

# Mussel farming in Baltic coastal waters

## Application of a System Approach Framework

### The role play

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**A SYSTEM APPROACH FRAMEWORK FOR  
COASTAL RESEARCH & MANAGEMENT**



# What is Integrated Coastal Zone Management (ICZM)?

**ICZM is a dynamic, continuous and iterative process designed to promote sustainable management of coastal zones.** ICZM seeks, over the long-term, to balance the benefits from economic development and human uses of the Coastal Zone, the benefits from protecting, preserving, and restoring Coastal Zones, the benefits from minimizing loss of human life and property, and the benefits from public access to and enjoyment of the Coastal Zone, all within the limits set by natural dynamics and carrying capacity.

**The “Integrated” in ICZM refers both to the integration of objectives and to the integration of the multiple instruments** needed to meet these objectives. It means integration of all relevant policy areas, sectors, and levels of administration. It means integration of the terrestrial and marine components of the target territory. ICZM is integrated in both time and space, and is inherently multi-disciplinary.

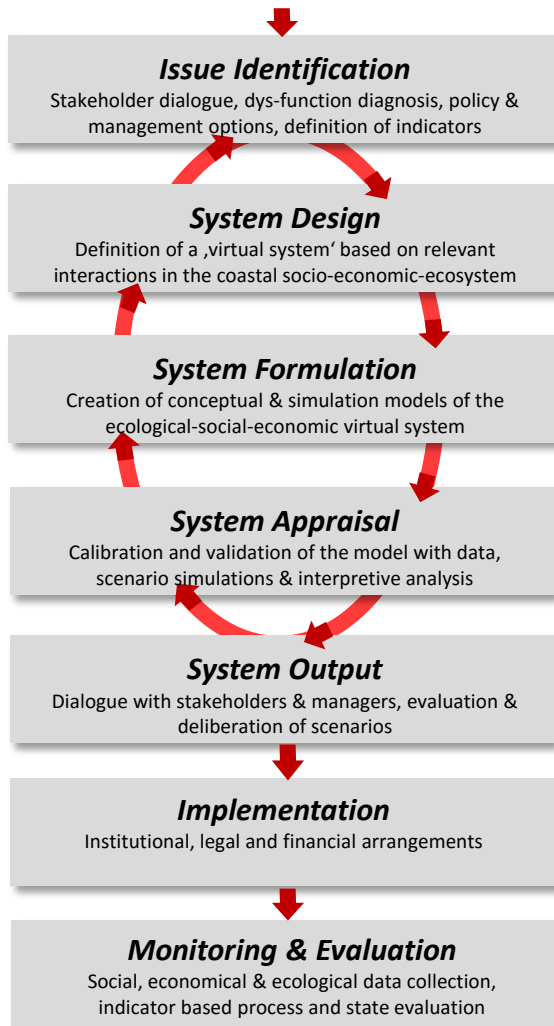
**Although ICZM refers to “management”, in fact, the ICZM process covers the full cycle of information collection, planning, decision making, management and monitoring of implementation.** “Planning” is thus intended in its broadest sense, to mean strategic policy development, rather than only land use planning or other sectoral planning.

**ICZM uses the informed participation** and cooperation of all interested and affected parties to assess the societal objectives\* in a given coastal area at a given time, and to initiate the actions necessary to move towards meeting these objectives.

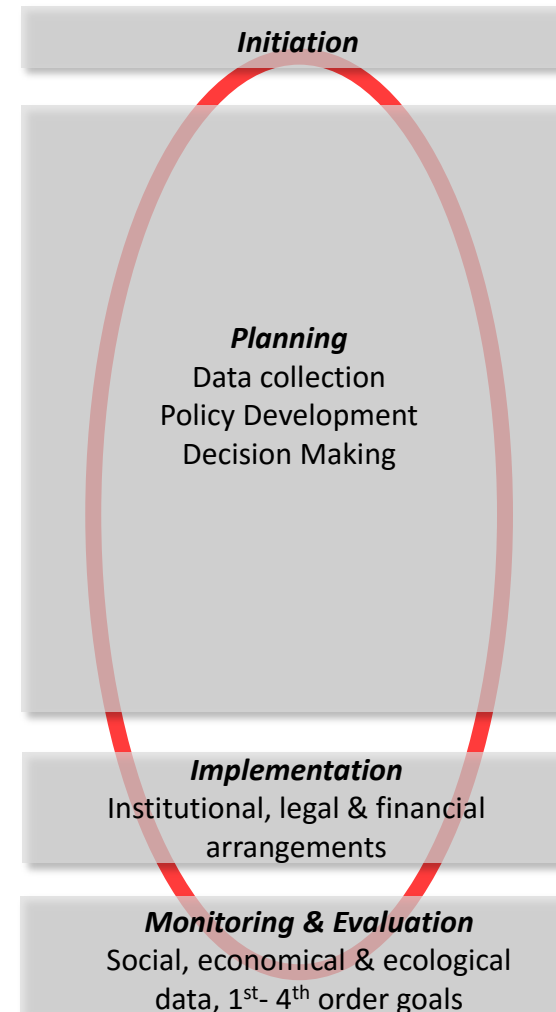


# ICZM-cycle & Systems Approach Framework

## Systems Approach Framework: Ecological-Social-Economic-Assessment

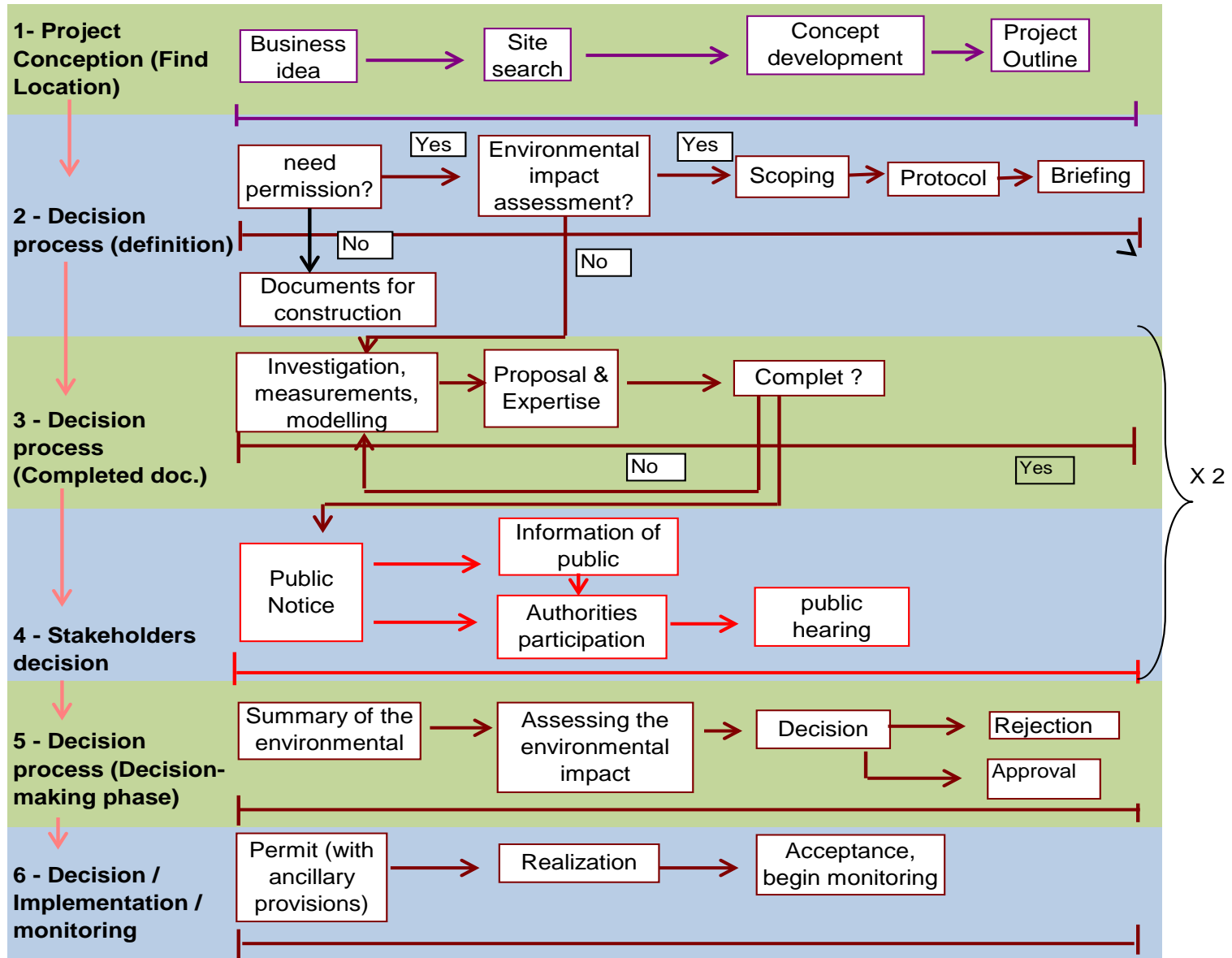


## ICZM-Cycle (<http://www.coastlearn.org/>)





# Common planning processes



There were 2 stakeholders dialogue because of additional expertise.



# New industries near Lubmin





# Lubmin: Public participation problems

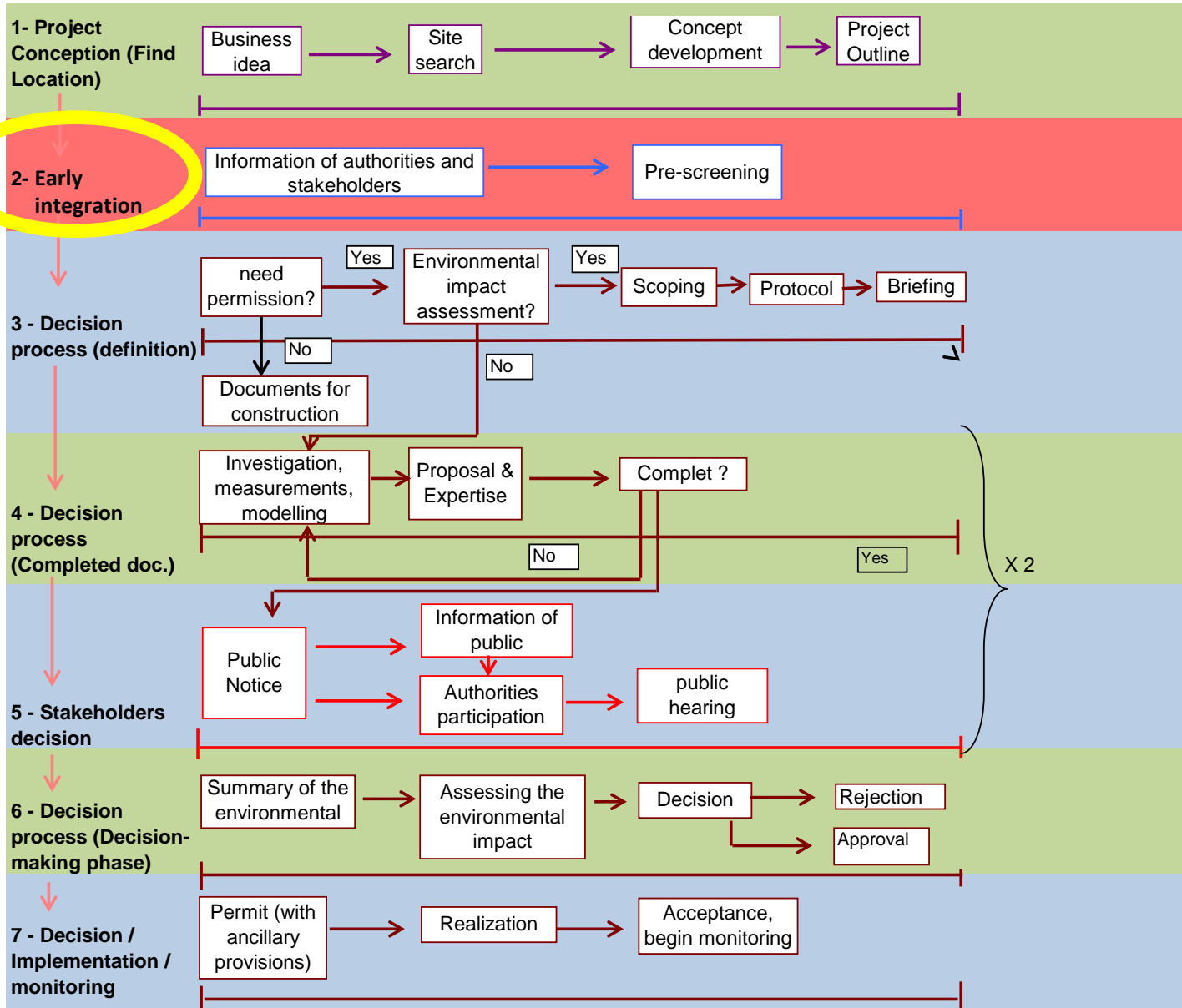
- Different plannings in and around Greifswalder Bodden, especially industries near Lubmin.
- Coal power plant planned with a financial volume of about 3 billion Euros caused public outcry
- Public participation process according to German law (EIA) seems too late for constructive ICZM
- Early informal stakeholder processes required to reduce costs and time effort

**Coal Power Plant:  
17.000 people say  
no!**





# A modified planning process



There were 2 stakeholders dialogue because of additional expertise.



**AQUABOD – for a blue future**

# **The Greifswalder Bodden Blue mussel farming project**

**Investor presentation**

**Slides 4-14 should be used for the introductory  
presentation by the investors...**

**others may be used**



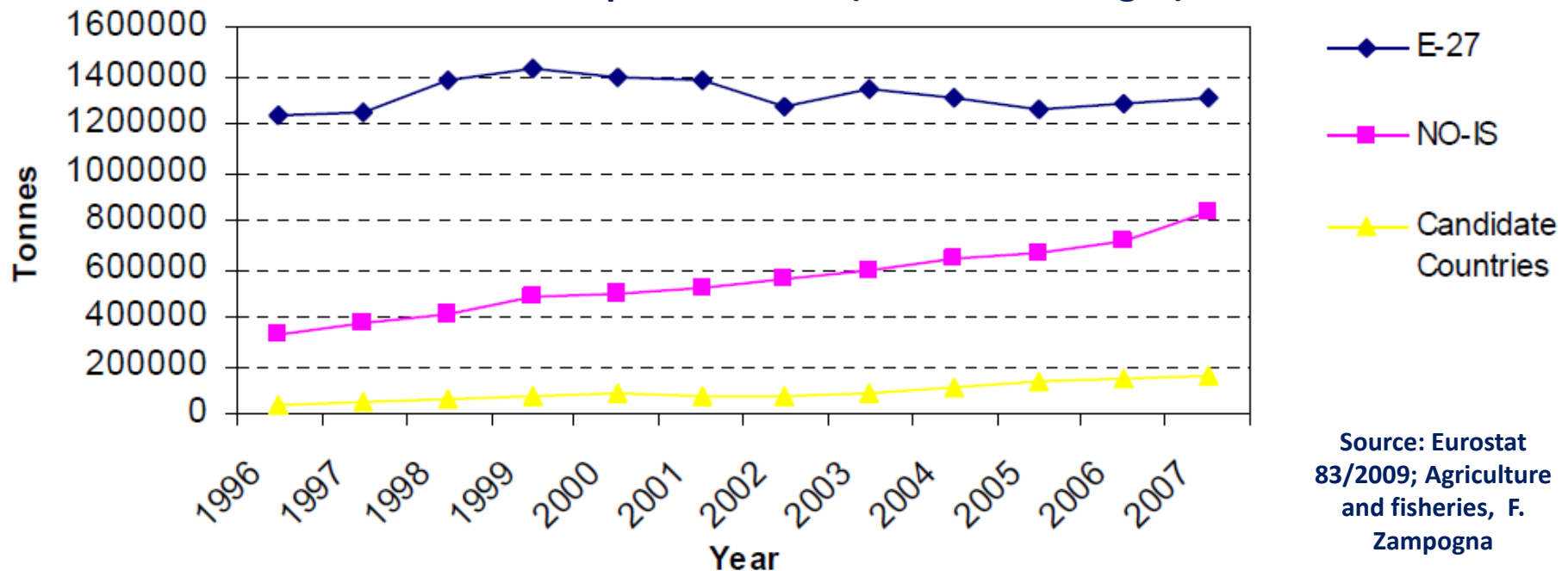


# Aquaculture - worldwide

- Aquaculture continues to be the fastest growing animal food-producing sector.
- It is set to overtake capture fisheries as a source of food fish.
- Production increase from <1 million tons (1950) to 51.7 million tons (2006)
- Per capita supply from aquaculture increased from 0.7 kg in 1970 to 7.8 kg in 2006
- Asia–Pacific region accounts for 89% of production; Europe contributes 4%.

Source: FAO - Fisheries and Aquaculture Department

### Production in Europe 1996-2007 (tonnes live weight)





# Aquaculture in Europe

- In the period 2004 to 2007 overall EU fisheries production (including aquaculture) decreased significantly, falling by more than 10 %.
- Aquaculture production changed relatively little in this time (-0.3%)
- The relative share of aquaculture as a proportion of total fisheries production rose from around 18% to just over 20%.
- 77% of the aquaculture production was in marine areas: 55 % from the Atlantic and 22 % from the Mediterranean.
- 48% of the total aquaculture production was of fish and 52 % of molluscs.
- The major species at EU-27 level are the blue mussel (*Mytilus edulis*) (23%) and the rainbow trout (*Onchorynchus mykiss*) (14%)
- Compared to 2004, the production of mussels decreased from 36% to 23%.

Source: Eurostat 83/2009; Agriculture and fisheries, F. Zampogna



# Greifswalder Bodden – biomass of mussel species



*Mytilus Edulis*  
(blue mussel)



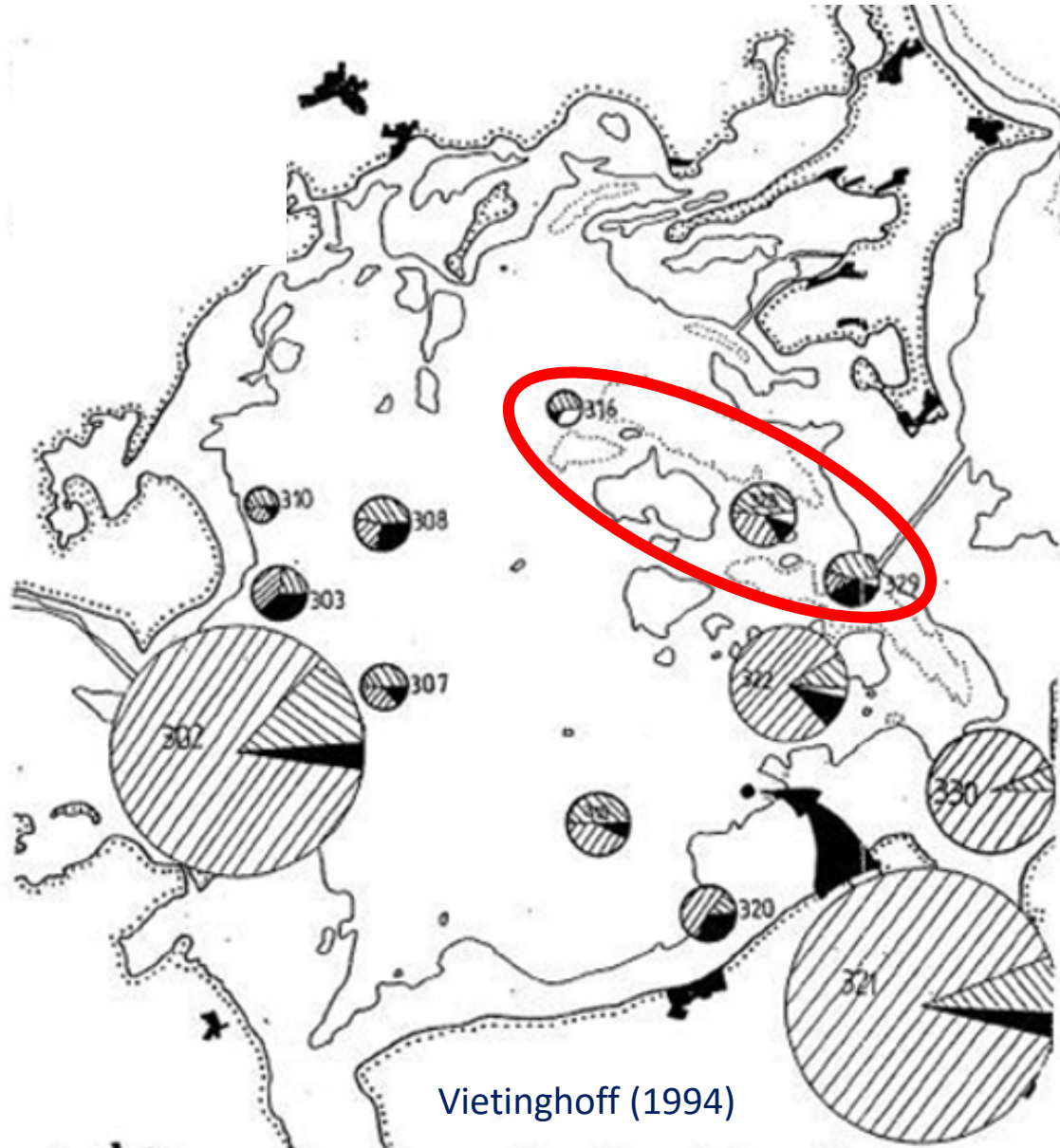
*Macoma balthica*



*Arenomya arenaria*



*Cerastoderma lamarcki*



Vietinghoff (1994)



# The blue mussel (*Mytilus edulis*)

- The blue mussel is euryhaline and occurs in marine as well as in brackish waters (Baltic) down to 4‰, although its growth rate is reduced below 18‰.
- Blue mussels are also eurythermal, even standing freezing conditions for several months and is well acclimated for a 5-20 °C temperature range.
- Blue mussels can live up to 18-24 years, most cultured mussels are produced in less than 2 years.
- In the wild, *M. edulis* settles in patches of open spaces, quickly building a dense population referred to as 'mussel beds'.
- Byssus threads allow themselves to attach to any firm substrate.



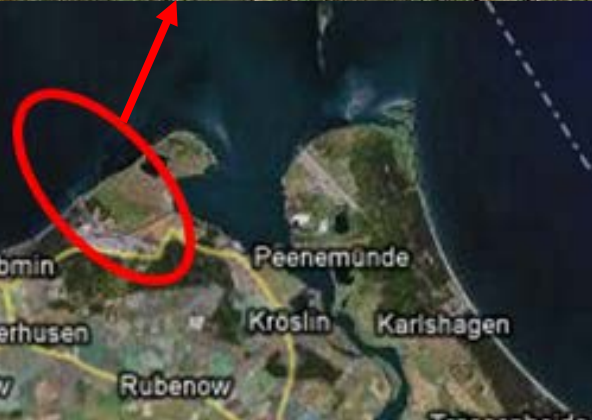
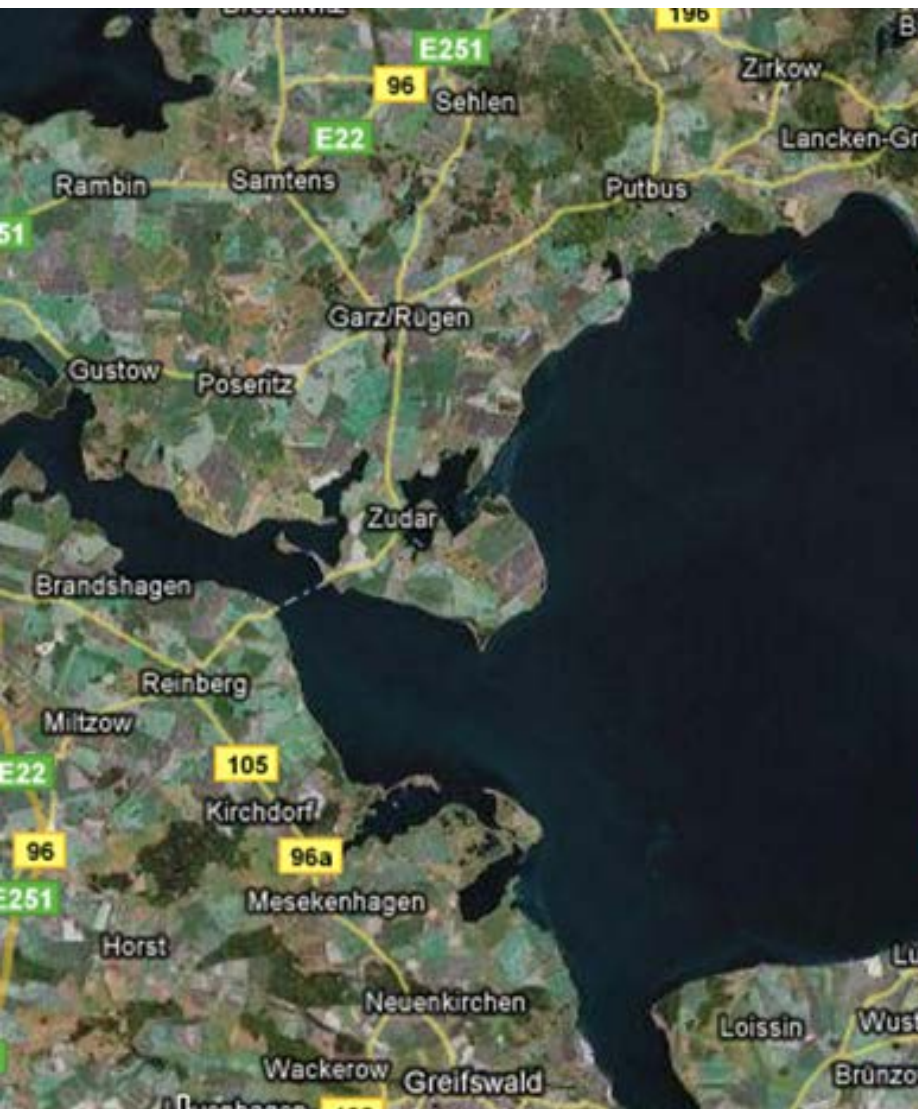


# Background for mussel farming

- Climate Change with increasing water temperatures and reduced ice cover favor mussel aquaculture
- Warm water emissions of power plants into the Greifswalder Bodden, would further favor mussel farming
- Mussel farming has no tradition in the Baltic, therefore competitors are lacking
- Mussels may become a local product and tourism may ensure a sufficient regional demand
- Mussel meal is a high quality protein and fat acid source that can replace fish meal. Fish meal demand and the prices are increasing rapidly.
- EU subsidies can support the establishing a farm
- Mussel farms have the potential to improve water quality (transparency and nutrient retention) and may allow additional subsidies for it

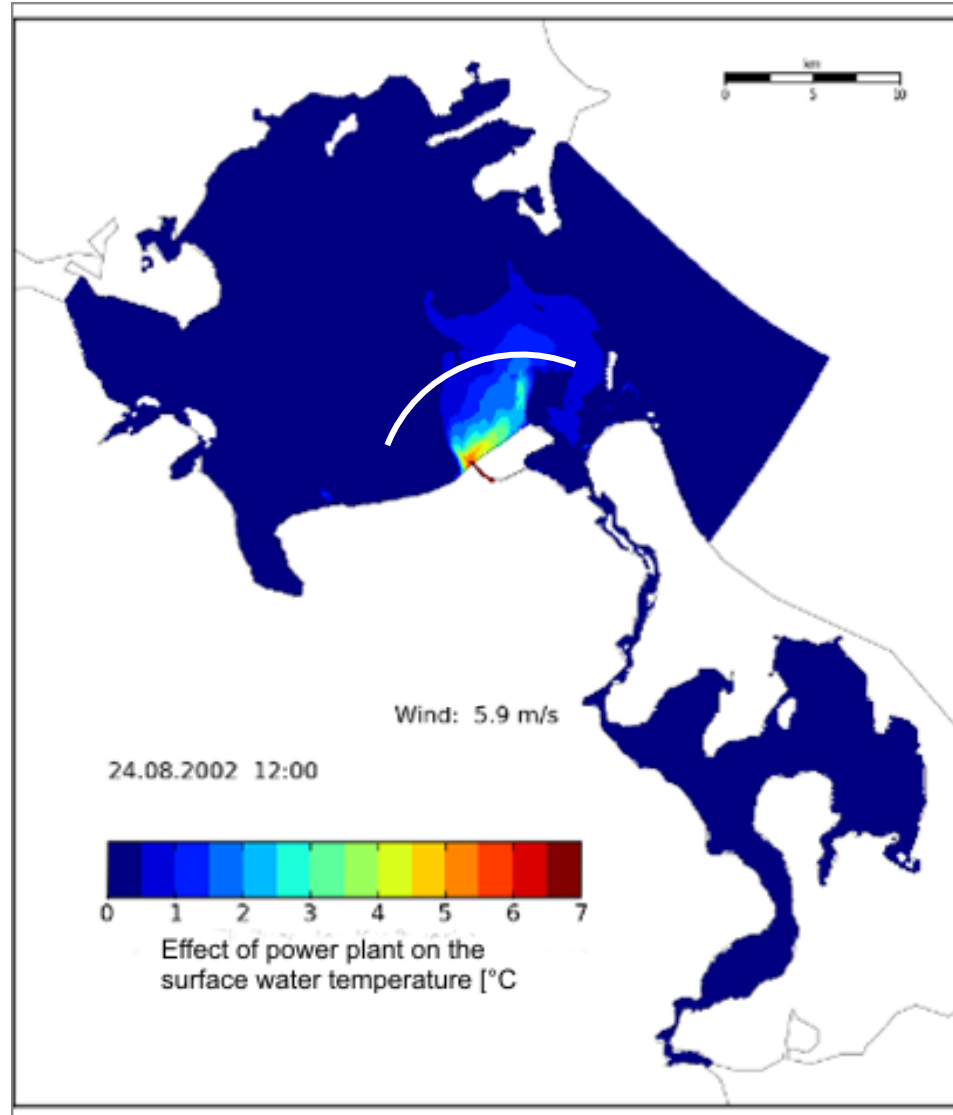
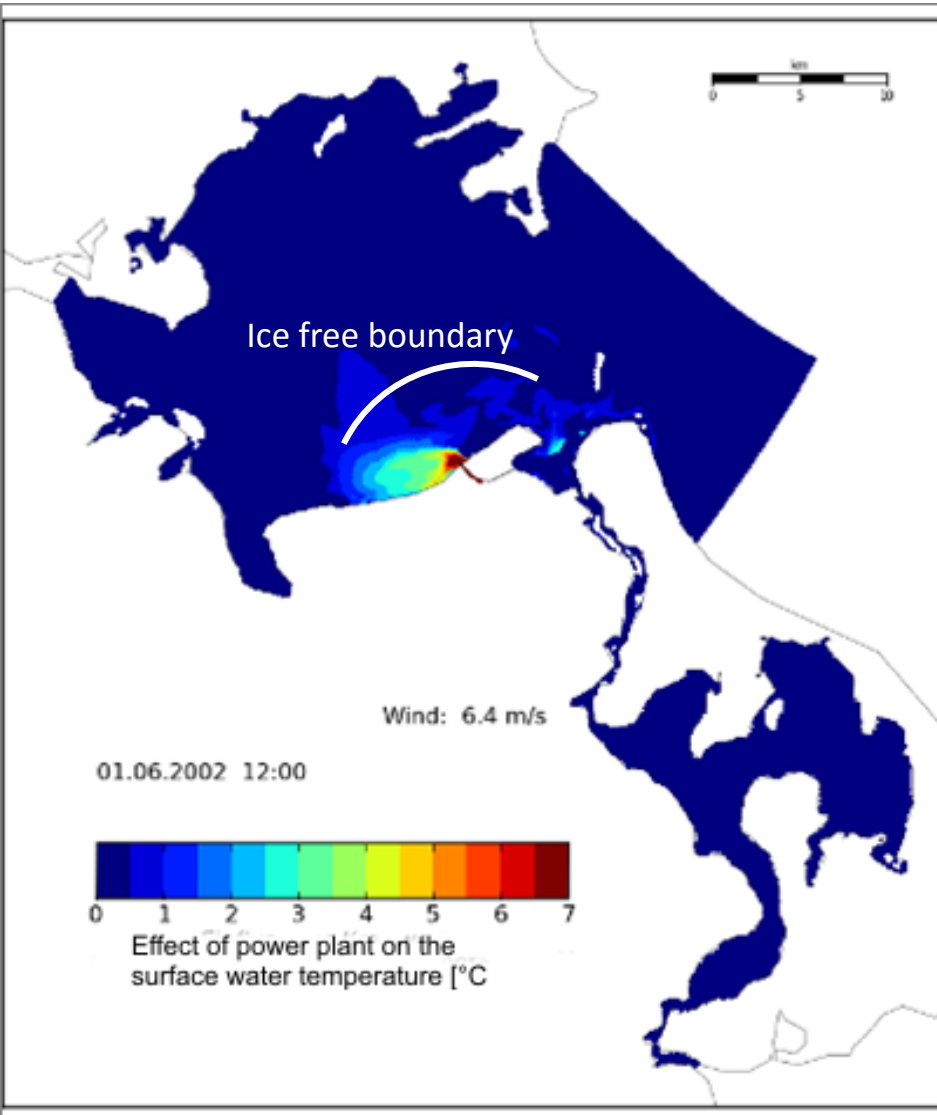


# Industrial developments: Lubmin





# Potential effects of power plant cooling water on surface water temperature



# Long-line mussel farming



[www.dfo-mpo.gc.ca](http://www.dfo-mpo.gc.ca)

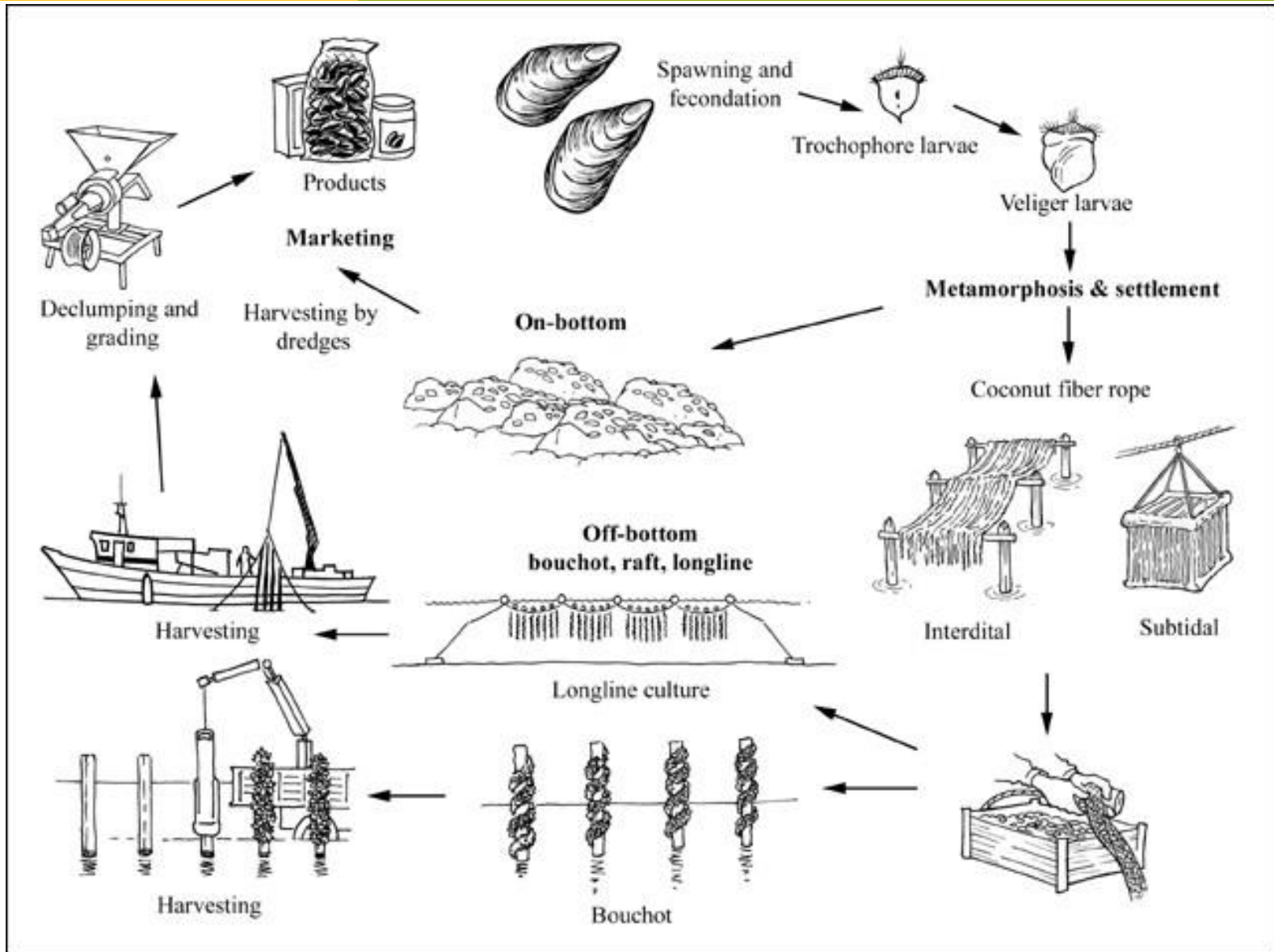


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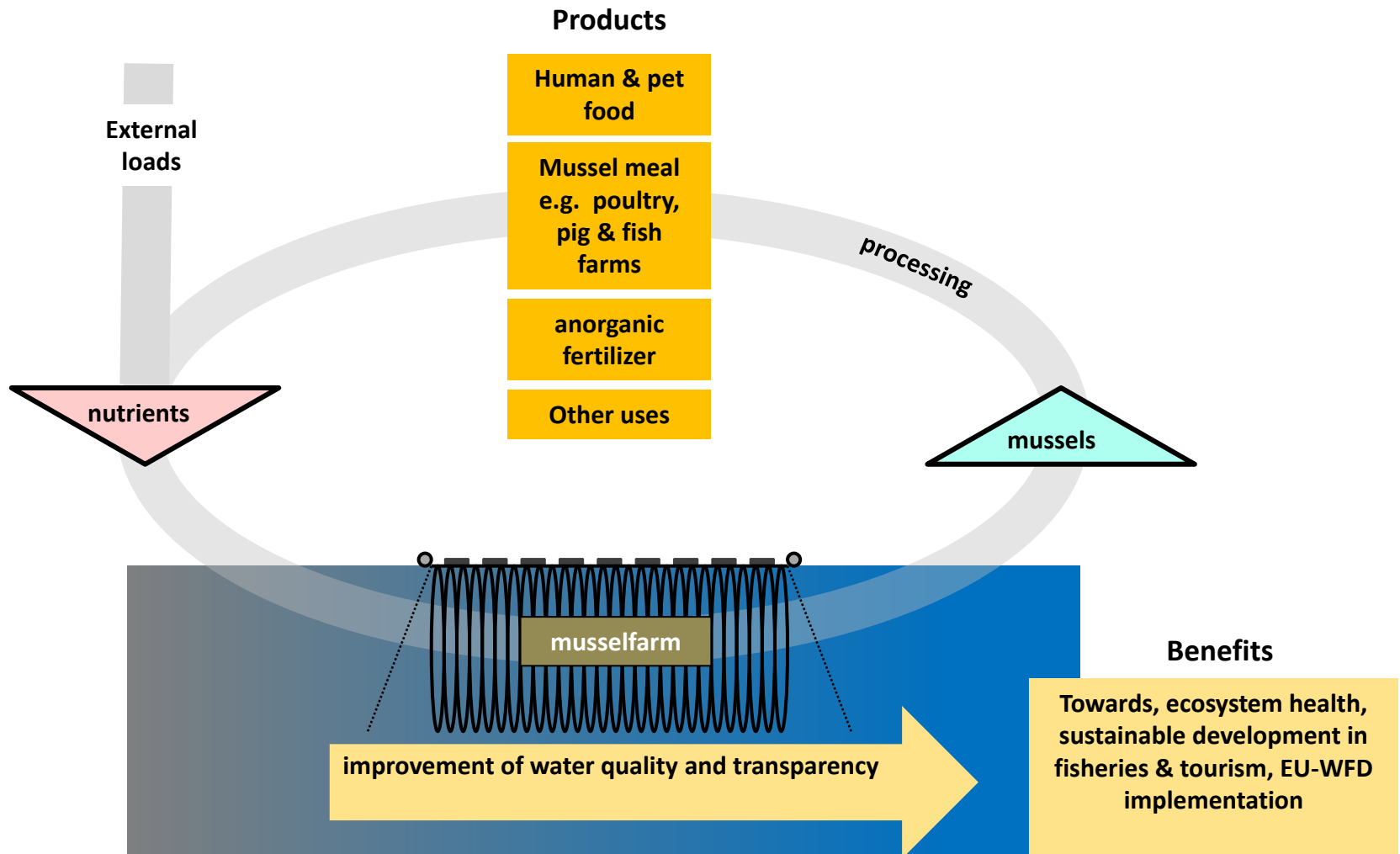


# Mussel cultivation methods



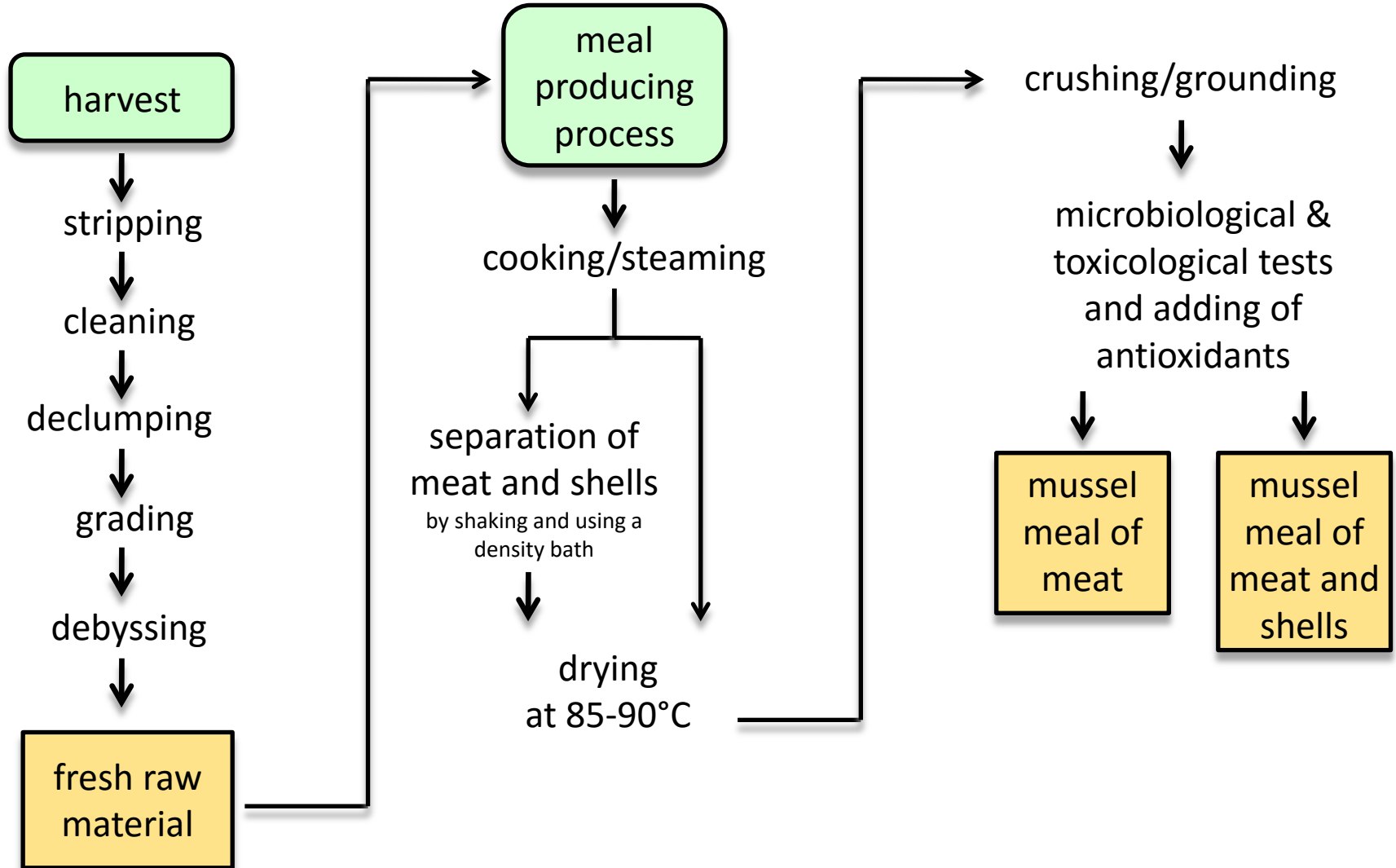


# Mussel farming: The basic concept



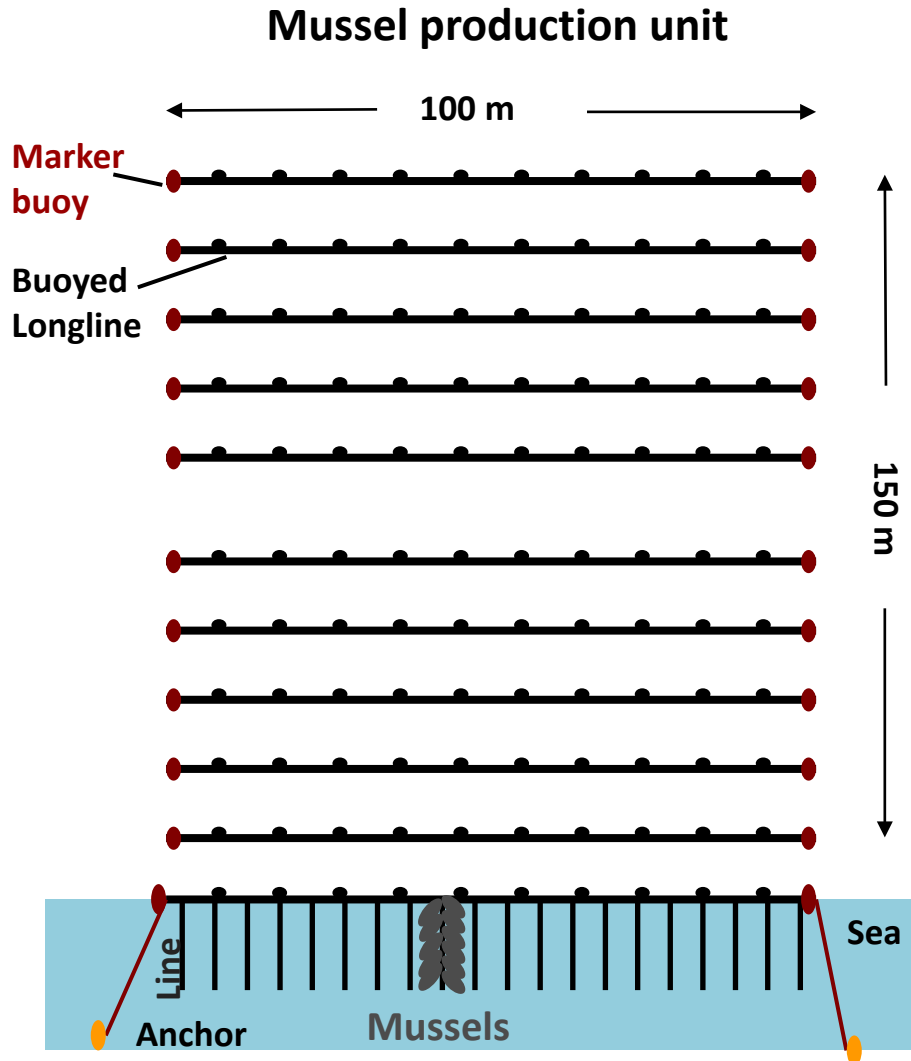


# Mussel processing in the harbour





# Mussel farming in shallow Baltic waters



- One production unit covers an area of 1.5 ha, 6 units form a commercial farm which occupies an area of 15 ha. Up to 3 farms are possible in one location.
- Minimum water depth for cultivation is 5 m, mussels are grown between 0.5 m below the surface and 2 m above the sediment
- The harvest takes place after 2 years
- Each unit produces 10 t mussels/a, a farm 60 t/a assuming a water depth of 5 m
- The removal of nitrogen is 1% of the mussels wet weight



# Greifswalder Bodden

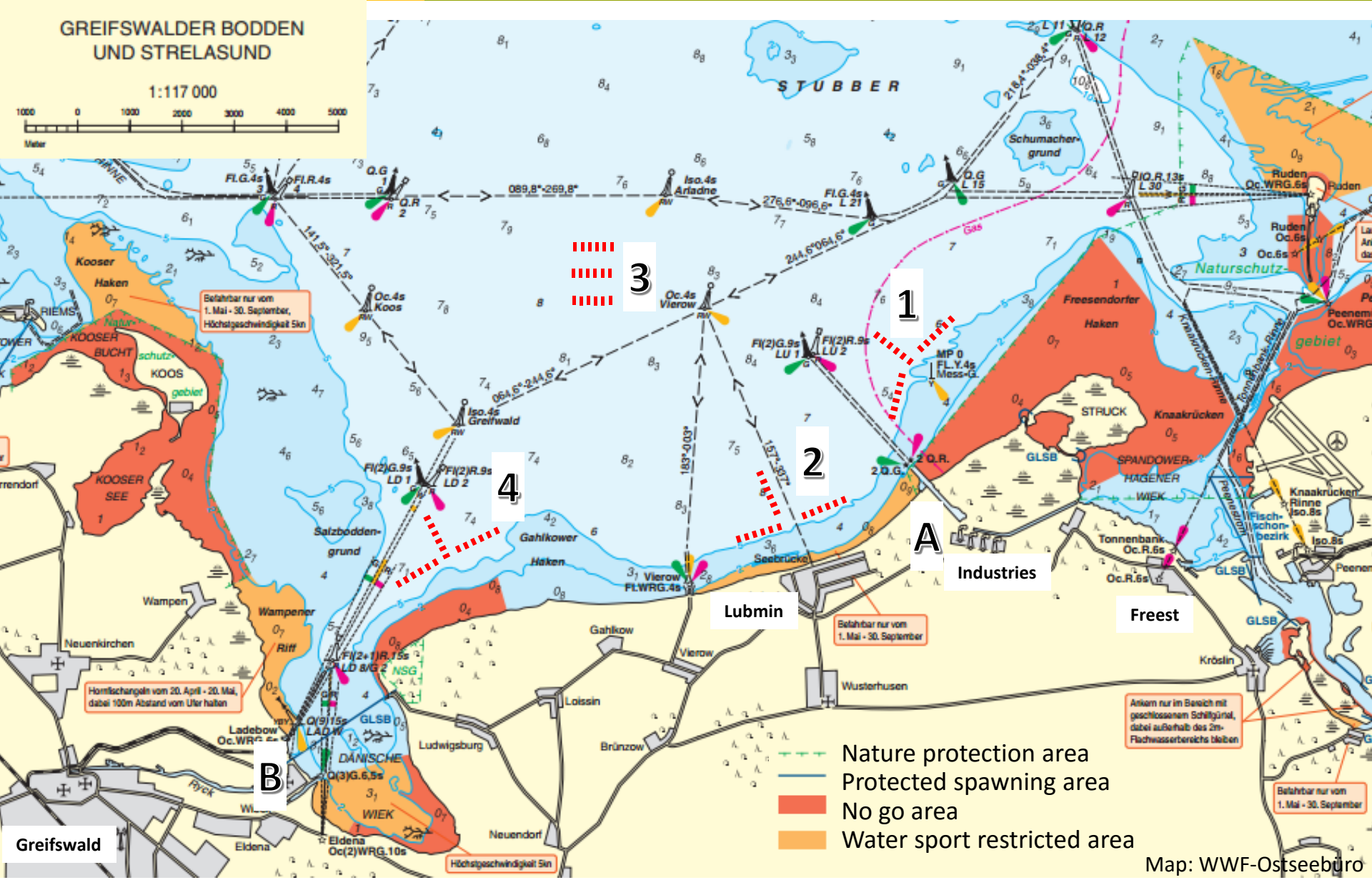
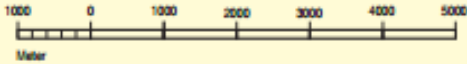
A,B: Processing locations

1,2,3,4: Farming locations

■■■■■ Farm with 6 production units

## GREIFSWALDER BODDEN UND STRELASUND

1:117 000



Nature protection area

Protected spawning area

No go area

Water sport restricted area



**AQUABOD – for a blue future**

**Thank you!**