

Clusters for Innovation

SUMES project Sustainable Marine Ecosystem Services

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PARTNERS AND TIMELINE



+ STRATEGIC ADVISORY BOARD + SCIENTIFIC ADVISORY BOARD

Project started 01/10/2020 and ended 31/01/2024 \rightarrow 3 years, 4 months

MAIN GOAL

Quantitative sustainability impact assessment method of human activities in Belgian part North Sea

- **positive effects** (e.g. ES and its socio-ecological value)
- negative effects (damages to the natural environment)
- both local and global level

In order to support sustainable Blue Growth



CASE STUDIES

The SUMES methodology has been tested on two case studies:

- Selected in collaboration with the SAB
- Single use: offshore wind energy
 - ightarrow collaboration with concession holder



- Multi use: offshore wind energy + offshore mussel farming

 \rightarrow collaboration with concession holder + ((inter)national experts)



LOCAL MARINE IMPACTS

Understanding which ES are relevant for the Belgian part of the North Sea

Method *Custodio et al. (2022)* :

1. ES literature



5. Connect to human activity

Туре Ecosystem Service (aggregated at the CICES Group or Class levels) Provisioning ES (biotic and abiotic) Surface for navigation Sand and other minerals Renewable offshore energy Regulating & maintenance ES Mediation of wastes (biotic and abiotic) Coastal protection

2. Relevant ES for North Sea





3. Stakeholder workshop





LOCAL MARINE IMPACTS



LOCAL MARINE IMPACTS

For each ES:

- Better understanding and quantification of underlying mechanisms and link between marine ecosystem parameters, functions, structures and processes.
- ightarrow need for different data, models and indicators
- Gaining insight in the demand of ecosystem services delivered by the North Sea and the coupling with supply.





ES EXAMPLE MEDIATION WASTE

Excess of nutrients, e.g. Nitrogen \rightarrow *Indicator*: Nitrogen removed from the marine system per year (ton N y⁻¹)

Denitrification plays a critical role in the regulation of waste.

The model of Toussaint et al. (2021) empirically estimates sediment denitrification :

- abiotic sediment characteristics (total organic matter and fine sediment fraction);
- macrobenthic community traits (irrigation rate and irrigation potential)

Denitrification rate in soft sediment surrounding the turbines = 2.71 + 1.40 TOM + 0.10 x FSF - 0.27 x IrrigationRate - 1.09 x 10⁻³ x IPc Expressed in mmol N.m⁻².d⁻¹

ES EXAMPLE MEDIATION WASTE



ES EXAMPLE MEDIATION WASTE

Demand side \rightarrow *Indicator*: Loadings of total N from the river Scheldt to the North Sea (ton N y⁻¹)



Mining



Blade manufacturing



GLOBAL IMPACTS

Blade landfill

GLOBAL IMPACTS

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Impact assessment method used: ReCiPe 2016 (H)

Monetized **AREAS OF PROTECTION** MIDPOINT IMPACT CATEGORY **AREAS OF PROTECTION** Global warming Natural Resources Natural Resources Stratospheric ozone depletion (€) (\$) Human carcinogenic toxicity Water consumption Land use **Ecosystem Quality** Ecosystem Quality (€) Fossil resource scarcity (species.yr) • *Etc.* Human Health Human Health (DALY) (€)

LCA method not designed to quantify ES changes along the value chain

VALUE CHAIN PROCESSES



LOCAL TERRESTRIAL IMPACTS

Land use as driver to cause terrestrial ES changes (Review De Luca et al., 2022)





Ecosystem Services Valuation Database (De Groot et al., 2020)

SUSTAINABILITY IMPACT ASS. MODEL

2. Local terrestrial ES



See Taelman et al. (2023) for more details

RESULTS SINGLE USE CASE

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More info De Luca et al. (2023)

RESULTS MULTI-USE CASE

LCA results ready

- including hotspot analysis and joint transportation scenarios
- benchmarking with nuclear energy and pork production
- uncertainty analysis to test robustness
- Marine ES results ready

LCA + all ES results

In progress, submission expected in March 2024

Taken from De Luca et al. (submitted)

SUMES WEBSITE AND OUTCOMES

Sumesproject.be/en							☆	ABP	6	6
	About SUMES	Advisory Boards	Partners	Modelling & Framework	Dissemination	Contact				
									NL	EN

- 9 open access deliverables (+ one to come)
- 5 open access peer-reviewed scientific publications (+ one submitted, one in prep.)
- the IMIS catalogue storing background data

TAKE HOME MESSAGES

- New sustainability impact methodology undergone peer-review
 - Environmental impacts at the local (both marine and terrestrial ES) + global level
 - Value chain perspective
 - Aggregation through monetization
 - o Both benefits and burdens (Handprint vs. Footprint)
- Relative comparison with benchmarks possible
- Assessing joint activities possible
- Reproducable to other activities/regions (for most underlying models, if local data is available)
- Data-intensive, requires skilled personnel
- Still scientific work needed for full integration of ES in LCA
 - Rethinking ES modelling towards cause-and-effect
 - Addressing more ES?
- User-friendly tool, to aid decision support?

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Thanks

SUMES PROJECT

