





#### **Environmental Organic Chemistry and Technology (EnVoc)**

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# Identification of ecosystem services in an artificial reef and quantification of coastal protection

#### Ecosystem Services in the Coastbusters project

- Aim? Provide an overview and a first quantitative estimation of the benefits supplied by an artificial reef in the North Sea
- What? Ecosystem services describe the benefits our society gains from natural components and processes.
- Why? Analysing ecosystem services helps to evaluate the ecological/sustainable aspects of the project.
- How? Converting these services via different methods to monetary values.

Table 1: Expected tendencies of ecosystem services in the Coastbusters project.

Class	Services	Mussel	Flora	Sand Mason		
Provision	Nutrition	<b>1</b> 4	Possible for algae <sup>4</sup>	<del>-</del>		
	Materials	_	Possible for algae <sup>6</sup>	-		
	Energy	_	Possible for algae <sup>6</sup>	_		
Regulation	Climate	<b>1</b> 4	<b>1</b> 4	_7		
	Mediation of Waste	<b>^</b> 2,4	<b>1</b> 4	<b>1</b>	<b>^</b>	Positive tendency
	<b>Coastal Protection</b>	<b>^</b> 2,4	<b>↑</b> 3,4	<b>↑</b> <sup>7</sup>	<b>↓</b>	Negative tendency
Cultural	Intellectual	<b>^</b>	1	<b>1</b>	<del>-</del>	No impact  Expected
	Experimental	<b>1</b> 4	<b>1</b> 4	-		Measured



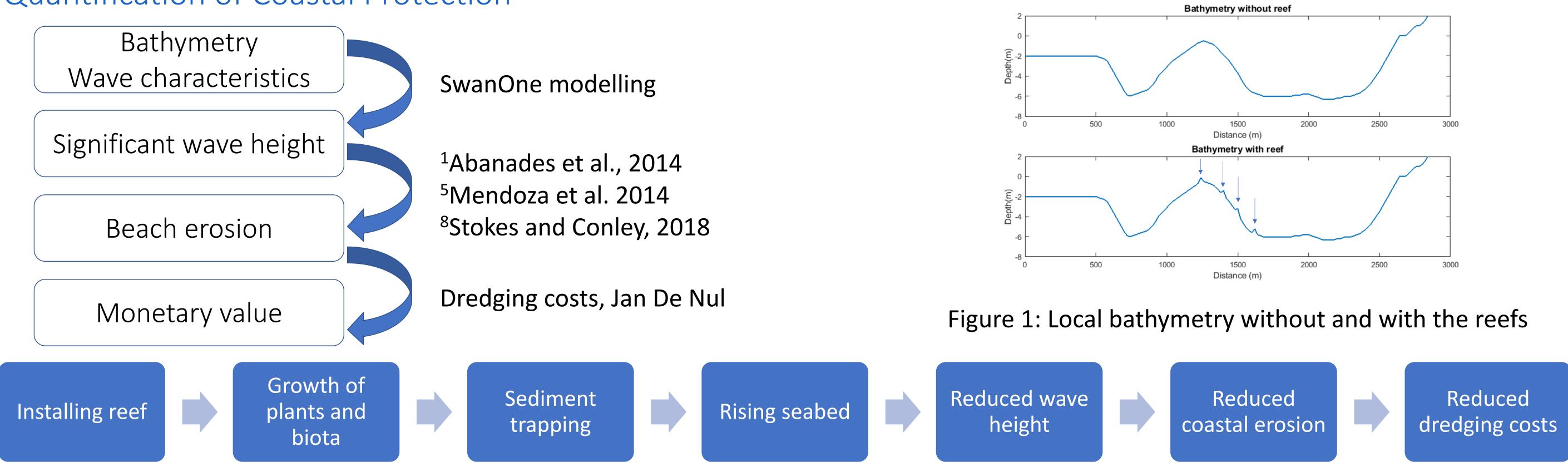


Figure 2: Expected effects chain within the Coastbusters project

### Conclusion and expectations

The reef provides other services than only coastal protection. Expected is that the reduced wave height will lead to reduced dredging costs

## nature based solutions:

like biogenic reefs

- improve water quality and clarity
- prevent erosion and stabilize shorelines
- are more **resilient** against storms
- reduce wave height up to 66% during storm events
- act as natural barriers to waves
- provide fisheries habitat, increase biodiversity and promote recreation
- store CO2



RESTORATION HYDRAULIC ENGINEERING
BIOBUILDERS BIODIVERSITY
NATURE CONSERVATION
STABILISATION
STABILISATION
STABILISATION
SEA LEVEL RISE
COASTAL DEFENSE
RECREATIONAL SPACE
NATURE BASED SOLUTIONS
CARBON SEGUESTRATION
WAVE ATTENUATION
SOCIETY
ECONOMY

ILVO, eCoast, DEME, Jan De Nul and Sioen industries have gathered forces to develop a new natural way of coastal protection. Coastbusters is a project financed by VLAIO Government Agency (Flemish Flanders Innovation & Entrepreneurship) where several tools for the creation of ecosystem based flood defense (shellfish reefs/marine flora reefs/sand mason worm reefs) will be tested. These ecosystems have the capacity to reduce erosion and even storm waves and can keep up with sea-level rise by natural accretion. If the project is successful, it can be implemented globally on a large scale, creating healthy ecosystems and protecting many of the world's highly populated coastal zones.





<sup>7</sup>Rabaut, M., Vincx, M., and Degraer, S. (2009). Do lanice conchilega (sandmason) aggregations classify as reefs? quantifying habitat modifying effects. Helgoland Marine Research, 63(1):37–46.

8Stokes, C. and Conley, D. C. (2018). Modelling offshore wave farms for coastal process impact assessment: Waves, beach morphology, and water users. Energies, 11(10).







