Ship noise and Good Environmental Status (GES)

WP7 GES ONLINE TOOL

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What is Good Environmental Status (GES)?

Marine Strategy Framework Directive:

"Introduction of … underwater noise, is at levels that do not adversely affect the marine environment"

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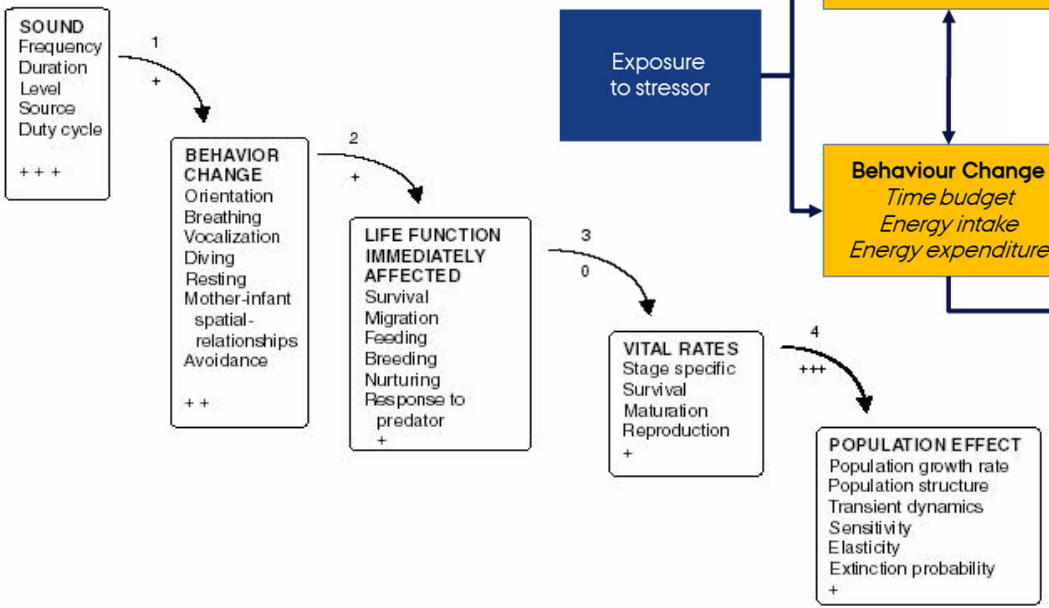
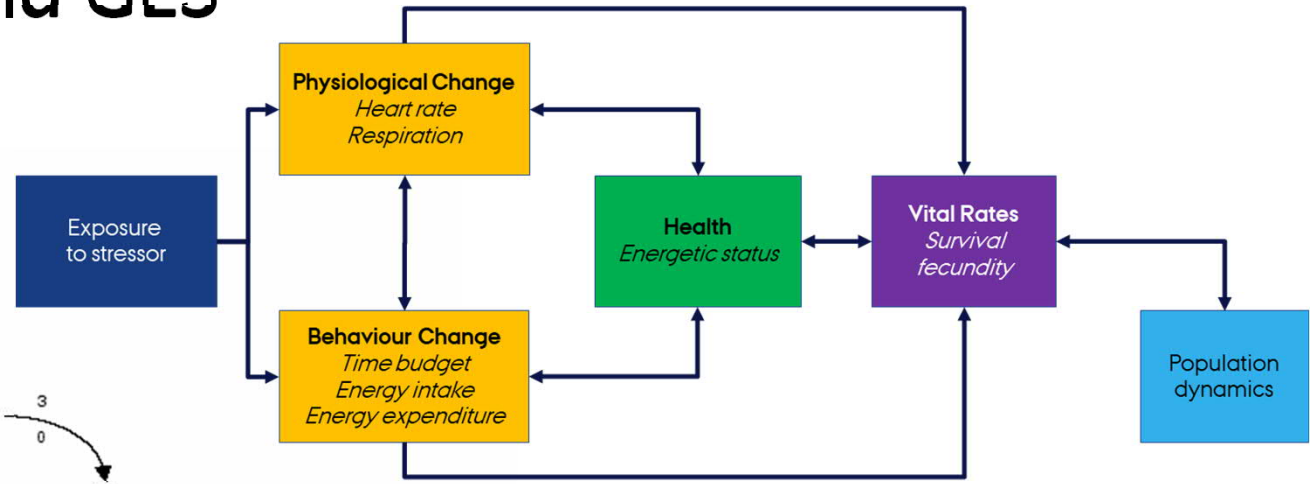
HELCOM BalticBoost workshop report (2016):

- Noise levels should not affect the energy budget nor breeding to a degree likely to affect the population significantly => Disturbance/displacement
- Noise should not be at levels that induce masking leading to significant negative change in population growth rate => Interference with communication

Disturbance and GES



Population consequences of Acoustic Disturbance (PCAD)
Natl. Res. Council (2005)



Population consequences of Disturbance (PCoD)
Pirotta et al. (2018)

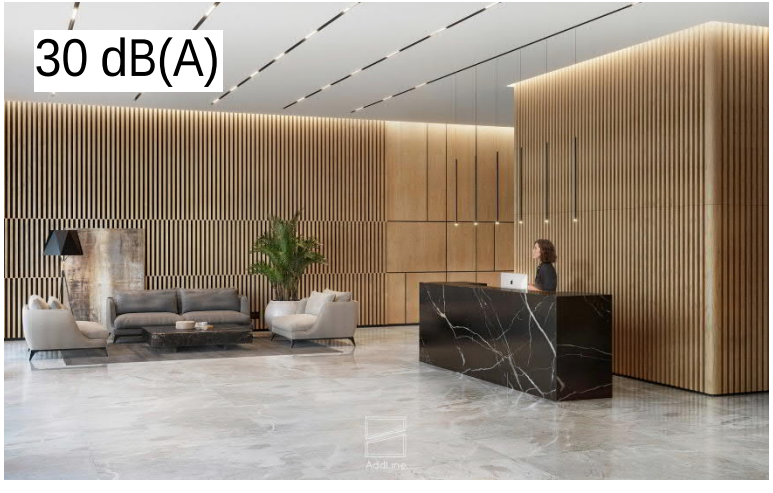
- Principles behind impact well known
- Some work remains before frameworks are operational

Disturbance and GES

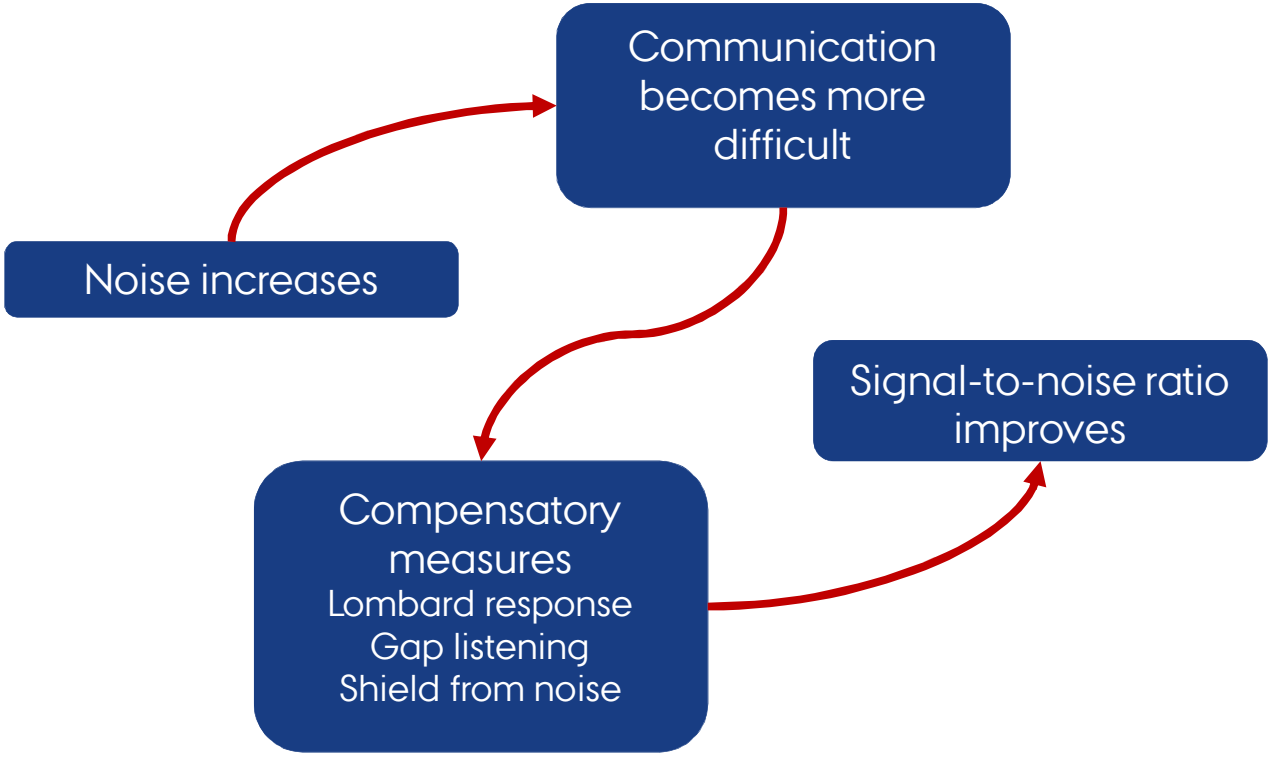
Habitat quality paradox:

If the reward is high and the risk low, habituation will happen

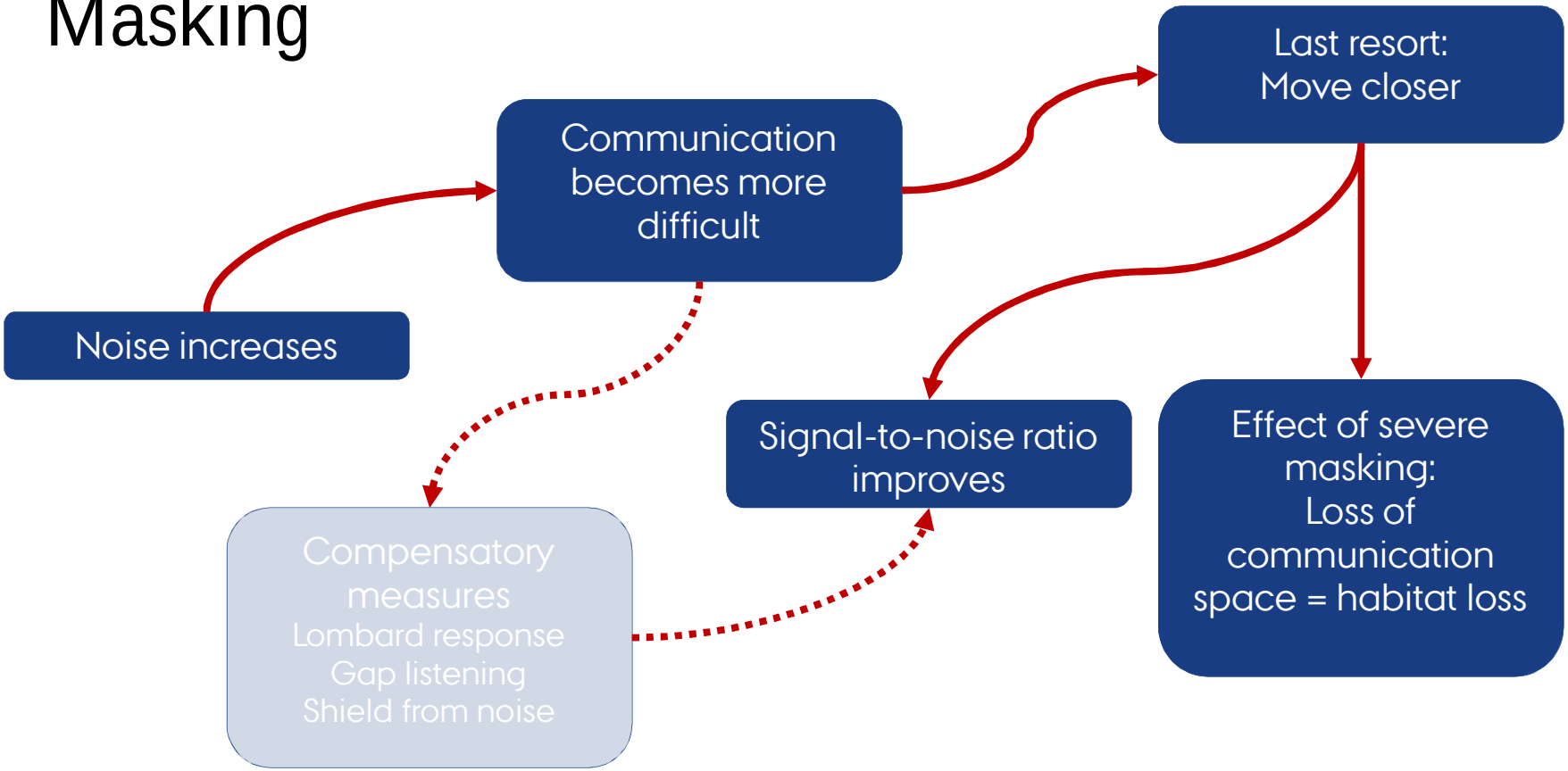
There is more to habitat quality than noise



Masking


Communication becomes more difficult
Noise increases
Signal-to-noise ratio improves
Compensatory measures
Lombard response
Gap listening
Shield from noise

Masking


Last resort:
Move closer
Communication
becomes more
difficult
Noise increases
Signal-to-noise ratio
improves
Effect of severe
masking:
Loss of
communication
space = habitat loss
Compensatory
measures
Lombard response
Gap listening
Shield from noise

Masking is natural

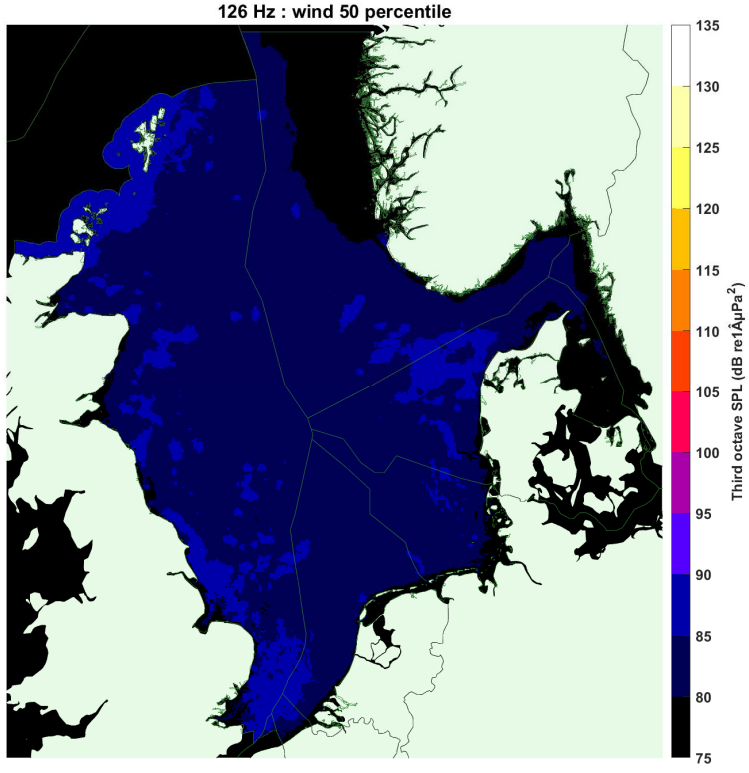
- Weather
- Other animals
- Own species!

Masking is natural

- Masking in itself is not the problem
- Too much masking, too often, is a problem
- Masking is linked to signal-to-noise ratio
  => Habituation is not possible

Masking and GES

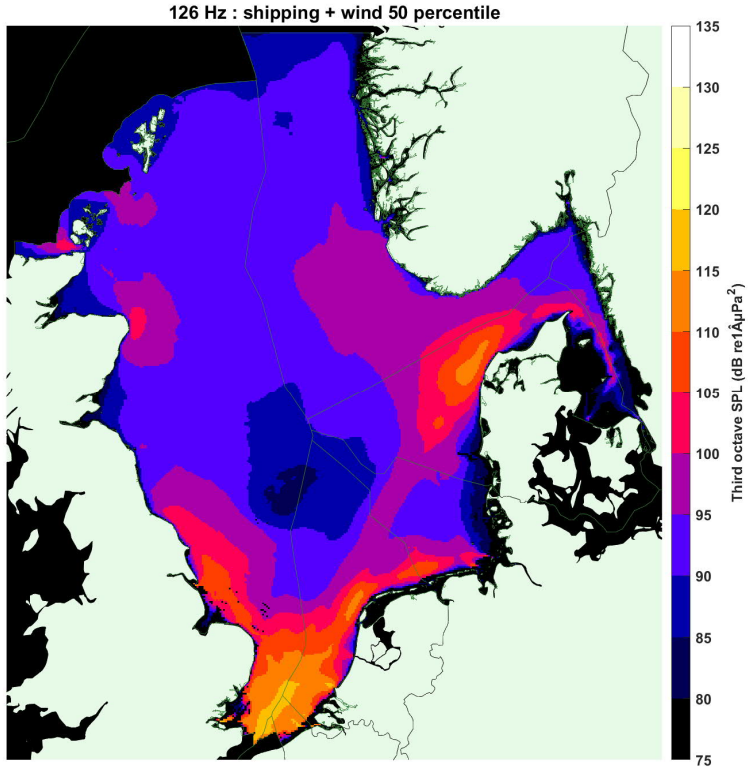
L_{ref} = Reference state: Natural sources



Masking and GES

L_{ref} = Reference state: Natural sources

L_{curr} = Current state: Reference state + ships



Masking and GES

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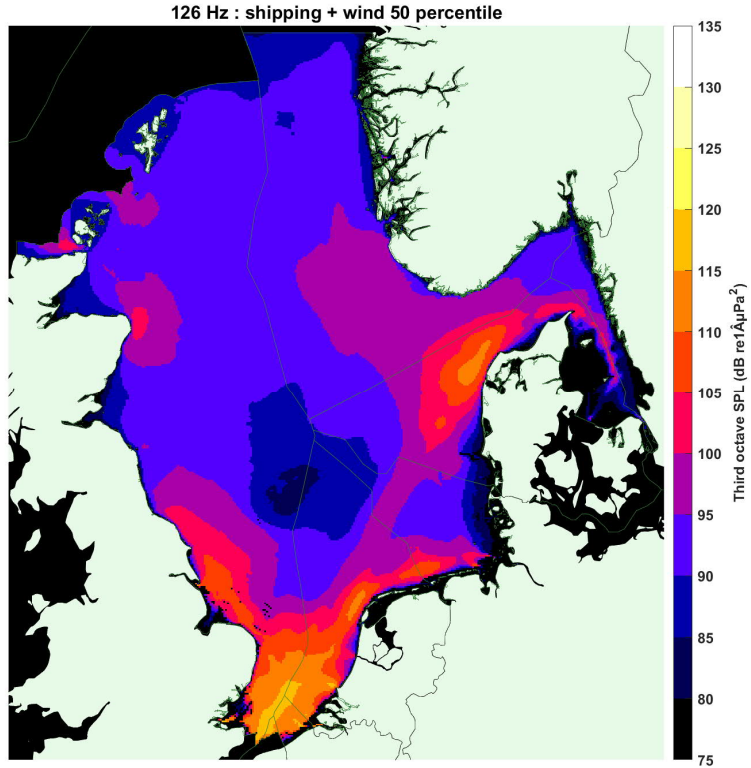
Communication limited by ships when

$$L_{curr} > L_{ref} + C$$

C = Lower limit of concern (6 dB or 20 dB)



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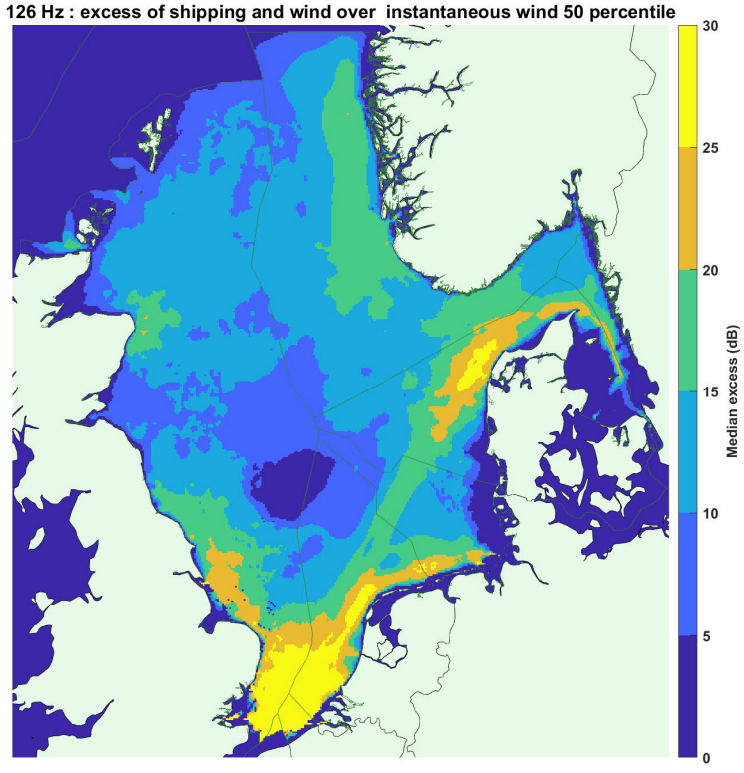
Excess is modelled on short time scale (1 s)



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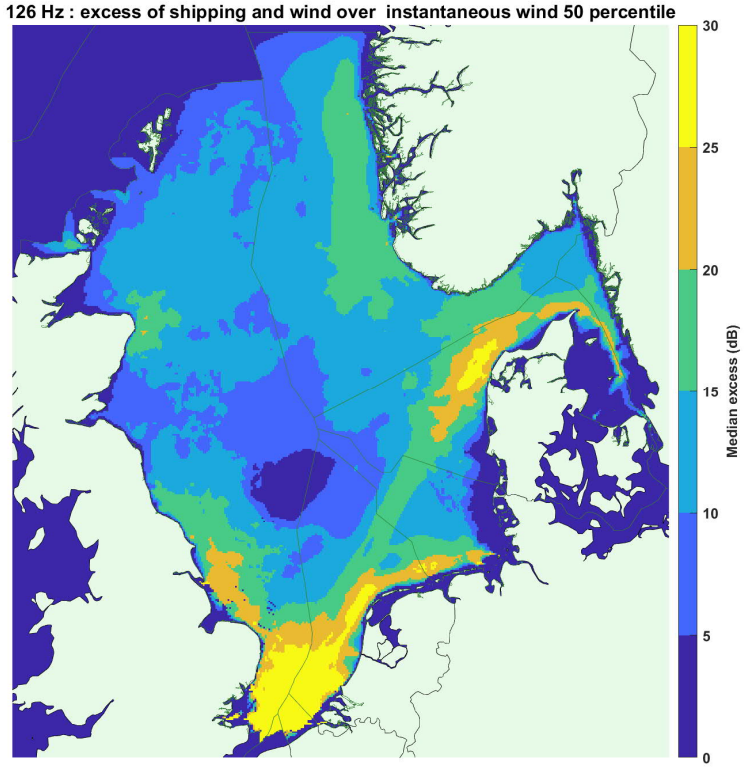

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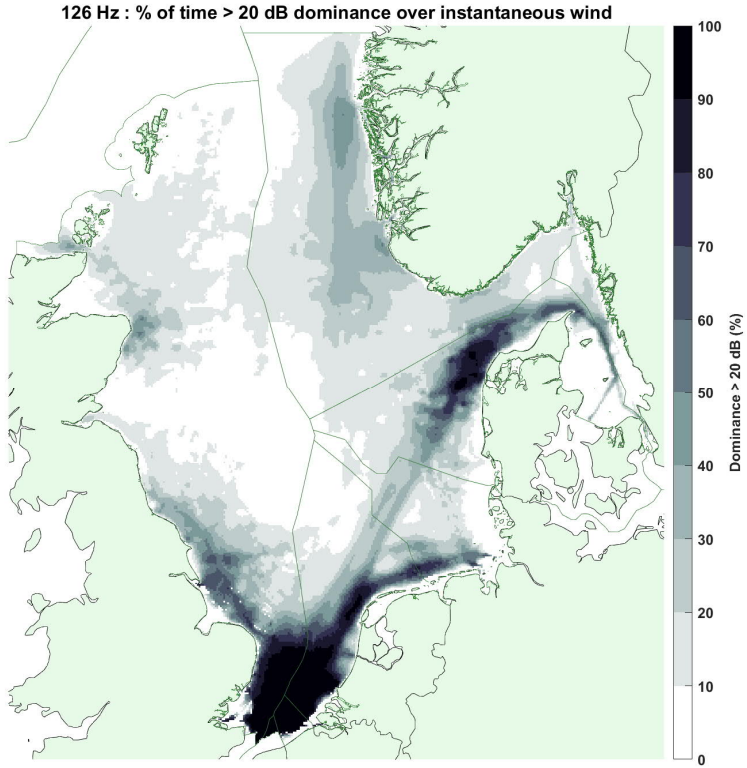
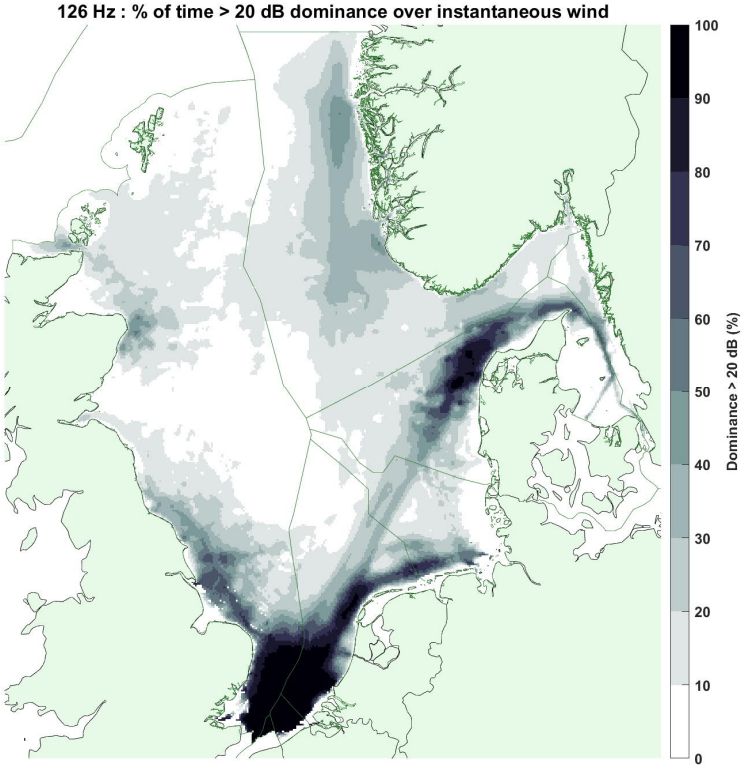
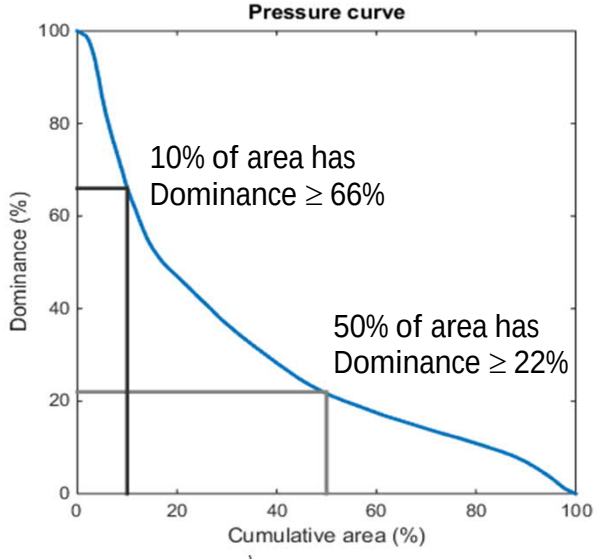
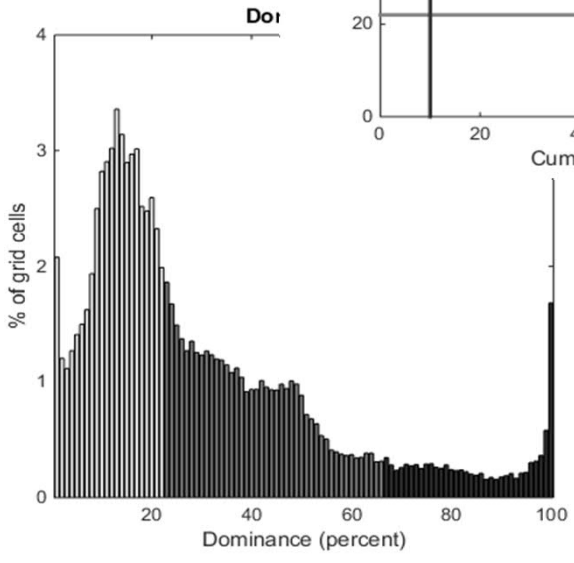
Dominance = % of T_{ev} where Excess > C



Pressure function





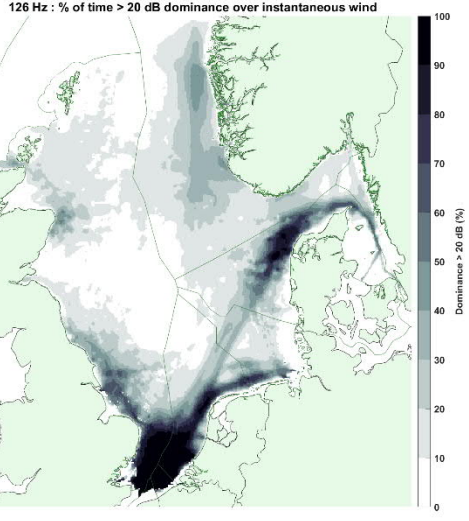


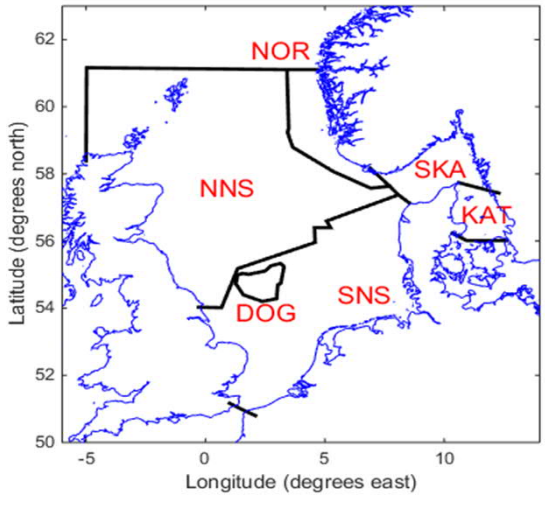
Assessing GES

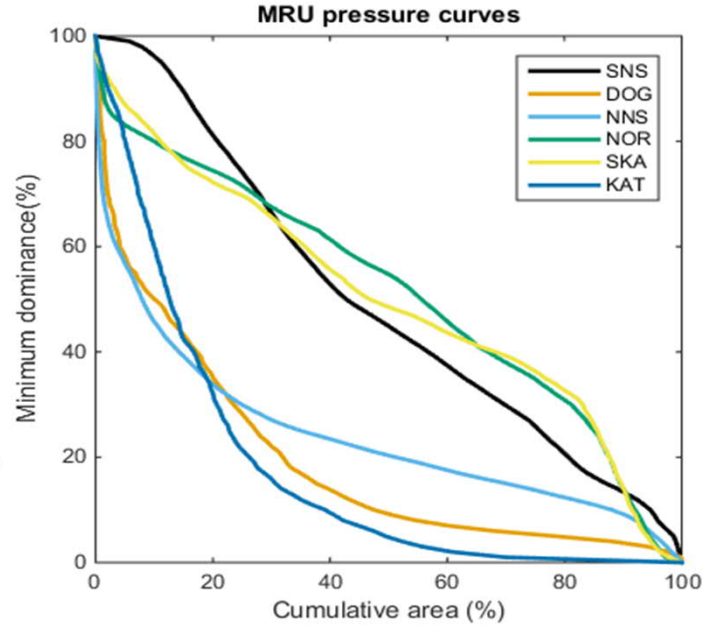
Area below curve useful index of GES:

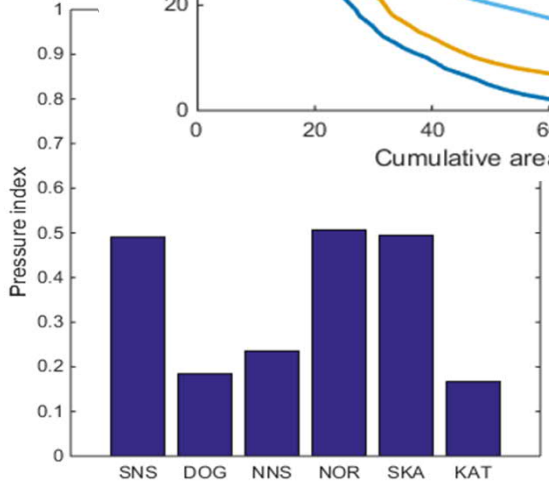
Dominance increases -> index increases

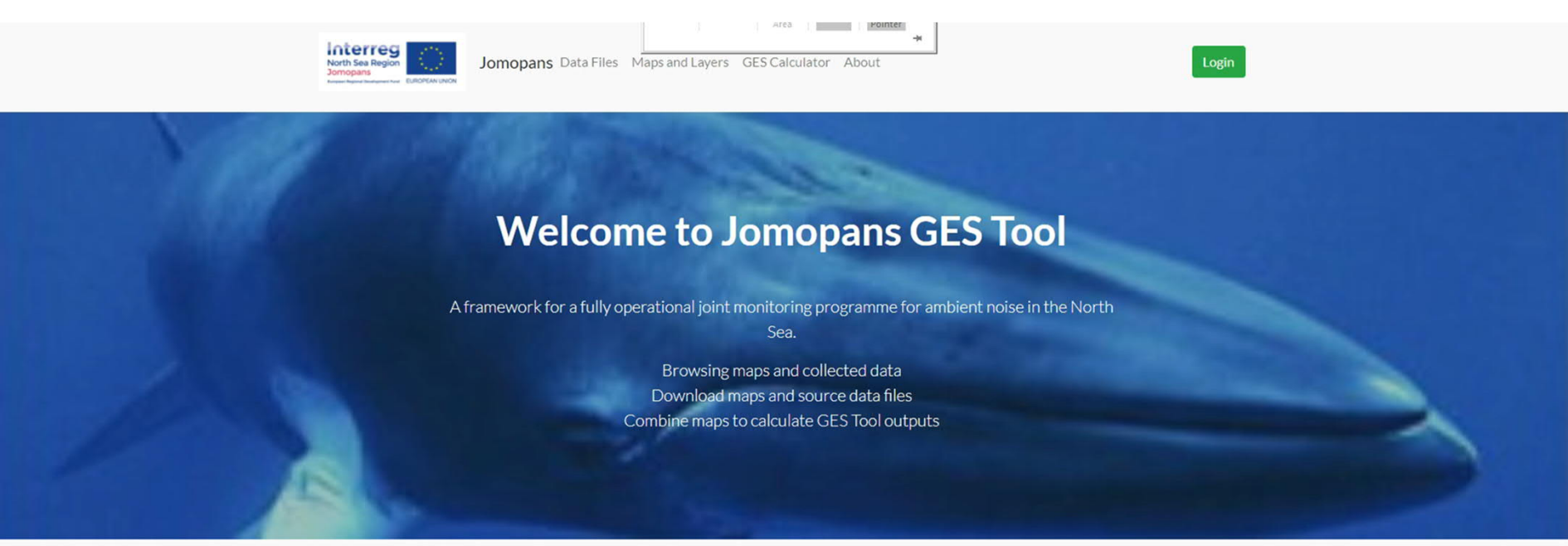
Affected area increases -> index increases











Data Files

Search and download the source data files

Maps and Layers

View all the input sound and habitat maps

GES Calculator Tool

View and calculate the Good Environment Strategy tool