Proposal For The
Implementation of a bioremediation and blue carbon action using Smart Enhanced Reefs®

IMTA SYSTEM | REMEDIA LIVE PROJECT

20th January, 2022

Life Reef Technologies

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Introduction

The Università del Salento together with Università di Bari and the Istituto Talassografico di Taranto (CNR) are experimenting the REMEDIA Life project:

- During the monitoring of the sea bottom below the cages of the Mariculture Mar Gande farm (fishes, *Sparus aurata*) a clear improvement in environmental conditions was observed, not only in the soft substrates in which the amelioration was indicated by the use of M-AMBI, but also in the few at present existing hard substrates that were present under the cages (anchor blocks of the breeding cages).
- In these few solid surfaces biodiversity increased enormously below the vertical collectors placed in long lines around the above mentioned aquaculture facilities in which you find our bioremediating organisms (polychates, sponges, ascidians, bivalves, etc.).
- The function of these artificial barriers is manifold:
    - They are centralizers of biodiversity,
    - They become sites for adult invertebrate populations that can provide propagules to vertical collectors in which the installation of oysters is also planned
    - They are an attraction for fish populations
    - They can transform, coupled with vertical collectors a degraded area in an area where diving tourism can be practiced.
    - They are, indeed, blue carbon promoters
- It was therefore decided, in the remaining period of the Remedia project (2022-2023), to implement the hard bottoms by placing artificial blocks under our long lines, to study their influence on the biodiversity of the area.
- The implementation can start with a small test relative to the placement of some blocks placed under the vertical collectors to compare with others out of the bioremediating system.
- **Adriana Giangrande (DiSTeBA University of Salento) contacts Underwater Gardens for The Implementation of a bioremediation and blue carbon action using Smart Enhanced Reefs® (SER®) in the sea bottom under the fish cages.**
- **The implementation with SER® is promoted by Università del Salento together with the Università di Bari and the Istituto Talassografico di Taranto (CNR).**

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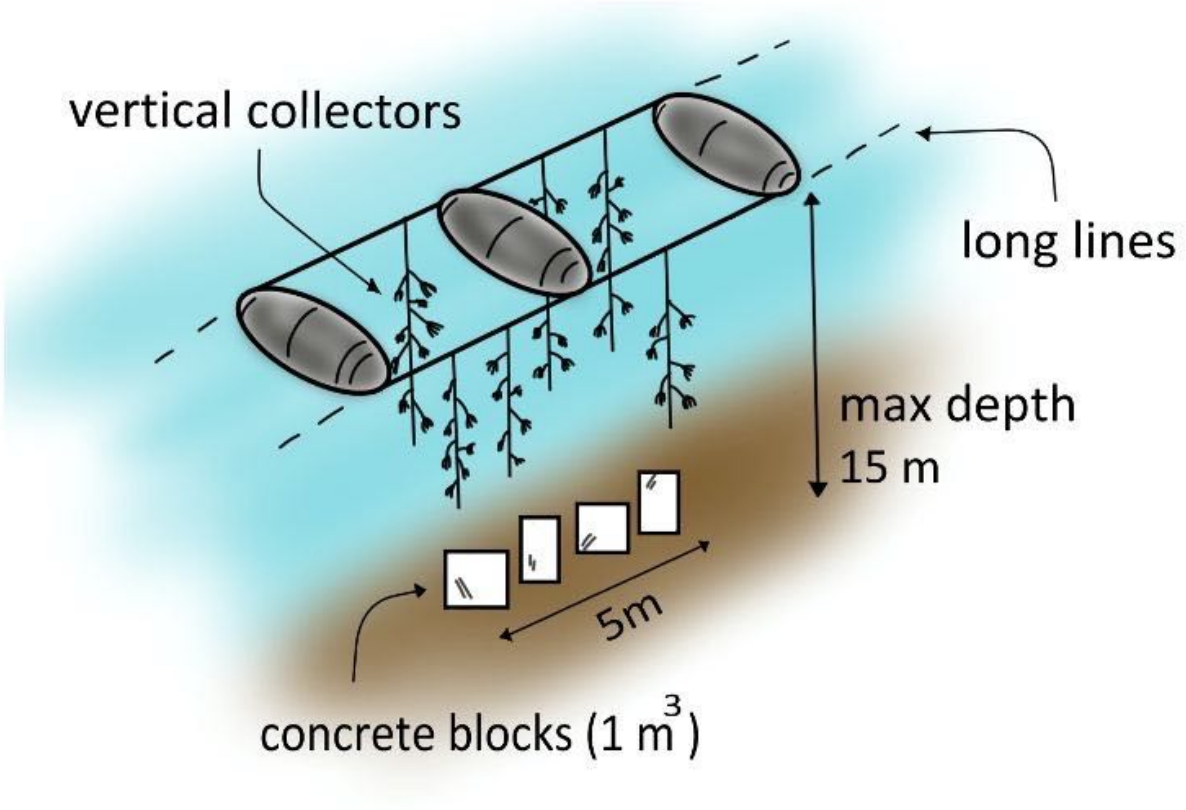
Provided briefing

Implementation of a bioremediation and blue carbon action using Smart Enhanced Reefs® (SER®)

- The area is located on the south-west side of the Mar Grande of Taranto (40 25'56" N; 17 14'19" E) (Ionian Sea), which is part of one of the most important coastal marine ecosystems along the Apulian coast.
- The sea bottom is composed especially by mud with a small percentage of sand and a large amount of debris deriving from the shell of reared mollusks.
- The positioning should therefore assist the action of the vertical collectors in the bioremediation of the site and help create an amelioration on the surrounding environment.
- The linear surface to be covered should be at least 10 meters (can be longer), 5 m in the bioremediated site and 5 m outside, depending on the size of the blocks, I believe that the minimum number could be 10 blocks (5 within the bio-mediated site and 5 outside).
- The blocks, ideally, have to be of similar size and weight (50-60 kg each block).



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On the importance of Smart Enhanced Reefs (SER®) in the mitigation of Environmental Impact and the regeneration of marine ecosystems

The Ocean is changing profoundly, on multiple scales, due to direct and indirect human impacts. Since the Industrial Revolution, seabed habitats have been drastically transformed by a variety of stressors, worldwide. Seabed habitats and communities are some of the most affected, as they are subject to various anthropogenic impacts and the effects of Climate Change. In the Ocean, the close relationship and dependence between benthic and pelagic systems means that the impacts of disruptions to the water column negatively affect benthic communities, which are the most threatened marine communities and some of the most fragile. These communities cover most of the sea floor, from shallow to deep water, and include animals and plants that act as habitat builders for other species. The installation of artificial reefs is used in many contexts with the aim of improving the ecosystem services provided by these habitats.

The sinking of artificial structures in the Ocean, both accidental and planned, has been going on for decades. These experiences demonstrate that the marine system has the capacity to colonise all types of solid structures. However, the quality of the colonisation (in terms of biodiversity, presence of species under protection, level of colonised cover, biomass generated, speed of colonisation, etc.) and ecological functionality of the Biotopes are not always the same, and are closely linked to their design (texture, shape, composition, dispersion, etc.) and number. An intelligent design of Biotopes responds to the ecological needs of the species in the area, and the other purposes of the same Biotopes (mooring of boats, beach lining, etc.). From Life Reef Technologies®, LRT®, (brand of Underwater Gardens International, UGI) we create 3D structures with intelligent design (Smart Enhanced Reefs®, SER®), through a design protocol (reefhopper®) based on algorithmic programming and the scientific and multidisciplinary knowledge of the company's team. The design and monitoring of the SER® ensures that they provide a holistic solution that responds to the specific needs of each project and the ecological needs of each marine location where they are installed. SER® are a unique solution based on nature and science, and an exceptional opportunity to increase the Ocean's potential to mitigate the effects of Climate Change and preserve life as we know it today.

Nowadays, humanity is facing a highly complex situation in which the need to restore natural habitats and mitigate impacted areas should be a priority in order to reduce and adapt to the effects of Climate Change. The Ocean and its habitats are widely recognised for their ability on reducing the effects of climate change, for their high biodiversity, their capacity to act as carbon reservoirs, climate regulation or O_2 production. We urgently need marine restoration plans that are appropriate for degraded ecosystems and that allow us to make a large-scale projection.

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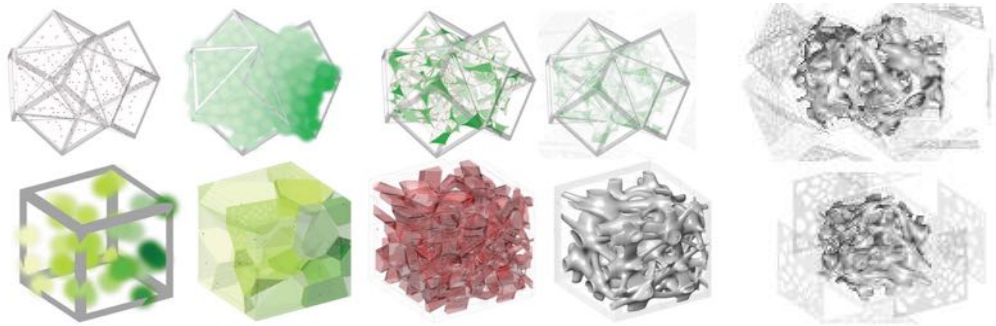
Reefhopper® Design Protocol



- REEFHOPPER: Expert Software for the design of Smart Enhanced Reefs.
- Manufacture with specific materials and technologies to improve efficiency.
- 3D printing and/or prefabricated products.

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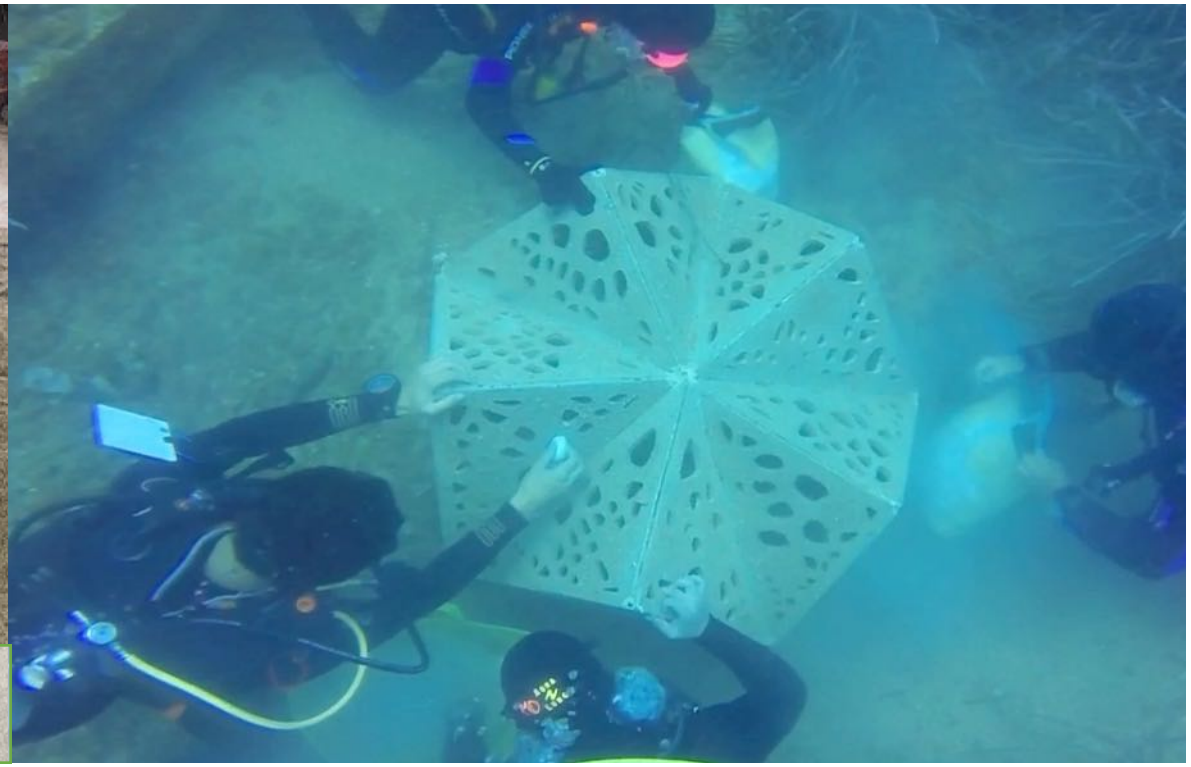

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BIOTOPES PROPOSAL

Scope:

- 3 units of 4 types of biotopes (12 biotopes in total) with morphological reef variety adapted to the project requirements and the environmental needs of the target sessile and vagile organisms.
- Resize of biotopes to meet weight requirements.
- Resize biotopes to cover 10 meters (5 m in the bioremediated site and 5m outside)

Selected Biotopes:

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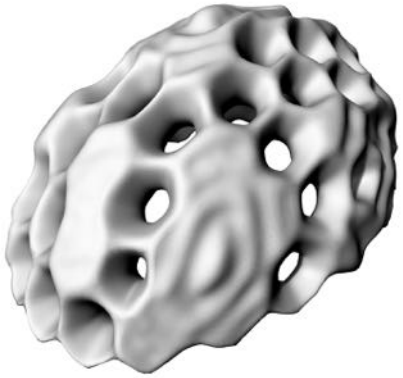
BIOTOPES PROPOSAL

Selected Biotopes:

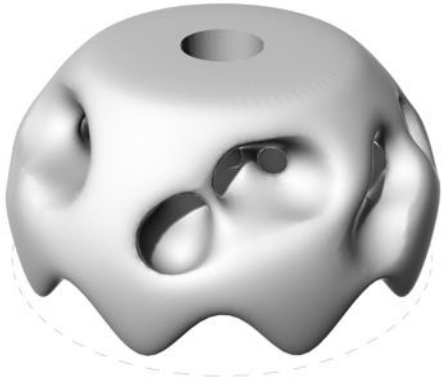


DATOURTLE-RIF®

Width: 0,50m
Length: 0,79m
Height: 0,32m
Weight: ~58kg*

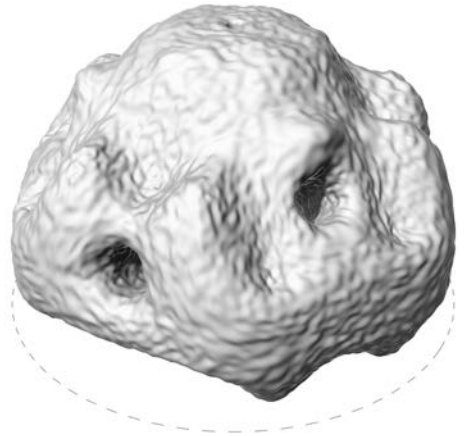
BOBLY-RIF®

Radius: 0,30m
Height: 0,44m
Weight: ~54kg*



DAMINION-RIF®

Radius: 0,25m
Height: 0,25m
Weight: ~63kg*



DAROC-RIF®

Radius: 0,25m
Height: 0,32m
Weight: ~62kg*

**The final weight will depend on the density of the proposed material. In order to calculate the orientate weights, a concrete density of 2.400kg/m^3 is used.*

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BIOTOPES PROPOSAL

Weight and coverage area of biotopes

**The final weight will depend on the density of the proposed material. In order to calculate the orientate weights, a concrete density of 2.400kg/m^3 is used.*

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Layout

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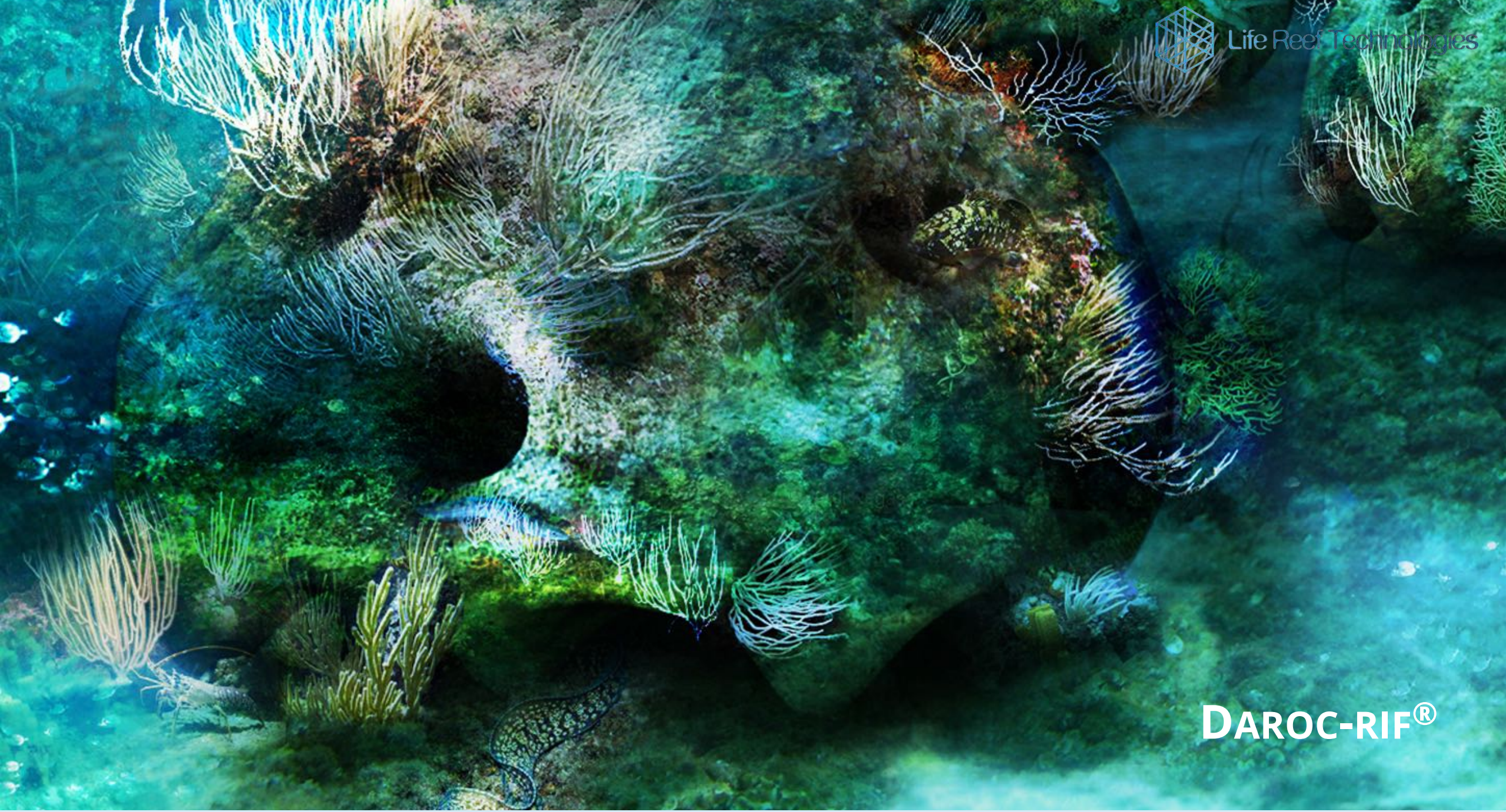

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Economic proposal

Description	Promotors	Cost
• *3x Datourtel-rif* • *3x. Bobly-rif* • *3x Daminion-rif* • *3x Daroc-rif*	*DiSTeBA University of Salento*	*6.000 €*
	IRSA CNR Taranto	*4.000 €*
	Dipartimento di Biologia University of Bari	*5.000 €*
	Total:	***15.000 €***

Datourtel-rif

Bobly-rif

Daminion-rif

Daroc-rif

Acceptance of the proposal

Once the proposal is accepted, the pertinent contract will be written up.

Periods/Deadlines

The deadlines for job execution and billing will be negotiated during the acceptance of the proposal.

General conditions

- Taxes not included
- Taxes, visas, permits, licenses or any concept not named here are not included

Additional remarks

LRT will not take responsibility on:

- required permits for the project execution
- On site installation

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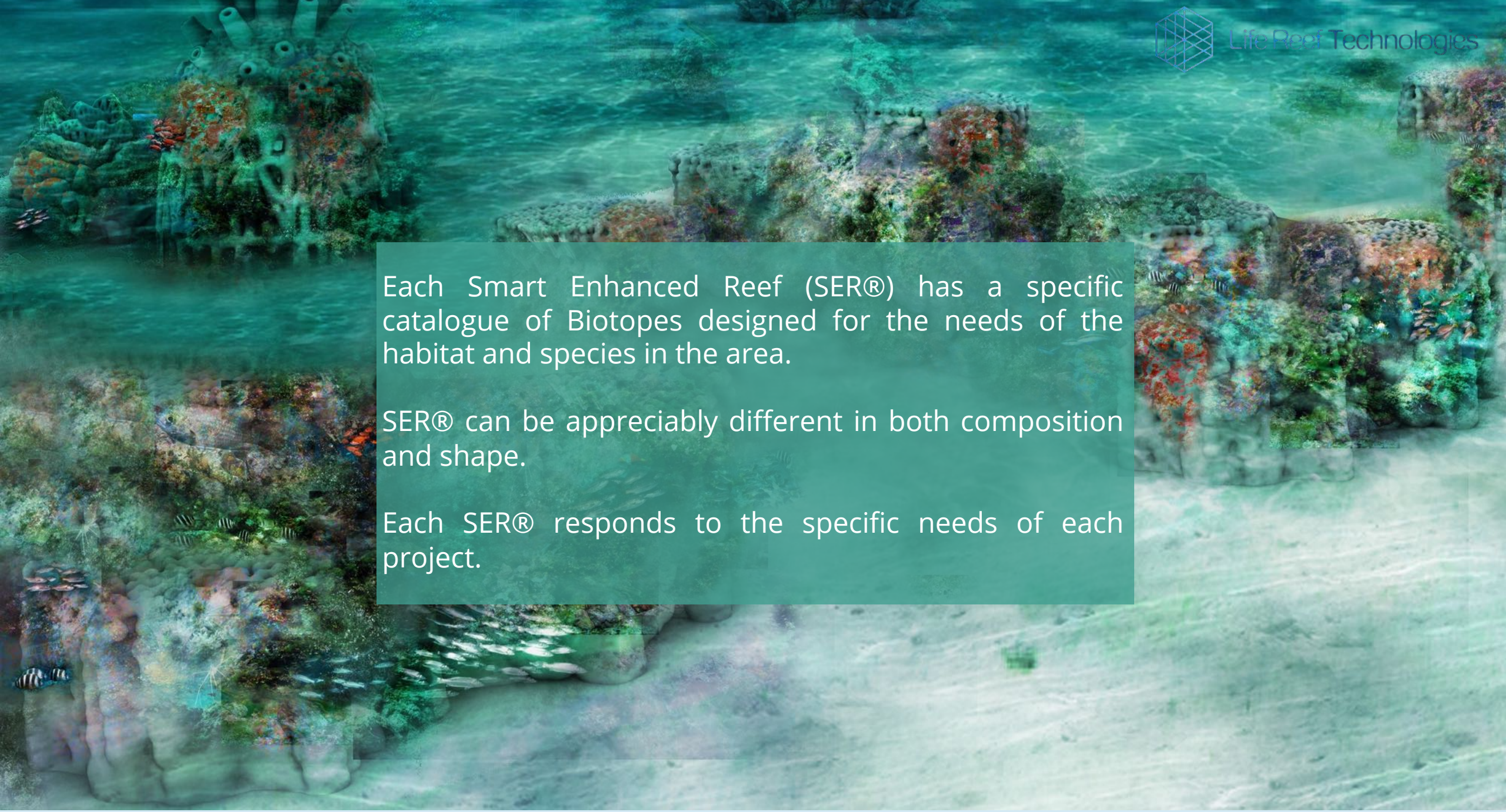

Each Smart Enhanced Reef (SER®) has a specific catalogue of Biotopes designed for the needs of the habitat and species in the area.

SER® can be appreciably different in both composition and shape.

Each SER® responds to the specific needs of each project.

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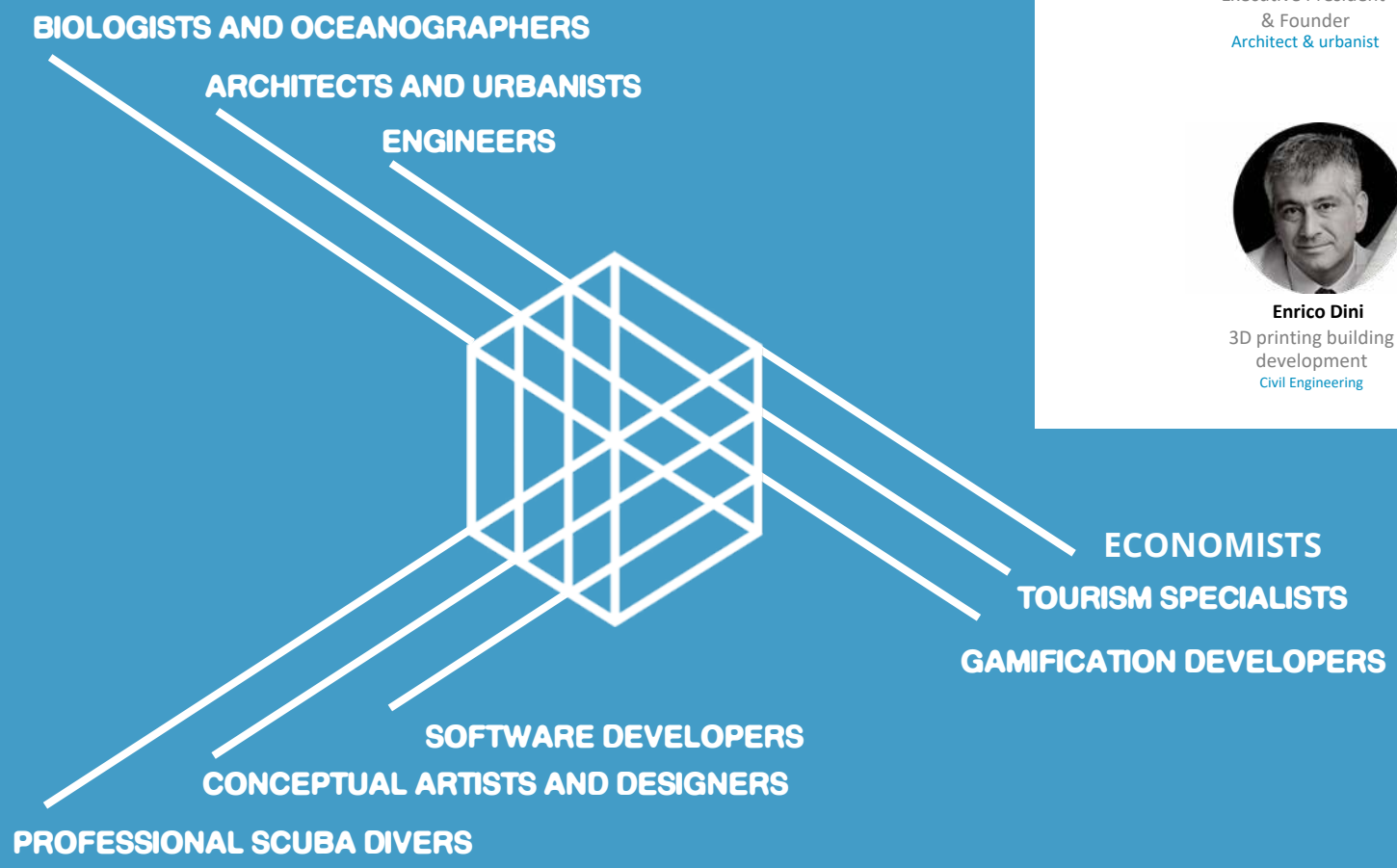
Multidisciplinary network



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Team:

Marc García-Durán Huet
Executive President & Founder
Architect & urbanist

Purificació Canals
Biology & Marine Ecosystems Advisor
Phd in Biology

Sergio Rossi
Biologist & Scientific Advisor
Phd in Biology

Laura Busquier
Costal Management & Marine Environment
Biologist

Enrico Dini
3D printing building development
Civil Engineering

Carlos Oliver
Organizational Development
Design thinking

Jayant Khanuja
Computational Designer
Architect

Simone Branchini
Senior Project developer
Architect

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