

Topics for Master- and Bachelor-Theses 2022

IOW, Coastal & Marine Management Group

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➤ **Ecosystem Service provision of changing coastal seas**

Ecosystem services are the benefits people obtain from ecosystems. Individual and expert group based assessment methods, as well as different Ecosystem Service concepts (potential/demand) will be applied using a wide range of data (monitoring, maps, literature, expert knowledge)

- **Heavy storms** - comparative assessment how recent extreme storms affected the coastline and the Ecosystem Service provision
- **Dredging of waterways** – Assessment how the dredging and dumping of sediments as result of shipping channel deepening affects ecosystems and Ecosystem Service provision
- **Human intervention in the sea** – Analysis of selected new or planned investments and their impact on Ecosystem Service provision in the coastal sea
- **Bathing water quality** – how do new human pathogens (e.g. vibrio) or an increased awareness of infection risks due to new monitoring methods affect the Ecosystem Service provision of southern Baltic Bathing waters, taking into account possible future changes due to climate change
- **Recovery of macrophytes** – consequences of the wide-spread re-settlement of macrophytes along the southern Baltic waters on ecosystem service provision
- **Invasive species** – invasion of the round headed goby (benthic fish) in southern Baltic waters. Consequences of the destruction and modification of benthic ecosystems on the provision of benthic ecosystem services
- **Jellyfish invasions** - Consequences of jelly fish invasions on the provision of coastal ecosystem services, taking into account future changes due to climate change
- **Destruction by fisheries** – analysis of the consequences of bottom touching fisheries on benthic habitats, the provision of ecosystem services and nature protection
- **Temporal hypoxia** - Consequences of temporal oxygen depletion above the sediments on benthic flora and fauna and the provision of coastal ecosystem services, taking into account future changes due to climate change
- **Extreme years** – comparative assessment how recent extremely warm years differ from common years with respect to Ecosystem Service provision
- **Ecological water quality and its management**
- **Anti-eutrophication measures** – compilation of possibilities and limitations of nutrient retention and anti-eutrophication measures in coastal waters. An analysis based on case studies, existing literature and long-term monitoring data

- **Eutrophication management via silicate** – assessing the role of silicate as limiting element in the Oder Lagoon, changes during the last decades, consequences for the ecosystem and eutrophication management. An analysis based on long-term monitoring data data
- **Development of cyanobacteria in the Oder Lagoon** – did the ongoing long-term reduction of nutrient loads into the lagoon affect composition and abundance of cyanobacteria, is there a likelihood that loads reductions are compensated by atmospheric N-fixation and is there any evidence of toxic species and toxin production?

- **Advanced technologies for coastal water monitoring and management**

- **Geo-Information Systems (GIS) and marine litter pollution** - provision of maps based on marine litter data of the Warnow estuary. It includes emissions into the Warnow estuary, sea floor pollution and integrates model simulations. The maps serve as basis for management and mitigation measures.
- **Flying and underwater drones for coastal mapping and monitoring** – possible applications are underwater vegetation, marine litter in harbours, mussel beds, and beach wrack
- **Development and application of marine litter monitoring technologies**
- **Assessment of marine litter mitigation measures**
- **Development of a decision support tree for single use plastic alternatives**

- **Marine litter pollution in North African countries**

Each topic will be carried out in one of the countries: Morocco, Algeria, Tunisia or Egypt. It requires a stay over weeks in one of the countries. The stay will be funded by our project. A local partner university will serve as co-operation partner. Arabic or French would be beneficial, but is not a must.

- **Meso- and macro-litter monitoring at remote beaches** - In Europe and many countries worldwide the OSPAR 100m beach litter monitoring method is the standard to assess the pollution of beaches with litter items above a size of 25 mm. The rake method is applied to assess the pollution of beaches with litter items between 25 and size of 2-3 mm (meso litter size fraction). Both methods shall be applied at several remote beaches (without seasonal cleaning) to identify the state of pollution as well as spatial and temporal gradients. The gathered data should allow the creation of a list of most common items, the identification of indicator items, the assessment of pollution pathways and sources and shall serve as basis for general mitigation measures.
- **Meso- and macro-litter (plastics) monitoring at urban beaches** - In the Baltic Sea region, the rake method is applied to assess the pollution of beaches with litter items between 25 and size of 2-3 mm (meso litter size fraction). This method shall be applied especially at urban beaches where seasonal macro-litter beach cleaning takes place. This method is complemented by surveys on macro litter. This means the amount and composition of

the daily collected litter during cleaning activities will be assessed. Aims are the identification of the state of pollution as well as spatial and temporal gradients. The gathered data should allow the creation of a list of most common items, the identification of indicator items and shall serve as basis for local mitigation measures.

- **Marine plastic monitoring in harbors** – Tasks are to develop and apply a method that allows the assessment of plastic in sport boat harbors. It covers floating plastics and plastics on the sediment. The latter shall be assessed with an underwater camera applied below the water surface, because the water transparency in Mediterranean sport boat harbors is usually high. Aims are a pollution state assessment, the identification of pollution hotspots, indicator items, land- and sea-based pollution sources as well as the development of mitigation measures.
- **Marine litter: perception and solutions** – task is to assess the perception of local people as well as national and international tourists with respects to marine litter pollution at beaches. This shall be done based on a survey with above 100 persons in selected seaside resorts and coastal cities. Additionally, interviews with local stakeholders, decision makers and managers as well as a compilation and analysis of existing peer reviewed and grey literature shall provide key data on local state, problems and challenges with respect to waste management at the coast. Based on these results, tailor-made mitigation strategies shall be developed, taking into consideration the cultural and social context.
- **Marine litter: Ecosystem service assessments** – Assessment how the pollution of beaches and coastal waters with marine litter affects their provision of ecosystem services for human. This topic is based on data as well as views of tourists and local people.
- **Marine plastic monitoring in beach wrack** - beach wrack refers to organic material (e.g. seagrass, shells) deposited at high tide or after storms usually at beaches. This organic material often is polluted with plastics, because both have comparable densities and floating properties. Therefore, plastics in beach wrack can be used as indicator for sea-borne plastic pollution. A method for monitoring beach wrack shall be tested to get insight into volume, species composition and age of the organic material as well as the composition and concentration of plastics in it. Aims are to identify the state of pollution as well as spatial and temporal gradients. The gathered data should allow the identification of indicator items, the assessment of pollution sources and shall serve as basis for general mitigation measures.
- **Environmental labels as motivation to reduce litter** - Compilation of existing coastal environmental labels such as the “Clean Coast Index”, “Blue Flag” or “OurCoast”. In depth analysis to what extent, they may support local litter emission reduction and may help to promote environmentally friendly management. Analysis of these labels and their suitability for and applicability in the North African target countries in general and in the pilot areas specifically. Concrete discussions with local stakeholder and tourism association about the application of labels in the pilot areas. Beside the coastal environmental label, labels for hotels and tourism cities, such as “Plastik-freie Stadt”, "plastic-free" will be considered.