SeaArt

Long term establishment of SEAgrass ecosystems through biodegradable ARTificial meadows

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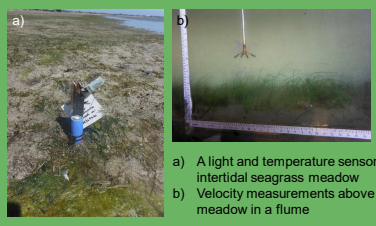
Establishing a purely natural seagrass meadow long-term

Seagrass meadows are important ecosystems which are under threat from human pressures including climate change. Counteracting the global decline with restoration is difficult as the absence of seagrass leads to enhanced hydrodynamic energy and turbidity levels which restrict seagrass growth.

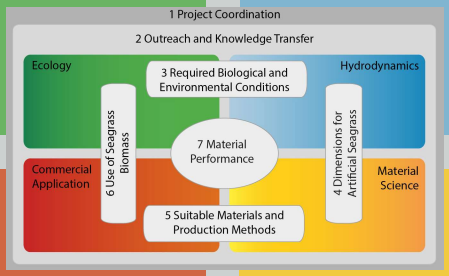
We are developing artificial seagrass (ASG) which provides suitable hydrodynamic and light conditions, and stabilises the sediment to allow natural seagrass to regrow more easily. We will use fully biodegradable materials to ensure that no potentially harmful non-degradable substances will be introduced into the system.

Defining required conditions

In field and laboratory tests, we will assess the conditions that seagrass needs to establish. These include light levels and the wave and current regime. For these conditions we will determine the optimal growth conditions and the limits beyond which it is too stressful for seagrass to survive.

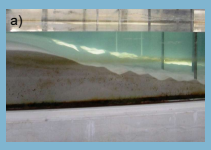


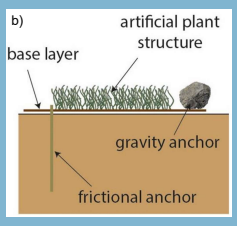
a) A light and temperature sensor deployed in an intertidal seagrass meadow
b) Velocity measurements above a seagrass meadow in a flume



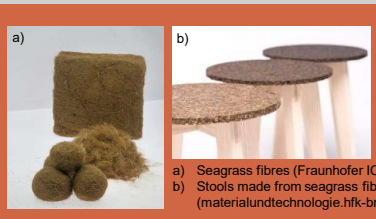
Designing natural looking ASG

We will design ASG which will provide good growth conditions for seagrass. Additionally, the ASG will look and move as similar to the natural seagrass as possible, to make it almost invisible. In addition, an anchoring system will be developed to ensure that the ASG stays in place, even under storm conditions.





a) Testing of sediment stability in a flume
b) Anchoring options for ASG that mimic natural seagrass



a) Seagrass fibres (Fraunhofer ICT)
b) Stools made from seagrass fibres (materialundtechnologie.hfk-bremen.de)

Exploring commercial application

It is anticipated that the ASG will be globally applicable in seagrass restoration projects. Therefore it has to be possible to produce an ASG prototype at large scale.

We will also explore how seagrass detritus can be used commercially, as it has long been part of beach management strategies. Our vision is to re-integrate detritus in the material used to produce parts of the ASG system to enable material cycling.

a) Biobased additives to colour biodegradable plastics (IfBB)
b) Injection moulding at IfBB

Engineering suitable materials

To achieve a fully natural seagrass meadow long term, we will produce the artificial structures from materials that disintegrate completely after a given time frame. The degradation behaviour of possible materials in the marine environment will be assessed and materials characterisation will evaluate their potential use as ASG.

For each part of the ASG an individual engineering concept (i.e. design, structure, function and demands) will be defined.

A field trial will be the next step

The direct exchange between academic research of different science disciplines and industrial partners is essential for the success of the project. Together we will produce a prototype during the second half of the project and test its performance and stability under controlled, yet extreme, conditions in a full scale flume experiment. These tests will build the foundation for a consecutive project which will deploy the ASG in a transplantation effort at a pilot field site.

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