



# Eco-Design Solutions



# Our eco-design solutions for single-layer armour units



## Issues with artificial maritime structures

Reduction in natural habitats

Disappearance of local species

Proliferation of invasive species

In general, concrete is a good material for marine biodiversity. However, its smooth surface can slow down the colonisation process of biodiversity.

In addition, the colonising species are not necessarily targeted, favouring the arrival of invasive species.



ACCROPODE™ II after installation



ACCROPODE™ II after 3 years in the water

## CLI has been developing technical solutions with its specialist partners for many years to reduce the negative impact of artificial structures.

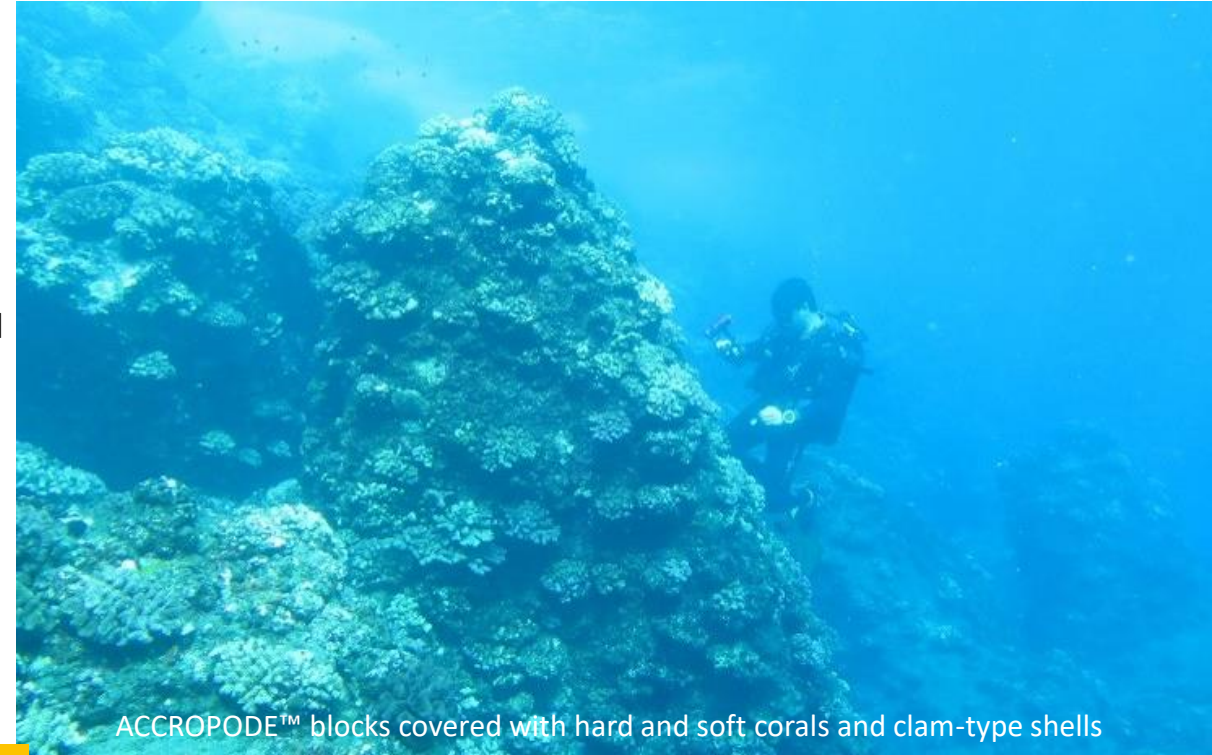
The **primary function** of a breakwater is to provide protection against the swell and the currents. On top of this, the secondary functions should also be highlighted, in particular the ecological role of these structures.

Specialist scientific literature shows that to promote marine biodiversity on artificial structures, they need to be made more complex.

In a breakwater the gaps between the blocks act as hunting grounds for large fish and are often unsuitable for

smaller ones. One of the key notions of effectiveness lies in creating a food chain which begins with the smallest organisms and algae, and goes up to large predators, via every intermediate stage.

To achieve this, the number of different types of habitat needs to be increased by adding textures with different dimensions (mm, cm) and degrees of roughness (holes, crevices, cavities, etc.).



ACCROPODE™ blocks covered with hard and soft corals and clam-type shells



ACCROPODE™ blocks after 20 years of service



Freshly laid ACCROPODE™ blocks

## Certain factors significantly accelerate colonisation. Studying the biotopes helps to select and design surfaces that are suitable for specific selected ecosystems.

Among the many factors, the roughness of the blocks is a key element for the attachment of the biofilm, biofouling, the larval stages, and the pioneer organisms.

Many marine organisms require habitats that are specific to each of them. This means that, wherever possible, the properties of the surface should be adapted to meet the needs of each species.

This roughness, which helps to create

areas of micro-turbulence, works on many levels just like macro-roughness which has elements measuring a few centimetres, to micro roughness which is defined by relief measuring in the millimetres.

Lastly, the creation of refuges in the form of cavities is essential, and also helps to create suitable habitats for targeted species.



## Overall objective

**Inspired by nature**, where nothing is uniform or homogeneous, the aim is to create a complex structure, made up of structural concrete blocks with a textured surface that mimics natural rock.

The goal is to **accelerate the attachment of biodiversity and to favour local species**.



# ECOPODE™

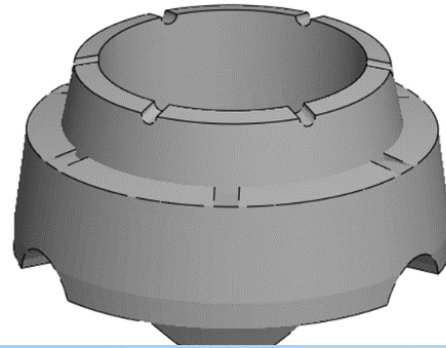
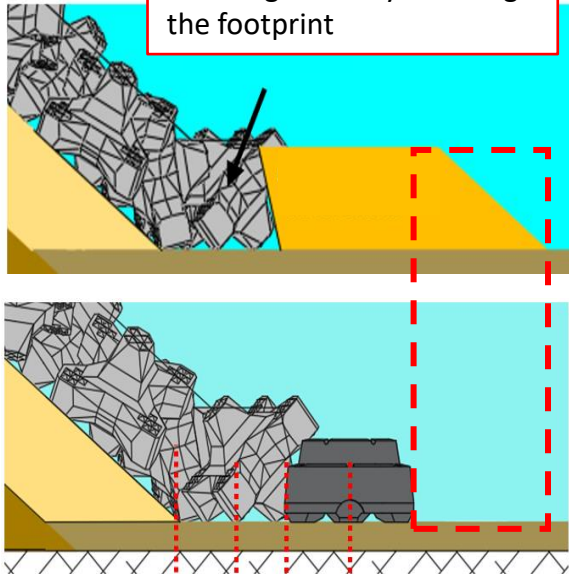
The first generation of eco-designed blocks, the ECOPODE™, has a macro roughness (measured in centimetres and tens of centimetres) and a similar appearance to rock. As they can also be produced in coloured concrete, these blocks are ideal for blending in with the local landscape.

Often installed out of the water, they can also be used underwater or in combination with the textured or smooth ACCROPODE™ blocks.

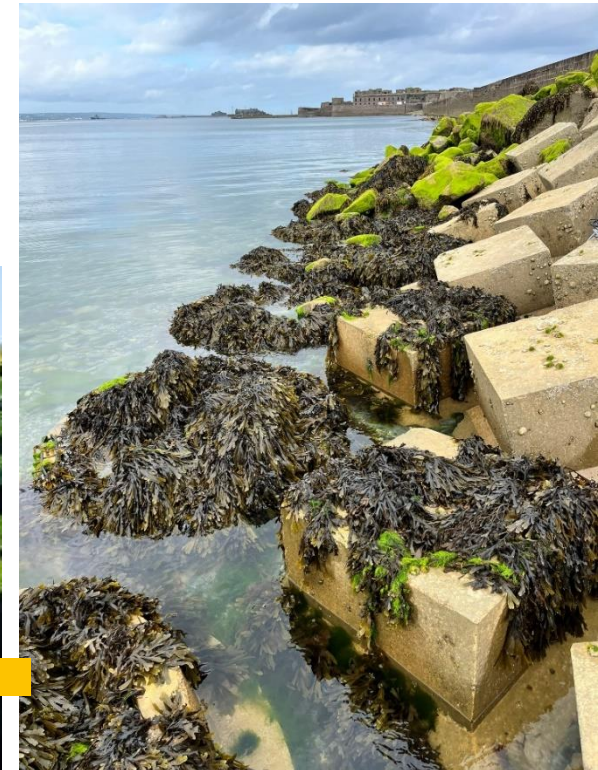


# ACCROBERM™

Offers the same stability with the same size blocks, while significantly reducing the footprint



Colonisation a few months after installation of the blocks



Colonisation three years after installation of the blocks

Eco-designed toe berm, designed to eliminate the need for rockfill toe berms, with the following advantages:

- Reducing the footprint of the toe berm;
- Offering crevices suited to the setting;
- Ecological continuity.

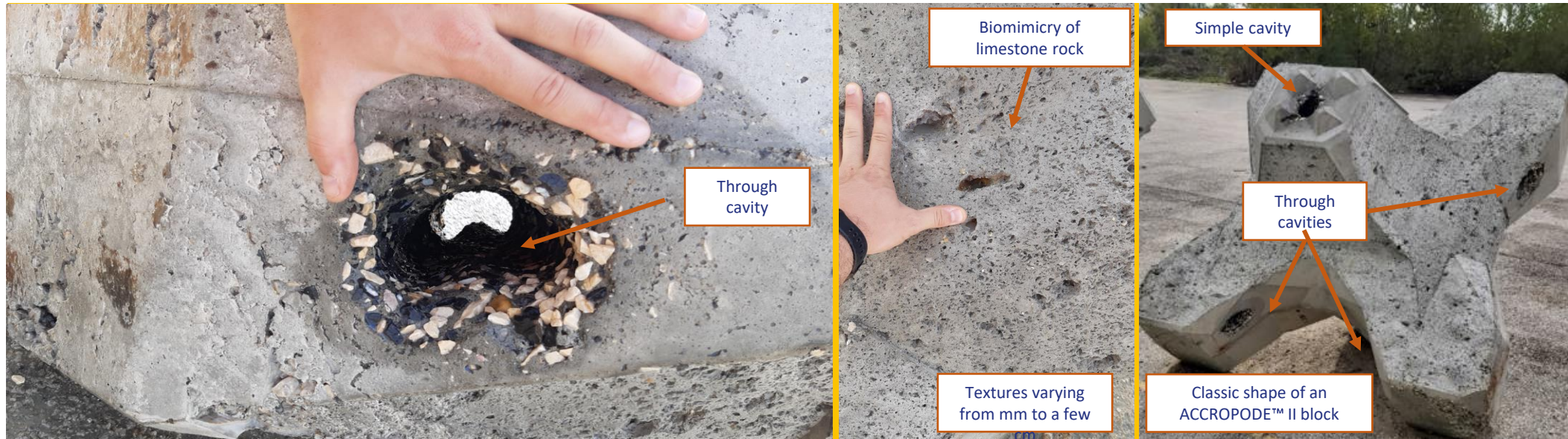
# ACCROPODE™ II eco-designed

AMARECO and CLI have jointly developed the ACCROPODE™ II with variable texture. An initial version imitating limestone rock, with cavities and crevices, without sacrificing its hydraulic stability capability.

Find out more on the



website: <https://www.amareco.fr/en/home/>

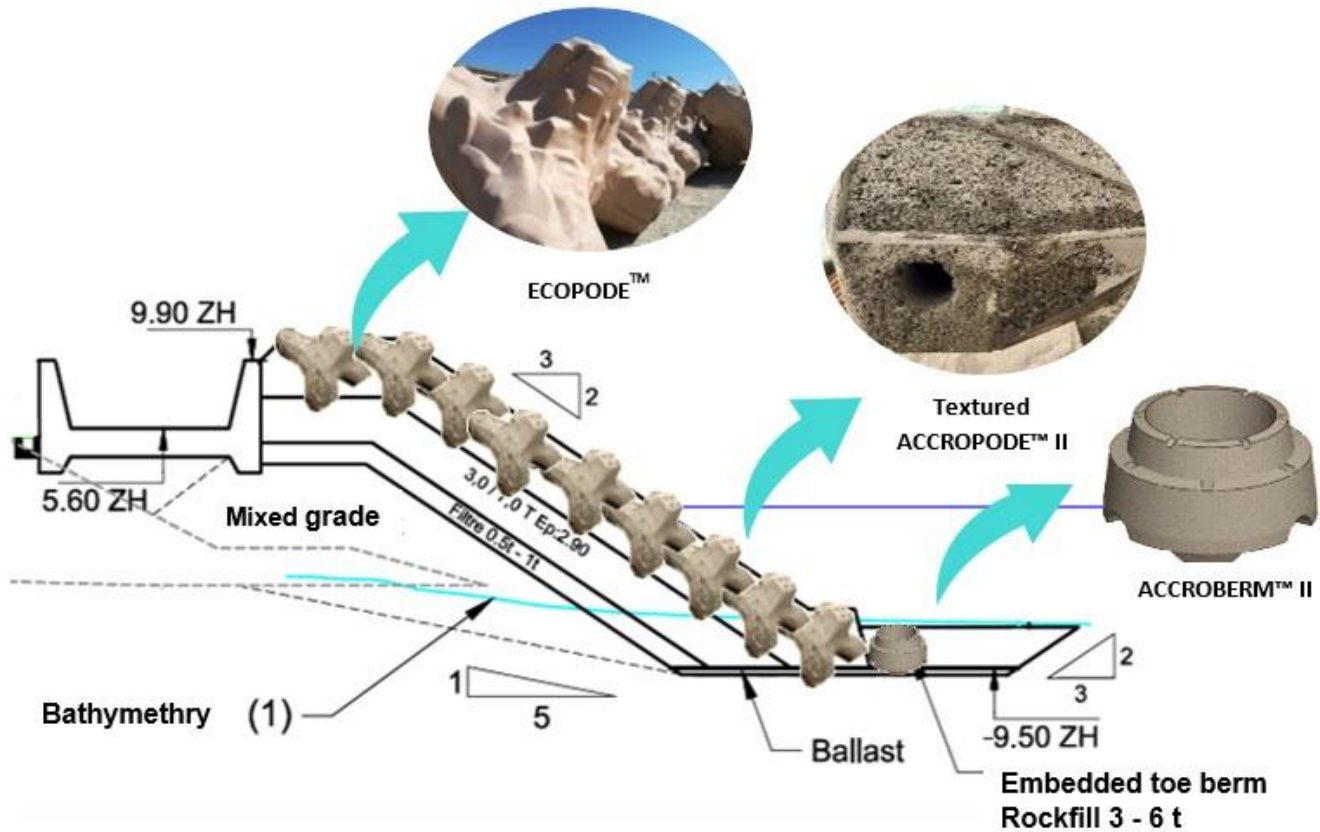


## Advantages:

- Primary function retained => No special blocks – the secondary function of attractiveness for biodiversity is incorporated into the armour unit block – no loss of stability or risk of unstable components in the armour unit.
- Flexible textures and cavities to target species.
- Use of bio-sourced materials in the manufacturing process.



## Example of application of eco-designed blocks





<https://www.concretelayer.com/en>

