



# THE 30<sup>th</sup> IAPH WORLD PORTS CONFERENCE

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## Ecosystem Services: Towards integrated Marine Infrastructure Project Assessment

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Part 1, Session 1

Enabling Trade. Energizing The World

# INTRODUCTION



- Educating
- Informing
- Promoting
- Networking
- Connecting



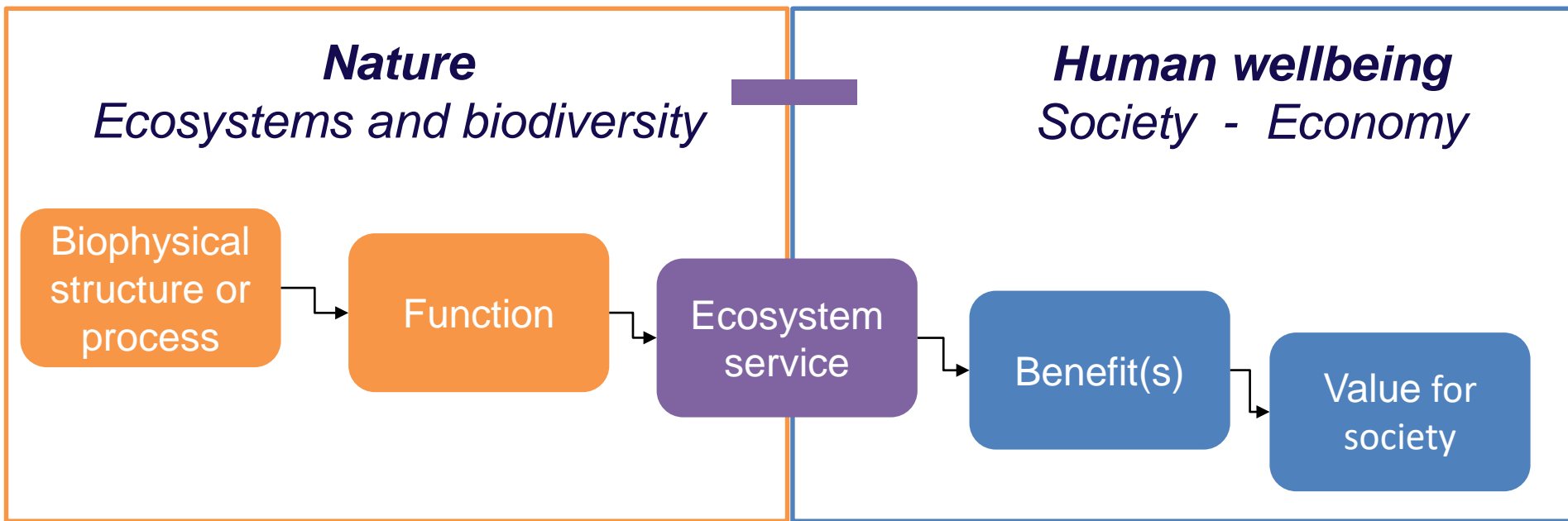
[www.iadc-dredging.com](http://www.iadc-dredging.com)

# WHY ECOSYSTEM SERVICES



# ECOSYSTEM SERVICES CONCEPT

“The benefits that humans derive from nature”





Demonstrate how the concept of ecosystem services can contribute to an integrated assessment of marine infrastructure project



# ECOLOGICAL FUNCTIONING VERSUS ECONOMY

“Goods and Services”  
(Costanza et al., Nature 1997)

Habitat	Value per ha (\$/ha/y)	total value (\$/y x 10 <sup>9</sup> )
Sea	577	20.949
Estuaries	22.832	4.110
Land	804	12.319
Forest	969	4.706
Wetlands	14.875	4.879
Arable land	92	128
Total		33.268

# ES IN THE DREDGING INDUSTRY

<b>Step 1</b>	Changes in habitat and land use (before vs after)
<b>Step 2</b>	ES analysis per habitat 1. International literature → potential ES 2. Project specific (EIA) → selection relevant ES
<b>Step 3</b>	Description of relevant ES (incl. biodiversity) and mechanisms driving the delivery
<b>Step 4</b>	Qualitative, quantitative and/or monetary assessment (depending on available data)

# BOTANY BAY PORT EXTENSIONS, SYDNEY, AUSTRALIA



- 2011
- 60 hectares of reclaimed terminal land
- construction of 1.85 km of shipping wharves with deep water berths



- Penrhyn Estuary Habitat enhancement
- Foreshore beach development



# BOTANY BAY, HABITAT AND LAND USE, BEFORE AND AFTER

Bay: -60 ha



Quay: +1850m

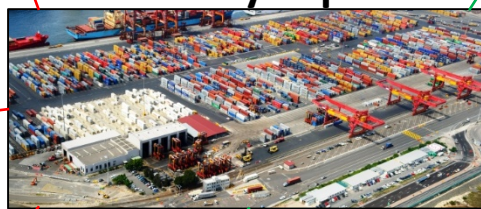
Rock rubble: +2 ha



Mangrove: -1 ha



**Port Botany Expansion**



& Foreshore beach development  
& Penrhyn Estuary Habitat enhancement

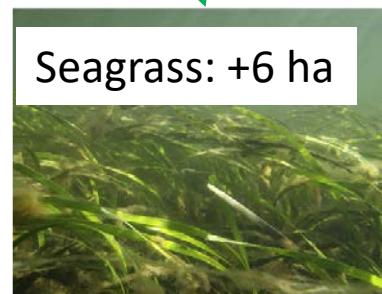
Shrub: -11 ha



Saltmarsh: +2 ha



Seagrass: +6 ha



Intertidal sand  
and mudflats: +8.3 ha



# RESULTS ES-ASSESSMENT

Qualitative, quantitative and/or monetary assessment

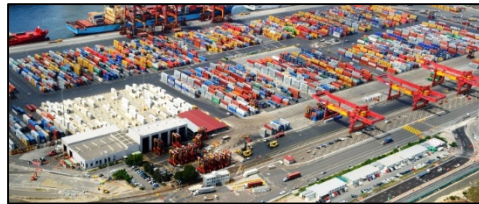
## Opportunities for transportation

+8,000 TEUs/y port capacity

## Recreation

Enhanced with  
the recreation  
plan

## Port Botany Expansion



## Fish production

Increase nursery  
area

## Biodiversity

Positive impact on  
shorebirds is  
expected

## Sedimentation /erosion regulation

Capacity:	
+3350 m <sup>3</sup> /y	

## Climate regulation

Capacity:	
-56 tonC/y	-12,320 €/y

## Water quality regulation

Capacity:	
-2,223 kgN/y +120 kgP/y	-82,277 €/y

## Air quality regulation

Capacity:	
-312 kgPM <sub>10</sub> /y	-18,848 €/y

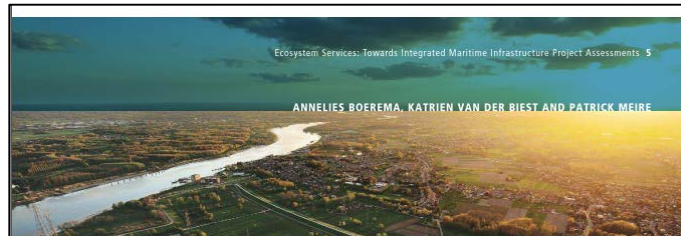


# Would this also work in the tropics?



# CONCLUSION

<http://www.iadc-dredging.com/en/371/environment/ecosystem-services>



## Ecosystem Services concept:

- Early stakeholder involvement
- Impacts and benefits
- Discussion based on arguments instead of gut feeling

those in the maritime sector, are in the process of applying ES to evaluating their processes of manufacturing and delivering products.

To that end, the Ecosystem Management Research Group (ECORE), Department of Biology, University of Antwerp, Belgium and the International Association of Dredging Companies (IADC) have joined forces to explore the subject as regards dredging. This article is the first result of that research. The aim of this joint effort is to show that with the use of ES a more integrated evaluation of the consequences of maritime infrastructure projects can be achieved. The presented method of ES evaluation is applied to a dredging-related case study: tidal marsh restoration in the Polders of Krabbeke, located in the Zeeland, the Belgian part of the tidal River Scheldt.

The authors would like to acknowledge Stefaan Nollé, project engineer of the Polders

2010). There are different types of ES which result in different benefits for human well-being, such as security, basic materials for a good life, health and good social relations (Figure 1). The different types of ES are:

- provisioning services (e.g., food, wood),
- regulating services (e.g., air quality regulation, water quality regulation) and
- cultural services (e.g., opportunities for recreation, cultural heritage).

Furthermore, biodiversity and supporting services are an underlying group of ecosystem

Above: One benefit of Ecosystem Services is addressing the challenges of flooding. In the Polders of Krabbeke in Belgium, a new dike will be built land inwards (the horizontal line in the middle going from the River Scheldt to the right). This new ring dike should protect the houses just outside the site when the flood area fills during storm tide.

changes have for the ecosystem benefits to humans.

To illustrate the significance of the application of ES evaluation to the maritime sector, a dredging-related case study – tidal marsh restoration in the Polders of Krabbeke, located in the Zeeland, the Belgian part of the tidal River Scheldt – is presented.

### ECOSYSTEM SERVICE EVALUATION FOR INTEGRATED PROJECT ASSESSMENT

Ecosystem service evaluation could be used as a method for an integrated assessment of specific maritime and dredging projects. The method consists of four basic steps (Table II):

- In step 1, the different habitat types that are affected by the project are identified.
- In step 2, all ES delivered by those habitat types are identified and the relevant ES for the specific project selected.

## ECOSYSTEM SERVICES

(ECOBE 016-R190)



Ecosystem Management  
Research Group (Ecobe)  
University of Antwerp

