

Review on land use considerations in LCA: methodological perspectives for marine ecosystems

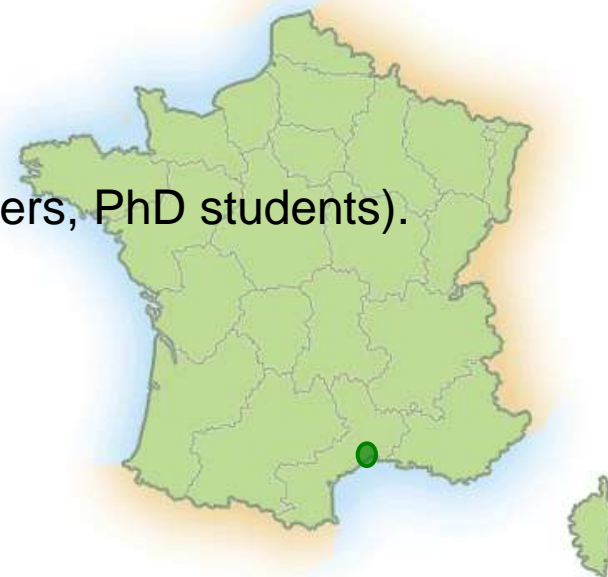


J. Langlois, A. Hélias, P. Fréon, J.P. Delgenes, J.P. Steyer

ELSA research group (<http://www.elsa-lca.org>)

■ Regional platform

- ⇒ Area of Montpellier, France
- ⇒ 5 French research institutes and universities
- ⇒ 26 members (professors & associate, researchers, PhD students).



■ Fields of competence

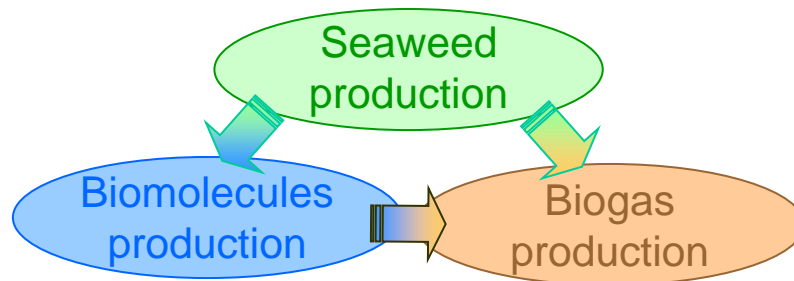
- ⇒ Environmental & Social LCA, industrial ecology
- ⇒ Agro-bioprocesses : bioenergy, waste treatment, crop production, tropical productions



Ecodesign within the WinSeaFuel's project

- A collaborative research project

2010  2013



- Ecodesign

- ⇒ Environmental impacts (LCA)
- ⇒ **Which impacts of marine space occupation and transformation ???**

 Build a Sea Use impact category



Land Use: definitions

- Impact category: use of space for human activities
 - ⇒ Space = resources
 - CML: every areas are equivalent ($m^2.yr$)
 - ReCiPe midpoint: several categories ($m^2.yr$ or m^2)

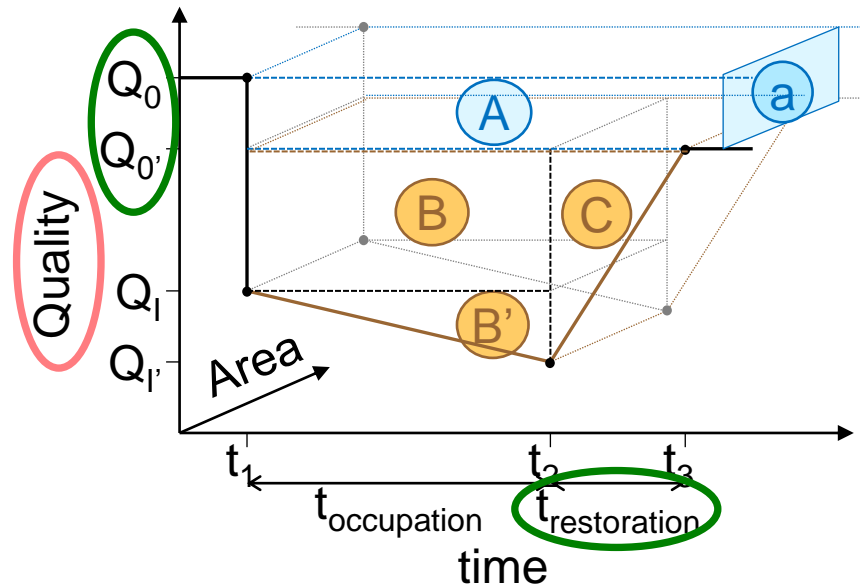
⇒ Competition

- ⇒ Space = support for ecosystemic services
 - ReCiPe endpoint & EcoIndicator99: biodiversity ($PDF.m^2.yr$)
 - Ecological scarcity 2006, Impact 2002+

⇒ Quality change

- Inventory data

Land Use: framework



$$I_{transf} = \text{section (a)}$$

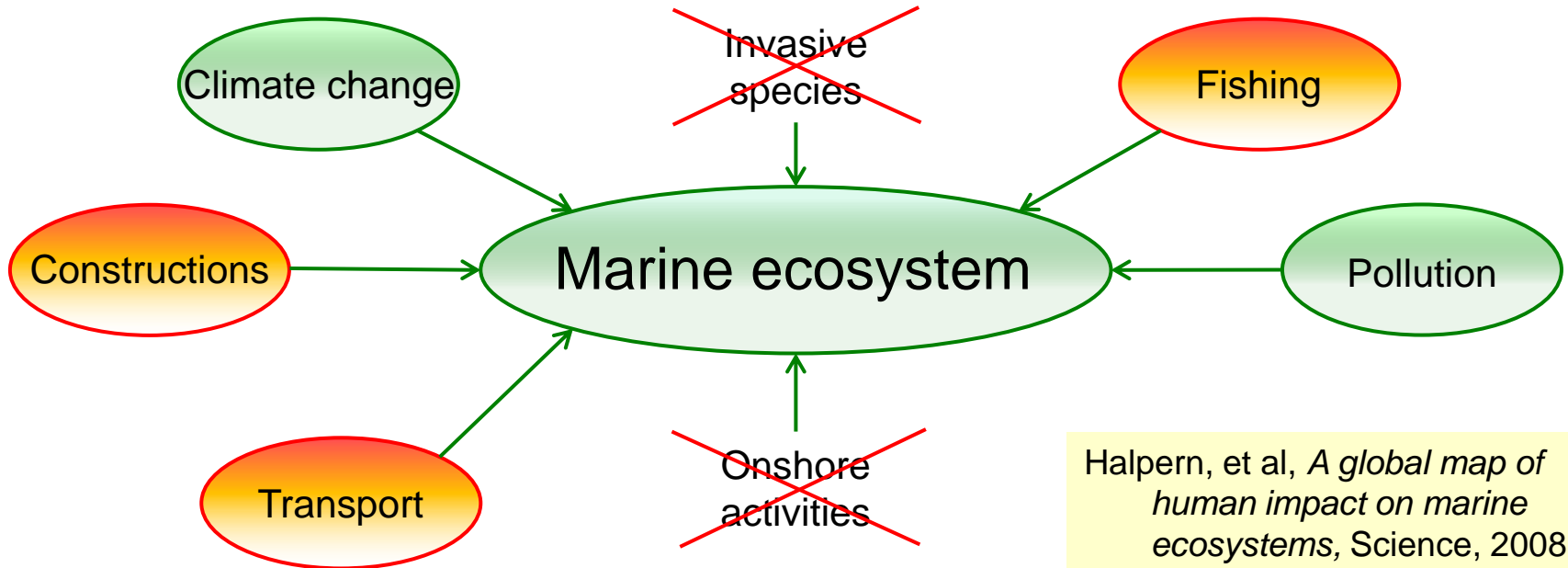
$$I_{occ} = \text{Volumes (B), (B') et (C)}$$

for each activities & ecosystems

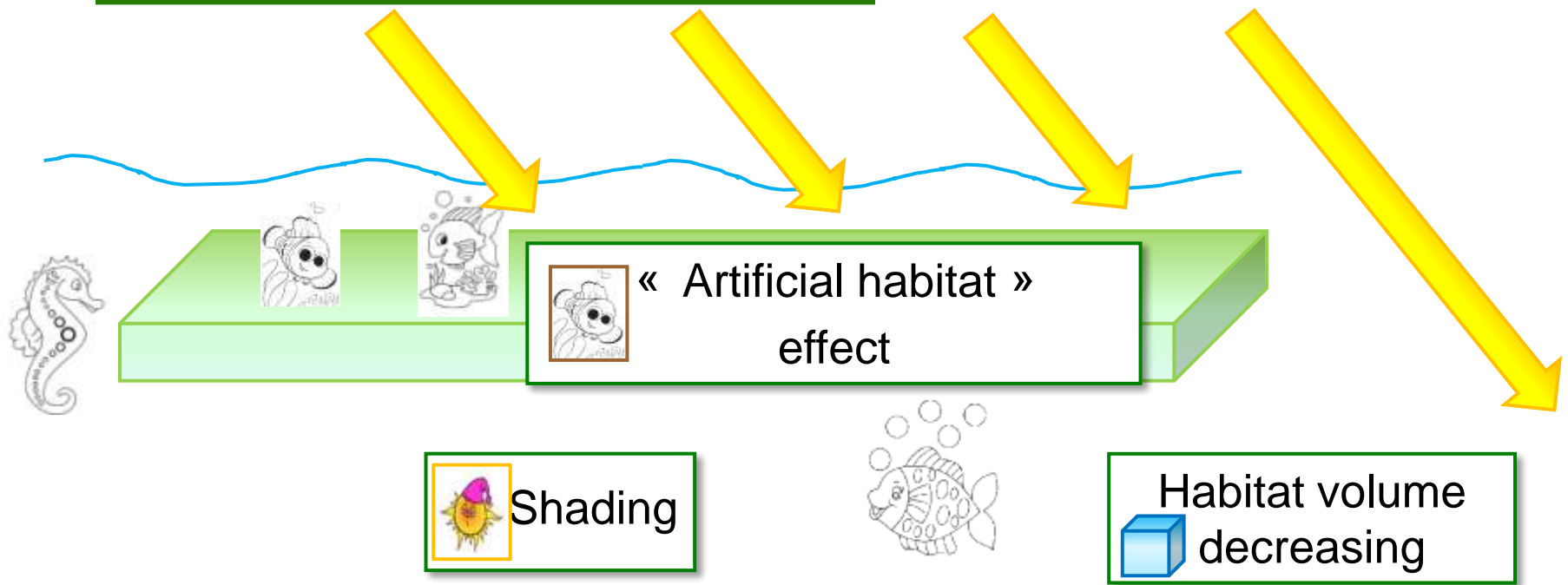
Mila i Canals, Romanya, Cowell, 2007

- Typology for activities & ecosystems
- Importance of the reference choice
- Ecosystem quality assessment: for which ecosystemic functions?
 - ⇒ Biodiversity
 - ⇒ Biomass production potential
 - ⇒ Resilience

Human effects on marine ecosystems



Impacts of a floating construction (photic zone)

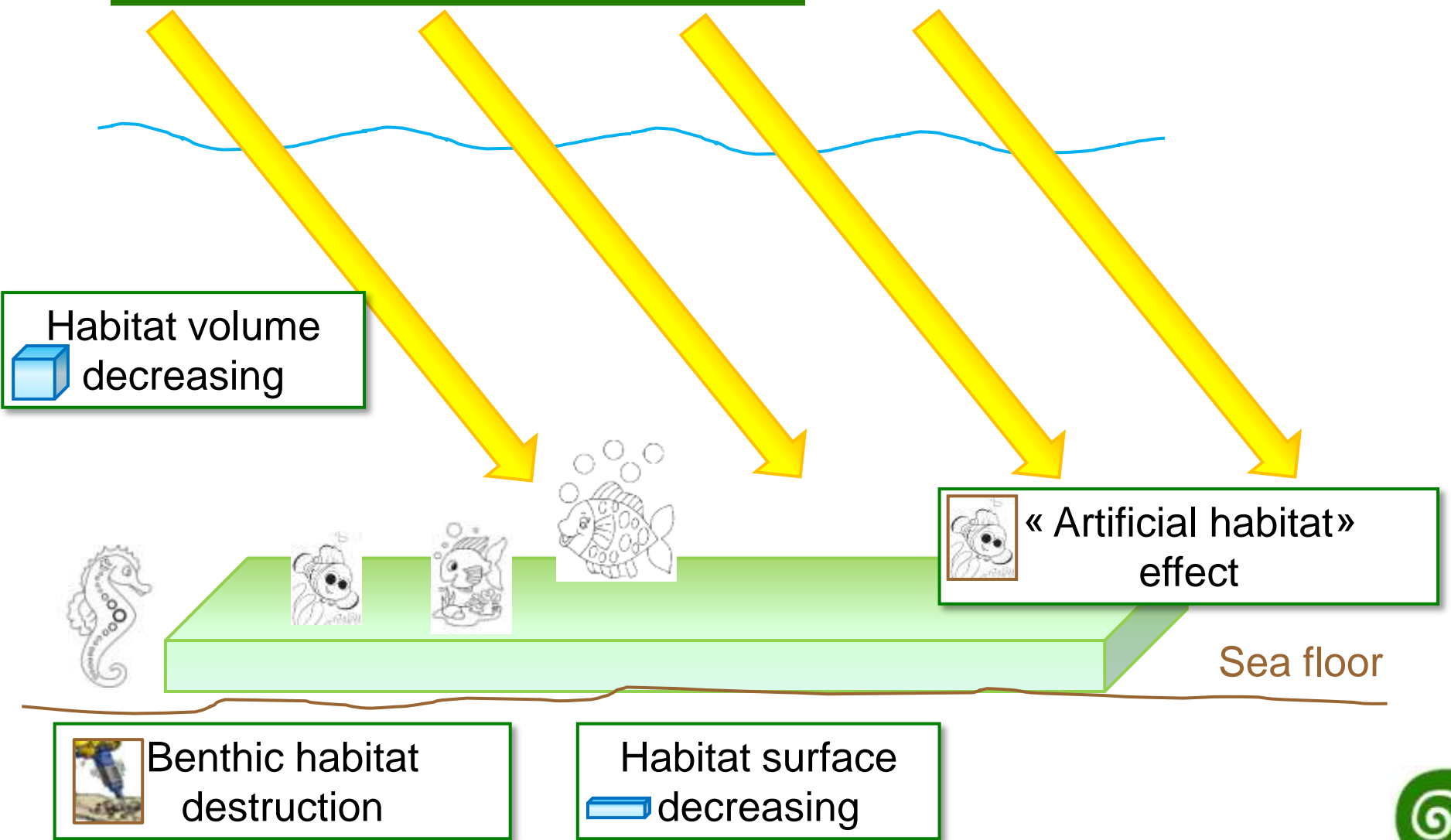


Photic zone

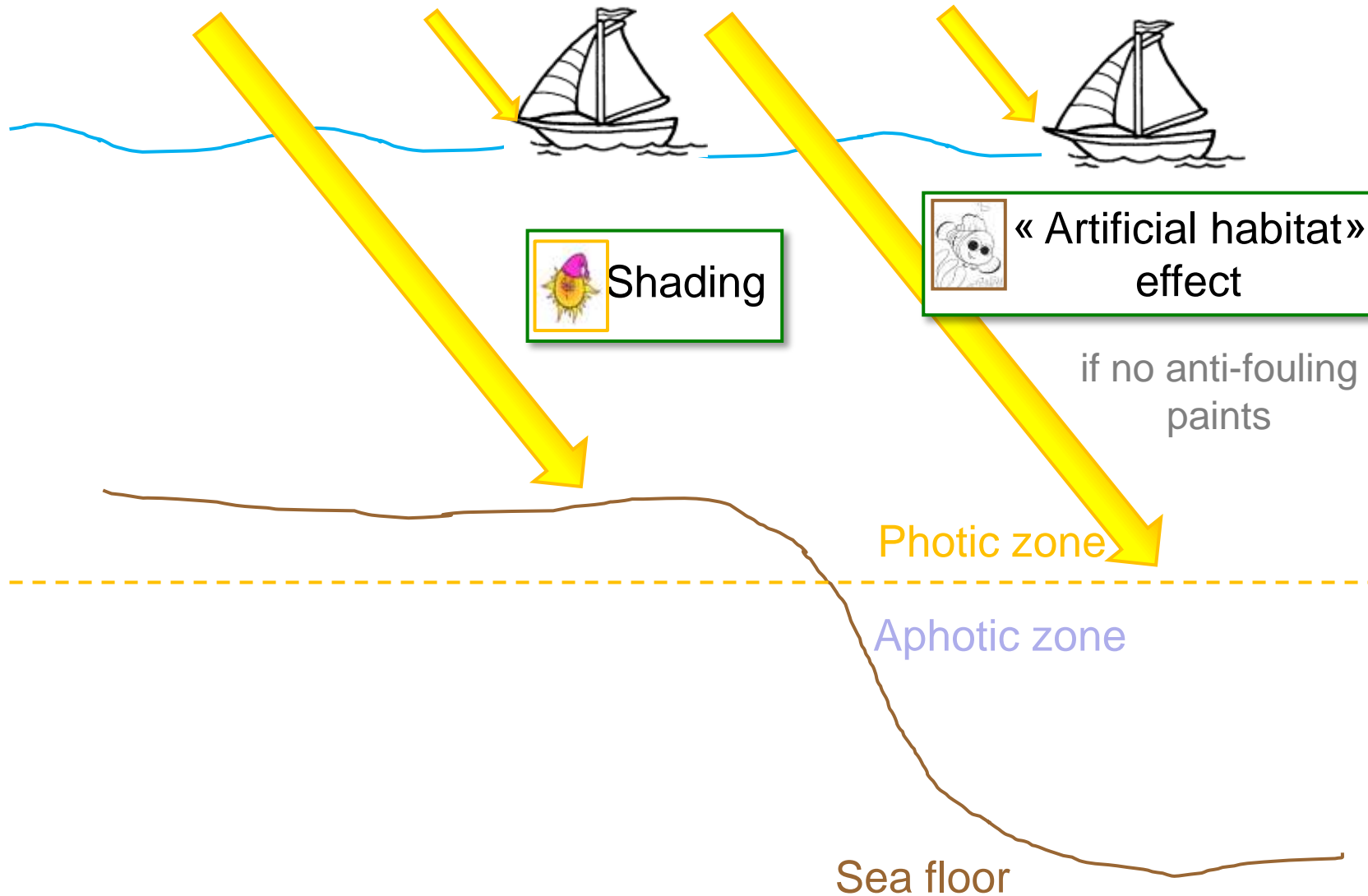
Aphotic zone

Sea floor

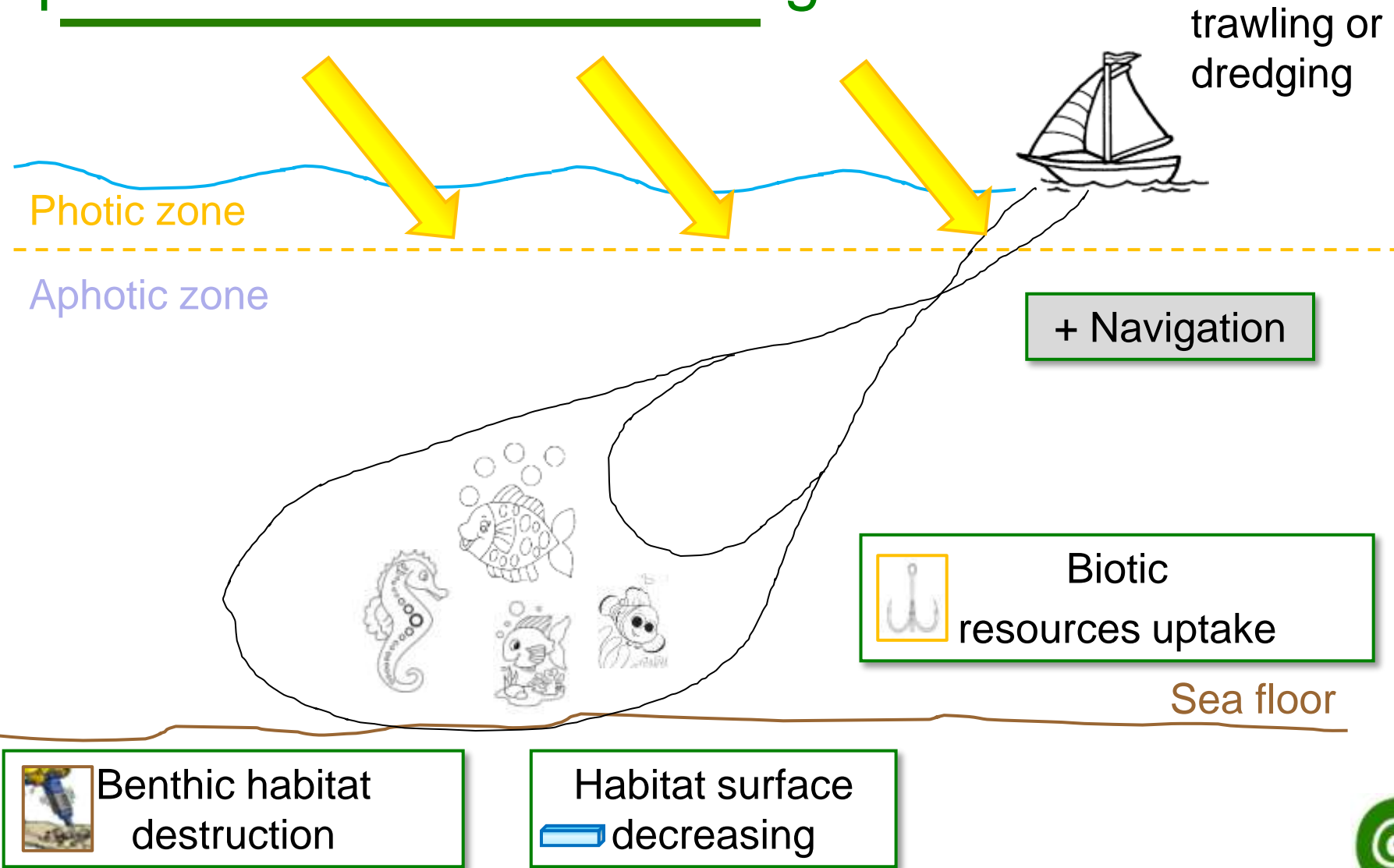
Impacts of an anchored construction



Impacts of navigation



Impacts of destructive fishing



Synthesis for impacts

	Benthic zone		Pelagic zone	
	Photic	Aphotic	Photic	Aphotic
Anchored construction				
Floating construction (aphotic)				
Floating construction (photic)				
Navigation				
Destructive fishing				
Non-destructive fishing				
Aquaculture				



Sea floor destruction
Artificial habitat



Creation/destruction
benthic habitat



Habitat volume change



Habitat surface change



Habitat quantity



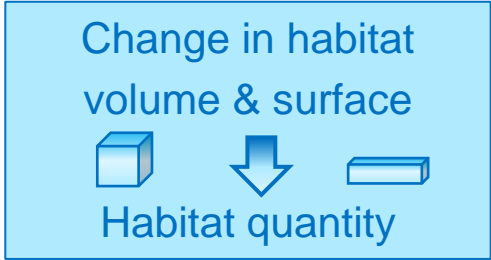
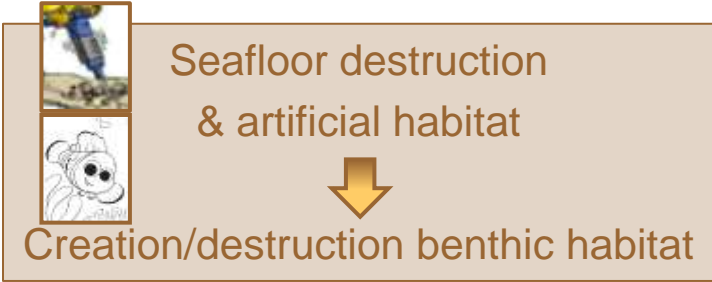
Shading

Biotic resources uptake



Biomass growth

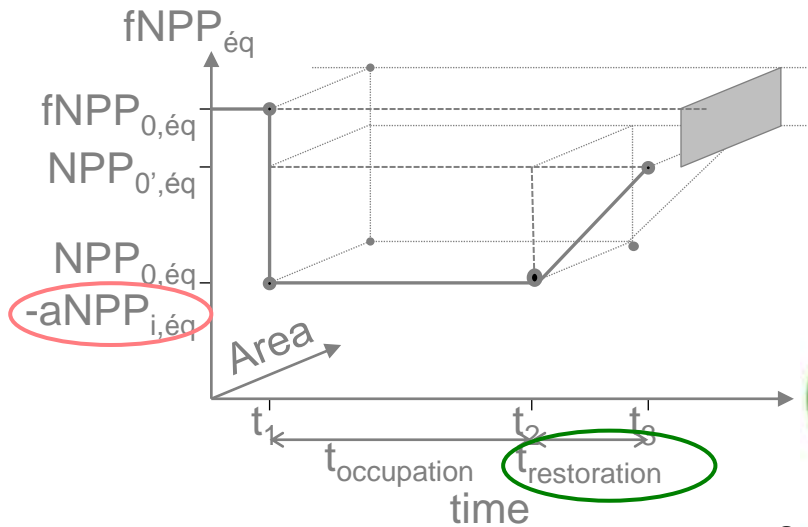
Which common measurement ?



- Specific indicators for fishing activities
 - ⇒ Fishing Intensity Index (FII): marine habitat recoverability (time)
 - ⇒ Appropriation of Net Primary Production (aNPP): exported $C_{equivalent}$

Applicability of aNPP for other activities?

- quantity of avoided biomass
- quantity of uptaken biomass
- quantity of avoided biomass
- quantity of additional biomass
- proportion of the total biomass in a given ecosystem?



Conclusion

- Perspectives for the rest of the task
 - ⇒ Typology of marine ecosystems & activities
 - ⇒ Generic methodology for characterisation factor calculation

- Limits to explore more deeply
 - ⇒ Noise / electromagnetic waves
 - ⇒ Sedimentation
 - ⇒ Invasive species
 - ⇒ Scarcity / vulnerability

- Advantages of the general methodology
 - ⇒ Habitat change & overexploitation of biotic resources
 - ⇒ Remote sensing
 - ⇒ Midpoint

- Data availability as the next limitation

- To be continued...



Thank you for your attention!



Questions ?