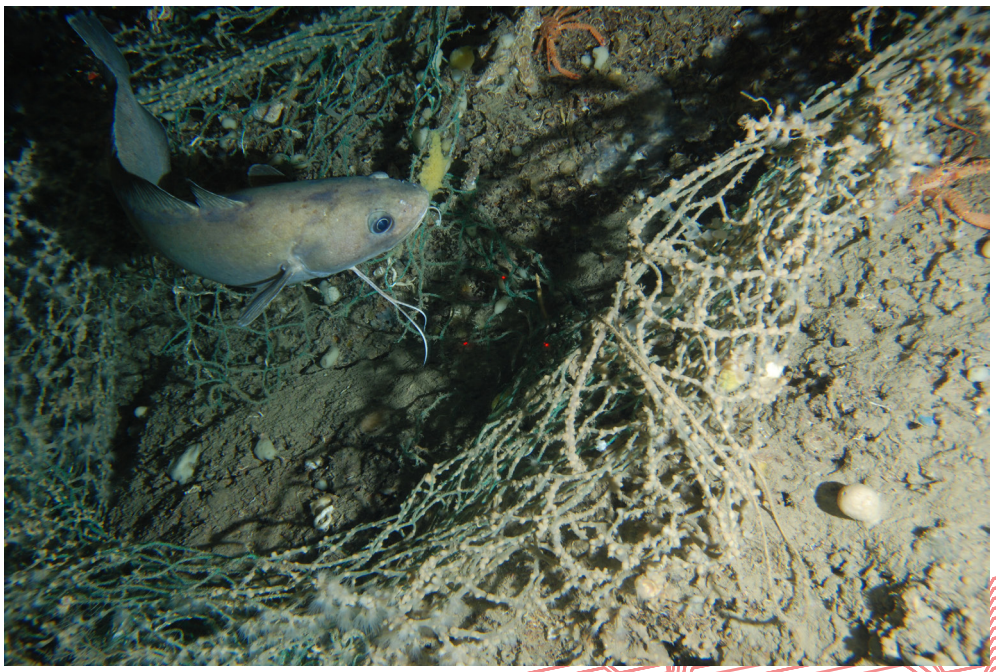
Dept. of Life and Environmental Sciences website
https://www.unica.it/unica/en/dip_scienzevitaamb.page

Dept. of Civil-Environmental Engineering and Architecture website
https://www.unica.it/unica/en/dip_ingcivile.page



A dense forest of black coral (Antipathella subpinnata) in the waters of Southern Sardinia
Credits:
Prof. Alessandro Cau
University of Cagliari



A sad image of the seabed suffocated by abandoned nets
Credits:
Prof. Alessandro Cau
University of Cagliari

Universita' degli Studi di Messina

Expertise

The University of Messina has a long and consolidated experience in teaching and research in the marine environment especially to marine biology, biodiversity and a one-health. The aims of the Departments of Veterinary Sciences and of Chemical, Biological, Pharmaceutical and Environmental Sciences are research, teaching and third mission. The research is aimed to promote and develop advanced projects in collaboration with International Universities and Research Centres with the objective of the well-being and eco-sustainable development of the Planet. Teaching includes first and second level degrees, PhD, master and specialisation courses. The third mission is the dissemination of scientific culture, which is considered essential for the development of an inclusive, egalitarian and eco-sustainable society, and the provision of the department's scientific knowledge for the needs of the territory. The departments offer degree courses in Marine and Terrestrial Environmental Sciences, Environmental Sustainability and Innovation and Coastal Marine Biology and Ecology. Moreover, there are specific competences concerning the pathologies of aquatic organisms and innovative laboratories on food quality of fish, crustaceans and molluscs.

Proposed project

Healthy sea turtles in a healthy sea: Investigating the presence of *Mycoplasma* spp. in sea turtles.

Hypothesis and Rationale: Sea turtles are among the most charismatic animals and at the same time endangered taxon dwelling the oceans and the seas worldwide. Recently, it has become more and more evident that infectious agents can play the role of relevant animal stressors increasing and emphasizing the effects of known threats including habitat loss, pollution, overexploitation and other anthropic activities. It is crucial to investigate and characterize the potential clinical relevance of known pathogens in chelonians. Among these, Mycoplasma spp. has been shown to be a serious threat to Testudinidae (tortoises) causing a severe upper respiratory tract disease considered among the factors, which contributed to the massive decline of the Agassiz's desert tortoise (Gopherus agassizii) in the US. The presence of Mycoplasma spp. and its potential role as a clinical relevant pathogen has been basically ignored in sea turtles to the best of our knowledge. Accordingly, it is critical i) to assess the presence of Mycoplasma spp. in sea turtles and ii) thoroughly characterize the strains present and iii) to determine their potential clinical relevance by correlating their presence to the health status of different sea turtle populations.

Specific Goals: This project aims to:
1) Determine the presence of Mycoplasma spp. in sea turtles (Caretta caretta, Chelonia Mydas, Lepidochelys olivacea, Dermochelys coriacea, Eretmochelys imbricata)
2) Characterize the species/strains of Mycoplasma by bacterial isolation and whole genome sequencing.
3) Correlating the presence of a specific Mycoplasma species/strain and the overall health status of the investigated sea turtle populations.

Methods: Sea turtles showing evidence of disease, which have been rescued and being hospitalized in wildlife rehabilitation centers will be sampled by collecting an oral swab (2 swabs) and a paired blood sample. The swab sample will be used to detect the presence of Mycoplasma spp. by qualitative PCR using a standard protocol (consensus pan-Mycoplasma PCR). The second swab will be used for bacterial isolation on SP6 culture media.
PCR and/or culture positive samples will be then selected for deep sequencing. Total DNA of the correspondent turtles will be prepared for next generation sequencing using the Illumina platform. Sequencing depth will be run at 100 Mio reads.
The sequencing results will be used to assemble the genomes of the detected Mycoplasma spp. and assessing the presence of similar and dissimilar features with M. agassizii, the most virulent reptilian Mycoplasma to date. The presence of the different Mycoplasmas detected in the different sea turtle populations will be correlated with the available data concerning the health of the regionally present sea turtle populations and with the severity of the clinical signs and clinical history of the sea turtle hosts in the wildlife rehabilitation centers where the bacteria were isolated from.

Expected results: This investigation will provide a first baseline data concerning i) the presence of Mycoplasma spp. in the sea turtles; ii) The characterization of the sea turtle Mycoplasma strains; iii) The potential clinical relevance of the newly characterized Mycoplasmas in sea turtles.

Target countries

Fiji, Marshall Islands, Cook Islands, Samoa, Bahamas, Barbados, St. Kitts, Guyana, Bahrein

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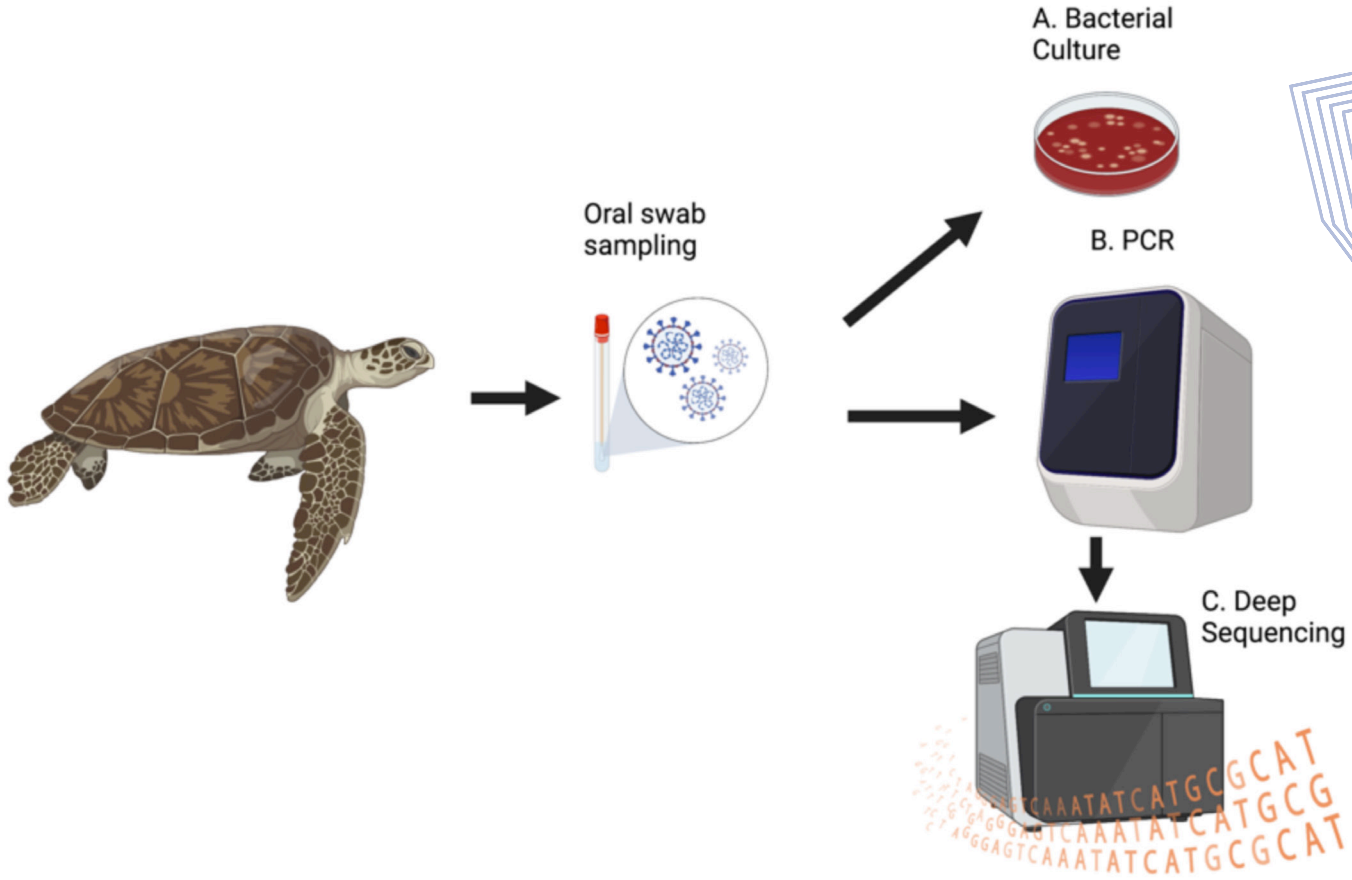

Figure Legend
This image show a graphic summary of the project.
Sea turtles will be sampled with an oral swab and the collected samples will be used for Mycoplasma spp. Isolation (A) and PCR detection B.
The positive samples either by culture or PCR or both, will be then submitted for next generation sequencing (C).
This image was realized with Biorender.com.

Università degli Studi di Milano Bicocca

Expertise

University of Milano Bicocca currently acts as leader or coordinator of the following research and dissemination projects:

- PRIN 2017: *Greening the Visual* (UNIMIB Working Group on Sea and Coastal Landscapes visual representation)
- Horizon MCDN 2022: *MEDiverSEAty. MEDiverSEAty*. In quest of the human dimensions of MEDiterranean Marine Biodiversity. UNIMIB Consortium's Leader.
- IGU Thematic Conference: *The Ocean and Seas in Geographical Thought* (June 2023)
- LIFE CONCEPTU MARIS - *CONservation of CEtaceans and Pelagic sea TUrtles in Med*: Managing Actions for their Recovery In Sustainability
- PNNR: *Cross-Border Cooperation Strategies In The Mediterranean For The Best Management Of Biodiversity And Development Of International Protocols For The Export of Italian Monitoring And Conservation Best Practices*. Spoke 1 – WP 4 – National Biodiversity Future
- The Marine Research and High Education Center www.marhe.unimib.it is part of: EMBRC https://www.embrc.eu/embrc-network/italy

Furthermore, University of Milano Bicocca, provides the following high education and training programs:
1. International MD in Marine Sciences (Joint Degree with Maldives National University)
2. International PhD Program in Marine Sciences, Technologies and Management (in partnership with Istituto italiano di Tecnologia)

Proposed project 01

Marine Research and High Education Center (MaRHE)

The Marine Research and High Education Center (#MaRHECenter) starts-up January 28th, 2009. MaRHE purpose is to carry out research and educational activities in the fields of environmental science and marine biology, tourism science and human geography. It also aims to educate as to how to protect this fragile environment and its biodiversity, as well as to use and manage its resources responsibly. Ocean water and coral reefs are vital for the economy of the Maldives. The two major industries there – fisheries and tourism – rely directly on the health of the marine ecosystem. Population growth, mass tourism, over-fishing and other environmental problems are all having an increasing and dramatic impact on the marine environment. The Maldives has an ecosystem characterized by rich biodiversity, which is at the same time extremely delicate and subject to drastic modification due to global climate change and local anthropic pressures, such as fishing overexploitation and mass tourism, as well as the threat of rising temperatures and ocean acidification. Furthermore, in the last few decades, the Republic of the Maldives has undergone complex changes in its socio-economical standing due to various factors: the constant increase in foreign investment in the tourism market; the dependency on oil producing countries; and the introduction of new consumption models. The Marine Research and High Education Center, in collaboration with the Maldivian Ministry of Fisheries, Marine Resources and Agriculture aims at blending technology, development and sustainability for the protection of the natural environment and the enhancement of human resources. MaRHE offers intensive trainings on: coral reefs restoration, tropical marine ecology, habitat mapping, tourism management. MaRHE has recently been included within European Marine Biological Resource Centre (EMBRC) https://www.embrc.eu/embrc-network/italy

Target countries

Italy, Maldives

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https://www.nbfc.it/

Coral Restoration in Faaf-Magoodhoo. Credits MaRHE Center

Ranthari (UNIMIB Research and Training Vessel) crossing a PAS in Faaf. Credits MaRHE Center

Università degli Studi di Milano Bicocca

Proposed project 02

Cross-border cooperation strategies in the Mediterranean for the best management of biodiversity and development of international protocols for the export of italian monitoring and conservation best practices

The project is part of National Biodiversity Future Center (Spoke 1, action 4) granted by PNRR (https://www.nbfc.it/). Over a three-year life-cycle (2022-2025) the project aims to spread best practices and regional protocols across the Mediterranean and to transfer them to extra Mediterranean areas: with the Maldives as target region. A combination of different approaches will be used to promote the design and release of guidelines and protocols for monitoring, restoration, rehabilitation, and conservation of the Maldivian reefs. A special focus will be addressed to local traditions and innovative and sustainable eco-tourism models by using visual methods and releasing video-making products. Training courses and modules will be also carried out in order to implement an effective capacity-building program and to promote training on coral reef rehabilitation for both citizens and practitioners: the main audience of these trainings will be municipal councillors, stakeholders, resorts managers operating in the Maldives as in other SIDS. A pilot project will be also performed in the United Arab States, with local institutions and the University of Dubai, to create an observatory for the study of biodiversity in environments particularly exposed to climate changes. Furthermore, the research group will cooperate with Maldivian authorities to start-up pilot Marine Protected Areas protocols.

Target countries

Italy, Maldives, UAE, (potential involvement of all Mediterranean Countries)

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The Research and Training Outpost in Faaf-Magoodhoo. Credits MaRHE Center

Università degli Studi di Napoli Federico II

Expertise

The University of Naples Federico II (UNINA), founded in 1224, is the oldest public university in the world.
UNINA offers courses in all academic disciplines, leading to 155 graduate level degrees.
Currently students are 86,000 and academics 2,532.
UNINA is made up of four Schools (Agricultural/Veterinary; Humanities; Medicine; Polytechnic/STEM).
UNINA has 26 Departments and 40 Research Centers covering all disciplines.
UNINA includes a cluster of 14 highly specialized Museums and 2 botanical gardens hosting unique species.
UNINA has 40 courses of PhD.
UNINA has 6 academies.
In the period 2018-2020, over 30,000 research products have been realized.
Very strong attractor of national and international funds was partner in 114 projects financed by the EU (H2020, 23 coordinated by UNINA), with an average of 13 international partners and a total financial contribution of over 47 million euros from the EU.
It has also participated in 23 international projects (other than H2020), 6 of which coordinated by UNINA. It currently runs several hundred projects funded by the Italian Ministry for Research (PRIN) and several tens of applied-research grants financed under the Operative National Program (PON) and Operative Regional Program (POR), with a total financial contribution of several tens of million euros. UNINA has been the host institution for 16 grants of the European Research Council (ERC) and UNINA faculty members have been principal investigators for 27 ERC grants.

Proposed project 01

TANGAROA
Marine volcanic island contribution to biogeochemical cycling in a changing ocean

Volcanic islands are fundamental in the functioning and health of the global oceans providing through eruptions and secondary geothermal manifestations critical nutrients and trace elements to the marine ecosystems. Shallow-water hydrothermal vents in particular are crucial for the functioning of local ecosystems and globally provide the oceans with large portions of the iron, cobalt and other trace elements required by marine organisms. Additionally, there are hotspots of biodiversity with potential biotechnological applications. Despite their importance, shallow hydrothermal vents contribution to biogeochemistry (the complex set of biological and geological processes controlling the recycling of elements) and their response to changing oceans has been so far understudied. We propose an integrated, multidisciplinary project combining cutting edge techniques in microbiology, ecology, and geochemistry to understand the critical contribution of volcanic islands to biogeochemical cycling and marine biodiversity and functioning. Our results will provide an unprecedented view of the contribution of volcanic islands to the health of our oceans, increase local biodiversity knowledge and provide critical information for future conservation and management strategies.

Target countries

Fiji, Palau, Samoa, Solomon Islands
Tonga, Vanuatu

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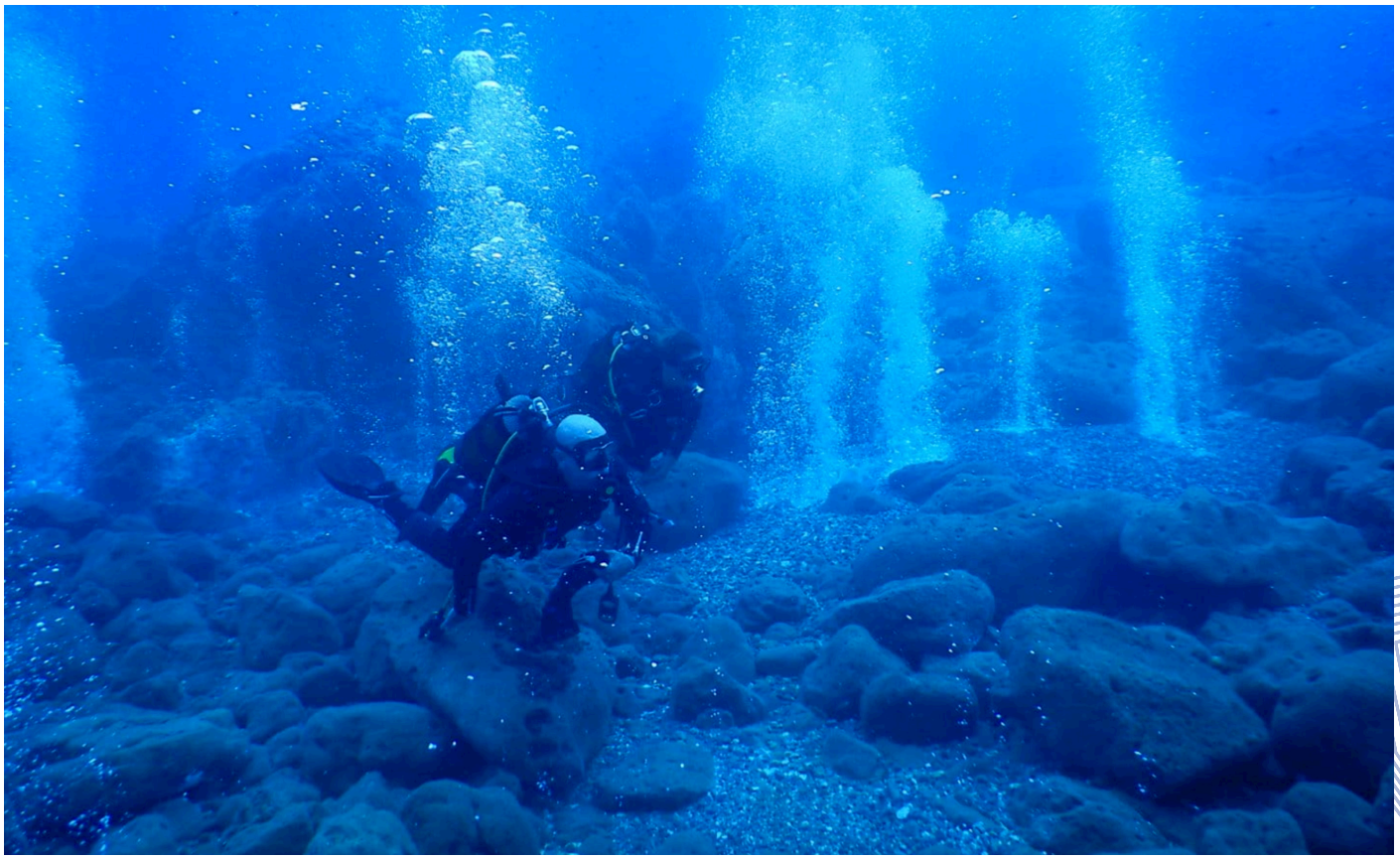

Underwater gas and fluid emission in proximity of a volcanic island in Sicily (Italy).
Credits: ERC CoEvolve/Giulia Bernardi

Hot fluids (75 °C) enriched in iron emitted underwater in proximity of the Campi Flegrei caldera (Italy).
Credits: ERC CoEvolve/Donato Giovannelli

Università degli Studi di Napoli Federico II

Proposed project 02

MEPOM
Monitoring of Emerging Pollutants and Preventing and Mitigating Mass Mortality Events in Marine

Assessing the impact of marine pollution on human health is a dynamic and complex field that requires epidemiological, toxicological, and environmental approaches.
Microplastics, heavy metals and organic pollutants, rare earth elements (REE), Pharmaceuticals, Personal Care Products (PPCPs), and Endocrine Disrupting Agents are continuously released into the environment; some of these are a prominent pollutant along the Pacific coast and their presence is closely linked to anthropogenic pollution.
They can originate from natural processes, but their impact on organic contamination is generally lower compared to human activities and can undergo bioaccumulation and biomagnification processes.
Some of these substances pose a potential threat by disrupting the endocrine system and causing significant damage to sensitive ecosystems, especially when they operate as multiple stressors, with synergistic outcomes.
Nowadays mass mortality events (MMEs) are rapidly causing catastrophic demographic losses that punctuate background mortality levels and are now recognized to have great ecological and evolutionary significance. A single MME can remove over 90% of a population. Coral diseases, in this sense, represent a paradigmatic example, capable as they are of modifying the functioning of coral reefs.
It is therefore urgent to activate the monitoring of emerging contaminants and pathogens on the organisms and communities inhabiting marine regions utilizing innovative analytical techniques to implement mitigation and prevention policies and actions to save and/or restore damaged populations.

Target countries

Fiji, Palau, Samoa, Solomon Islands
Tonga, Tuvalu, Vanuatu, Comoros
Maldives, Mauritius, Seychelles

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Menu of the day.
Credits: https://www.21secolo.news/la-plastica-principale-fonte-di-inquinamento-marino/

Under the sea.
Credits: https://ilgiornaledellambiente.it/inquinamento-ambientale-inquinanti/inquinamento-marino-da-plastica-cose-cause-e-conseguenze/

Università degli Studi di Napoli Federico 11

Proposed project 03

An integrated study of coral bleaching in the Caribbean: oceanographic impact on loss of fish biodiversity on coral reefs habitat

Coral bleaching has attracted the attention of scientists due to its increasing occurrence and impact on marine ecosystems. Coral reefs are vulnerable to rising temperatures and when they become stressed, they expel the symbiotic algae that live within their tissues, causing them to turn white or "bleach." Without algae, the corals are more vulnerable to disease and death. This study aims to provide a comprehensive review of the current knowledge on coral bleaching in relation to oceanography in the Caribbean's islands.

The study will assess the current state of coral bleaching in several Caribbean Islands, examining oceanographic data available from buoys and satellite, possibly extending to pollution levels, light intensity, and water quality.
It will focus on the loss of symbiotic zooxanthellae, the disruption of the coral's metabolism and the cascading effects on fish populations and the loss of biodiversity, aiming at assessing the importance of monitoring and managing coral bleaching events.

This research will highlights the urgent need for a better understanding of the oceanographic factors contributing to coral bleaching and aims to suggest effective strategies for the protection and restoration of coral reefs in the face of climate change.

Target countries

Antigua & Barbuda, Bahamas, Barbados
Belize, Cuba, Dominica, Dominican Rep.
Grenada, Jamaica, Guyana, Haiti, St. Kitts & Nevis
St. Lucia, St. Vincent & Grenadine

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A photo composite of before, during and after bleaching at Airport Reef in Tutuila, American Samoa. Credit: R. Vevers of XL Catlin Seaview Survey, National Oceanic and Atmospheric Administration

Università degli Studi di Napoli L'Orientale

Università degli studi di Napoli "L'Orientale"

Expertise

The University of Naples "L'Orientale" (the Orientale University) has its beginnings in the Chinese College founded by Matteo Ripa, a lay priest and missionary worker who lived between 1711 and 1723 in the court of the Manchu Qing Emperor Kangxi. Upon his return to his homeland, he founded the "Chinese College" in Naples in 1732.
The University is the oldest school of Oriental Studies in Europe. With its rich tradition in languages, cultural and social studies, from Europe to Asia, and from Africa to the Americas, since its very foundation our University has represented a pivotal Centre of Studies whose aim is to highlight the differences as well as the points of contact between cultures.
From the very beginning, the Orientale University has been engaged in intense international cultural relations, constantly collaborating with diverse academic institutions of other countries, thus, providing its students with an education able to meet the demands of the modern world.
Research at the Orientale University ranges between the study of Languages and Linguistics, Cultures, History, Geography, History of Thought, Archaeological and Artistic Heritage, and The Legal and Socio-Economic Systems of Western, African and Asian Countries.
Specific research interests regard Asian, African and Mediterranean Studies (focused on the Philological, Historical and Archaeological study of ancient civilizations); International Studies (centered in the fields of History, History of Thought, Geopolitics, Economic, Institutional and Cultural Relations); Literary, Linguistic and Comparative Studies (centered on European and American Languages and Literatures).

Proposed project

Project Indonesia: Indonesian-Italian boatbuilding endangered knowledge project

The joint Indonesian-Italian boatbuilding endangered knowledge project is a multidisciplinary research aiming to record the multiple aspects of boatbuilding knowledge in the archipelago through archaeological surveys and excavations, iconographic and historical investigations, ethnographic interviews, language documentation and study of museum collections.
Fieldwork research activities were conducted so far in Lamalera (Lembata, East Nusa Tenggara) and Tana Beru (South Sulawesi), where a boat has been built according to traditional practices, and on the Punjulharjo shipwreck (Rembang, Central Java) — the most ancient complete boat of South East Asian preserved so far —, and on museum collections of boat models in Jakarta.
The project has been funded by the Italian Ministry of Foreign Affairs, EMKP (British Museum, UK), ISMEO (Associazione Internazionale di Studi sul Mediterraneo e l'Oriente), Università L'Orientale and Universitas Indonesia

Project Qatar: L'Orientale University has an agreement with the University of Exeter which in turn has agreements with the National Museum of Qatar for the study, already carried out, of the collection of traditional boats from the Gulf, owned by the Museum.
No further research collaborations are foreseen at the moment but the agreement with the University of Exeter and the exchanges of teaching staff are still ongoing.

Project Saudi Arabia: L'Orientale University has an agreement with the Saudi Arabian Ministry of Culture to conduct archaeological research, including those concerning the excavation of the Umm Lajj wreck, a project active since 2016.
The deal with the Saudi Ministry of Culture is still pending and searches at the Umm Lajj wreck are expected to continue in the future.

Project Yemen: At the moment we do not have active agreements with this country but we plan to participate in an archaeological research project on the island of Socotra in January 2024

Target countries

Islands of Java, Sumatra, Bintan and Sulawesi,
the Red Sea (Saudi Arabia), the Emirates and Qatar,
the Farasan Islands (Saudi Arabia), Egyptian
and Eritrean coast.
A mission planned is in Socotra island.

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Museum collection

Punjulharjo boat

Università degli Studi di Padova

UNIVERSITÀ DEGLI STUDI DI PADOVA

Expertise

Founded in 1222, Padova University (UNIPD) is a leading University in Italy, with a consolidated reputation in Coastal and Marine Sciences. The Adriatic Sea and Venice Lagoon are our training field to investigate socio-ecological interactions and mitigation strategies. Our commitment is to strengthen international collaborations at the interface of coastal and marine ecology, biology, geology, engineering, economy and management, and ensure that the scientific knowledge of marine processes and human impacts is transferred to the society and the decision-making process. UNIPD owns extensive facilities for field- and lab-based research, training and outreach in Chioggia, including the Hydrobiological Station "Umberto D'Ancona", and the marine Museum of Adriatic Zoology "G. Olivi". It is also home to the International Master Degree in Marine Biology. The Study Centre for Environmental Challenges, the Center for Lagoon Hydrodynamics and Morphodynamics and the Climate Change Impacts Centre facilitate multidisciplinary exchanges among several UNIPD departments. UNIPD is/has been involved in several projects related to marine health and protection: 2 Horizon 2020, 3 LIFE, 6 Horizon Europe, and 3 JPI Ocean. A MSCA-Doctoral Network will start a new line on "Underwater Noise"

Proposed project 01

Demonstrating innovative nature-based solutions for climate and flood resilience of estuarine and coastal areas

We use a multidisciplinary approach that integrates impact assessment, laboratory and field experiments, mathematical modelling and multi-risk analyses to: 1) quantify the combined impacts of multiple climatic (marine heatwaves, anoxia, coastal erosion, storm surges and sea level rise) and human activities (sprawl of hard infrastructures, coastal erosion, eutrophication, use of storm surge barriers) on coastal and marine systems; 2) map and valuate ecosystem services for their application in hybrid or entirely nature-based solutions (e.g. restoration of coastal ecosystems for erosion control and flood resilience); 3) develop forecasting scenarios of environmental and anthropogenic changes to identify current hot-spots of climate risks where key ecosystem services could be lost; and 4) demonstrate the feasibility of nature-based solutions for climate risk mitigation and adaptation and their ecological and societal co-benefits. Examples of solutions being tested include artificial 'biomimetic' surfaces and materials for the eco-design of docks and coastal defence structures that support greater biodiversity, nature-based solutions to restore saltmarshes under erosion and concurrently create local jobs, turf scrubbers to remove excess nutrients in urbanised areas.

Target countries

Kiribati, Maldives, Grenada, Mauritius, Seychelles, Bahrein, Belize, Vanuatu, Samoa, Guyana, Suriname, Bahamas, Comoros, East Timor, Palau, Tuvalu

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Nature based solutions against salt marsh erosion in the Lagoon of Venice (Italy), based on a combination of biodegradable barriers against waves and sediment nourishment to promote plant colonization.
Credit: project LIFE VIMINE.

Università degli Studi di Padova

UNIVERSITÀ DEGLI STUDI DI PADOVA

Proposed project 02

Understanding, monitoring and predicting future coastal and marine ecosystem features and values

We develop and integrate molecular ecology techniques, field-based research, remote sensing, AI, biomorphodynamic modelling, participatory approaches and multi-risk analysis to study the dynamics and resilience of socio-ecological systems under natural and anthropogenic forcing, including climate changes, underwater noise, constructions and deep mining, biological and chemical pollution, diseases. We focus on the bio-morphodynamic evolution of coastal landscapes and on the mutual interaction between physical and biological processes, changes at all levels of biological diversity, and what factors increase coastal-ecosystem adaptive potential to future stressors, including genetic and functional connectivity, to support marine conservation planning and management. Emphasis is on natural versus restored habitats of different ages, to understand the successional trajectories of restored ecosystems and support evidence based restoration in changing coasts and oceans. Landscape and ecosystem response and resilience to environmental changes are addressed based on a set of possible future scenarios driven by climatic changes and human interference. Results are capitalised in responding to existing legal frameworks, implementing new regulation bodies and driving policy makers.

Target countries

Kiribati, Maldives, Grenada, Mauritius, Seychelles, Bahrein, Belize, Vanuatu, Samoa, Guyana, Suriname, Bahamas, Comoros, East Timor, Palau, Tuvalu

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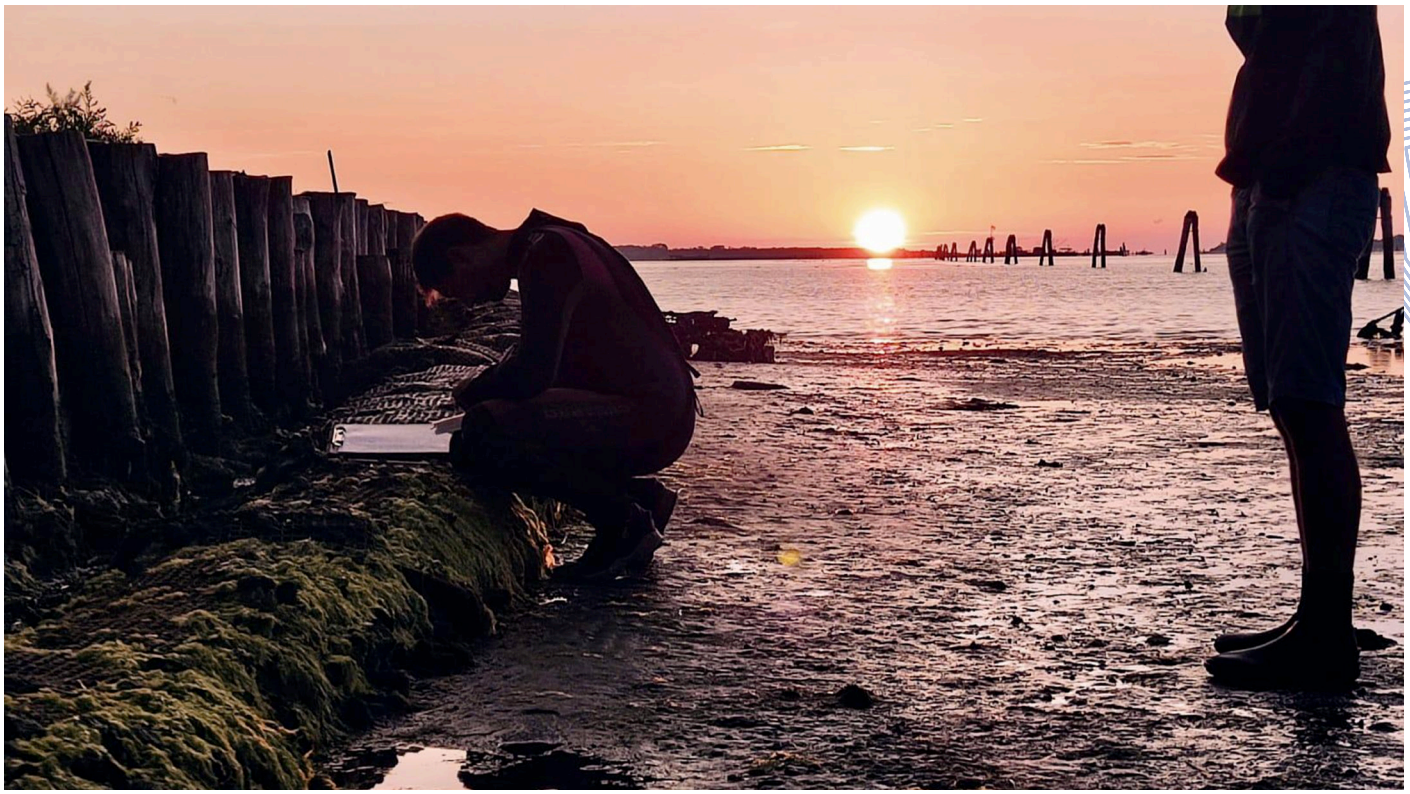

Sampling of the biota associated to structures for foreshore erosion control in the Venice Lagoon (Italy). Credit: project Development of "green" bioactive surfaces to restore marine life (REACT EU – PON "Ricerca e Innovazione 2014-2020" - DM 1062/2021, MUR Italian Ministry of University and Research

Università degli Studi di Padova

UNIVERSITÀ DEGLI STUDI DI PADOVA

Proposed project 03

Marine food health and sustainability

With the aim of making healthy and sustainable food available, protecting wild populations and enforcing local economy, we use different approaches to: 1) evaluate the impact of fishery activities on resources and vulnerable species, through surveys on board of fishing boats, recovery of local ecological knowledge of fishers, analyses of fishery data, construction of models at individual, population and ecosystem levels; 2) explore strategies for a sustainable fishery through experimental tests and integration of biological data into models; 3) assess the impact on existing biodiversity, including protected species, testing and applying proper mitigation measures aimed to make fishing activities more sustainable; 4) contribute to the preservation and promotion of local products of fishery resources by developing data libraries and application of innovative systems for rapid, eco-friendly, and cost-effective real-time traceability and origin of fish products; 5) contribute to the development of sustainable aquaculture and improvement of the health status and welfare of aquacultured species through experimental approaches; 6) protect biodiversity through reproduction and farming of local species for aquaculture purposes and the selection of resistant and resilient genetic lines.

Target countries

Potentially all the countries that base their economy on fishing and aquaculture as an example Fiji, Bahamas, Maldives, São Tomé e Príncipe.

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Fishers preparing the longlines (Chioggia, Italy).
Credit: Emilio Riginella, CLODIA project (Regione Veneto, interventi L.R. 15/2007)

Università degli Studi di Palermo

Università degli Studi di Palermo

Expertise

The University of Palermo (UNIPA) is a consolidated cultural, scientific and teaching presence in central-western Sicily. Its 16 Departments cover the most important domains of contemporary scientific and technological knowledge: 130 courses (first and second cycle 23 PhD courses, targeted to the training of specific professional figures, often in cooperation with external institutions and companies. Researchers at UNIPA daily study to find new solutions to the questions posed by nature, science and society.
The University of Palermo is HUB of the National Biodiversity Future Center (NBFC), one of the centers of excellence and the most important research and innovation initiative on biodiversity ever undertaken before in Italy.
With 48 research partners, both public and private, the actions of the NBFC will work to align the Italian biodiversity policy, reaching the objectives of the "European Strategy for Biodiversity to 2030" in three years.
NBFC-UNIPA is made up of over 100 scientists (about 10% of the entire UNIPA academic community) including biologists, ecologists, economists, sociologists, engineers, statisticians, mathematical modelers, doctors, humanists, and agronomists, who attest to the centrality of UNIPA in the Mediterranean Sea.

Proposed project 01

Mapping and monitoring actions to preserve marine ecosystem biodiversity and functioning in the Mediterranean Sea

Mapping and monitoring actions to preserve marine ecosystem biodiversity and functioning are the main goal of NBFC-SPOKE 1, led by UNIPA team.
SPOKE 1 focuses on the Italian marine systems covering more than 8,500 km of coast and are featured by a combination of hotspots of biodiversity embedded in a human seascape. The main objective is to provide innovative cross-border cooperation strategies in the Mediterranean Sea for the conservation and sustainable use of biodiversity and the development of international protocols for the export of Italian monitoring and conservation best practices, in accordance with the EU target and SDGs 2030. Spoke 1, through a combination of descriptive and manipulative research, harmonizes and integrates marine-coastal biodiversity databases, monitor marine biodiversity at various levels (by promoting and make use of the most cost/effective new/emerging methodologies and technologies), and experimentally assess the vulnerability across Mediterranean habitats to global and local stressors. The final objective will be to make predictions on future marine habitat distribution, structure and functioning to set priorities and plan new conservation scenarios for reaching EU targets.

Target countries

Fiji, Bahamas, Maldives, Bahrein, East Timor, Mediterranean area

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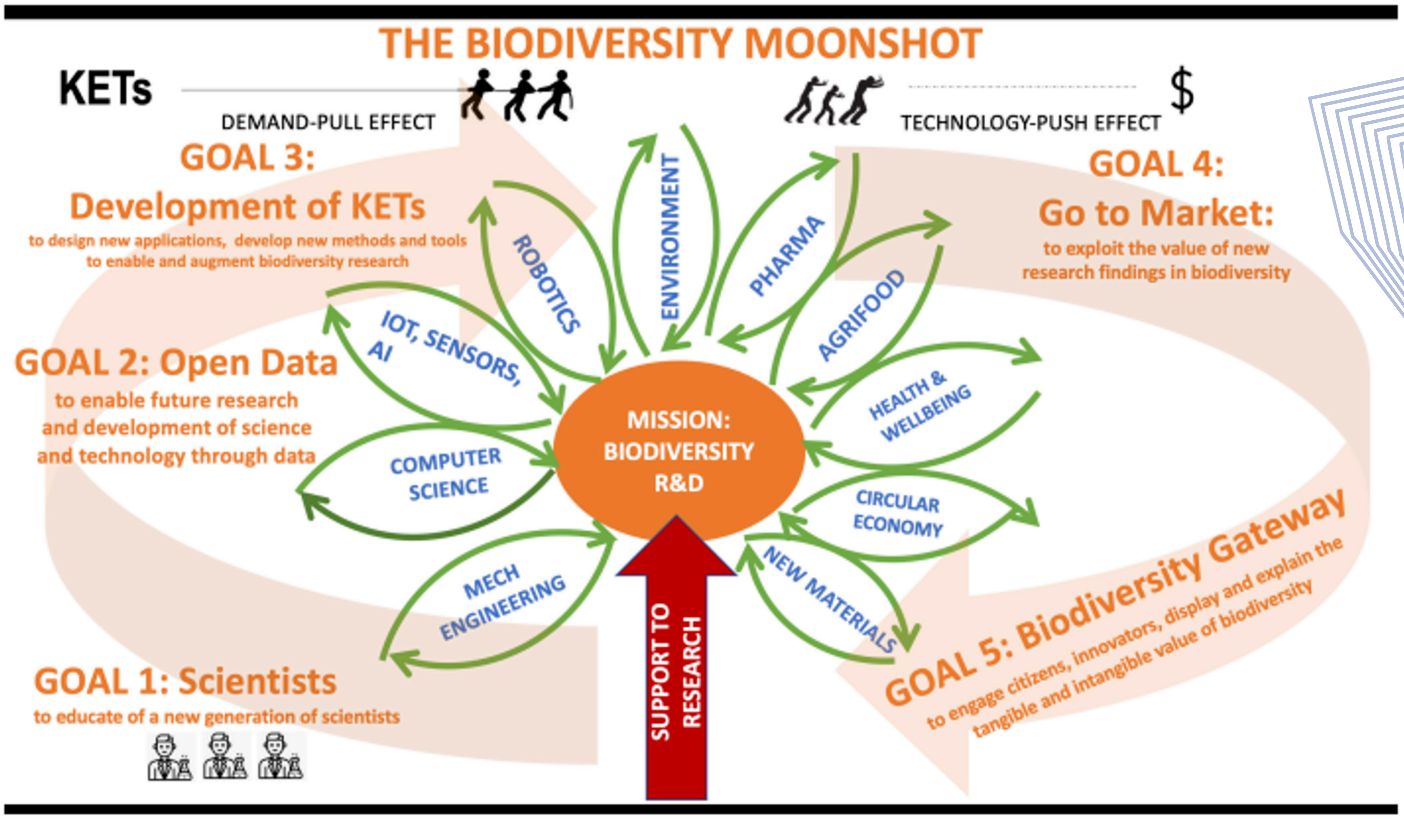
https://www.unipa.it/dipartimenti/distem/


THE BIODIVERSITY MOONSHOT
KETs
DEMAND-PULL EFFECT
TECHNOLOGY-PUSH EFFECT
$
GOAL 3:
Development of KETs
to design new applications, develop new methods and tools to enable and augment biodiversity research
GOAL 4:
Go to Market:
to exploit the value of new research findings in biodiversity
GOAL 2: Open Data
to enable future research and development of science and technology through data
GOAL 1: Scientists
to educate of a new generation of scientists
GOAL 5: Biodiversity Gateway
to engage citizens, innovators, display and explain the tangible and intangible value of biodiversity
ROBOTICS
ENVIRONMENT
PHARMA
AGRIFOOD
IOT, SENSORS, AI
HEALTH & WELLBEING
COMPUTER SCIENCE
CIRCULAR ECONOMY
MECH ENGINEERING
NEW MATERIALS
MISSION: BIODIVERSITY R&D
SUPPORT TO RESEARCH

Università degli Studi di Palermo

Università degli Studi di Palermo

Proposed project 02

Biomonitoring of coastal area condition to prevent natural/antropogenic degradation and discovery of promising bioactive compounds for biotechnological use in one health framework

Marine organisms are also source of novel unexplored bioactive compounds with possible roles as pharmaceuticals, nutritional supplements, enzymes, pesticides, and cosmetics. Despite their biological diversity, productivity, and importance to humans, both warm and cold-water coral reefs are being heavily impacted by human activities. While local factors can have significant impact on coral reefs (e.g., pollution, overfishing, and the physical destruction), changes in ocean temperature and chemistry due to anthropogenic activities are dramatically reducing the survival of entire coral reef ecosystems.

The project focuses on the holistic perspective of "One Health, on:

- The principle of systemic biomonitoring in the coral coastal marine habitats
- Validation of measurable biological marker to the exposure and the toxic effects of environmental contaminants. The development of biomarkers as a detection system for environmental condition is an essential biotechnological contribution for policy makers to manage and control pollution or environmental degradation due to warming and/or pathogenic invasions.
- Investigation of the presence of bioactive molecules and evaluate their potential study in terms of biotechnological applications.

Target countries

Fiji, Bahamas, Maldives, Bahrein, East Timor, Mediterranean area

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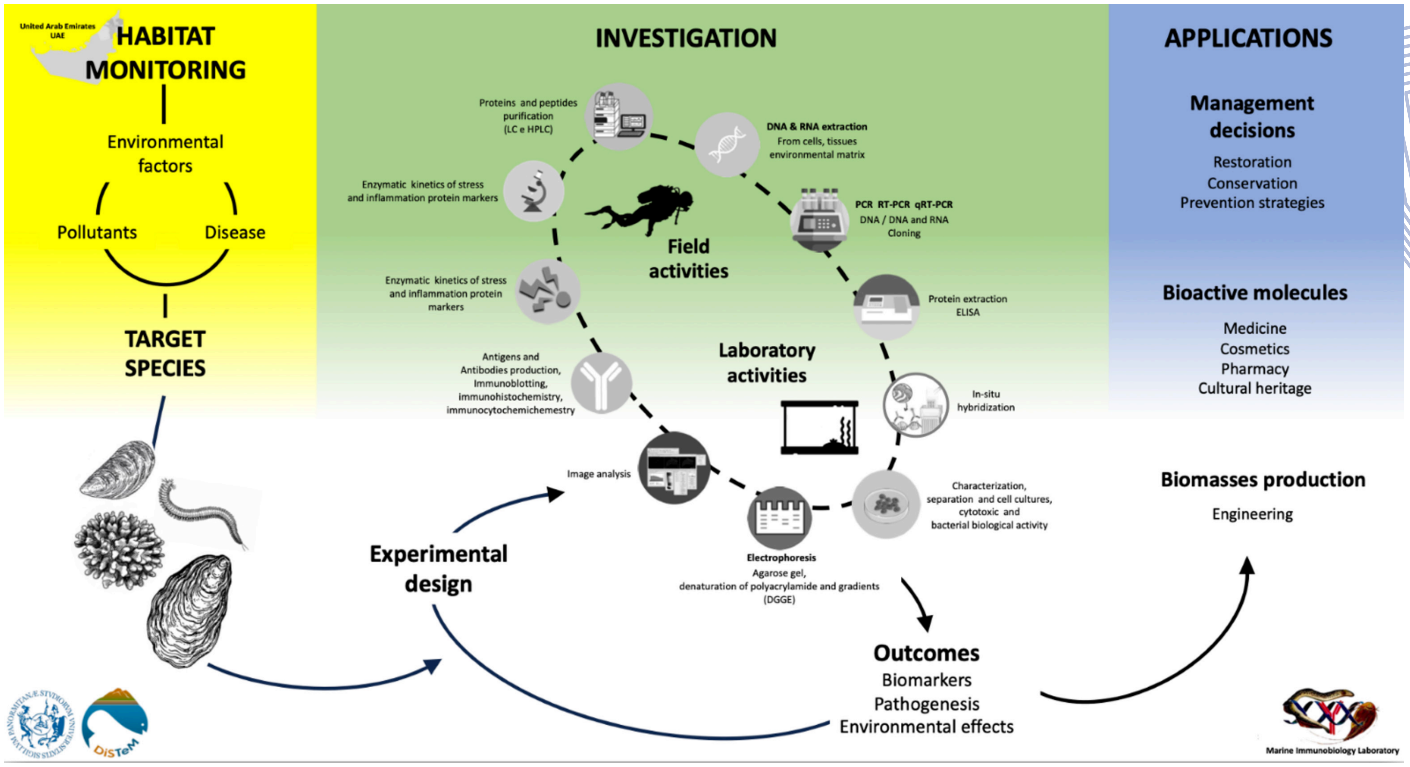
United Arab Emirates
UAE
HABITAT MONITORING
Environmental factors
Pollutants
Disease
TARGET SPECIES
INVESTIGATION
Proteins and peptides purification (LC e HPLC)
DNA & RNA extraction
From cells, tissues environmental matrix
Enzymatic kinetics of stress and inflammation protein markers
Field activities
PCR RT-PCR qRT-PCR
DNA / DNA and RNA Cloning
Enzymatic kinetics of stress and inflammation protein markers
Protein extraction
ELISA
Laboratory activities
Antigens and Antibodies production, Immunoblotting, immunohistochemistry, immunocytochemichemestry
In-situ hybridization
Image analysis
Characterization, separation and cell cultures, cytotoxic and bacterial biological activity
Electrophoresis
Agarose gel, denaturation of polyacrylamide and gradients (DGGE)
Experimental design
Outcomes
Biomarkers
Pathogenesis
Environmental effects
APPLICATIONS
Management decisions
Restoration
Conservation
Prevention strategies
Bioactive molecules
Medicine
Cosmetics
Pharmacy
Cultural heritage
Biomasses production
Engineering
DISTeM
Marine Immunobiology Laboratory

Università degli Studi di Palermo

Università degli Studi di Palermo

Proposed project 02

The role of seagrass blue carbon: stock evaluation, effects of anthropogenic disturbance and benefits from seagrass restoration

Seagrass meadows, tidal marshes and mangrove forests can capture carbon effectively and sequester it in their sediments representing nature-based solutions to contrast climate change. In the Mediterranean Sea, focus has been given to the endemic seagrass Posidonia oceanica, a climax-slow growing plant. To speed up the recovery process, transplanting and seedling techniques have been implemented at University of Palermo i) to investigate the role of seagrasses as biogeochemical sinks and BC ecosystems, ii) to identify factors affecting carbon sequestration and burial, iii) to assess effects of various stressors on carbon storage, and iv) to evaluate the effects of seagrass restoration on the capacity to restore carbon sinks.
Research carried out in a degraded area demonstrated that sediment maintained its carbon sink and continued to be an effective archive to allow for reconstructing environmental change in coastal areas. Other results highlighted that carbon storage capacity may not increase at high pCO2-low pH conditions.
These examples emphasize the need to further investigate the consequence of disturbance and restoration on the climate mitigation service delivered by coastal vegetated habitats and to adopt appropriate management strategies to protect BC ecosystems in order to prevent release of carbon.

Target countries

Research activities have been focused on the Mediterranean area, but can be exported elsewhere, especially in the tropical region where multi-specific seagrass meadows exist, often associated to other relevant BC ecosystems such as mangrove forests.

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Poseidonia oceanic prairie
(Photo: Agostino Tomasello)

Università degli Studi di Parma

UNIVERSITÀ DI PARMA

Expertise

The University of Parma is a multidisciplinary university with an international vocation, focused on areas that are qualitatively relevant for the attractiveness and sustainability of their educational offer. The Department of Engineering and Architecture at the University of Parma addresses this issue through environmental analysis and design. The theme of ocean preservation in architectural design is highly innovative and original. It combines the expertise of climate and environmental analysis with the technologies of parametric design and additive manufacturing. The combination of advanced design technologies and 3D printing production processes enables the development of underwater structures that can be used to enhance the health of marine ecosystems. The Food and Drug department is placed on the national and international scene as a centre of excellence in research and training in the agri-food world (safety, technological and formulation innovation, production processes and assessment of the sustainability of production). Strong competences in the field of food toxicology and reduction by lactic acid fermentation of natural toxins (phycotoxins, cyanotoxins and mycotoxins) in food matrices are strong competences.

Proposed project 01

3d printed reef from parametric design optimisation for marine ecosystem

Climate change, maritime traffic, invasive fishing techniques, and traditional construction methods endanger marine life. They damage marine ecosystems, leading to habitat loss, reduced marine biodiversity, and impaired ecosystem functions. In this case study, artificial reefs are developed using experimental formal optimization features and 3D printer manufacturing technology. The aim is to restore the balance of the marine ecosystem through the use of sustainable architectural reefs. The analysis of critical issues is complemented by a study in marine biology to comprehend the optimal habitat characteristics of animal and plant species. Each marine species has specific requirements, which are translated into dimensions, compositions, and combinations of elements in the design. The combined use of parametric design methods, complex software, biomimetic processes, and a demanding performance approach proves to be crucial for the creation of high-performance reefs. The first result is a series of complex organic digital forms. The forms mimic natural mathematical optimization processes. The most suitable technology to produce such complex forms is additive manufacturing on an architectural scale using a powder bed. This 3D printing technology is developed by the company D-Shape. The selected material is eco-cement. The adoption of eco-concrete 3D-printed artificial reefs in coastal restoration projects has demonstrated accelerated marine regeneration. The study highlights the key benefits of this innovative project, which include enhancing marine biodiversity. Artificial reefs provide a stable and nurturing environment for marine life, promoting flourishing ecosystems and supporting diverse species. The company D-shape has already installed 3D-printed reefs in the seas of the following locations: Italy, Albania, the Principality of Monaco, the Netherlands, the Canary Islands, and Hong Kong.

Target countries

The technology is applicable to all target countries:
Pacific Ocean, Caribbean and C. Americas,
Indian Ocean, Atlantic Ocean, Middle and Far East C.

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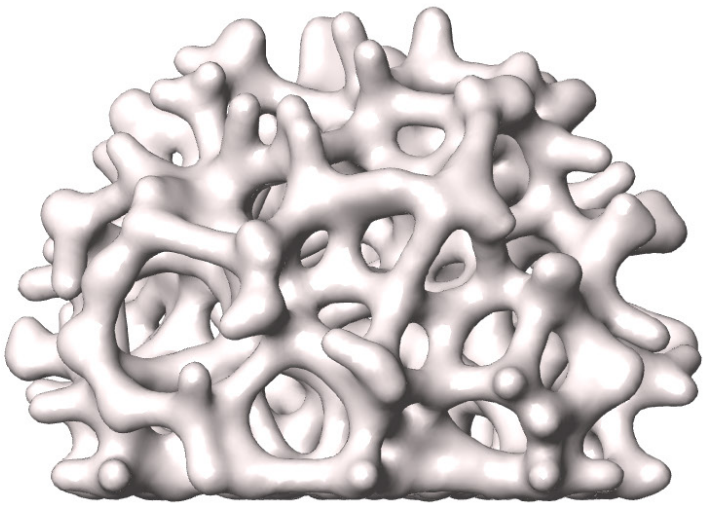
Links

https://d-shape.com/
https://www.vaha.it/

Figure 1. Parametric Design Reef. Project by Rossella Siani.



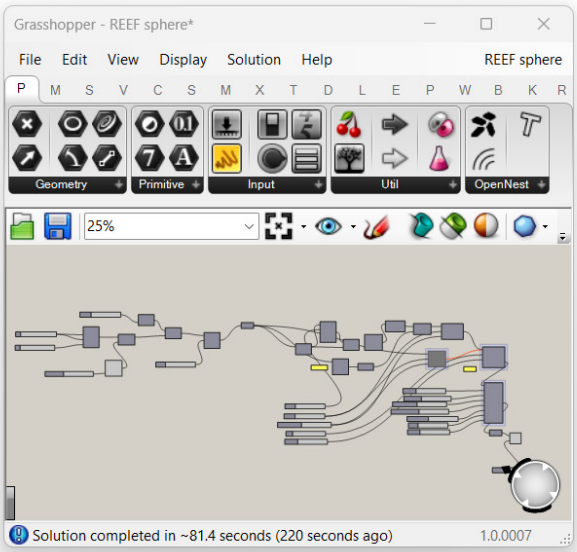


Figure 2. 3D Printed Reef by D-Shape, Enrico Dini. Project by Rossella Siani.

Figure 3. 3D Printed Reef by D-Shape, Enrico Dini. Project by Rossella Siani.

Università degli Studi di Parma

UNIVERSITÀ DI PARMA

Proposed project 02

Mitigation of emergent marine toxins by means of lactic acid bacteria (LAB)

Harmful algal blooms (HAB) and marine toxins are serious safety issues responsible for intoxication or even death of animals and humans. Furthermore, HAB and marine toxins are also an economic issue for shellfisheries causing an impact on profitability due to site closures and the related consequences. Mitigation strategies to support aquaculture and ensure consumers' health are of great interest given the issues related to their presence in certain foods. As an example, Okadaic Acid are significant contaminants for shellfisheries and the development of strategies to faster the reduction of the toxins and limiting the commercial damage is of great interest. At the same time, there are emerging threat as Tetrodotoxin and the identification of mitigation strategies is desirable to cope with its possible diffusion in different types of foods. In this context, bioremediation by means of microbial metabolism to biodegrade toxins or reduce their toxicity, represent a promising strategy. The aim of a research conducted at the University of Parma was to investigate the effect of interaction between Lactic acid bacteria and two marine toxins, Okadaic acid and Tetrodotoxin, in order to evaluate their possible reduction. In particular, different LAB strains were considered, and the effect of viable, not viable and cell-free extracts was tested *in vitro*. The results of this work have underlined interesting results and evidence. Lactic acid bacteria are able to metabolize or bind at the cell walls the tested toxins. As a general remark, this study provided a sound line of evidence for the possible future use of either specific bacteria or selected bacterial components to reduce the level of harmful marine toxins in aquaculture and food production. Future studies could also directly address bivalves or food matrix to check whether the use of bacteria described in this work could mitigate the level of toxins.

Target countries

Bahamas, Barbados, Cuba, Dominican Rep., Jamaica, Haiti, Mauritius, Comoros, Cape Verde, Fiji, Kiribati, Palau, Samoa, Tonga, Antigua, Guyana.

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https://www.sciencedirect.com/science/article/pii/S0956713521005661?via%3Dihub
https://www.foodproject.unipr.it/en/

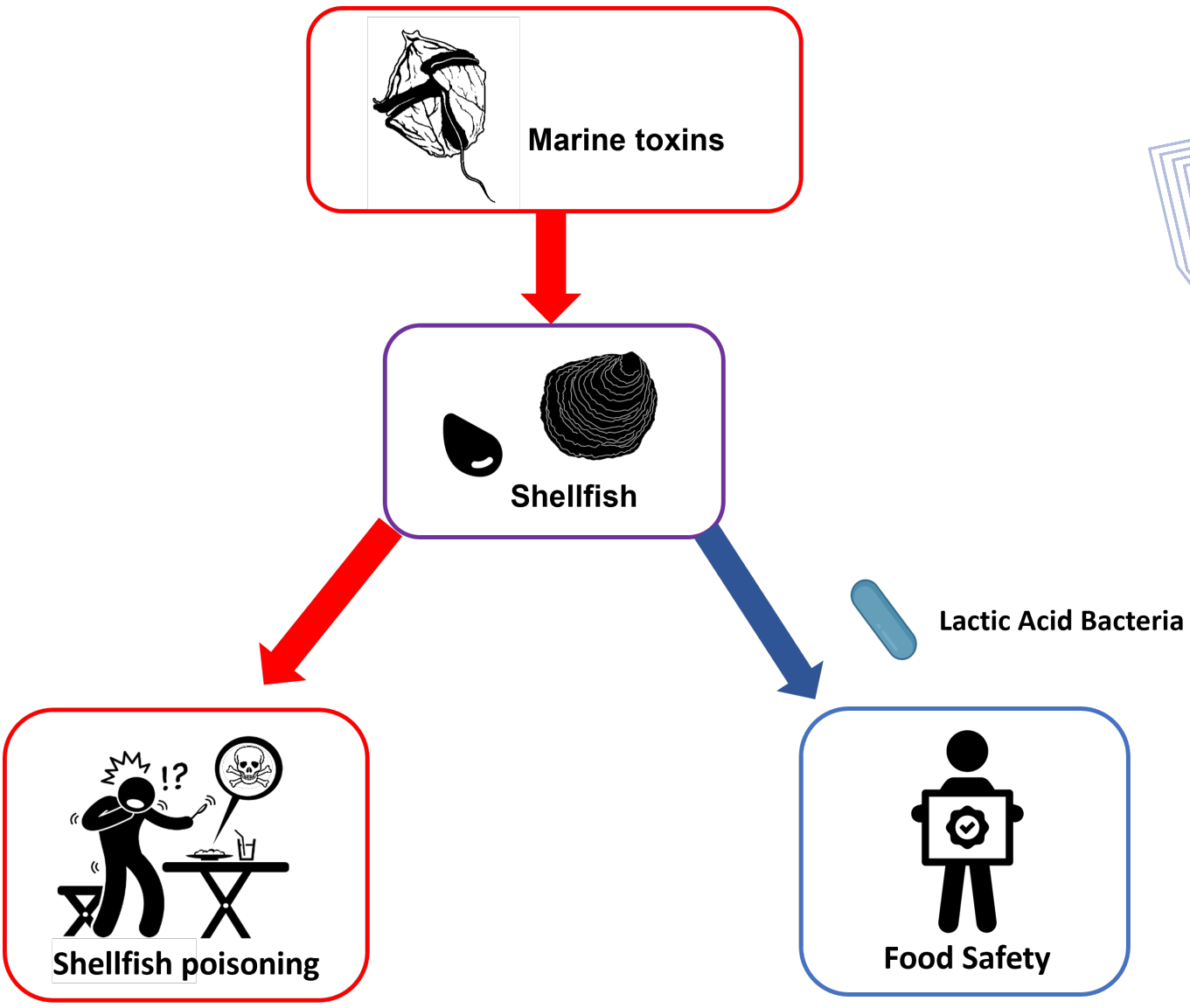

Figure 1. Evocative picture about the effect of Lactic acid bacteria on Marine toxins

Università degli Studi di Perugia

Expertise

The University of Perugia has been actively engaged for years on environmental and sustainability issues. Since 2017, it has been part of the Universities Network for Sustainable Development (RUS) and has realized two Reports (2017, 2020). The Report RUS analyses the 7 Working Groups of RUS which address specific goals of the Agenda 2030. In 2020, it established the University Sustainability Commission with the aim of sharing good practices on sustainability issues within its institutional missions, i.e. teaching, research, and third mission, according to the three-year Action Plan 2021-2023. Relevant achievements have already been made such as implementation of renewable energy systems and energy retrofitting interventions, reduction of greenhouse gas emissions through updated carbon footprint calculation, promotion of sustainable mobility with a regional public transportation pass for all students, introduction of a transversal sustainability course for all university students, and many others. The recent report "QS World University Rankings 2024" acknowledges the commitment of University of Perugia in the field of sustainable development, as it climbs approximately 120 positions in the global rankings, reaching the position 661-670/a (21/a in Italy).

Proposed project

High-albedo solutions for Greenhouse Gases emissions compensation

This project proposed a new methodology for mitigating Global Warming (GW) by improving the Earth albedo. The mitigation of GW is generally achieved through 3 major principles (renewables, energy efficiency and Carbon Capture and Sequestration) aiming to reduce the Greenhouse Gases (GHG) emission. Actually, the only way to produce emission credits (EC) is by pursing the above 3 major principles. Many authors and research groups have dealt with the direct relation of management the terrestrial albedo surface and GW mitigation. Innovative solutions such as diffusive materials have been largely investigated and proposed for buildings and infrastructures application to increase the terrestrial albedo. These solutions are called high albedo solutions (HAS) and they represent a promising surface capability to increase the terrestrial albedo and so to tackle GW. GW mitigation via terrestrial albedo increase has been investigated in literature via the concept of Radiative Forcing (RF). However, literature methods calculate RF by averaged input data, without considering RF variation due to many local and temporal phenomena. Furthermore, the calculus for CO2 compensation requires an energy evaluation by the knowledge of the time history of RF as well as the Intergovernmental Panel on Climate Change (IPCC) proposes for the calculation of Global Warming Potential (GWP). Under this framework, the present project proposes a novel method to better estimate the amount of CO2 compensated by HAS. The proposed methodology is suitable to introduce HAS as a method to get EC. The procedure is based on a combined contributions by ground measurements, calculus and satellite sensing. In particular, the so called RF-meter continuously determines the reduction of RF given by an HAS. In this way, adopting the relation, an amount of compensated CO2 may be associated to HAS. RF-meter operating scheme is reported in Fig.1. It is here proposed a road map to manage EC produced by HAS which involves the following main steps: 1. Recognition of CO2 offset by HAS trough a political lobby activity; 2. Definitive introduction of CO2 offset mechanism into ETS; 3. Introduction of an independent body, i.e. Agency for Albedo (AxA) with the following tasks: a. Develop an applicative procedure based on the RF-meter methodology; b. Assess HAS projects claimed by a physical person, company or institutional agency; c. Approve the valuable HAS projects; d. Monitor the time-variant CO2 offset due to the approved HAS projects; e. Annually allocates proper EC to any approved HAS projects (generally 1 EC equals 1ton CO2eq). Actually, on European emission market 1 equivalent ton of CO2 value is around 100€ which is predicted to rise because of many factors as IPCC climatic change predictions, energy price and rising social awareness on GW. By that, potential economic benefits may be easily seen since, for United Arab Emirates area, 1m2 high albedo surface may offset up to 100kg of CO2eq which correspond on actual Emission Trading Scheme (ETS) to 10€/m2 . HAS are a cost-effective method: application price is generally not expensive. The methodology may also involve humanitarian application: the so-called "Albedo for Africa," approved by the UN as a strategic project to support Sub-Saharan economies (Fig. 2), can be extended to Comoros, Maldives, Mauritius, Seychelles, Bahrein and East Timor with the same climate conditions. HAS find a specific application in infrastructures areas, such as parking areas and in the agricultural sector: high-reflective mulching membrane (see Fig.3) can offset CO2 and meanwhile save water and increase crop yield. HAS may strongly contribute to tackle GW especially if they will be included into an ETS.

Target countries

Comoros, Maldives, Mauritius, Seychelles, Bahrein, East Timor

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https://sdgs.un.org/partnerships/albedo-africa-0
https://doi.org/10.3390/en15155

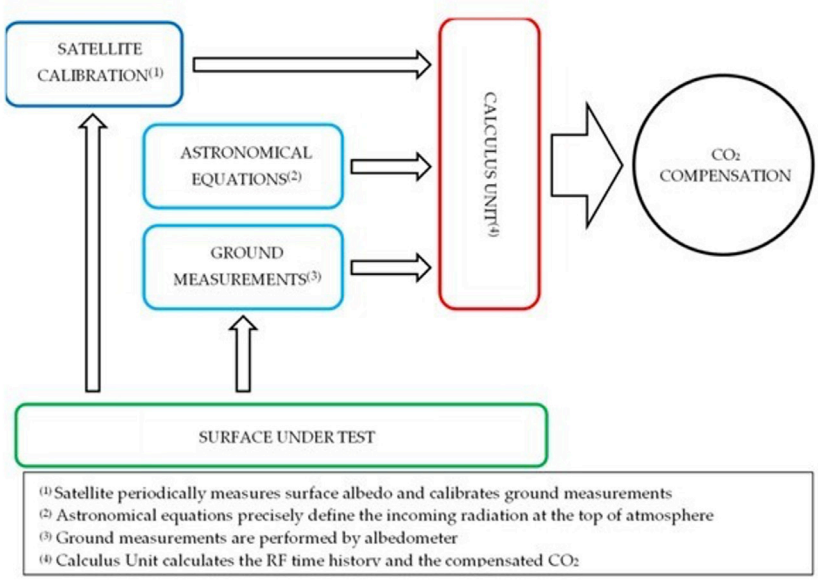

Fig. 1 RF meter synoptic scheme (Source: Rossi et al., 2022. https://doi.org/10.3390 /en15155695).

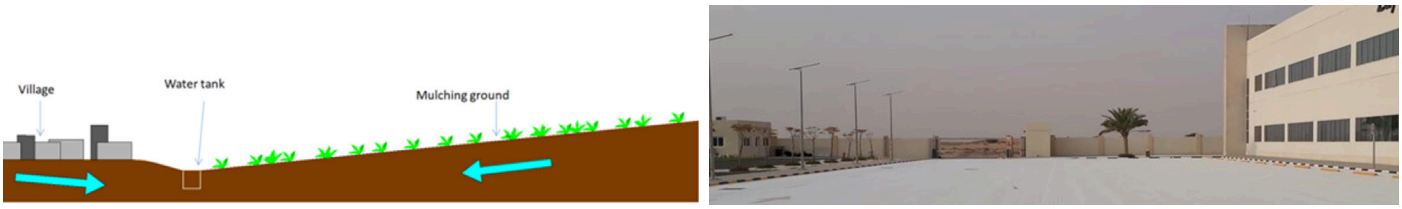

Fig. 2 Scheme of sustainable high albedo village with high albedo parking, roofing, water recovery, and mulching ground (Source: Albedo for Africa project).

Fig. 3 High-reflective mulching membrane applied on the experimental field at CIRIAF Research Center, University of Perugia.

Università degli studi di Scienze Gastronomiche

University of Gastronomic Sciences
Università degli Studi di Scienze Gastronomiche

Expertise

The University of Gastronomic Sciences has within it the Sustainability and Circular Economy Laboratory which aims to be the reference point for the realities that are committing themselves to the necessary evolution of the economic-environmental paradigm, carrying out scientific research and finding their application in social and productive fields.
From this point of view, the Laboratory acts as an aggregator of skills and collaborations with professionals, companies and research institutions of national and international importance in order to systematize, in an interdisciplinary framework, the best resources for the evaluated topic.
In particular, the Laboratory is active on various sustainability projects related to marine ecosystems.

Proposed project

Evaluation and management of fisheries in coastal areas of the Pacific

The objective of the project, carried out in collaboration with the Stazione Zoologica Anton Dohrn, is to protect and restore biodiversity, fish resources and marine ecosystems by promoting sustainable development of both artisanal and industrial fishing activities, through:

- the punctual monitoring of fisheries;
- the assessment of coastal habitats health;
- awareness-raising and training actions for fishing operators.

Support in the implementation of energy plants from renewable sources

A promising technology, especially for remote and insular areas, is the micro wind turbine and specifically the Venturbina, a shrouded wind turbine conceived to increase the velocity of the air passing through the rotor plane, and thus the generated power, and to be installed nearshore on floating structures.
The UNISG Sustainability Lab, thanks to the collaboration with the Stazione Zoologica Anton Dohrn and the Mediterranean University of Reggio Calabria, can support in identifying the most correct technologies in relation with the ecosystem, as well providing its advice in identifying locally the necessary resources and the most appropriate funding sources.

Support in the use of technologies aimed at combating drought phenomena

In the important fight against drought it is central the identification of ways of finding fresh water for local realities, even those difficult to reach which are severely endangered by the global water crisis.
In this scenario, desalination vessels bring about a series of advantages both for the individual as the water is withdrawn offshore, with less probability of being contaminated, and for the environment with a decrease in the consumption of land destined for desalination plants.
The Laboratory, thanks to the collaboration with Marnavi, can support in identifying the most correct tools given the environmental and socio-economic reality involved, as well as provide its advice in identifying the necessary resources on site and the most funding sources.

Target countries

Fiji, Kiribati, Marshall Islands, Nauru, Palau, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Antigua and Barbuda, Bahamas, Barbados, Belize, Cuba, Dominica, Dominican Rep. Grenada, Jamaica, Guyana, Haiti, St. Kits & Nevis, St. Lucia, St. Vincent & Grenadine, Suriname, Comoros, Maldives, Mauritius, Seychelles, Cape Verde, Guinea-Bissau, São Tomé and Príncipe, Bahrain, East Timor

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www.unisg.it
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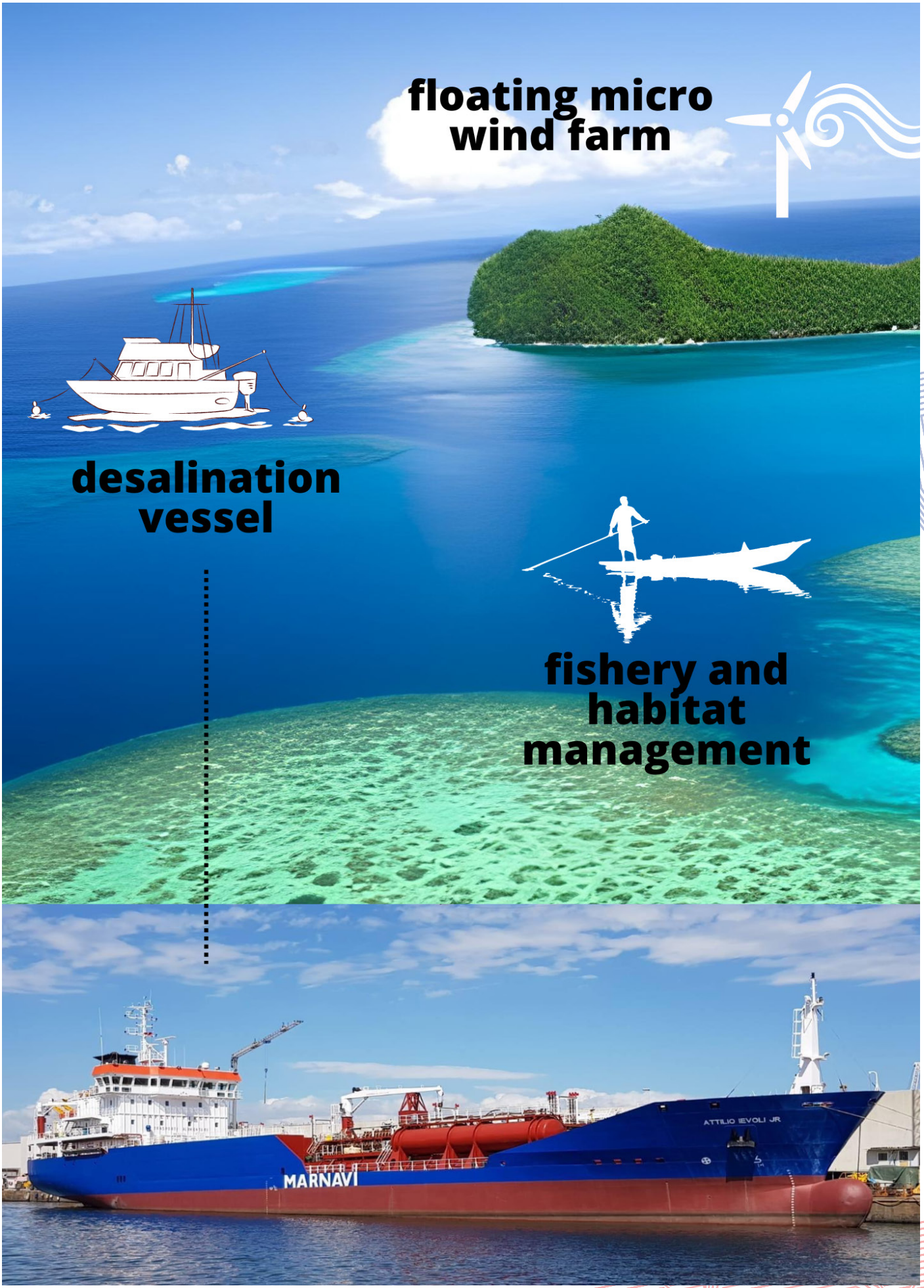
floating micro wind farm
desalination vessel
fishery and habitat management
MARNAVI
ATTILIO IEVOLI JR

Università degli Studi di Teramo

UNIVERSITÁ DEGLI STUDI DI TERAMO

Expertise

University of Teramo (www.unite.it) has 5 Departments, 23 Degree Programmes (among them the new established degree course in Environmental Law, unique at Italian level), more than 20 Masters, 6 Specialisation Schools. The University has two centres of excellence - dealing with law, politics and communication on one hand, and with studies in biosciences, agri-food and veterinary medicine on the other. From such strong points, research and innovative educational activities have been activated at international level, enabling the University to build a very close network of relations within the scientific community worldwide (Erasmus +, Horizon and Interreg projects). The 2nd level Master's Degree on Law and Economics of the Sea is a unique and innovative programme dedicated to the study of issues related to the law and economics aspects of maritime activities, including environmental law of the sea. In order to gather and analyse information about the effects of directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure, the University assigned a research fellowship on this topic, focused on the realization of an alternative fuels 'infrastructure dedicated to maritime transports.

Proposed project 01

Research Fellowship on legal effect arising from the national transposition of UE directive 2014/94/UE of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure dedicated to maritime transport

Climate change, maritime traffic, invasive fishing techniques, and traditional construction methods endanger marine life. They damage marine ecosystems, leading to habitat loss, reduced marine biodiversity, and impaired ecosystem functions. In this case study, artificial reefs are developed using experimental formal optimization features and 3D printer manufacturing technology. The aim is to restore the balance of the marine ecosystem through the use of sustainable architectural reefs. The analysis of critical issues is complemented by a study in marine biology to comprehend the optimal habitat characteristics of animal and plant species. Each marine species has specific requirements, which are translated into dimensions, compositions, and combinations of elements in the design. The combined use of parametric design methods, complex software, biomimetic processes, and a demanding performance approach proves to be crucial for the creation of high-performance reefs. The first result is a series of complex organic digital forms. The forms mimic natural mathematical optimization processes. The most suitable technology to produce such complex forms is additive manufacturing on an architectural scale using a powder bed. This 3D printing technology is developed by the company D-Shape. The selected material is eco-cement. The adoption of eco-concrete 3D-printed artificial reefs in coastal restoration projects has demonstrated accelerated marine regeneration. The study highlights the key benefits of this innovative project, which include enhancing marine biodiversity. Artificial reefs provide a stable and nurturing environment for marine life, promoting flourishing ecosystems and supporting diverse species. The company D-shape has already installed 3D-printed reefs in the seas of the following locations: Italy, Albania, the Principality of Monaco, the Netherlands, the Canary Islands, and Hong Kong.

Target countries

All the countries can be interested in the project as the master can be attended both in person and remotely.

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Links

Link: https://www.unite.it/UniTE/Master_e_corsi_di_formazione_2022_2023/Diritto_ed_economia_del_mare
https://www.unite.it/UniTE/Ricerca/Bando_assegno_ricerca_1_anno_Giurisprudenza_RAM_SSD_IUS_06

University of Teramo, Contemporary Sculpture Garden: Venanzo Crocetti, "La Gravida" (Pregnant woman). Credits: Sergio Pipitone

University of Teramo, Contemporary Sculpture Garden: Venanzo Crocetti, "Porta del Tempio della Vita" (The Temple of Life Gate). Credits: Sergio Pipitone

Università degli studi di Teramo

Proposed project 02

2nd Level Master's degree on Law and Economics of the Seat

The Master aims to enable the student to acquire an in-depth knowledge in the areas of law most relevant to the field of the sea, always bearing in mind the perspective of ensuring sustainability, as well as in the area of economics related to the ocean – the major areas of development of the sustainable economy of the ocean, financing sources of the shipping industry and the link between natural resources and the economy of the sea. Special emphasis is dedicated to environmental issues related to ocean resources exploitation, understanding the current challenges and opportunities of a sustainable Ocean. The interdisciplinary approach of the Master allows students to gain transversal knowledge on maritime governance and marine resources management, involving different areas of law, management and economics. The programme includes a wide range of national and international oriented topics in maritime field such as: a) Italian national maritime law; b) international and European maritime law; c) economic of air and maritime transports, peculiarity of maritime tourism from an economic perspective and major shipowners financing sources and business models; d) development of the sustainable economy of the ocean, environmental protection and the exploitation of marine resources, including fishing regulation aspects; e) ports regulation and operation of ports infrastructure, with a keen eye to touristic use of the maritime State property; f) maritime business management; g) main contracts in maritime sector, including the area of tourism contracts. Furthermore, students, during the Master programme, are called to attend an internship with a university or a public or a private company operating in maritime sector. During the internship period, therefore, students have the opportunity to experience first-hand what they studied during the course. The master can be attended both in person and remotely.

Target countries

All the countries can be involved in the project as the master can be attended both in person and remotely.

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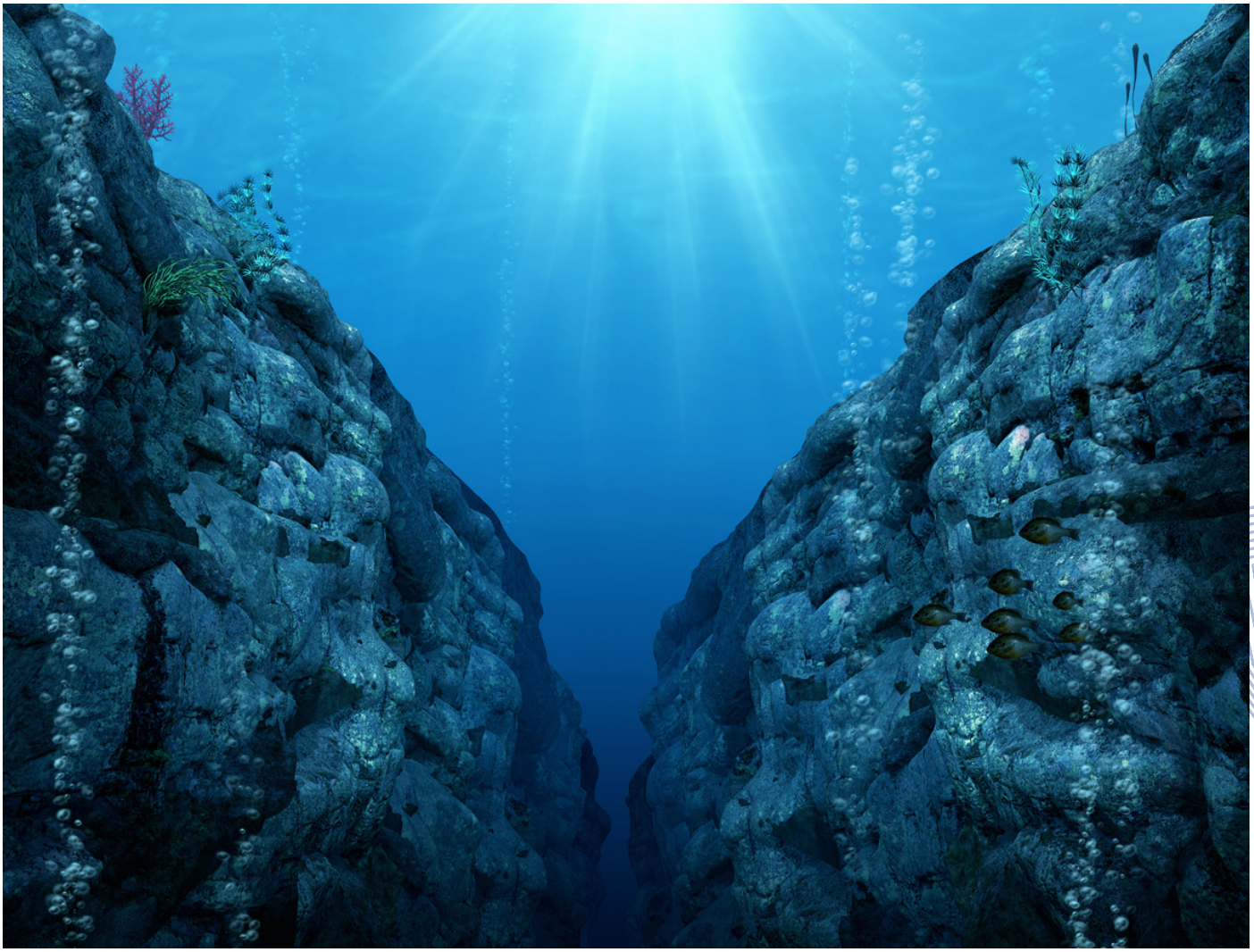
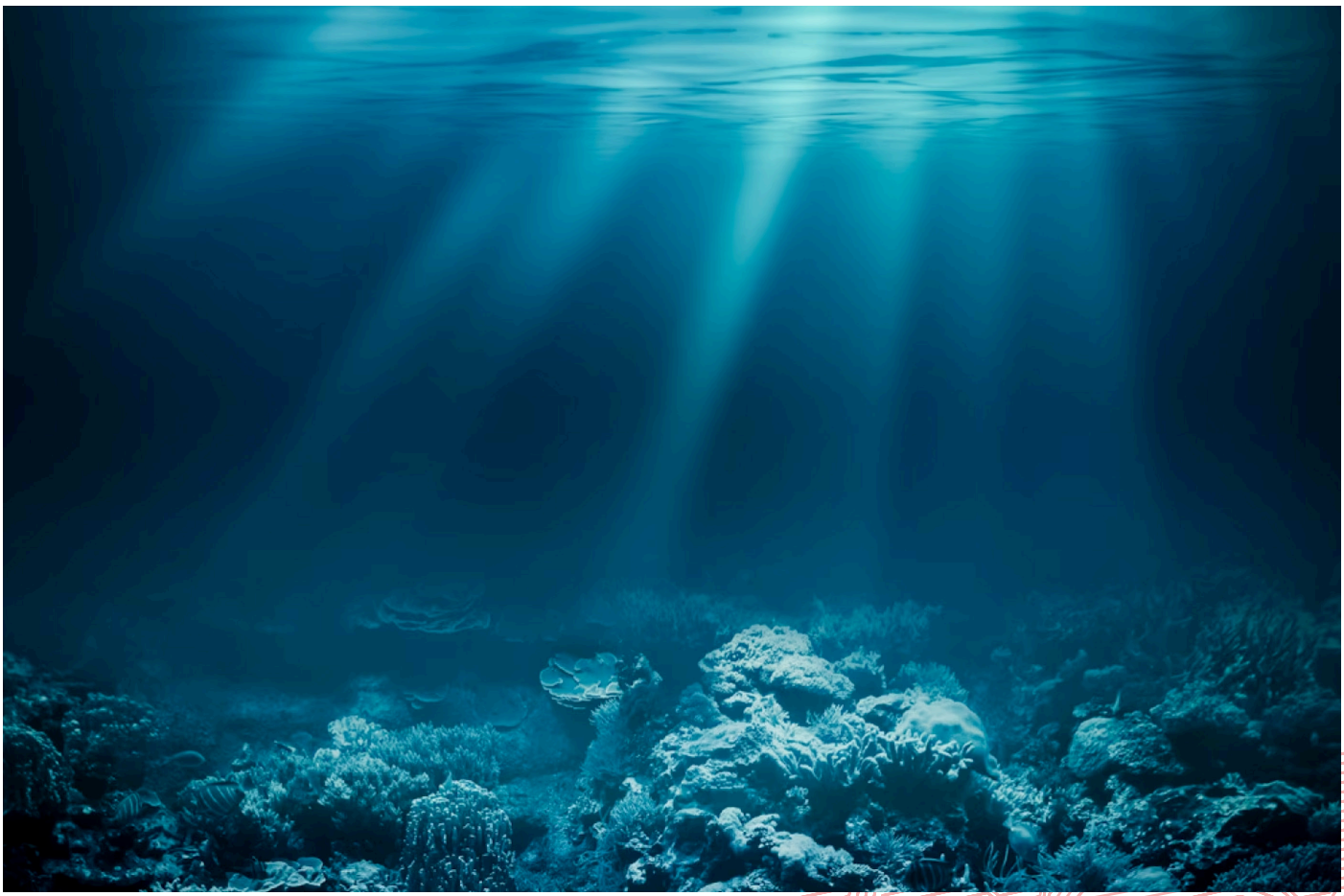
Link: https://www.unite.it/UniTE/Master_e_corsi_di_formazione_2022_2023/Diritto_ed_economia_del_mare
https://www.unite.it/UniTE/Ricerca/Bando_assegno_ricerca_1_anno_Giurisprudenza_RAM_SSD_IUS_06





Università del Salento

UNIVERSITÀ DEL SALENTO
The University of the two seas

Expertise

The University of Salento (UniSalento) is geographically located in the middle of the Mediterranean Sea: the words "The University of the two seas" (Ionian and Adriatic) are in its official name and logo. UniSalento is part of the Mediterranean Universities Union (UNIMED); it is one of the 9 founding members of the Euro-Mediterranean Centre on Climate Change (CMCC). UniSalento has set up a unique international marine biology Master's course (taught in English), named *"Coastal and Marine Biology and Ecology"* (CMBE), delivering an international Double Degree (with University of Lille). CMBE provides advanced education on basic and applied sciences addressing key biological and ecological patterns, processes, and mechanisms at various scales in coastal, transitional, and marine ecosystems; job opportunities deal with research and consultancy in the field of ocean conservation, management of coastal and marine ecosystems, assessment of their environmental status and threats. UniSalento also houses the Observatory on Ecology and Health of Mediterranean Ecosystems, located at the Lighthouse of Punta Palascia (Otranto), a natural bridge between East and West; it is a research node of LifeWatch ERIC, an e-Science European infrastructure for biodiversity and ecosystem research.

Proposed project 01

OCEAN CITIZEN
Marine forest coastal restoration: an underwater gardening socio-ecological plan

Horizon Europe Project 101093910, Jan 2023-Dec 2026
Call: HORIZON-MISS-2021-OCEAN-02
Topic: HORIZON-MISS-2021-OCEAN-02-01

Restoration acts promote biodiversity, enhance carbon sequestration and accelerate coastal and offshore resilience. Yet, we still lack a program that combines conservation and restoration under a unified setting, as the involvement of local citizen, embracing socio-economic parameters into opportunities. An advanced restoration program must join ecological perspectives, societal commitment, and clear economic benefits for local communities. OCEAN CITIZEN project brings together 21 partners and represents a novel restoration approach in which (1) restoration is depicted as a toolbox holding ubiquitous properties and as such it is experienced in 5 sites, representing different marine ecosystems and environments; (2) a profession of "gardeners of the sea" is created and endorsed, including detailed curriculum; (3) restoration of the most neglected marine biome, encompassing the various types of Marine Forest (MF), is prioritized; (4) new eco-engineering aspects are applied, including Integrated Multitrophic Aquaculture and Smart Enhanced Reefs (SER); the SERs act as substrates for massive regeneration of organisms from shallow, mesophotic to continental shelf areas with a complete business plan. Implementation: Canary Islands, Mediterranean, Arctic, Baltic and Red Seas.

Target countries

All SIDS Countries.

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https://oceancitizen.eu

OCEAN CITIZEN

creating a biodiversity oasis, making a socio-economical attractive proposal toboost local development whilst regenerating the oceans

Image courtesy of Underwater Gardens International
https://www.underwatergardens.com

Università del Salento

UNIVERSITÀ DEL SALENTO
The University of the two seas

Proposed project 02

THE MERMÉD PROJECT
To see the Mediterranean Sea Reign Again

The Rights of the Mediterranean Sea as a Legal Entity:
A Science Based Feasibility Study
(A Voluntary Commitment to the UN Ocean Conference - #OceanAction46735)

The Project unites the Research Institute for Sustainable Development (IRD, France), the Universities of Salento, Rome "La Sapienza" and Malta, the International Centre for Comparative Environmental Law (CIDCE), the Centre for Research and Documentation on Oceania and the Jean Nicod Institute (EHESS-CNRS). A previous IRD Voluntary Commitment (VC) to the 1st UN Ocean Conference (#OceanAction41675) proposed to recognise the Pacific Ocean as a legal person. Moving on from here, MerMéd Project consists of a scientific feasibility study (VC) for recognising the Mediterranean Sea as a legal entity with its own rights, like Pacha Mama (Ecuador), the Amazon River (Colombia), Whanganui River (New Zealand), Ganges/Yamouna rivers (India), the Magpie river (Quebec) and the Mar Menor Lagoon (Spain). The Project considers the critical ecological state of the Mediterranean Sea and recommendations on the measures to be taken; the state of play of the legal protection; Mediterranean cultural and historical heritage; socio-economic and geopolitical issues. The recognition of the Mediterranean Sea as a legal entity could enhance the protection of marine biodiversity and integrity, being an asset for the implementation of SDG 14. The final VC report will be submitted to the 3rd UN Ocean Conference.

Target countries

All SIDS Countries.

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https://sdgs.un.org/partnerships/mermed-project-see-mediterranean-sea-reign-again-rights-mediterranean-sea-legal-entity

POSTER OF THE MERMÉD PROJECT (JUNE 2023)
Image courtesy of Victor David

Università del Salento

UNIVERSITÀ DEL SALENTO
The University of the two seas

Proposed project 03

STRENGTHENING OF MUSEUM SYSTEM For Protecting and Promoting Marine Environments

UniSalento manages a Museum System (MS) including 7 structures, 3 of which related to the marine and coastal heritage: Marine Biology Museum (MBM); Observatory on Ecology and Health of Mediterranean Ecosystems (OEHME); Museum of the Environment (ME). As a whole, MS can cover multiple dimensions of both protection and promotion. MBM mainly targets the bio/zoological aspects, OEHME the social/ecological and ME the paleontological/historical ones. MBM has inspired the creation of a Marine Protected Area *(Porto Cesareo)* and belongs to the MARS European marine stations network, being a leader in Marine Biology research, and publishing a scientific journal *(Thalassia Salentina)*. MS supports a marine Station *(Avamposto Marte)* and has a research boat *(Pelagia)*. OEHME hosts permanent multimedia resources and collects and disseminates data, knowledge and information on Mediterranean ecosystems, focusing on their biocultural interest and role in human wellbeing and social development. ME houses a rich collection of marine fossils from the Upper Cretaceous to Pliocene.
The Project aims at enlarging the scope of action of MS, proposing it as an integrated model and a reference pole for other countries/institutions, internationalizing its activities and strengthening its equipment.

Target countries

All SIDS Countries.

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Links

https://international.unisalento.it/destination/university-life/museums
https://www.facebook.com/museobiolmar
https://museoambiente.unisalento.it/home_page
https://www.facebook.com/museodipalascia/

Visitors in the fishery room of the Museum of Marine Biology at Porto Cesareo

The research *Boat Pelagia* at Taranto during an interaction with young students for the promotion of marine environments .
Images courtesy of the Museum System of the University of Salento.

Università della Calabria

UNIVERSITÀ DELLA CALABRIA

Expertise

The University of Calabria is particularly active in the field of ocean protection.
The main interdisciplinary structure operating in this area is the Marine Zoology and Herpetology Laboratory, which boasts national and international collaborations. The group deals with the study of the space-time distribution, trophic and behavioral ecology of large marine vertebrates (fish, sharks, cetaceans, sea turtles) in the Mediterranean but also tropical and subtropical environments (Mexico, South-Africa, Madagascar). It applies modern and innovative research methods, such as the study of ecology through the analysis of trace chemical elements, or marine monitoring through BRUVS and ROV.
It supports the Master's degree in Biodiversity and Natural Systems. Thanks to the OCEAN international cooperation agreement, it allows at least 6 students to spend three months in Madagascar every year to study the behavior of marine megafauna during ecotourism activities. It has activated several PhD grants within the Life Science and Technology doctoral school. It has successfully conducted numerous funded research projects on issues relating to marine biodiversity (CESPES-BIO), aquaculture (AVAM-AZA) and the creation of reefs for the fish restocking of areas overexploited by fishing (CIRPES).

Proposed project 01

Demersal fishes as sentinels of ocean health

Demersal fish represent an effective experimental model for monitoring the health of the oceans. Being sedentary animals, they accumulate trace elements in their tissues, through their diet or through direct contact with the sediment or sea water. By determining the levels of accumulation of trace elements in the tissues and of plastics and microplastics in the stomach contents, valuable information is obtained on the levels and dynamics of pollution in the sea. The trace elements, analyzed by inductively coupled plasma mass spectrometer (ICP-MS), are also useful for evaluating aspects related to the basic ecology of the species, such as any changes in diet or habitat during life. The target tissues to be used are the muscle, the skin and the vertebrae: the latter are analyzed in their growth lines and also allow us to obtain information on the levels of accumulation of elements in the past. The stomach contents, on the other hand, are analyzed both to evaluate the diet of the species and to determine the presence and phenology of plastics and microplastics ingested during feeding. The data obtained are integrated to have an exhaustive picture of the pollution dynamics of the habitats in which the species have been sampled.

Target countries

Pacific countries. Countries of the Caribbean and the Americas. Countries of the Indian Ocean.
Countries of the Atlantic Ocean.
Countries of the Middle and Far East.

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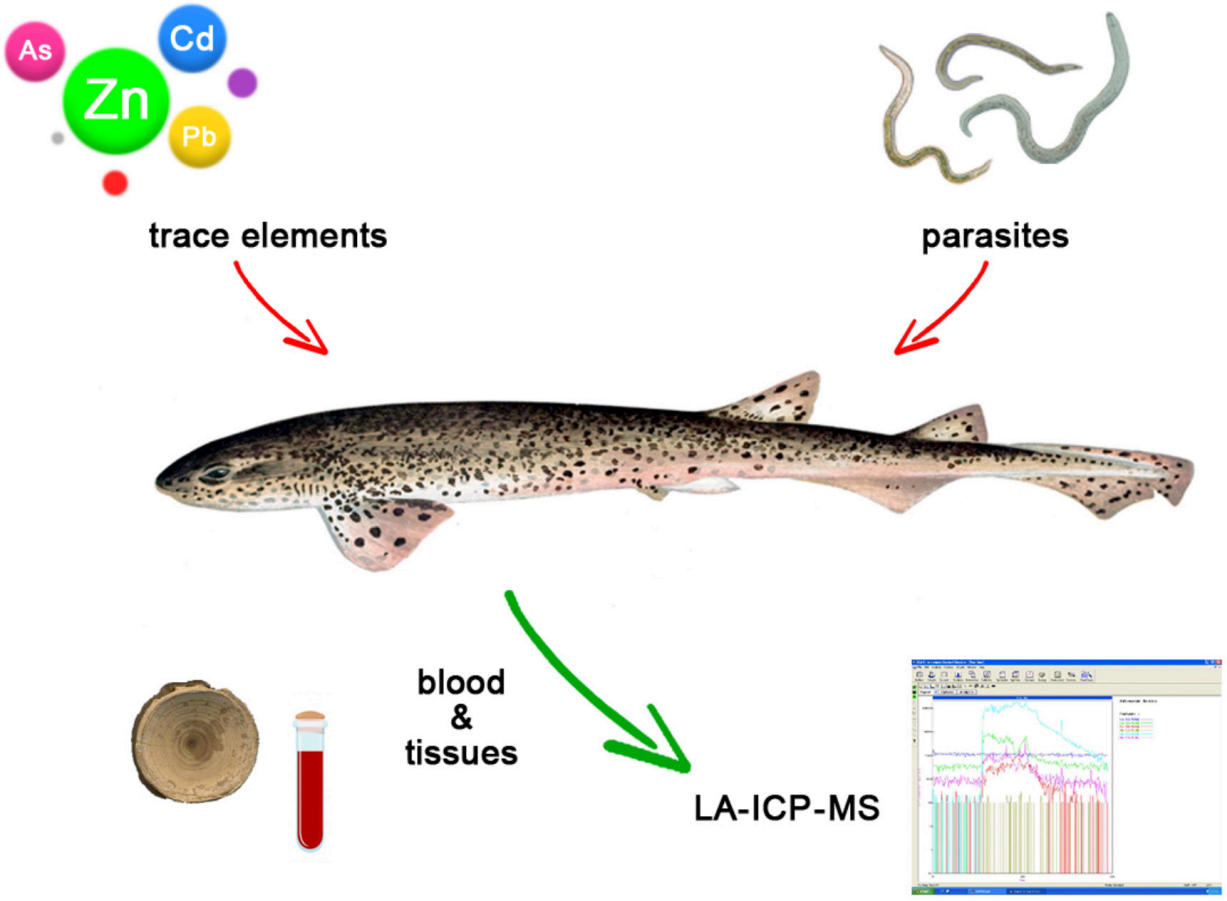
Links

Results of the project carried out in the Mediterranean Sea
https://www.mdpi.com/2079-7737/12/7/951



Graphical abstract of the paper Reinero et al., (2022)
https://www.mdpi.com/2079-7737/11/5/663#
that summarizes the project path (parasites are not considered in this case)

Università della Calabria

UNIVERSITÀ DELLA CALABRIA

Proposed project 02

Study of the behavior of epipelagic marine vertebrates in ecotourism conditions

Marine ecotourism is spreading on a large scale across all oceans. It is a practice which on the one hand sensitizes tourists to the knowledge and understanding of the ecological value of the observed species (sharks, cetaceans and sea turtles above all), on the other it represents an important opportunity for economic development for small countries. Unfortunately, in many cases the effects of ecotourism pressure on the natural behavior of marine vertebrates are not known and, therefore, possible consequences cannot always be foreseen. The present project aims to study the surface behavior of epipelagic marine vertebrates of ecotourism interest, outlining their transition matrices and decision trees. The data obtained, through the knowledge of the behavior of these animals, allow to define the codes of conduct that tourists must respect in order to avoid interfering in a negative way with the animals they observe. The data also makes it possible to identify the best times of the year and hours of the day to carry out ecotourism activities, maximizing the chances of meeting animals and minimizing possible disturbances.

Target countries

Pacific countries. Countries of the Caribbean and the Americas. Countries of the Indian Ocean.
Countries of the Atlantic Ocean.

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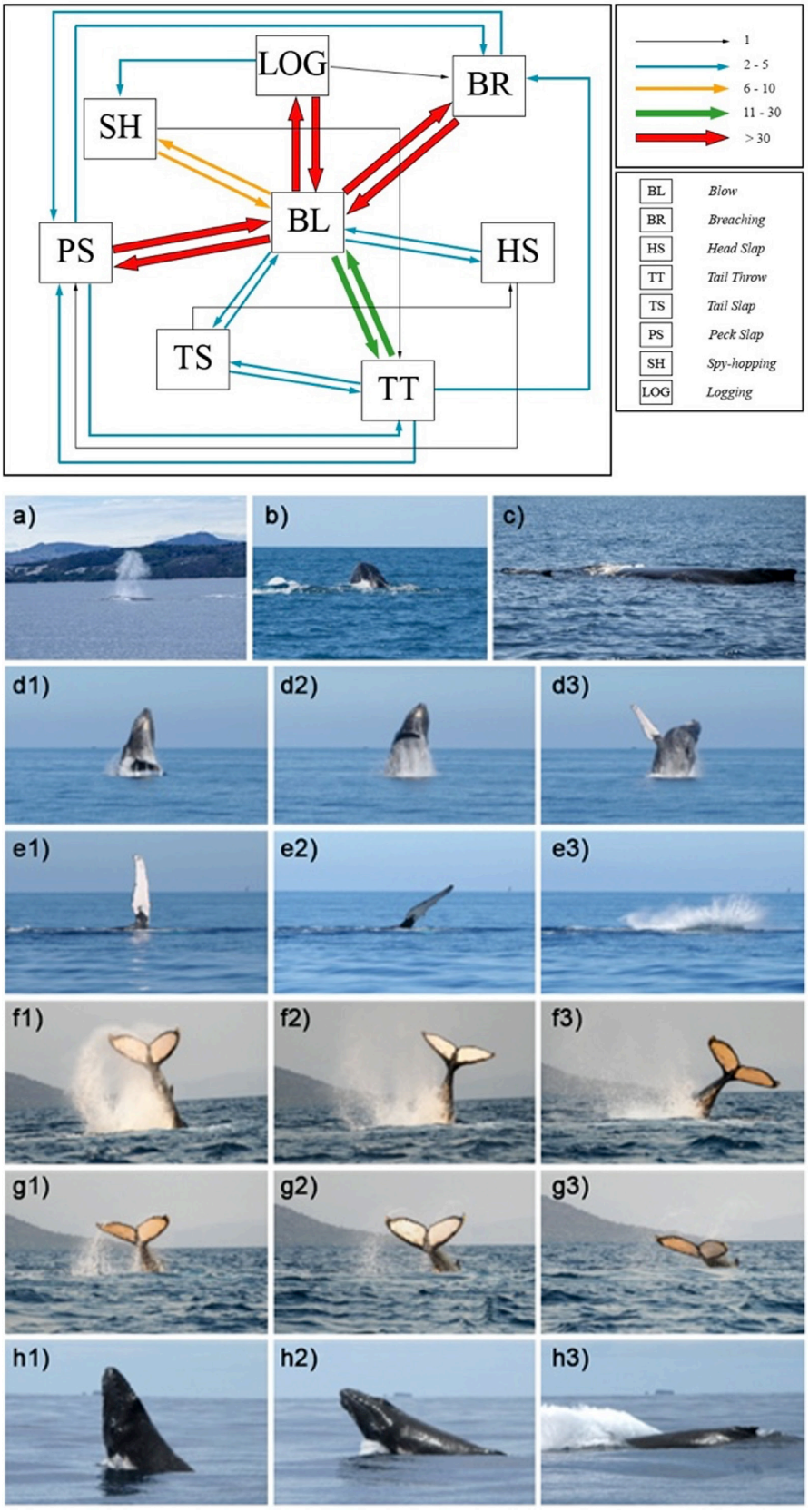
Links

Results of the project carried out at Guadalupe Island, Mexico
https://www.nature.com/articles/s41598-020-67947-x



Transition matrix and characterization of surface behavior of humpback whales in Madagascar (by Ylenia Fabietti)

Università di Cassino

Expertise

University of Cassino, a public university, "pursues, in compliance with the principles of freedom, responsibility and sustainable development, the elaboration and transmission of knowledge, organically and coherently combining research, teaching and third mission, in view of scientific, cultural, civil and economic progress. (Article I. 2 of the Statute). Students can choose among bachelor's degree programs, master's degree programs, specialization programs and doctoral degree programs. The international orientation of the university focuses both on research as well as teaching activity. Our university is also involved in the PhD in Sustainable Development and Climate Change (PhD_SDCC based at IUSS Pavia). Concerning ocean sciences, Unicas has researchers with expertise in the fields of economic, social, and environmental sustainability and health.

Proposed project

One Healthy Ocean for One Health dimension

Studies on global warming are beginning to explore new aspects, such as the different speeds of the phenomenon's evolution in specific geographical contexts. Among the maritime spaces, the Mediterranean is often used as an example of an environmental context showing faster warming than the average figure. This also affects the number of extreme weather events growing globally but increasing faster in some geographical spaces. Other research is identifying new impacts of global warming, such as those on health, particularly the increase in respiratory diseases and some chronic degenerative and mental disorders. This modifies the scenarios of environmental risk and health risks in ocean spaces and coastal areas. Therefore, transdisciplinary, and multi-scale approaches are required. Our project aims to use satellite images to identify scenarios of environmental and health disorders regarding developing island microstates seen as spaces of flow and connectivity and sentinel regions of global change. The project also aims to set up advanced practices for the most urgent situations to identify the privileged interlocutors and stakeholders for integrated environmental and health risk management in coastal areas and for a multilevel participatory approach for the transition to sustainability to achieve UN Agenda 2030. Climate change is responsible for intensifying this problem, which has adverse health consequences, such as a greater prevalence of hypertension and cardiovascular diseases. Furthermore, saltwater intrusion in the soil promotes coast erosion, reduces the arable lands, and pushes the populations to move away from the coasts to migrate to more livable areas. These shifts determine further changes to the socio-cultural structures of reference. After mapping the coastal regions under study, our project plans by a transdisciplinary approach to study the association between coastal erosion levels with the incidence of cardiovascular diseases in populations from these regions and identify, through system indicators, policy strategies that can allow populations to adapt and promote ocean health. The One Health approach (WHO 2017) allows you to identify the need to combine the relationship you come to create between Ecosystems, People and Animals for health as a holistic dimension that "leaves no one behind". The proposed study is very complex because it is not determined by the absence or presence of biological disease in the populations subject to intervention but by the secondary effects that climate change can generate in the ecosystems of coastal people. A higher daily sodium consumption values than recommended limits is reported in people from some coastal regions. Our project will also aim to measure the perception of the impact of climate change on target populations through a mix-method research approach (web survey). At the end of the planning, it will be possible to make a social impact assessment on the territories subject. Our goal promotes the intervention in order to guarantee healthy Oceans and Climate Justice.

Target countries

Maldives, Cuba, Comoros

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Links

https://www.unicas.it/siti/comitati/comitato-di-ateneo-per-lo-sviluppo-sostenibile-case.aspx

Muzuane (Mozambique, Indian Ocean)
Credit Alessandra Sannella

Università di Genova

Università di Genova

Expertise

The Sea Study Centre (Centro del Mare), established in 2019, is a strategic centre of the University of Genoa (UNIGE) with the aim to:
• Catalyse internal teaching and research activities on the sea • Enhance interdisciplinary approaches and synergies
• Stimulate cooperation with Public Entities and Companies • Promote the role of Genova and Ligurian Region in the exploitation of sea values at national and international scale •Promote activities for Healthy and Protected Oceans

There are more than 250 staff members carrying out teaching and research activities on the sea. The Sea Study Centre provides 5 bachelor's and 7 master's degree programs directly related to the sea, and a PhD program in Marine Sciences and Technologies, thus representing the largest educational offer dedicated to the sea in Italy.

Thematic Areas of research are:
• Marine and Coastal Environment • Marine Biology, Ecology, and Biotechnology • Monitoring, Conservation, and Restoration of Marine Ecosystems • Sea and Maritime Law • Coastal and Off-Shore Infrastructures • Sea-going Vessels, Underwater Technology and Robotics • Energy from the Sea • Maritime Transport Networks, Logistics, and Port Economics
• Sports and Motion Recreational Activities at Sea •History and Cultures of the Sea •Sea Tourism and Cruises.

Proposed project

Monitoring the ecological status and biodiversity of Maldivian coral reefs, evaluation of their resilience to global and local pressures, and assessment of change through time

Global climate change has increased the frequency and intensity of extreme heat anomalies and consequent mass coral mortalities. Long-term dynamics of hard corals, bioconstruction potential of reefs, and reef community composition and structure are being monitored over a 26-year period in the Maldives to investigate the effects of climate and local human disturbances and to identify reef recovery patterns. The status of coral reefs is related to environmental characteristics (e.g., exposure, geographical location) and to the level of local human pressures, also applying the novel HIPI index recently proposed to measure the degree of disturbances (both natural and anthropogenic) that affect Maldivian coral reefs.
Our long series of data collected (the only available for the Indian Ocean lasting such a long period) showed that Maldivian reefs needed 16 years to recover after the mass mortality occurred in 1998, the year when the first severe heat anomaly caused by El Niño phenomenon was detected. A second similarly severe bleaching event hit again the Maldives in 2016, but the coral mortality was reduced, and recovery pattern in the following years was faster. Today (data from our last scientific expedition ended in May 2023) most of the coral reefs of the Maldives are on the way of a nearly complete recovery, with hard coral cover values being close to those displayed before the 2016 mass mortality. This situation supports the hypothesis of coral adaptability to climate disturbances, as the recovery is going to a faster pace than after the heatwave of 1998. However, a significant geographical variability in recovery patterns has been evidenced, with reefs affected by a lower degree of local human pressures, as well as by higher hydrodynamic conditions, showing healthier conditions. The longer recovery period, especially in sites with high human pressures, suggests that monitoring activities are mandatory to identify critical areas where local pressures should be reduced to improve reefs resilience.
During our yearly scientific expeditions to Maldives another environmental heritage monitored through time is the Blue Hole of Faanu Madugau, located in the South-Est side of the Alif Alif Atoll. This is the only blue hole found in the whole Indian Ocean to date. Dif.ferent research activities are in progress to characterize the unique ecosystem that inhabit the Blue Hole, i.e. composition and functioning of benthic and microbial communities characterization, physical and chemical characterization of the water column. Availability of historical series of data also for the Blue Hole allows for the analyses of change over time of this peculiar habitat, which appears to be more stable to human and climate disturbances when compared to the surrounding coral reefs.

Target countries

Maldives

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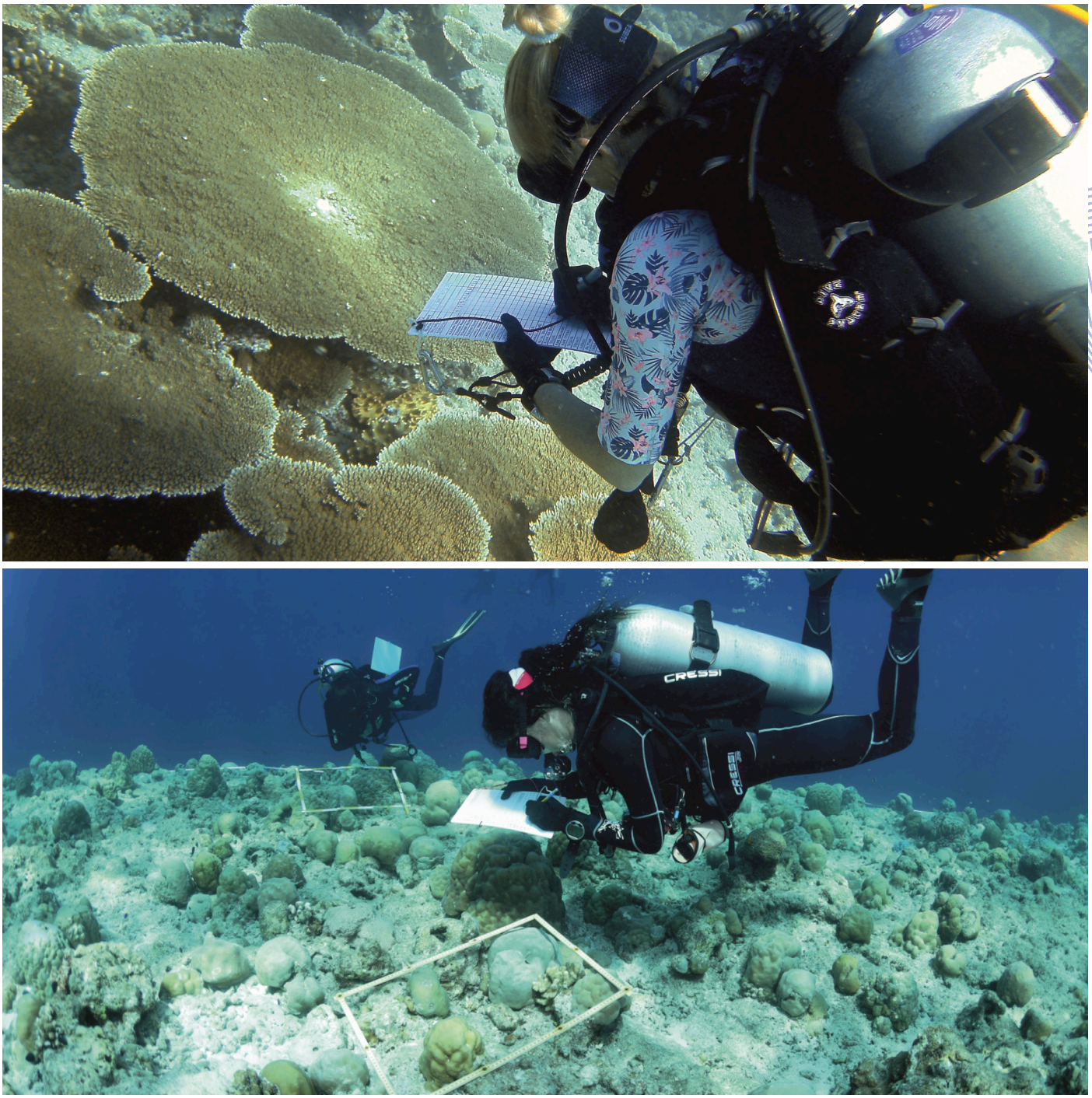
https://mare.unige.it/



Underwater visual surveys on coral reef communities (upper panel) and monitoring of coral recruitment (lower panel) in the Maldives (photos by Annalisa Azzola, UNIGE)

Università di Pisa

Expertise

Projects

-Marine Systems Approaches for Biodiversity Resilience and Ecosystem Sustainablity (Marine SABRES https://www.marinesabres.eu/)

-Advancing understanding of Cumulative Impacts on European marine biodiversity, ecosystem functions and services for human wellbeing (ACTNOW https://www.actnow-project.eu/)

-Horizontal and vertical oceanic distribution, transport, and impact of microplastics (HOTMIC https://www.hotmic.eu/)

Study programmes

Ms'C in Marine Biology (Double degree in partnership with Zheijang Ocean University – China)
Ms'C in Environmental Science
Master II level in Sustainable development and climate change
PhD in Geosciences and Environment
PhD in Biology

Research Centers

Interdepartmental Research Center of Marine Pharmacology
University of Pisa – Zheijang Ocean University (China) Marine Graduate School

Proposed project

Climate Change and Future Marine Ecosystem Services and Biodiversity (Acronym : FutureMARES)

Marine and transitional waters support a large portion of the global biodiversity. Harbouring key climate-regulating processes and habitats, they contribute to worldwide food security, in addition to other valuable economic and well-being services and resources. The EU-funded FutureMARES project will deliver new solutions to climate change challenges. This highly multidisciplinary project will investigate socially and economically viable nature-based solutions for climate change adaptation and mitigation. Solutions will include the restoration of habitat-forming species that can buffer coastal habitats from climate change effects and improve seawater quality. Conservation actions and sustainable, ecosystem-based harvesting (capture and culture) of seafood are also a project priority. Overall, the aim is to safeguard these ecosystems' natural capital, biodiversity and services.

Objective

Marine and transitional ecosystems provide fundamental climate regulation, food provisioning and cultural services. FutureMARES provides socially and economically viable nature-based solutions (NBS) for climate change (CC) adaptation and mitigation to safeguard these ecosystems' natural capital, biodiversity and services. The program advances understanding of the links between species and community traits, ecological functions and ecosystem services as impacted by CC by analysing the best available data from monitoring programs and conducting targeted experiments and beyond state-of-the-art modelling. Ensemble physical-biogeochemical projections will identify CC hotspots and refugia. Shifts in the distribution and productivity of keystone, structural and endangered species and the consequences for biodiversity will be projected within different CC-NBS scenarios to reveal potential ecological benefits, feedbacks and trade-offs. Novel, social-ecological vulnerability assessments will rank the severity of CC impacts on various ecosystem services and dependent human communities. Complementary analyses at real-world demonstration sites will inform managers and policy-makers on the economic costs and tradeoffs of NBS. These physical, ecological, social and economic analyses will be integrated to develop three, climate-ready NBS: i) restoration of habitat-forming species acting as 'climate rescuers' buffering coastal habitats from negative CC effects, improving seawater quality, and sequestering carbon, ii) conservation actions explicitly considering the range of impacts of CC and other hazards on habitat suitability for biota to preserve the integrity of food webs (e.g. marine protected areas) and protect endangered species (e.g. charismatic megafauna), and iii) sustainable, ecosystem-based harvesting (capture and culture) of seafood. FutureMARES is co-developed with policy-makers and managers to ensure impactful and transformative cost-effective actions.

Target countries

Belize

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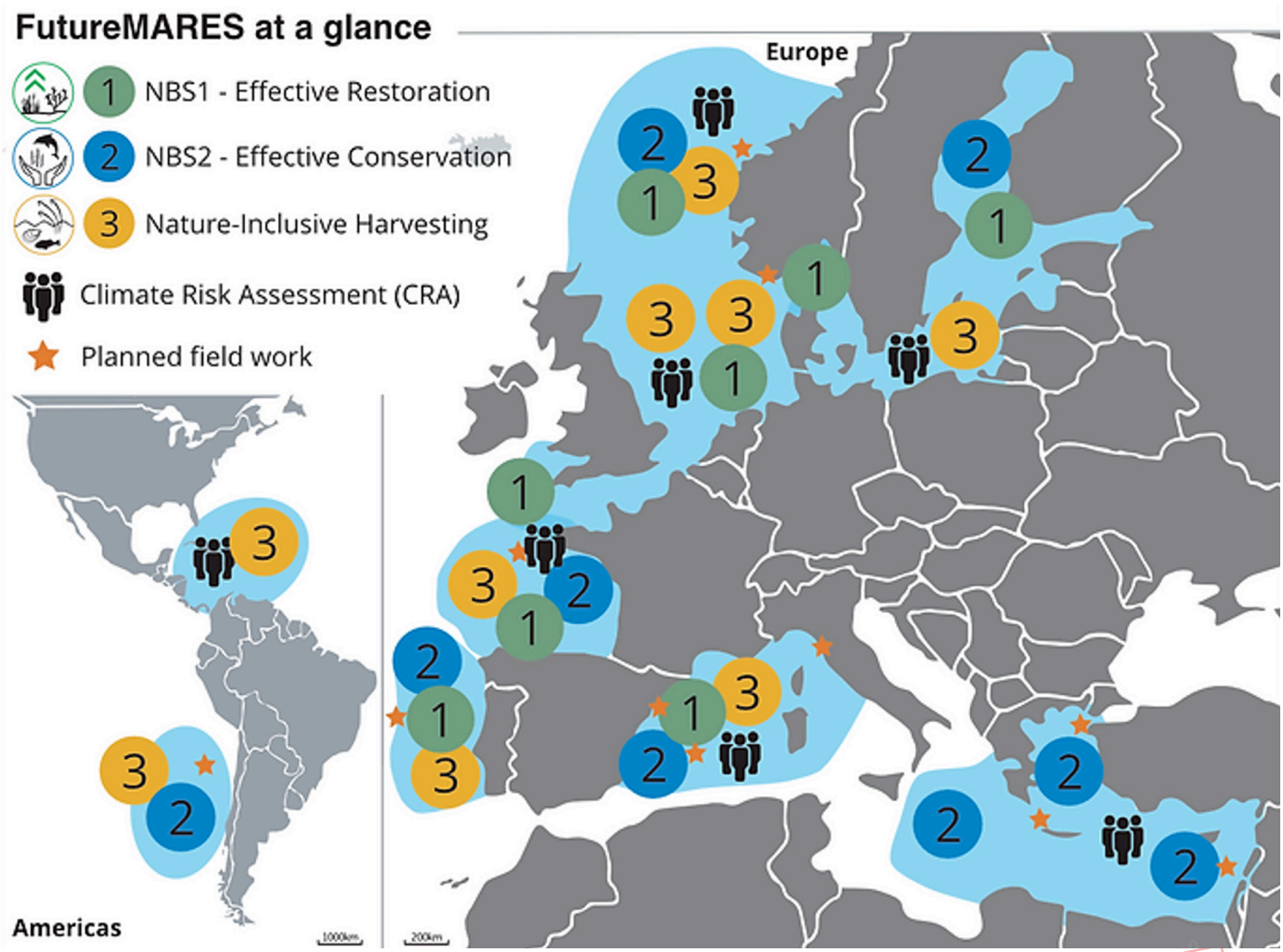
Links

https://www.futuremares.eu/
https://www.unipi.it/index.php/risultati-e-prodotti/item/19065-futuremares



Università di Torino

UNIVERSITÀ DI TORINO

Expertise

The University of Turin virtually covers every field of knowledge; its Medical Diagnostic, Biosensoristics and Nanotechnologies research centers are amongst the best ones in Italy.
The University of Turin has a remarkable research tradition in traditional subjects such as history, philosophy, law, economics and medicine but it is currently branching out into important modern sectors, such as food science, social politics, IT, performing arts and communication sciences.
Research in the area of issues relating to the protection and regeneration of marine and coastal environments involves several Departments and research groups.
Of particular note are the following projects of the Department of Biology:
H2020 Ocean4Biotech - European Transdisciplinary Networking Platform for marine biotechnology
LIFE CONCEPTU MARIS - CONservation of CEtaceans and Pelagic sea TUrtles in Med: Managing Actions for their Recovery In Sustainability.

Proposed project

SeaPaCS Participatory Citizen Science against Marine Pollution

SeaPaCS proposes a participatory citizen science (CS) project led by social and natural scientists that mobilizes volunteers in data collection, elaboration and sharing on the biological consequences of marine plastic pollution (via *in-situ* samples collection for plastisphere DNA analysis, underwater video documentation of new ecological niches, plankton evaluation), and in drafting a plan for sustainability-oriented practices based on interviews with fishermen and sailors, in the coastal city of Anzio (Italy) on the Mediterranean Sea. SeaPaCS project, supported by the European funds of the ***IMPETUS4CS*** project is coordinated by Chiara Certomà (***DIGGEO@ESOMAS*** laboratory, University of Turin) and co-coordinated by Federico Fornaro (***Italian Naval League*** Anzio) and Luisa Galgani (Marine Biochemistry Division of ***GEOMAR Helmholtz Centre for Ocean Research*** Kiel). SeaPaCS is intended to raise awareness about the consequences of marine plastic pollution on local biodiversity and to trigger transformative local action for sustainability-oriented behaviours in the coastal small city of Anzio (Rome). It answers two complementary **research questions**: What microbes are present in the Mediterranean plastisphere (i.e. the living microbial community on plastics and microplastics in marine environments) and how are they affecting the biodiversity of the Mediterranean ecosystem? How can the experience of sea workers and amateurs help decrease plastic debris and promote sustainable behaviours? SeaPaCS combines natural and social science research and **engages multiple citizen groups** (migrant fishermen cooperatives, students, associations, sailors and divers, scientists, video makers and photographers) in "collaboratorium" meetings, training sessions and co-production of tools for collective sea-going expeditions in the coastal waters (for plastic samples collection, microbial life analysis, interviews and video-documentation of new biological formation and fishing plastic practices), organization of outreach activities (e.g. video and photo expositions, media coverage, redaction of follow-up plan). SeaPaCS is included in the ***Public Engagement projects at ESOMAS Dep***.– University of Turin, institutional page available here. SeaPaCS's topic and aims situate within the IMPETUS' **Healthy Planet** challenge (with specific reference to water and biodiversity subtopics). It connects with the **EU Green Deal's** goal of "Protecting our Environment", notably by maintaining clean water and biodiversity while ensuring no person or place is left behind. It also contributes to **U.N. SDG 6** (indicator 6.3) on water-related ecosystems and 14 (ind.14.1 and 14.2) on the consequences of marine plastic pollution towards sustainable use of the ocean; and refers to SDG 15 (ind.15.8) on biodiversity loss. SeaPaCS focuses on the **Mediterranean Sea**, a hotspot for unique habitats that hosts 32% of all European-threatened marine ecosystems, and acts as a plastic accumulation zone. SeaPaCS covers the coastal waters (12 miles from shore) of the small village of **Anzio** (60 km south of **Rome**, Latium region, 50.000 inhab.) whose local economy is highly dependent on the sea (fishing, commercial boating, and tourism). SeaPaCS has been ***endorsed by the UN Ocean Decade programme.***

Links

https://crowdusg.net/seapacs/
https://www.esomas.unito.it/do/home

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Implementation Plan

Phase 1. Co-design and preparation (m.1-2)

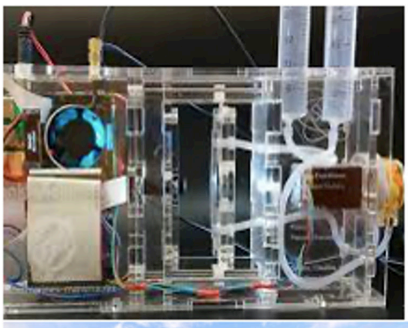
* Preparation of GDPR plan, data quality and preservation, EDI-related ethical checks.
* **Collaboratorium**: kick-off meeting for collaborative drafting the project plan; preparation of scientific and technical equipment

Phase 2. Collection data + elaboration (m.3-5)

* Two **sailing boat collective expeditions** for collection of samples for DNA analysis of the plastisphere (external lab)
* Two **fishing boat collective expeditions** for documenting plastic collection during fishing activity
* **On boat analysis** of microbiological life via Planktoscope on boat + on boat and underwater **video and photographic** documentation;
* **Interviews** with fishermen and sailors + Discourse Analysis on gathered contents
* **Elaboration of visual material** for communication purposes by external media agency Raw News

Phase 3. Discussion, sharing, planning (m.6)

* **School meeting**
* **Collaboratorium**: results presentation and preparation of the sustainable management plan
* Realization of an **exposition and projection** of visual products + final press release
* **Evaluation** of SeaPaCS project



Università IUAV di Venezia

Università Iuav di Venezia

Expertise

The IUAV University of Venice (IUAV) is an Italian state university, located in Venice, active in the field of education and research, in the disciplines of architecture, urbanism and spatial planning. IUAV has acquired a specific experience in training, analysis and international research on Maritime Spatial Planning (MSP).
International training programmes have been established at IUAV, such as the Master Erasmus Mundus in MSP, the intensive course Erasmus+ Marine ECOMED and regular courses at university level. Including one doctorate dedicated to MSP in 2021. IUAV has also started a fruitful collaboration with CORILA and CNR-ISMAR on MSP issues. Over time, this partnership has acquired extensive experience in the analysis, research, training and implementation of maritime spatial management plans, developing an ecosystem-based methodology. And this through the participation in several EU projects: ADRIPLAN, SUPREME, SIMWESTMED, PORTODIMARE, MSP-MED, MSP-GREEN, REGINA-MSP, ReMap.
At national level, thanks to the experience gained, IUAV, CORILA and CNR currently act together in supporting the Italian competent authority (Ministry of Transports) and other ministries involved in the elaboration of Italian maritime spatial plans.

Proposed project

COMPMAR ITALY-EASTERN CARIBBEANS: COMParative assessment of legal tools, policies and plans for the management of the MARine environment across regions.

Through the study and analysis of the different legal, policy and programmatic frameworks and of the salient points of the plans (MSPs and sectoral plans) already developed, the project proposes to identify elements (methodological and planning) of common relevance, therefore also transferable between the countries involved. The analysis will make particular reference to the marine ecosystems to be preserved and the socio-economic assets to be further developed, also considering the impacts due to climate change or the effects of economic insecurity, also through the instruments of international cooperation. Indeed, small islands, which have economies and livelihoods closely linked to the marine environment, present a clear need for marine spatial planning. Although with very different characteristics, the environment-blue economy nexus is also of primary importance for Mediterranean states (e.g. with regard to fishing, aquaculture and tourism). Methodologies and practices developed by these contexts will therefore be shared, also as a useful reference for other Caribbean states that are in the process of adopting legal instruments for maritime spatial planning.
The project aims to contribute to cooperation in the field of MSP at international level, linking distant realities in order to foster the transferability of effective tools for sustainable development and joint actions in the face of global changes. Both Italy and the Caribbean countries under study will benefit from the project results and the possible transferability of methodologies and management models, for the Caribbean countries this would be a useful step towards the adoption of planning tools.
The project will provide MAECI with a useful tool to foster international cooperation in the area of marine ecosystem protection and sustainable development of the blue economy.
The project will, in fact, strengthen relations between Italy and the Eastern Caribbean, relations that can be further developed on these issues in the near future, given their global relevance. The project therefore wishes to be preparatory to possible future collaborations between Italy and the aforementioned Eastern Caribbean states. Furthermore, the project may represent an international showcase for the skills and processes developed in Italy and the Mediterranean.

Target countries

Dominica, Grenada, St. Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines

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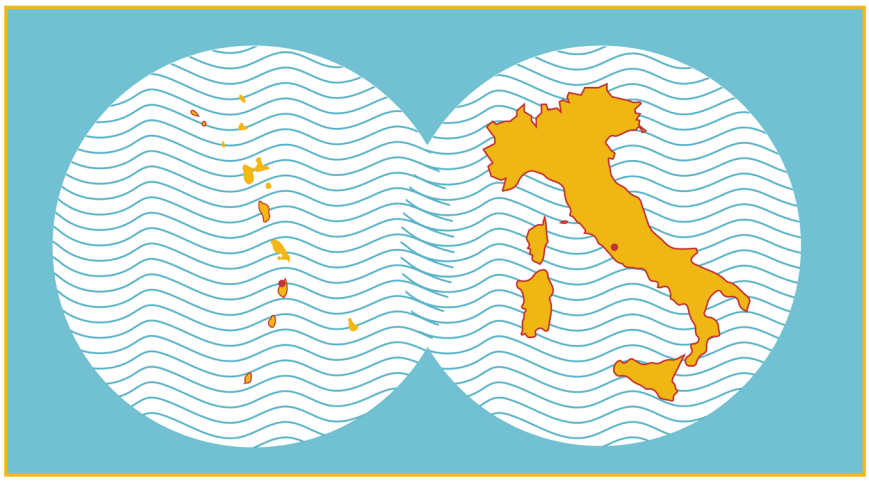
Links

www.iuav.it
https://www.iuav.it/Ricerca1/EVENTI-IUA12/COMPMAR-In/index.htm

COMPMAR
International Symposium
Italy - Eastern Caribbeans

on marine spatial planning and ocean management as frameworks to enhance international cooperation

22nd of May 2023 Hybrid event
3pm - 6pm Piazzale della Farnesina, 1, 00135 Rome (Italy)
9am - 12pm Coco Palm Resort, Reduit Beach Ave Rodney Bay, Saint Lucia (Saint Lucia)



The symposium will be a moment to share the results of the initial comparative study on legal frameworks and planning documents, asking experts to provide comments on possible ways of enabling cooperation on MSP between Italy and the Caribbean states.

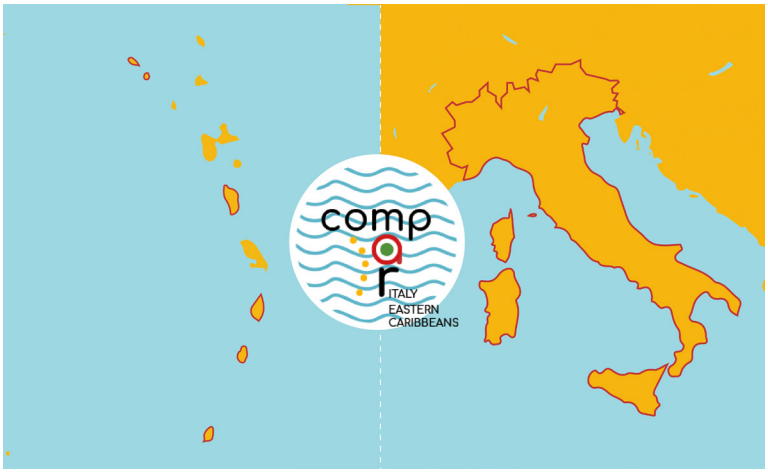
Intervenants

Francesco Musco – Iuav University of Venice
Gianni Michele Piccato - MAECI
Pierpaolo Campostrini - CORILA
Roberto Danovaro - Polytechnic University of Marche
Jose Courrau - IUCN
Emiliano Ramieri - CNR-Ismar
Sarah Mahadeo
Micol Roversi Monaco - Iuav University of Venice

Moderators and Discussants

Folco Soffietti – Iuav University of Venice
Fabio Carella – Iuav University of Venice
Tullio Scovazzi – Università Milano Bicocca
Tanja Lieuw - Caribbean Biodiversity Fund
Alana Lancaster – University of West Indies
Sarah Wollring – UNEP
Gabriele Torelli – Iuav University of Venice
Klaudia Kurkani – Iuav University of Venice
Derrick Theophille - Dominica Fisheries Department
Camille David - GIZ LC

Zoom link: https://us02web.zoom.us/j/83410816773



Università Politecnica delle Marche

Expertise

Polytechnic University of Marche (UNIVPM) has 12 Departments in Environmental and Life Sciences, Engineering, Agriculture, Economics and Medicine, 5 of which ranked as Departments of Excellence.
Within Healthy and Protected Oceans, UNIVPM participated in 20 EU projects, with recognized experience in coordination of international programs. Highly qualified groups operate in marine biology and ecology, nature conservation and restoration, marine pollution, climate change, ecotoxicology, biotechnology and blue tourism. An innovative Aquarium Infrastructure for temperate, tropical and polar organisms is part of the European Marine Biological Resource Centre, EMBRC, along with high-tech laboratories and a scientific vessel. UNIVPM collaborates with several marine Institutions and networks of excellence all over the world, with research activities in the Mediterranean, Atlantic, Pacific, Arctic and Antarctic Ocean. It offers a first level Laurea Degree in Biological Science (with curriculum in marine biology), a Master Laurea Degree in Marine Biology, an International Master of Science in Marine Biological Resources (IMBRSea), an international first level Master in Marine Biology, a PhD Course in Life and Environmental Sciences with a curriculum on Marine Biology.

Proposed project 01

Monitoring Environmental Pollution and Risk Assessment

The presence, impact and risks of pollutants in a climate-change scenario can be assessed through a multidisciplinary approach integrating their environmental occurrence, bioavailability and trophic transfer in food webs, and a wide panel of biological effects spanning from molecular responses in key sentinel species to ecosystem changes. Beside legacy pollutants, focus is given to emerging chemicals like pharmaceuticals, plasticizers, microplastics, pesticides, perfluorinated and abuse substances. After mapping priorities at regional/local levels, innovative effect-based monitoring tools will be developed through specific biosensors capable to detect various classes of chemicals based on their mechanism of action and receptorial binding. Diagnostic health tools, measuring toxicological and adverse effects in bioindicator organisms will represent fundamental tools for maintaining Healthy Protected Oceans, or rapidly understanding the onset of environmental disturbance. Novel weighted elaboration procedures summarizing huge datasets of monitoring results, will represent a support-decision model for stakeholders for site-oriented risk assessment and management. The project will provide significant technological innovations, new business models and economic development.

Target countries

All the SIDS Countries could potentially be involved in implementation of the projects.

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Links

https://www.disva.univpm.it/

Project 1.
Monitoring Environmental Pollution and Risk Assessment

Università Politecnica delle Marche

Proposed project 02

Conservation, mapping and restoration of marine ecosystems

Human well-being is impacted by the climate crisis which is contributing also to a growing loss of biodiversity, especially over recent decades. To prevent reverse biodiversity decline and bolster resilience to climate change, scientists warn that we must protect at least 30% of our lands, rivers, lakes, and wetlands by 2030. This objective asks for urgent criteria to prioritize areas and develop an ecologically coherent network of Protected Areas or Other Effective area-based Conservation Measures (OECMs). Mapping and modelling habitats and species distribution is a powerful approach to designing this strategy and addressing the restoration of different degraded marine habitats. Specific aims will include a) improving existing and developing new restoration actions of degraded marine habitats; b) enhancing marine ecosystem resilience and services; c) conducting cost-benefit analyses for marine restoration measures; d) creating new industrial targets and opportunities. To achieve these objectives the project will apply an integrated approach including skills in marine ecology, restoration, law, policy and governance, socioeconomics, knowledge transfer, dissemination, and communication.

Target countries

All the SIDS Countries could potentially be involved in implementation of the projects.

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Project 2.
Innovative tecnologies to restore degraded marine ecosystems

Università Politecnica delle Marche

Proposed project 03

Conservation, mapping and restoration of marine ecosystems

Plastic pollution is a typical problem that, in addition to ecological consequences, has negative impact on tourism and economic development of coastal areas. New systems for plastic identification, as drones with Artificial Intelligence, can help in monitoring and recovery activities. Citizen engagement, local communities and schools are useful to increase awareness on environmental problems, while the involvement of tour operators, resorts and other economic actors can enhance the blue-tourism, the development of new business models thus enhancing opportunities. Plastic collection in remote areas is often complicated by the logistical costs related to transport and disposal, when recycle is not possible. New technologies allow to reconvert plastic litter into energy directly on site of collection, using a high-temperature pyrolysis, capable to transform plastic litter into syngas with elevated calorific value. Such systems are cheap, easy to be transported from a location to another, allowing to hypothesize the development of a local and mobile system for plastic litter collection and energy production. The possibility of converting garbage into energy provides a further opportunity to combine environmental protection, economic development and touristic promotion.

Target countries

All the SIDS Countries could potentially be involved in implementation of the projects.

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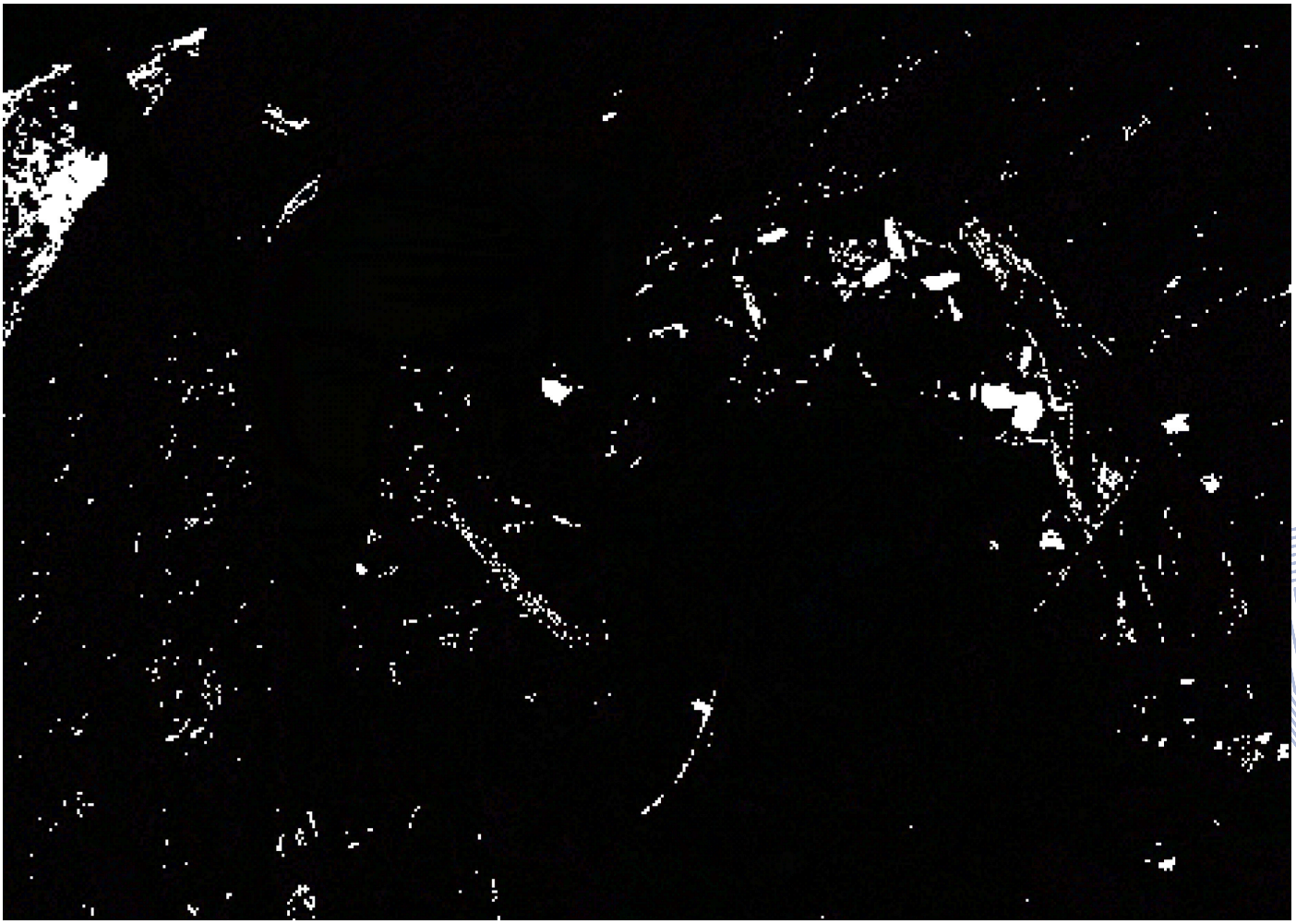

Project 2.
Plastic pollution on the coastal rocky shores and manta net to monitoring microplastics in seawater

CO.N.I.S.Ma.
Consorzio Nazionale Interuniversitario per le Scienze del Mare

Expertise

CoNISMa – National Inter-University Consortium for Marine Sciences was established on 21 February 1994 and is currently made up of 36 Italian universities.
The CoNISMa Consortium promotes and coordinates research and scientific activities and their applications in the field of Marine Sciences among the 35 associated Universities (among these there is the Polytechnic University of Bari).

Since 14 October 2011 it has been a member of the European Marine Board
It is among the 16 founding members of the "BLUE ITALIAN GROWTH National Technological Cluster" - CTN BIG.

It also participates, with its own representatives, in the following networks:
EUROMARINE
IPBES-Intergovernmental Platform on Biodiversity & Ecosystem Services
EMBRC (European Marine Biological Resource Centre)
EMSO-ERIC (European Multidisciplinary Seafloor and Water Column Observatory – European Research Infrastructure Consortium)
CNR commission for the coordination of the Italian participation in the International Ocean Discovery Program (IODP)
Italian Oceanographic Commission – COI
Working groups of the Italian Oceanographic Commission

Proposed project 01

SMART - Sea wave energy converters and MARine Tidal turbines

This project intends to make a fundamental contribution to advanced research and technology transfer in the field of renewable energies, particularly on energy converters from marine waves and currents.
Furthermore, this project follows the guidelines of the National Research Plan (PNR) 2021-2027.
A key element in the EU's maritime policy is to harness the energy potential of seas and oceans in a sustainable way.
The project consists of a series of activities on laboratory and field scales, and numerical simulations divided into 5 milestones: 1) Design and construction of the energy converters; 2) Lab scale experimental tests; 3) Open sea tests; 4) Numerical simulations of the energy converters; 5) Dissemination of the results.

In summary, the project intends:
a) to design and construct the energy converters, also on the basis of numerical simulations results;
b) to test energy converters in large laboratories, in order to verify their efficiency and the hydrodynamic behavior with different flows of sea currents and waves; c) to perform field tests in two pilot sites; d) to perform numerical simulations, based on experimental and field data, which allow us to analyze different operating conditions; e) to disseminate the results, also with stakeholders.

Target countries

All SIDS countries

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www.michelemossa.it/stazionemeteo.php
www.michelemossa.it/stazionemeteo2.php

Figure 1.
Infographic of the project

CO.N.I.S.Ma.
Consorzio Nazionale Interuniversitario
per le Scienze del Mare

Proposed project 02

Wave dumping due to riparian vegetation

Mangroves are a natural defense of the coastal region against extreme waves and tsunamis.
Furthermore, innovative techniques of naturally based coast defense are increasingly used, according to the canons of eco-hydraulics. Therefore, it is important to correctly evaluate the transmission of waves through cylinder arrays, which simulate coastal vegetation. The attenuation of waves propagating through an array of rigid emergent and submerged cylindrical stems on horizontal bottom is investigated theoretically, numerically and experimentally. The results of the theoretical model are compared with the numerical simulations obtained with the SPH-Smoothed Particle Hydrodynamics meshless Lagrangian numerical code and with experimental laboratory data. In the latter case, solitary waves were tested on a background current, in order to reproduce more realistic sea conditions, since the absence of circulation currents is very rare in the sea. The comparison would try to confirm the validity of the theoretical model, allowing its use for the purposes indicated above.

Target countries

All SIDS countries

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www.michelemossa.it/stazionemeteo2.php

Figure 1.
Indian Ocean tsunami with its attenuation due to riparian vegetation

Figure 2.
Picture of the channel where an experimental simulation of wave dumping due to rigid vegetation has been carried out.

CO.N.I.S.Ma.
Consorzio Nazionale Interuniversitario
per le Scienze del Mare

Proposed project 03

Micro PLASTIC processes and Fate in maRinE Environment PLASTICFREE

PLASTICFREE is a multidisciplinary project addressing the problem of MicroPlastics MPs polluting the sea, through a combination of theoretical, numerical and experimental approaches. The collaborative effort of leading experts on different fields (Fluid Mechanics, Chemistry, Physics, Material Science) is based on two main research lines:
A) investigation of the mechanisms governing the MPs discharge, mixing, spreading, transport and fate, at different spatial and temporal scales in marine environment, under the effect of multiple forcings;
B) design of the most suitable biocompatible solvents able to selectively extract MPs dispersed in sea water and optimization of extraction protocols to be used in situ.

The general objectives of the project are:

1. to improve the knowledge on the hydrodynamic processes that govern the spreading and transport of both floating and immersed MPs
2. to quantify the MPs distribution and concentration in water column and bottom sediments in the coastal zone, providing indicators showing their dependence on forcing actions (i.e., waves, wind, currents, and thermohaline gradients) and boundary conditions (i.e., wave breaking type, wave characteristics, sediment features).

Target countries

All SIDS countries

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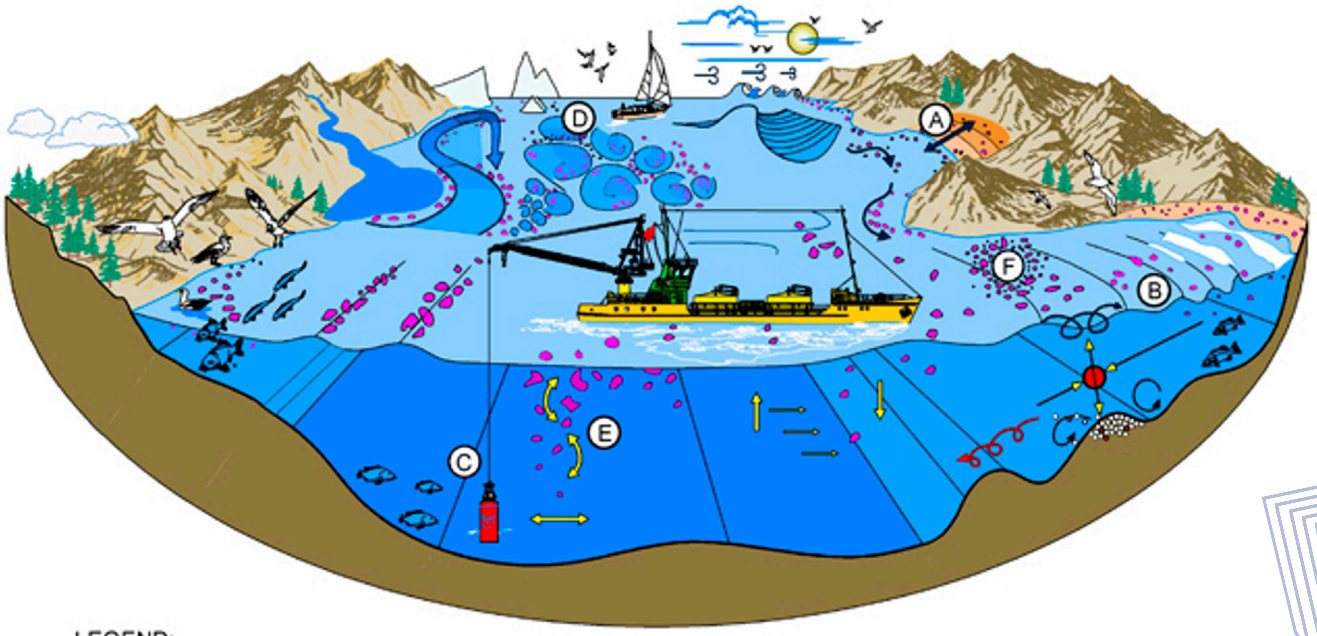

LEGEND:

(A) Coastal currents, surface waves and beaching [WP1, WP3]

(B) Force balance of MPs particles in coastal zone (Effects of swash zone dynamics and partial reflection) [WP1, WP3]

(C) Field data measurements of MPs and NPs (Discrete samplings of the water column up to large sea water depths, 3500 m) [WP6, WP3]

(D) Large scale open ocean processes [WP3, WP6]

(E) Mixing processes and buoyancy, MPs transport in stratified flows [WP1, WP2, WP3]

(F) Eco-friendly solvent for extracting of MNPs [WP4, WP5, WP2]

3D wave basin of the LIC – Coastal Engineering Laboratory

COMPANIES, ASSOCIATIONS AND ITALIAN ENTITIES CONTRIBUTIONS

CNR

Italian National Research Council

The Consiglio Nazionale delle Ricerche (CNR) is the largest public research organization in Italy founded in 1923 and supervised by the Ministry of Research. CNR has the task of carrying out, promoting, and enhancing research in the main sectors of knowledge, pursuing the integration of disciplines and technologies, of transferring and applying the results for the scientific, cultural, technological, economic and social development of the country and of providing technical-scientific support to constitutional bodies and public administrations. The Scientific network of CNR is organized in seven departments: Biomedical sciences; Bio and agri-food; Chemistry and materials technology; Earth and environment; Engineering, ICT, energy and transportation; Physics and matter; Social sciences and humanities. Under the supervision of the departments, institutes perform research tasks according to their programs. Three institutes are exclusively devoted to the study of Marine Sciences including Physical and Chemical Oceanography, Geology and Geophysics, Climate and Paleoclimate, Ecosystems and Biogeochemistry, Microbiology, Fisheries and Aquacolture, Anthropogenic Impacts, International Law of the Sea.

Proposed project 01

Deep sea research

Recognizing the synergies existing between the mandate and activities of the International Seabed Authority and the work undertaken by the CNR under its research programs in marine science and technology and by virtue of its research infrastructure; within the context of the 2030 Agenda for Sustainable Development and the UN Decade of Ocean Science for Sustainable Development, the ISA and CNR signed a letter of cooperation to undertake, inter alia, the following:

1. strengthening the deep-sea related knowledge and capacity of developing countries, including small island States, to support their strategic development goals;
2. development of joint capacity building programmes on deep-sea related matters, including but not limited to exploration, environmental management planning and technology, ocean affairs and law of the sea, also through ad hoc training opportunities onboard the oceanographic vessel Gaia Blu;
3. development of joint project and research proposals within the framework of the Mission of Horizon Europe "Restore Our Ocean and Waters by 2030", the Sustainable Blue Economy Partnership and the Italian National Biodiversity Future Center;
4. conception and implementation of activities in support of women's empowerment in deep-sea research.

Target countries

All the countries, with specific attention to SIDs of the Pacific region

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https://www.isa.org.jm/news/isa-secretariat-and-the-italian-national-research-council-officialize-partnership-to-boost-deep-sea-research-deep-sea-literacy-and-capacity-development/

The R/V Gaia blu in the Lagoon of Venice for the centenary celebrations of CNR.
Photo Credits Vittorio Tulli

The R/V Gaia blu docked near san Marco Square in Venice for the centenary celebrations of CNR.
Photo Credits Marzia Rovere

CNR

Italian National Research Council

Proposed project 02

National Biodiversity Centre

CNR is the coordinator of the National Biodiversity Centre (NBFC), a network of 48 partners intending to promote the sustainable management of biodiversity and improve Planet's health. The Mission of the NBFC is to create an extended national network of universities, research centers, associations, private and public stakeholders to take immediate action to halt biodiversity loss and impairment of ecosystem services while enhancing the sustainable use of natural resources and foster new job opportunities.
NBFC is improving methods and approaches to monitor, preserve and restore biodiversity in marine, terrestrial and urban ecosystems for the sustainable development in Italy and the Mediterranean region.
The experience, as well as methodologies and policies, can be shared with Countries worldwide and be beneficial in the policy making to counteract biodiversity erosion.

International training will be designed to:
1. quantify ecosystem services;
2. define actions to conserve and restore biodiversity;
3. identify innovative solutions to increase the carbon sequestration by ecosystems;
4. form a new class of researchers and train new professionals in green jobs;
5.create awareness and participation of the civil society for the protection and enhancement of biodiversity.

Target countries

All, with special attention to long-term collaboration in the Caribbean area

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Monitoring of fish stocks on board RV/ Dallaporta.
Photo Credits CNR-IRBIM

CNR

Italian National Research Council

Proposed project 03

Monitoring sea level rise and flooding

Our society developed and thrived through 10, 000 thousand years of unprecedented climatic stability. Global warming is now bringing increasing instability to the climate system, with possible tipping points that can bring the Earth climate system in a state impossible for humankind to cope with. Currently, we are facing a dramatic increase in extreme events with catastrophic coastal flooding, storm surge and wave set up.
CNR has 50-years' experience in collecting oceanographic data in long time series and use them in predictive models capable to identify high-water events in the lagoon and coastal system of the iconic Venice. The problem is similar in many coastal settings worldwide and is being exacerbated by the increasing global sea level rise (now approaching 5 mm/yr), driven by the thawing of ice at mid at high latitudes. CNR has safeguarded Venice by studying its subsidence (mostly anthropogenic), providing tide gauge and wave-height data in the longest time series worldwide, developing models of high water prediction, invaluable for coastal defence and warning strategies. This expertise can be shared and adapted to coastal regions of Countries that are particularly threatened by the combination of global sea level rise and increased extreme meteorological events.

Target countries

All SIDS Countries

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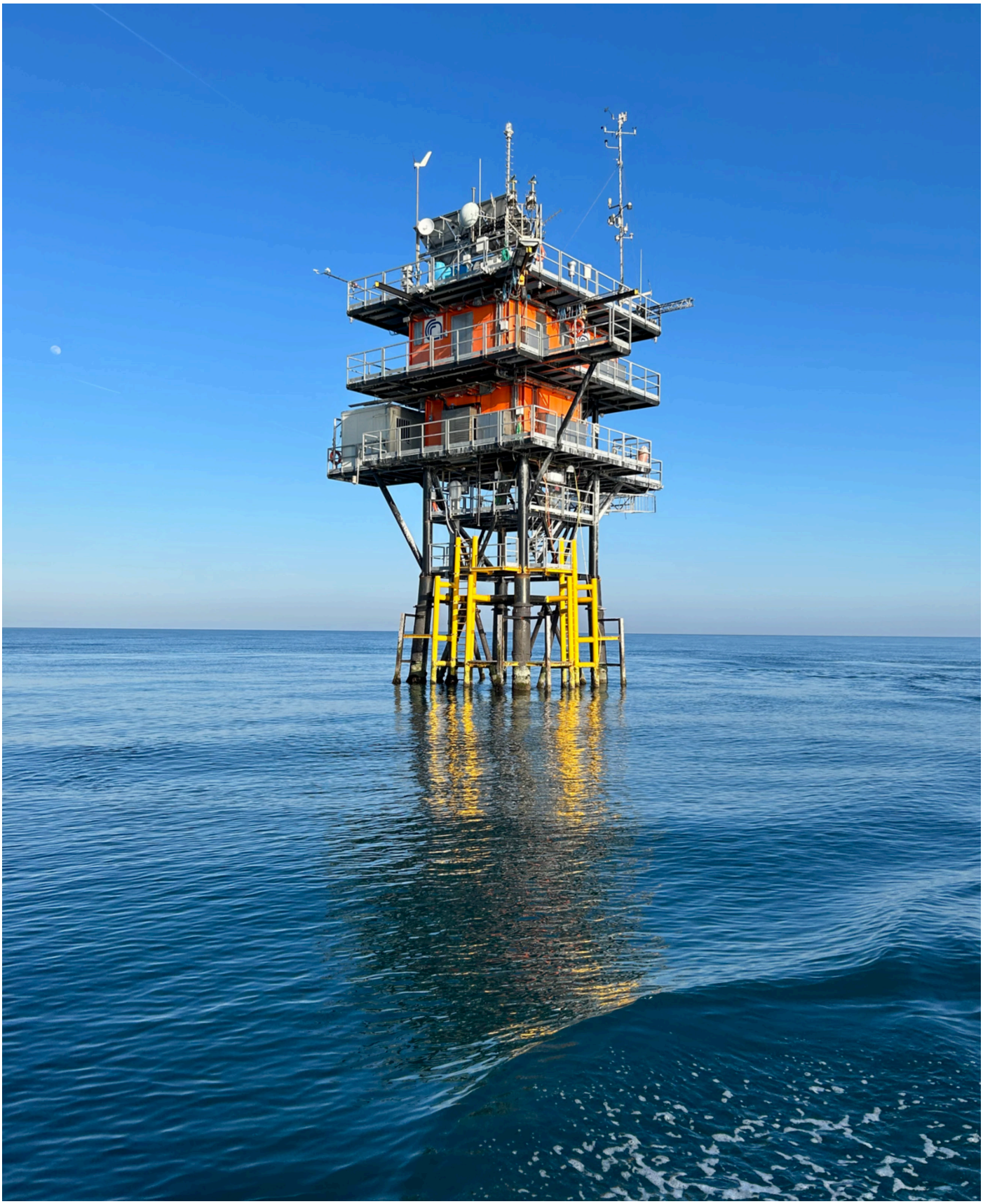

Acqua-Alta Oceanographic Tower deployed in the northern Adriatic Sea to monitor weather, waves and currents, hydrology in order to inform the warning system design to protect the Lagoon of Venice from flooding and high-water events.
Photo Credits Fabio Trincardi

FEDERPESCA

The National Federation of Fishing Companies (FEDERPESCA) was established in 1961 and since then it is a member of CONFINDUSTRIA. It operates within the Public Administrations, the Parliament and the European Union, by representing and protecting Italian shipowners, fishers and companies of the fishing sector (numbering approxitemately 2,000) towards Italian Administration, Italian Parliament and European Union Institutions. Federpesca implements projects in support of fishers and their families, in promotion of blue growth, food security, gender equality and for the protection of the marine environment, especially in Italy and the Mediterranean area. It is part of the National Fisheries Observatory, the Bilateral Fisheries Authority (E.BI.PESCA) and the Supplementary Assistance Fund of the National Health Service (FIS Pesca) for the management of the regulatory institutions provided for by the C.C.N.L (National Collective Labour Contracts) of Fishing.
Federpesca collaborates with different Italian and European Universities, in particular it has two framework agreements with two Italian Research Institutes: National Research Council (CNR) and Stazione Zoologica Anton Dohrn (SZN).

Proposed project 01

AGAPE – Aquaculture Global AI Platform for Europe's Skills Passport

AGAPE represents a collaborative platform, AI based. AGAPE can bring, for the first time, to the EU aquaculture market, education approach, consumers and research ecosystems, an innovative model of interaction among stakeholders and broaden community on skills, capabilities and competencies, globally and in real time. AGAPE's main scope focuses on promoting the transition from the ordinary aquaculture market to a circular economy approach in the aquaculture field on re-skilling processes and awareness of cross knowledge while answering to an effective market demand of competences. AGAPE also helps companies to understand the capabilities of their workforce, compare those against industry benchmarks, identify emerging and future skills, and address gaps with "build, borrow, buy or bot" strategies; ensuring an agile and evolving workforce plan that adapts to the ever-changing business needs.
AGAPE contributes to achieve the objectives indicated in the Strategic Guidelines for the Sustainable Development of EU Aquaculture for the expansion of the aquaculture sector across the EU. Besides, AGAPE is in line with the EU Pact for Skills adopted by the European Commission in 2020.

Target countries
Indian Ocean, Atlantic Ocean, Middle East and Eastern Asia Countries

Proposed project

LIFE SEA. NET

Life Sea.Net project, co-financed by the LIFE program of the EU, aims at improving the management of the marine sites of the Natura 2000 Network and increasing knowledge of the Network and its role in the conservation of marine biodiversity.
Main objectives of the project are:
- Improving the governance of marine Natura 2000 sites using an approach that can be replicated and which ensures coherent management of the Natura 2000 network.
- Increasing awareness of the Natura 2000 network through the active involvement of some stakeholders and through a series of local initiatives.

Specifically, Life Sea.Net is:
- Increasing data detail and monitoring in relation to the biodiversity heritage through the implementation of specific protocols
- Increasing awareness of the natura 2000 network among stakeholders
- Supporting the correct application of appropriate site assessment under the Habitats Directive by proposing a handbook for impact analysis in marine areas
- Supporting Natura 2000 site managers in defining conservation objectives and measures
- Promoting the adoption and sharing of the governance toolkit in public administration.

Target countries
Pacific Islands, Caribbean, Indian and Atlantic Ocean Countries

Proposed project 03

LIFE DREAM

Project 'Deep REef restoration And litter removal in the Mediterranean sea' (Life Dream for short) is funded by the European LIFE programme. The project aims to restore deep sea reefs and combat the problem of marine litter in the Mediterranean Sea. The expected results are:

- The development of an innovative and sustainable approach to mitigate anthropogenic pressure on deep coral reefs and promote their recovery.
- The production of scientific data and knowledge on deep coral reefs to support the flow from scientists to decision-makers and improve the management and governance of natural resources.
-T he extension of the Natura 2000 network to deep benthic habitats by collecting and providing information to support the designation of 2 new deep-water sites.
- Apply restoration actions (active or passive) that extend the area of target habitats and provide new substrate for reef-forming species.
- Develop a prototype for marine litter removal and improve cooperation with fisheries to follow a circular economy perspective and further recycle and reuse the removed marine litter.

Target countries
Pacific Islands, Caribbean, Indian and Atlantic Ocean Countries

Links

https://agape-skillset.com/
https://lifeseanet.eu/
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INGV

The National Institute of Geophysics and Volcanology (INGV) was established in 1999 by merging five existing and prestigious research institutes, some of which with a long tradition, such as Osservatorio Vesuviano, and is presently spread over eight main sites and many other minors. INGV's mission is to contribute to understanding the dynamics of the Earth System, in its various phenomena and solid and fluid components, and mitigating associated natural hazards.
The activities of INGV consist in
- scientific and technological research in seismology, volcanology, and environmental sciences;
- service provision to society, public administrations, and industry, including seismic and volcanic surveillance of the national territory and corresponding hazard assessments by agreement with the Civil Protection Department, and seismic and ground deformation monitoring in industrial areas by the task of the Ministry of Economic Development;
- management of infrastructures also part of European research infrastructures EPOS- European Plate Observing System and EMSO- European Multidisciplinary Seafloor and water column Observatory;
- Third Mission activities including training, dissemination, technology transfer, patents, spin-offs, and the activity of own permanent museums.

Proposed project 01

GEophysics for the Ocean – Training OPportunities

GEO-TOP

We propose to activate grants for knowledge and expertise transfer to post-docs and young researchers and involve them in research activities, seminars, lab experiments, and data analyses alongside experienced researchers of INGV. Proposed research themes aim at promoting a multidisciplinary and as-much-as –possible comprehensive approach to understanding the Earth System and the interaction of its main components from the observations of the marine environment from the coast and shallow waters to the open and deep basins and from satellites. The themes span from Earth's internal structure and marine geo-hazards to oceanography, including facilities and techniques for observational data acquisition.
The impact expected from this project is skill strengthening and capacity building of the target countries' research communities and helping them build a knowledge base for Ocean protection and resilience to climate change.

Theme 1 - Natural hazards in marine environment (3 grants):
-Volcanoes in marine environment - volcanic activity studies by Remote Sensing and in situ data, and analysis techniques;
-Tsunami hazard - real-time analysis of tsunamigenic earthquakes and sea level monitoring for tsunami threat assessment;
-Sea level rise and coastal flooding - elaboration of relative sea level rise projections along coastal areas using high-res digital maps, analysis of vertical land movements by geodetic and Remote Sensing data, and climatic data.

Theme 2 - Multidisciplinary observation platforms for deep marine environments (2 grants):
-Significant technological challenges and general requirements of deep-sea observation platforms for the operation in remote, hostile, corrosive environments;
-Data Acquisition System for deep sea multidisciplinary observation platforms – requirements for long autonomy, high reliability, capability to manage a wide range of instruments and large data flow;
-Recent achievements in the development of hardware for the management and control of power, instruments and technical parameters of multidisciplinary observation platforms.
-Best Practices on multidisciplinary observation platforms data management.

Theme 3 – Deep and shallow marine circulation (2 grants):
-Study of the variability of deep and shallow currents over different time scales by the analysis of in situ data
-Numerical modeling to simulate the interactions between deep and shallow currents under various scenarios and forcing mechanisms.

Theme 4 - Investigation on the Earth's crust and upper mantle below marine basins by seismological data (1 grants):
- Accurate earthquake location by integration of ocean bottom broadband seismometers, seismometers on seafloor observatories, and land networks;
- Computation of 1D velocity and 3D tomography models of the crust and upper mantle for a better definition of tectonic and seismic activity of fault systems in marine basins at crustal scale and a more accurate resolution of the subducting plates at upper mantle scale; focal mechanism computation to refine our knowledge of tectonic structures offshore.
-Investigation of seismic discontinuities with P and S receiver functions (RF). Signals converted at discontinuities are detected at various depths, such as the Moho, the lithosphere asthenosphere boundary and discontinuities in the mantle transition zone. RFs can be jointly inverted to calculate Vp and Vs models down to ~250 km depth.

Target countries

Cook Islands, Fiji, Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Antigua e Barbuda, Bahamas, Barbados, Belize, Cuba, Dominica, Jamaica, Haiti

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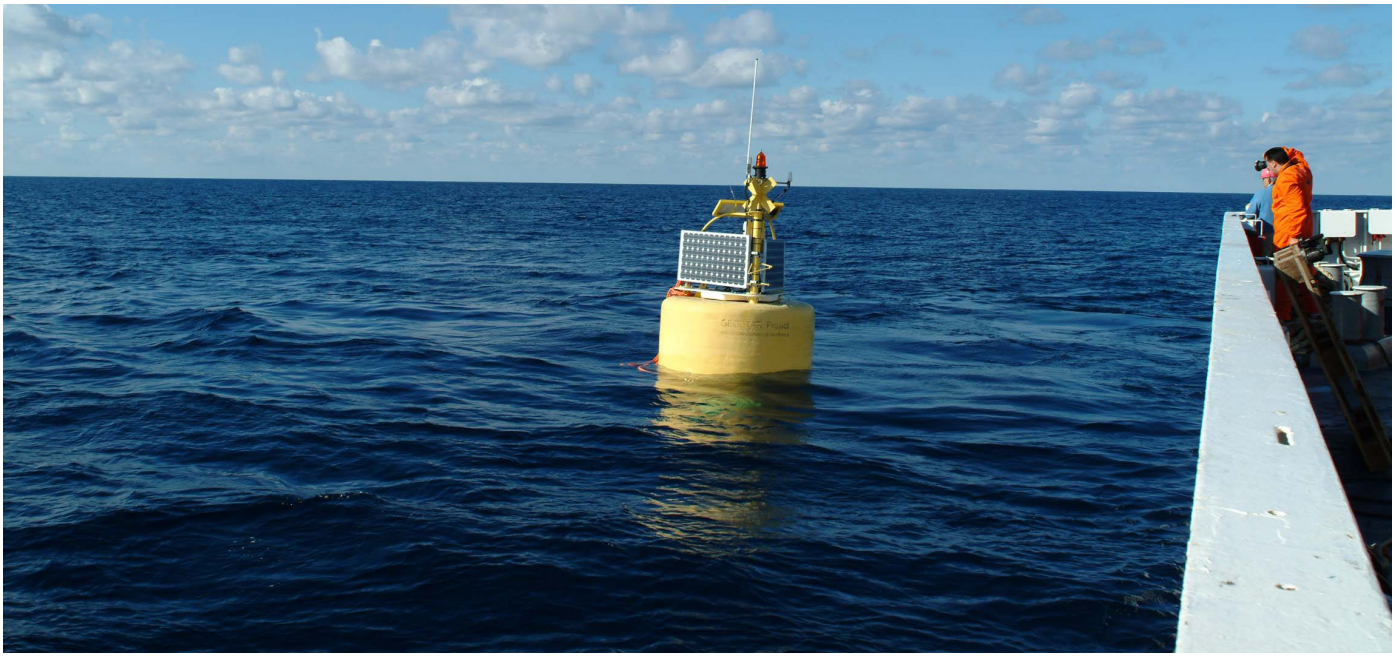

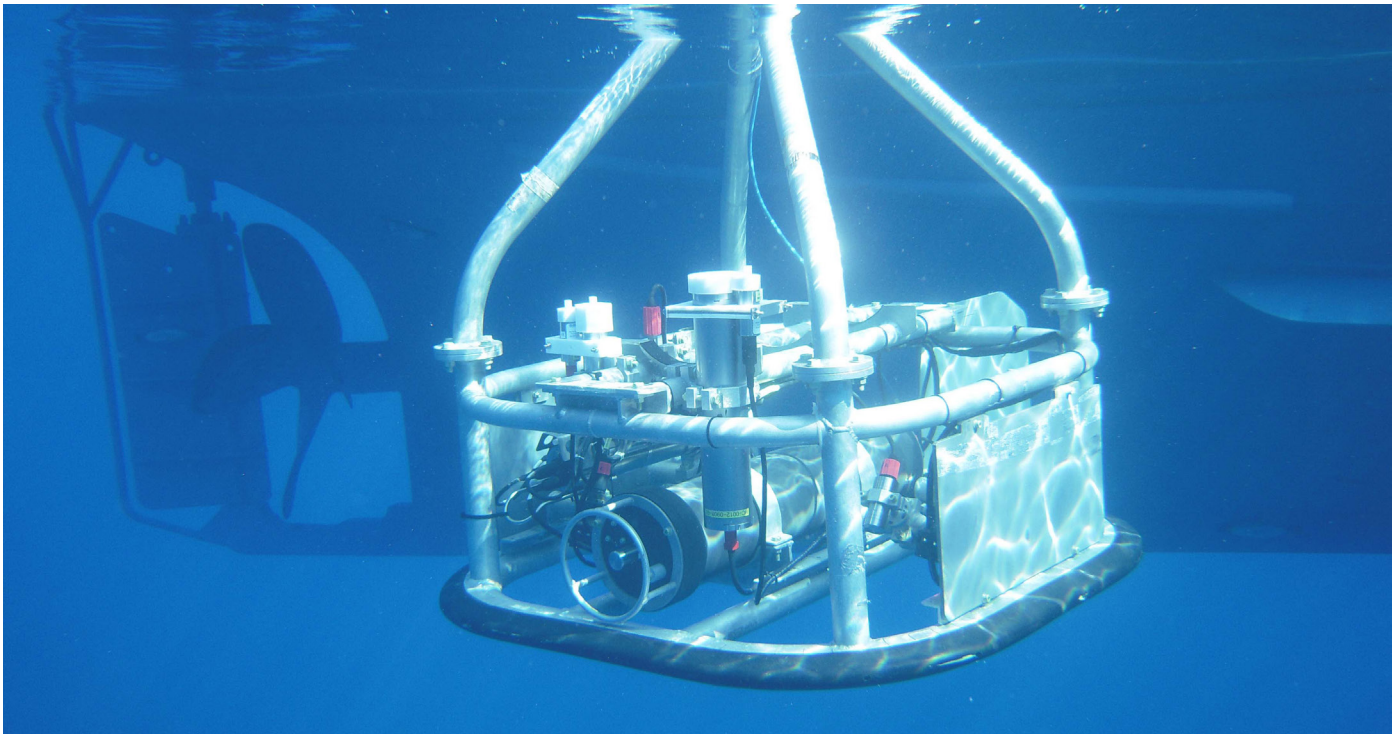

Credits INGV, National Institute of Geophysics and Volcanology.

OGS

OGS
Istituto Nazionale di Oceanografia e di Geofisica Sperimentale

The National Institute of Oceanography and Applied Geophysics - OGS is a public research institution operating internationally in the field of Earth and Ocean Sciences in the following areas:

- Oceanography (physical, chemical, biological and geological)
- Geophysics (applied and exploration)
- Seismology and engineering seismology

The research competencies encompass Earth and Ocean Sciences and the activities focus on key topical issues such as the environment, its response to global change and other anthropogenic stressors, biodiversity and ecosystem functioning, geohazards and associated risks, sustainable and safe use of natural resources, and green energy transition.
Capacity development is a core activity of OGS as a cross-cutting support to all scientific programs. Together with other partners, universities, research institutions, governmental bodies and industries, OGS is promoting a training path which aims at overcoming the existing skill mismatch between higher education and labor market needs.
The capacity development programs include summer schools and other higher education initiatives, PhD and master programs with universities, professional development and vocational training, internships and job placements, strategic partnerships and international relations.

Proposed project

National Institute of Oceanography and Applied

Earth exploitation, both in marine and terrestrial environments, is constantly growing. A better knowledge of geological, geophysical and ecological processes is a major challenge for the development of a sustainable, safe and informed society. OECD (The Organization for Economic Co-operation and Development) suggests to provide country-specific evidence to address the increasing pressures on marine and coastal ecosystems (e.g. from pollution, overfishing, climate change, etc.) and chart a new course for sustainable development through the conservation and sustainable use of ocean and coastal resources. Cross-sectoral management of ocean resources, using Marine Spatial Planning, offers the opportunity to apply a holistic strategy to overcome use-conflicts of ocean resources across sectors, and cater to the requirements of ecosystems.
Thanks to the use of its research vessel *Laura Bassi*, OGS can contribute to the study of the seafloor, a pillar in building Marine Spatial Planning, and can help to better understand potential resources and natural hazards. OGS can contribute to the production of high-resolution maps to describe the physical features of the ocean floor, as well as the geologic layers, and its underlying structure. The maps could contribute to identify waste deposits on the seabed.
At the end of the Antarctica cruise, the R/V Laura Bassi, can be used to carry out seabed surveys in areas along the route to the Mediterranean.
The R/V *Laura Bassi* is a PC5 class A icebreaker that obtained the Polar Code certification in 2020. The main objective of the R/V *Laura Bassi* is to provide scientific and logistical support to Italian polar missions and, at the same time, enable oceanographic and geophysical research by the scientific community at a global level. It is a multipurpose polar 5 class research vessel, which combines a significant scientific research capacity with a considerable potential for material and human transport. The ship has a tonnage of 4,028 tons, is 80 meters long and 17 meters wide, and has a dynamic positioning system that guarantees high maneuverability and accuracy in the order of 1 m at a given point. The vessel is suitable for Morphobathymetry, Sub bottom profiling, Seismic, Oceanography, Biology and Multipurpose, and is equipped with one wet lab and one dry Lab.

Target countries

Maldives: assessment of the impact of waste on the seabed
Cape Verde: contribution to the seabed stability risk assessment

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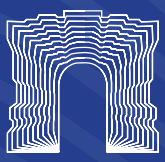
Laura Bassi ship (Trieste, Adriatic Sea)
Photo Francesco Granbassi

Laura Bassi ship
Photo Francesco Granbassi

EXPO 2030 ROMA
FOR HEALTHY OCEANS
A PRIORITY FOR SIDS
AND THE ENTIRE WORLD



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Italia
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World Expo 2030
Candidate
RUS