BaltCoast

12 – 15 April 2015, Project kick-off meeting
at Baltic Sea Research Institute (IOW)
Warnemünde, Germany

Workpackage 5.1

Case study site - Oder/Szczecin Lagoon

BONUS

Eco-technologies to support eutrophication management and local development: Oder/Szczecin Lagoon

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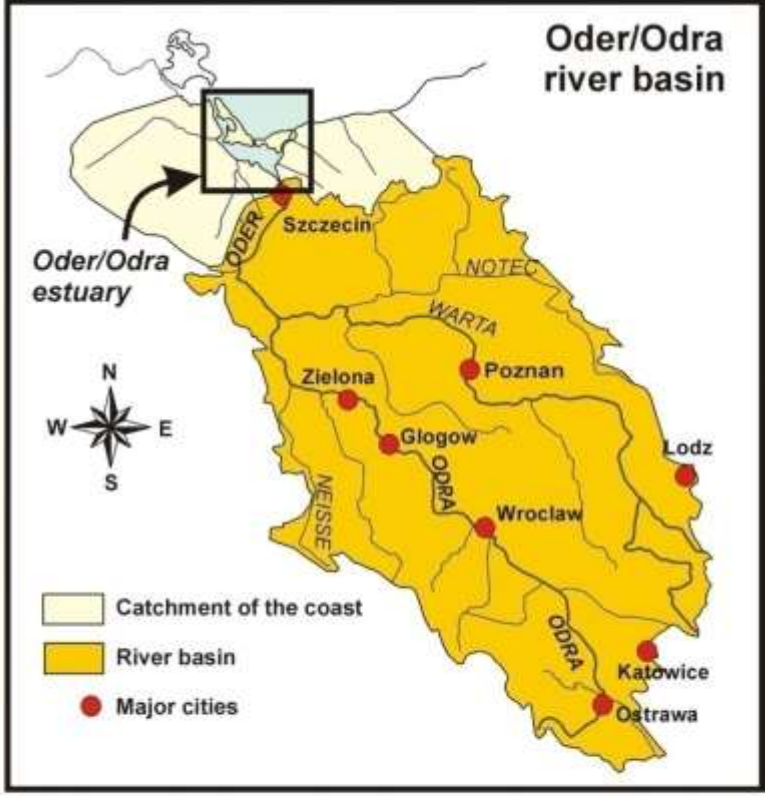
The Oder/Odra river–coast –sea system



Oder/Odra river basin

Length (km):	854
Catchment (km²):	118,000
Discharge (m³/s):	530 (average)
Population (Mio):	15.4

Oder/Odra estuary

Catchment (km²):	8000
Lagoon area (km²):	687
Lagoon depth (m):	3.7 (average)

Coastal climate:

Temperature (°C):	8.7 (average)
Precipiation (mm):	550

Tourism
at the Oder Lagoon

Oder/Szczecin Lagoon

Schernewski (2008)

Eutrophication and algal blooms in the Oder Lagoon

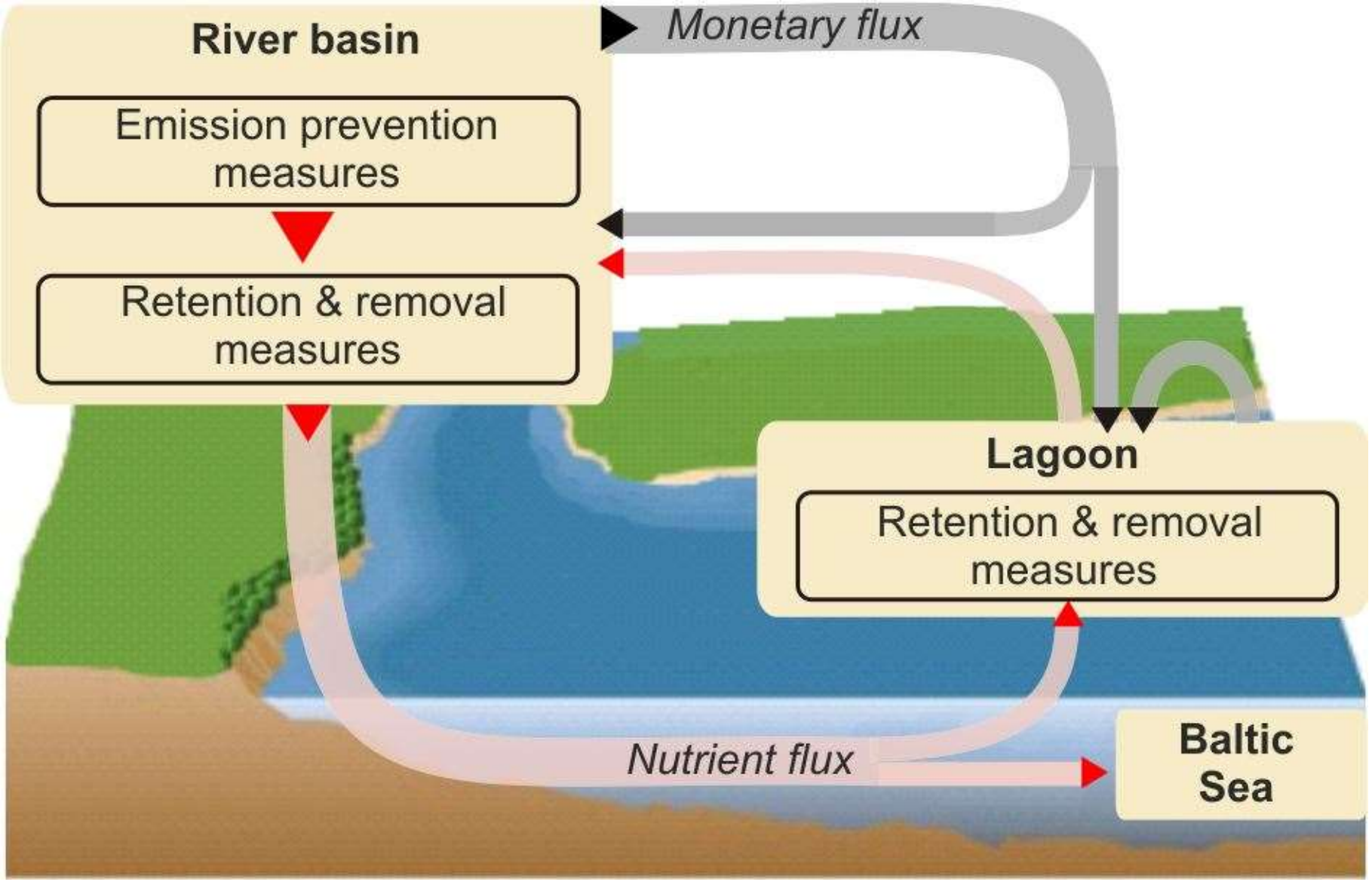
Schernewski
(2000, 2001)

Hypoxia in the Oder Lagoon

Zettler (1999)

Oder Lagoon in May 2000 (Schernewski 2000)

Integrated approach to eutropication management



Internal measures to improve water quality

Biological:

- Mussel cultivation
- Enlargement of natural mussel beds
- Bio-manipulation (selective fisheries)
- Macro algae cultivation
- Enlargement and management of macrophyte areas

Mechanical:

- Groin rows to support sedimentation
- Dredging of sediment and dumping on land
- Sediment capping to prohibit nutrient release from sediments

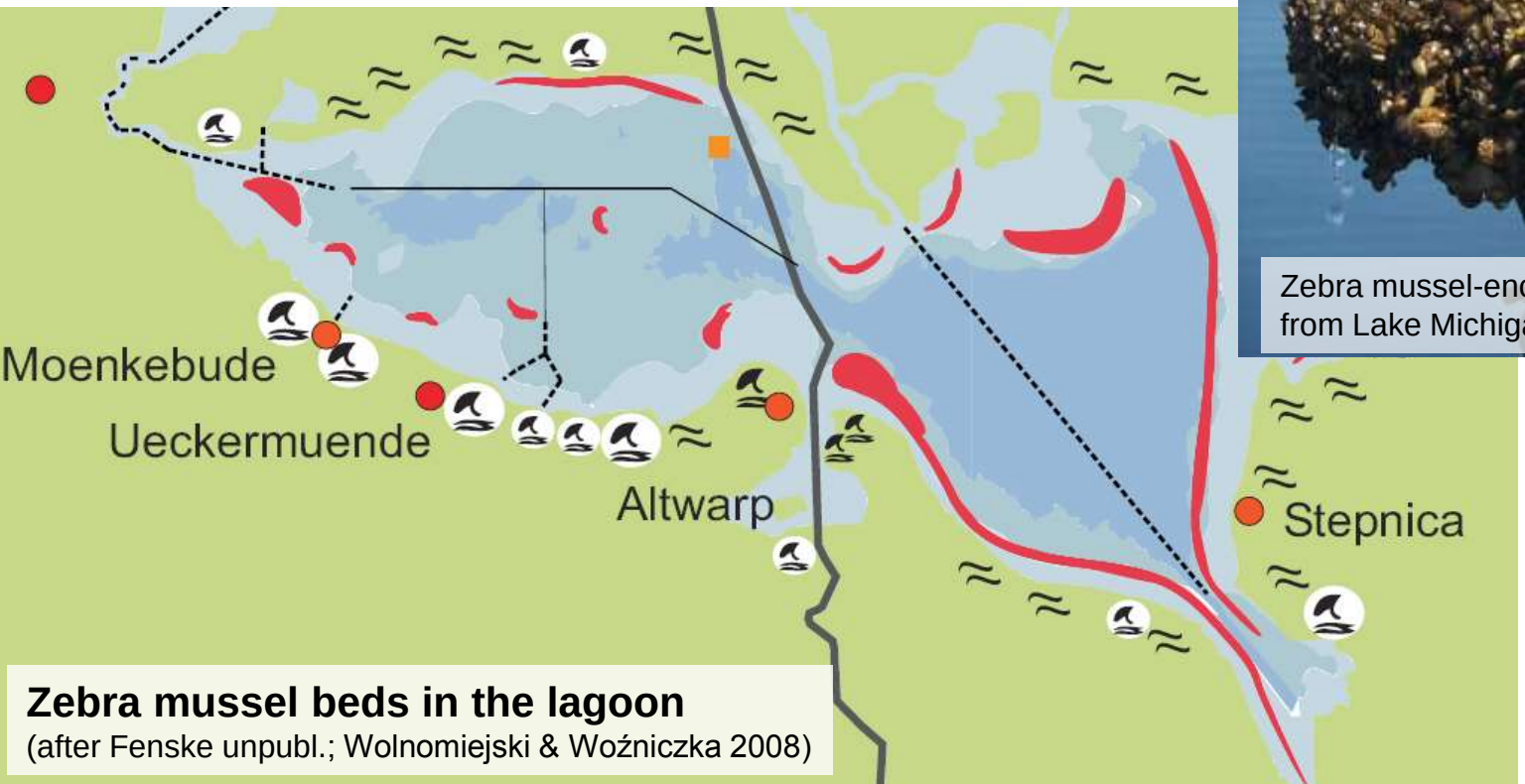
Chemical:

- Precipitation of nutrients

Zebra mussels in the Oder/Szczecin Lagoon

- Total biomass: ca. 68.000 t (about 8.000 t in the German part)
- Mussel beds in the German part: 6,56 km² or 2,4%
- Limitations for natural settling and spreading: missing hard substrate and anoxia

(Data after Radziejewska et al. (2009); Wolnomiejski & Woźniczka 2008)



Zebra mussel beds in the lagoon
(after Fenske unpubl.; Wolnomiejski & Woźniczka 2008)

Zebra mussel-encrusted current meter from Lake Michigan (Wikipedia)

Mussel farming and new mussel beds:
Zebra mussel (*Dreissena polymorpha*)

2-3 cm

Zebra mussel (Wikipedia)

Mussel bed (Wikipedia)

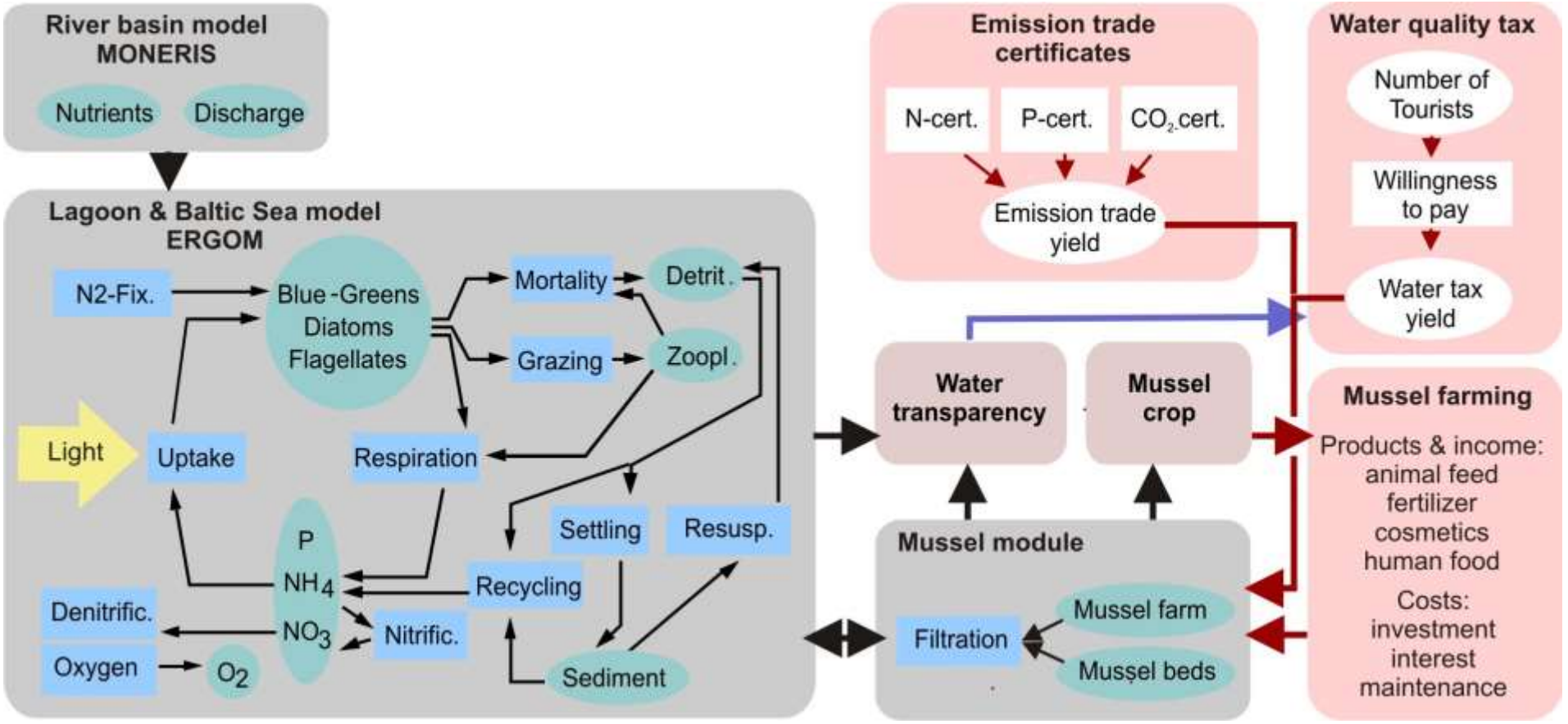
Zebra mussel shells (R.Scheibe 2008)

Questions:

- Are mussel farming and beds environmental friendly and what is the carrying capacity of the Oder Lagoon?
- To what extent can mussel farming contribute to nutrient retention and water transparency improvement in the lagoon?
- Are mussel farming and beds a cost-effective measure compared to measures in the river and the catchment?
- Can mussel farming be a profitable business and support local economy?

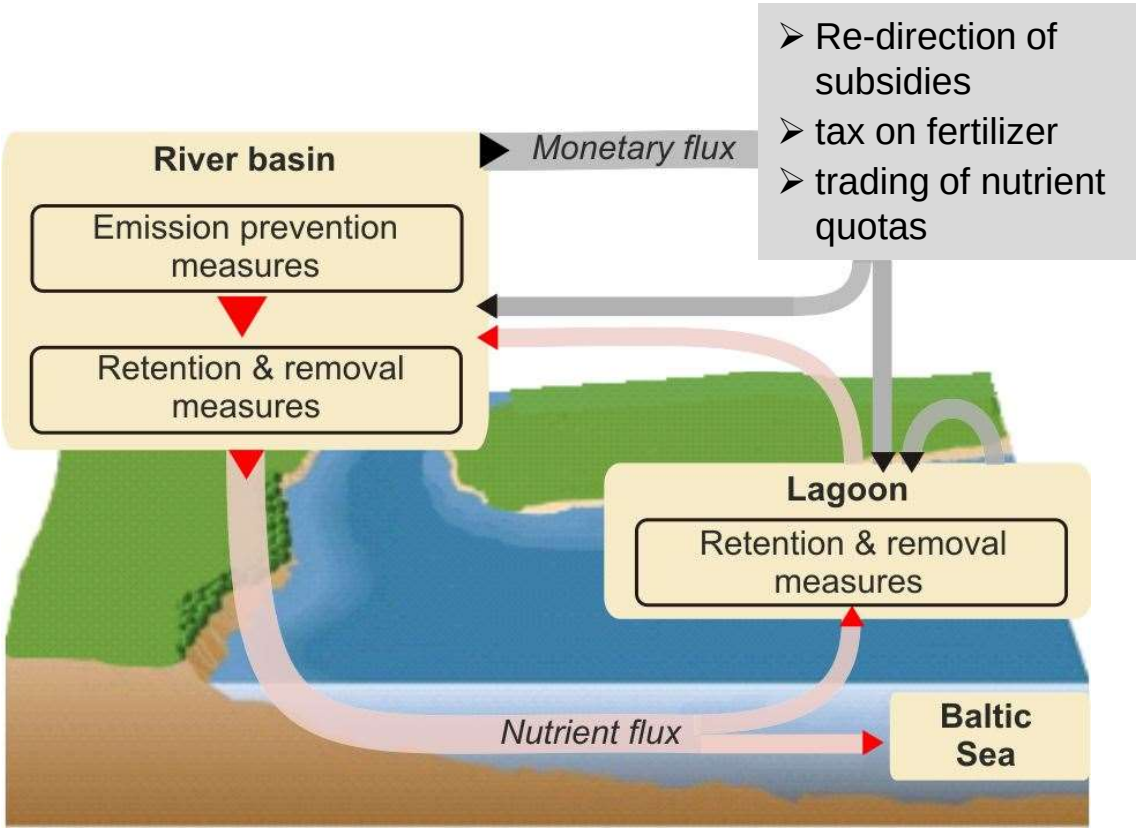
Our approach:

- Extension of an ecological model by a mussel module
- Development of an economic model
- Linking both models via water transparency and mussel yield
- Scenario simulations with the model system



Summary

- Zebra mussel farming is a **suitable supportive measure to remove nutrients** and to protect the Baltic Sea. In the Oder/Odra mussel farming potentially could remove nearly 1000 t N per year or 2 % of the annual Oder N-loads. Its potential is limited in the Oder Lagoon, but this is different for other systems.
- Zebra mussel farming is **not a cost-effective measure** to remove nutrients today. At a N-load reduction target of 50% and more, mussel farming would become cost-efficient and has the additional benefit of improving water transparency.
- Zebra mussel farms in the lagoon are **not profitable** and would require additional subsidies.
- Zebra mussel farming can be regarded as **environmental friendly** as long as the carrying capacity and specific max. density are not exceeded.
- Mussel farming will not allow an ecosystem **regime shift** in the lagoon.



Tasks within BaltCoast

- Assessment of alternative methods to support water quality improvement like extension of macrophyte belts and supporting pile rows.
- Further development of these methods (mussel beds, mussel farming, macrophyte belts and pile rows) into single and combined measures that support the implementation of Water Framework, Marine Strategy Framework, Habitats and Bathing Water Quality Directives. Change of focus from nutrients towards water transparency.
- Implementation of a mussel model into the full 3D- ecosystem model with a high spatial resolution, that allows scenario simulations, the analysis of spatial (and seasonal) environmental effects and supports concrete measure planning.
- Development of integrated ecological, social and economic scenarios for the implementation of small mussel farms to support local bathing tourism, nature protection and policy implementation (partly by supporting macrophyte growth).
- Implementation of a test mussel farm with accompanying ecological and economical studies.