

Results of the sufficiency of measures (SOM) analysis

Document 2-1-Rev.1

HELCOM ACTION, HELCOM Secretariat

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Outline

- Brief overview of the SOM approach
- Full topic results
 - Non-indigenous species
 - Coastal fish (perch and other coastal piscivores)
- Coverage of other topics highlighting results of interest/concern
- Identified changes and additions
- Schedule for work in autumn 2020



Overview of the sufficiency of measures (SOM) analysis

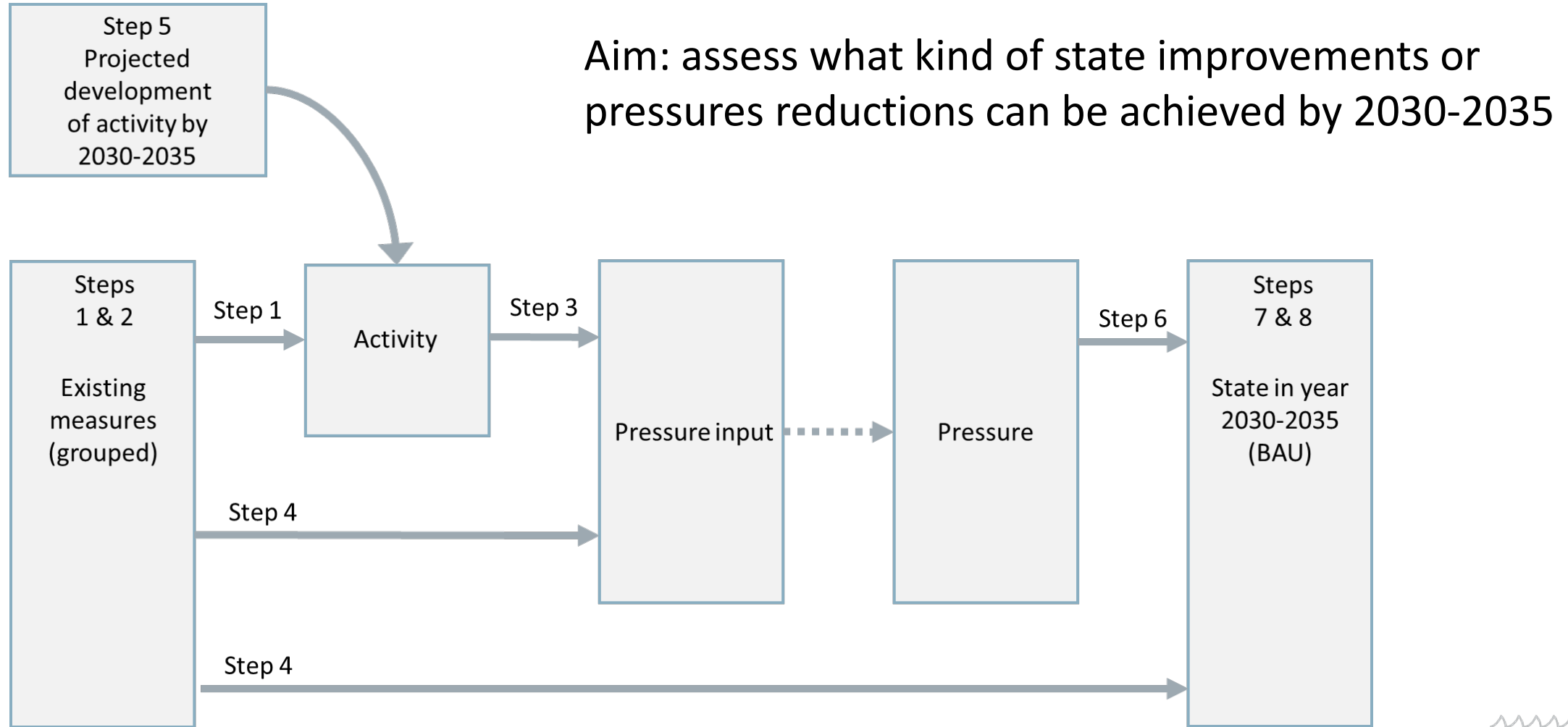


Background of SOM analysis

- Provides supporting information for evaluating proposed new actions
- First attempt to quantify the effects of existing measures on achieving objectives
- Combination of natural and social sciences approaches
- No final answers - should be considered in relation to other relevant results and assessments



Main components of the SOM analysis



Relationship between pressure inputs and pressures

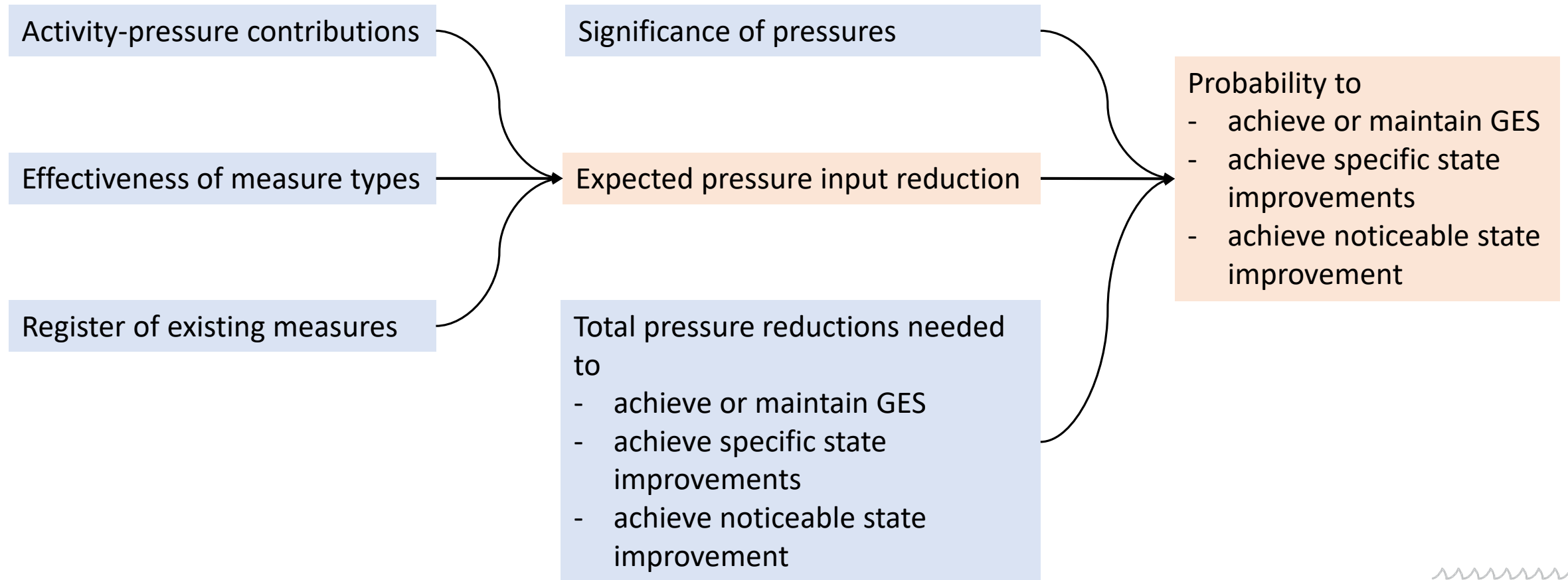
Pressure input	Relationship	Pressure
Bycatch of porpoise	Equivalent	Bycatch in fishing gears
Potential loss of seabed	Assumed equivalent	Physical loss of marine habitats
Input of continuous noise 63/125 Hz + Input of continuous noise 2 kHz	Assumed equivalent	Continuous underwater noise
Anthropogenic introductions of NIS	Link not quantified	Effects of non-indigenous species
Input of nutrients	Link not quantified	Effects of eutrophication
NA	No link	Human-induced food web imbalance
NA	No link	River, lake, or land habitat loss/degradation



Independent

Dependent on previous results

Relationships between results



Assumptions and features to keep in mind

- Only measures affecting pressures in 2016-2035 considered
- All existing measures assumed to be fully implemented
- Effectiveness of measure types used to approximate the effectiveness of existing measures
- When considering total pressure, all pressures are interchangeable
- Not able to account for the effect of reductions of all pressure inputs on state components (e.g. because no link between input of nutrients and effects of eutrophication)
- Only most likely scenario on development of human activities included
- Data mainly from expert elicitation
 - literature data on effectiveness of measures not yet included



Results of SOM analysis for non-indigenous species

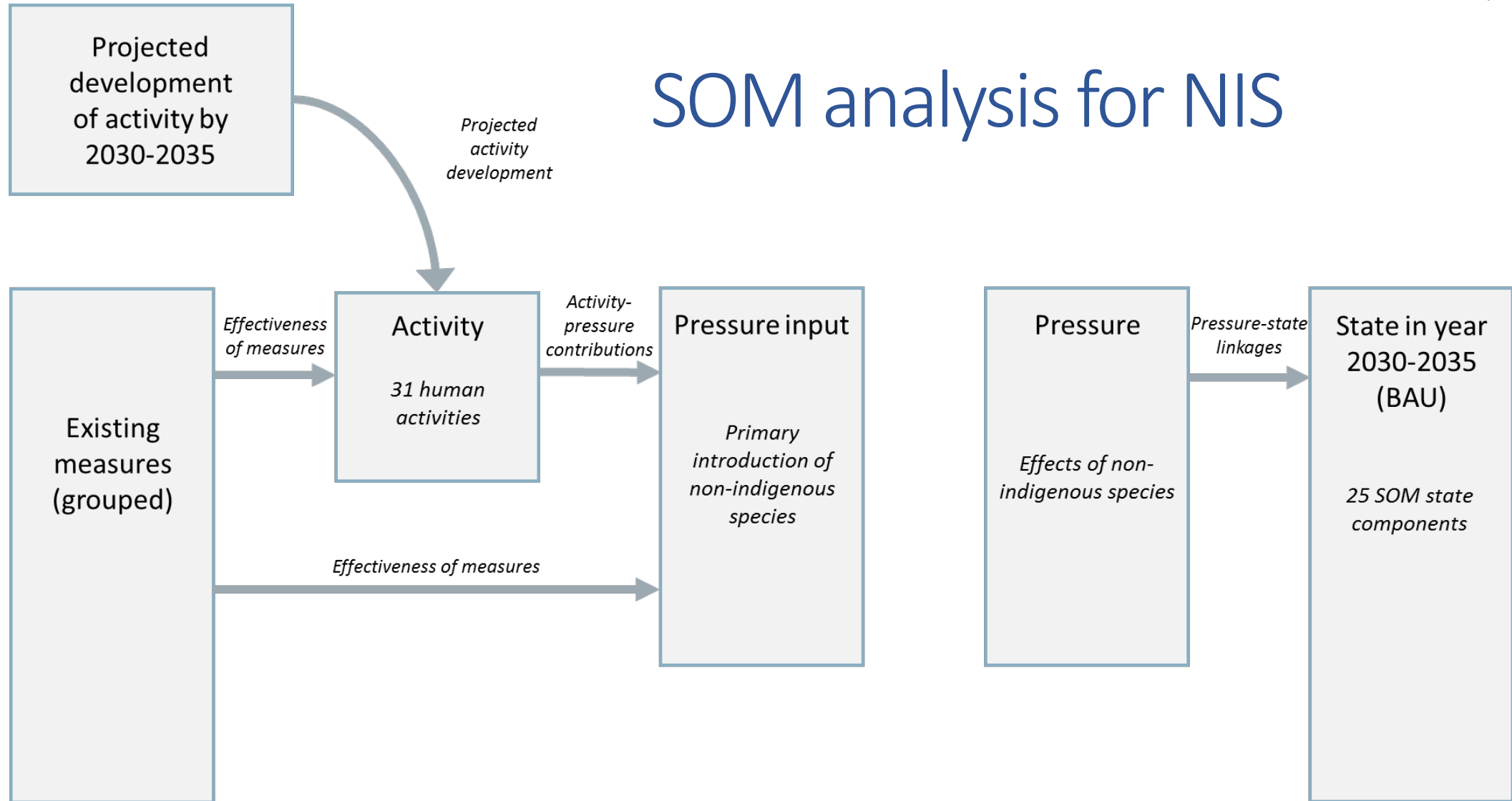


Topic-specific issues

- Only considers primary introductions to the Baltic - secondary spread within the Baltic is not assessed
- Mainly expert-based data
 - Number of experts per data component: 15
 - Activity-pressure contributions from AquaNIS database



SOM analysis for NIS



Data for NIS

Data component	Origin of data	Spatial resolution
Activity-pressure contributions	AquaNIS database	Whole Baltic Sea
Existing measures	Literature review, Contracting Parties	17 sub-basins
Effectiveness of measures	Expert evaluation	Whole Baltic Sea
Development of human activities	Literature review, existing data and projections	Whole Baltic Sea
Pressure-state links	Expert evaluation	NA



Focus of SOM assessment for NIS

- Projected reductions in the anthropogenic introduction of NIS



HELCOM GES threshold for NIS

No new introductions of
NIS/CS to the Baltic Sea
through human activities
during a six-year
assessment period

Projected reductions in pressure inputs

Anthropogenic
introduction of NIS

Low reduction
(15 – 20 %)

Changes in pressure inputs result from existing measures and changes in human activities (e.g. shipping, aquaculture)



The most effective measure types per activity— anthropogenic introduction of NIS

Activity	Aquaculture	Transport – shipping ballast water	Transport – shipping biofouling	Transport – shipping infrastructure (canals)
Measure type	Require rigorous invasion risk assessment before any potential NIS is allowed for importation	Full implementation of the Ballast Water Management Convention	Regionally harmonized in-water cleaning regulations	Mandatory hull cleaning en route
	Mandatory and rigorous NIS risk assessments prior to introduction of new fish stock (e.g. stock escape, parasites, etc)	More stringent technical requirements and standards for ballast water and sediment management on ships	Enforce installation and maintenance of anti-fouling systems	Mandatory ballast water treatment en route (canals)



Activity	Transport – shipping ballast water	Transport – shipping biofouling
Full implementation of the Ballast Water Management Convention	68.8 (23.7) ○●●	NA
Strict enforcement of compliance with the Ballast Water Management Convention through increased frequency of sampling and analysis of ballast water as part of port State control inspections	62.5 (27.9) ○●●	NA
More stringent technical requirements and standards for ballast water and sediment management on ships	64.3 (24.8) ○●●	NA
Enforce installation and maintenance of anti-fouling systems	NA	61.0 (20.7) ○●●
Regionally harmonized in-water cleaning regulations	NA	62.0 (22.3) ○●●
Adoption and implementation of a HELCOM Roadmap on Biofouling Management	NA	54.0 (23.4) ○●●
Perform in-water inspections of ships' hulls for ships arriving from high risk areas prior to entering the Baltic. Take necessary action if NIS are identified (denying port access, requiring in-water cleaning of hull, dry-docking etc.)	NA	53.5 (16.5) ○●●
Require hull niche areas to be free of biofouling	NA	51.4 (17.4) ○●●
Implementation of biofouling management plan and biofouling management record book for ships	NA	49.0 (14.5) ●●●
Risk assessment based in-water cleaning procedures	NA	60.2 (16.9) ●●●
Confidence	Moderate	Moderate
Number of experts	15	14

Most important activities to introduction of NIS

Anthropogenic introduction of NIS
Transport – shipping ballast water
Activities and sources outside the Baltic Sea Region
Transport – shipping biofouling



Results of SOM analysis for coastal fish

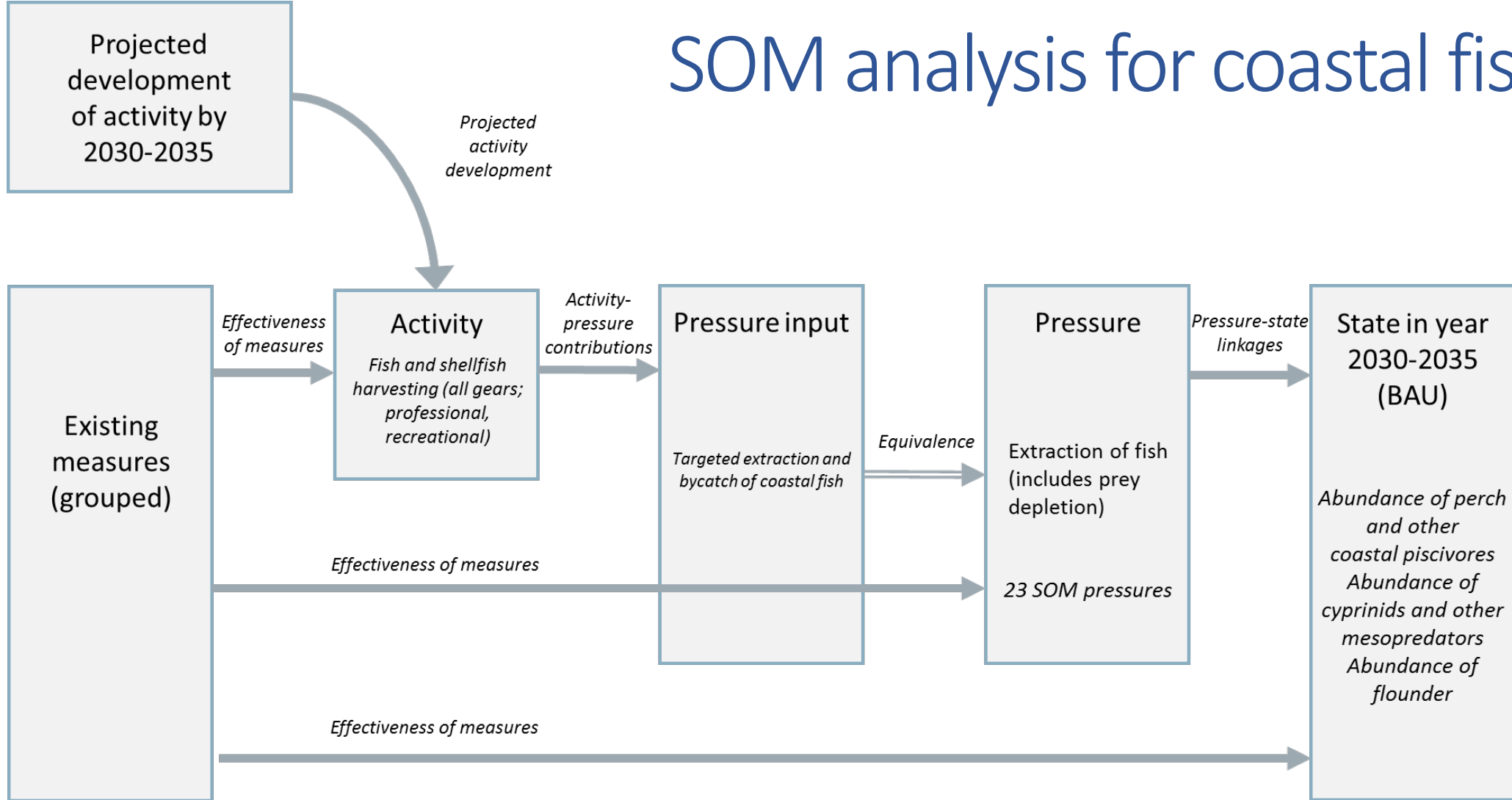


Topic-specific issues

- Presented as approximate Baltic Sea averages, available in the report for four to six distinct sub-areas
- Eutrophication a major pressure on some species/functional groups, but its reduction not quantified in the SOM analysis
- Only expert-based data
 - Number of experts per data component: 1 - 36
- Very low number of participating experts for some species/functional group – area combinations
 - 1 experts: 2 species/functional group – area combinations
 - 2 experts: 3 species/functional group – area combinations
 - 3 experts: 4 species/functional group – area combinations
 - 4+ experts: 7 species/functional group – area combinations



SOM analysis for coastal fish



Data for fish

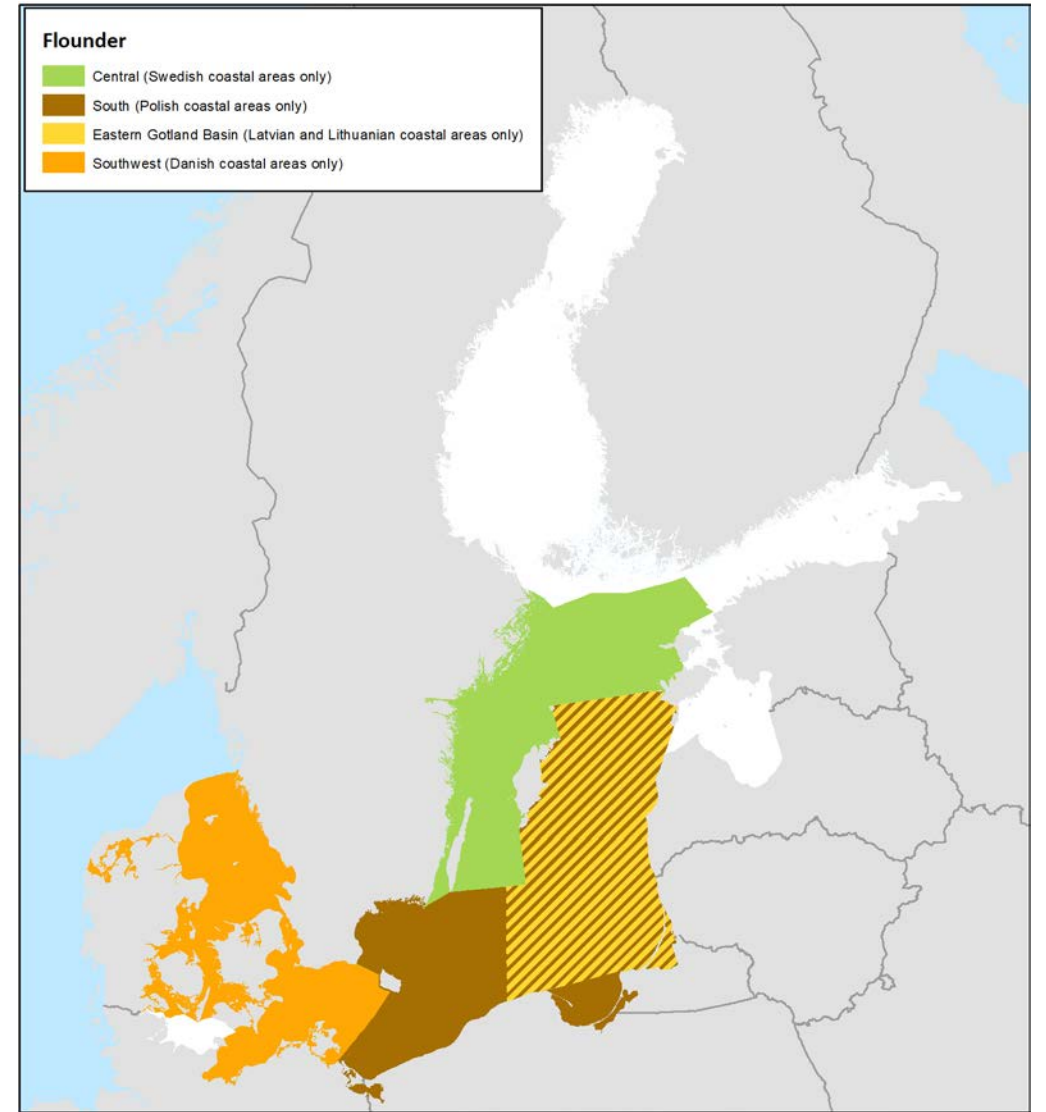
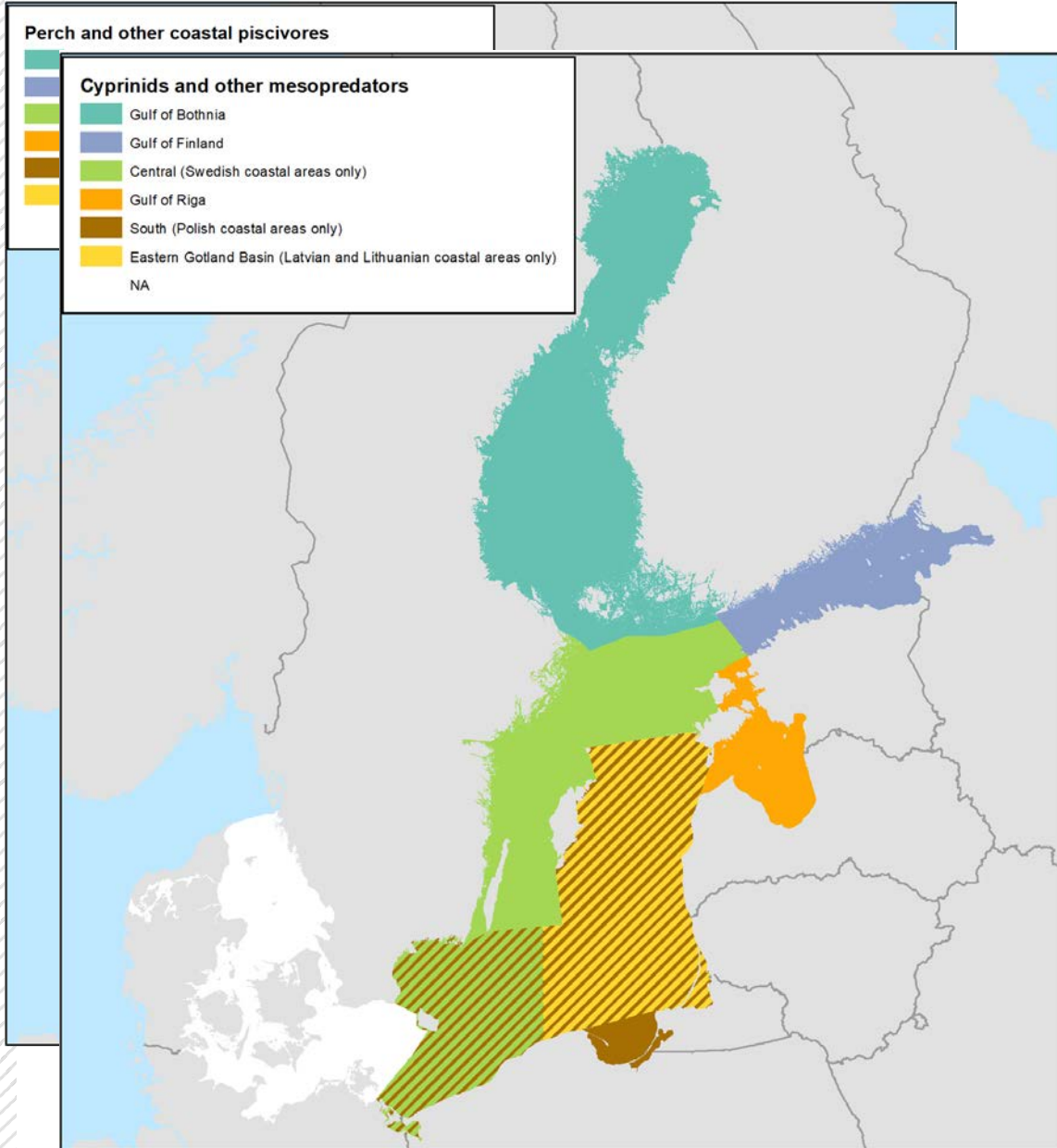
Data component	Origin of data	Spatial resolution
Activity-pressure contributions	NA	NA
Existing measures	Literature review, Contracting Parties	17 sub-basins
Effectiveness of measures	Expert evaluation	Whole Baltic Sea
Development of human activities	Literature review, existing data and projections	Whole Baltic Sea
Pressure-state links	Expert evaluation	Various



Focus of SOM assessment for coastal fish

- Probability to achieve GES for
 - i. **Perch and other coastal piscivores (4 of 6 assessments)**
 - ii. Cyprinids and other mesopredators (4 of 6 assessments)
 - iii. Flounder (3 of 4 assessments)
- Probability to achieve specific state improvement for
 - i. **Perch and other coastal piscivores (2 of 6 assessments)**
 - ii. Cyprinids and other mesopredators (2 of 6 assessments)
 - iii. Flounder (1 of 4 assessments)





Probability to achieve GES for perch and other coastal piscivores is...

Very low -
Moderate

Expected pressure reduction
9 – 33%

Required pressure reduction
to achieve GES: 30 - 60%
(standard deviation: 0 - 15%)

Very low

- Central
- Eastern Gotland Basin

Moderate

- Gulf of Bothnia
- Gulf of Riga

Probability to achieve 10%
state improvement for
**perch and other coastal
piscivores** is...

Very low -
High

Very low

- Gulf of Finland

High

- South

Expected pressure reduction
6 – 21%

Required pressure reduction
to achieve state improvement:
11 - 21%
(standard deviation: 1 - 2%)

The most significant pressures affecting the abundance of each species or functional group

Perch and other coastal piscivores

- 1.Extraction of fish (includes prey depletion)
- 2.Effects of eutrophication
- 3.Human-induced food web imbalance

Cyprinids and other mesopredators

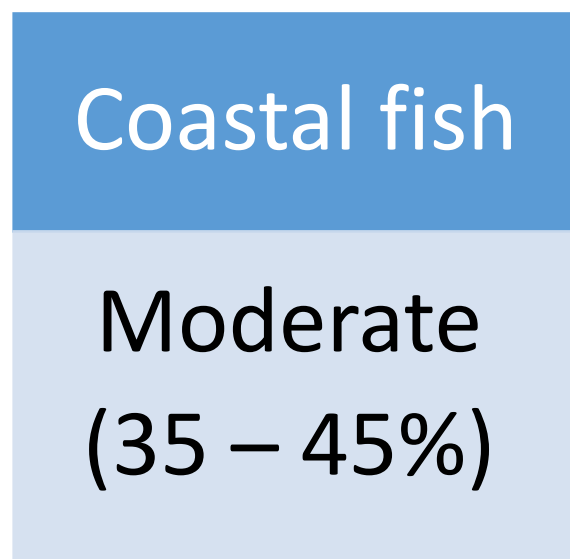
- 1.Extraction of fish (includes prey depletion)
- 2.Effects of eutrophication
- 3.Human-induced food web imbalance

Flounder

- 1.Extraction of fish (includes prey depletion)
- 2.Effects of eutrophication
- 3.Effects of non-indigenous species



Projected reductions in targeted extraction and bycatch of coastal fish



The most effective measure types to reduce targeted extraction and bycatch of coastal fish

Activity: Fish and shellfish harvesting
Spatial closures
Seasonal closures
Measures to reduce recreational fishing (e.g. licenses)

Changes in pressure inputs result from existing measures and changes in human activities

Other SOM results



Bimodal distribution

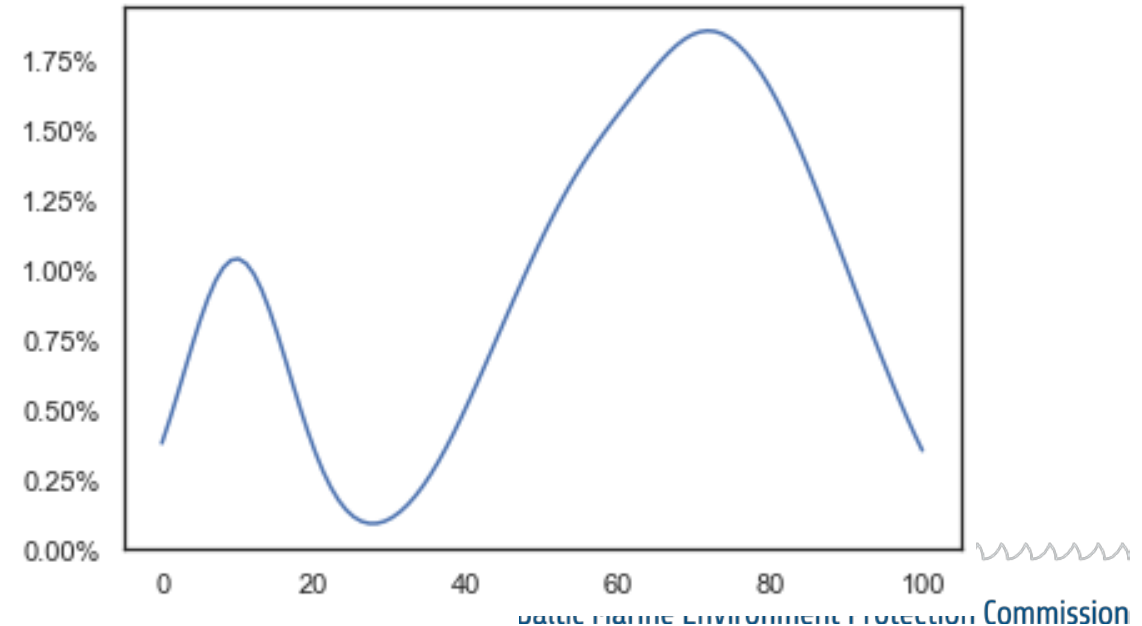
Example from hazardous substances

Probability to reach GES for PFOS is...

LOW

Expected pressure reduction
6 – 20%

Required pressure reduction
to achieve GES: 51%
(standard deviation: 21%)



Impact of bimodal distribution

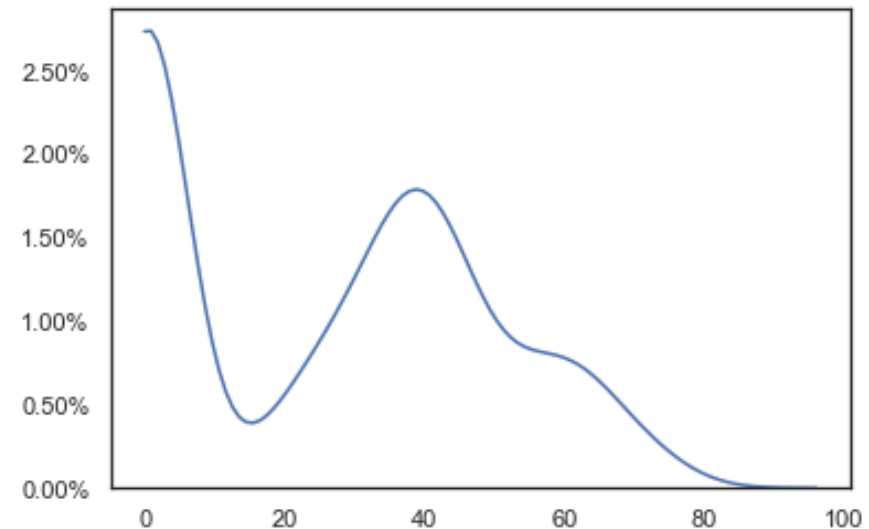
Example from birds

Probability to achieve a 10% state improvement for **long-tailed duck** is...

Moderate

Expected pressure reduction
0 – 40%

Required pressure reduction
to achieve 10% state
improvement: 36%
(standard deviation: 16%)



Bimodal distribution vs uncertainty

Example from hazardous substances

Probability to reach GES
for TBT is...

Very low

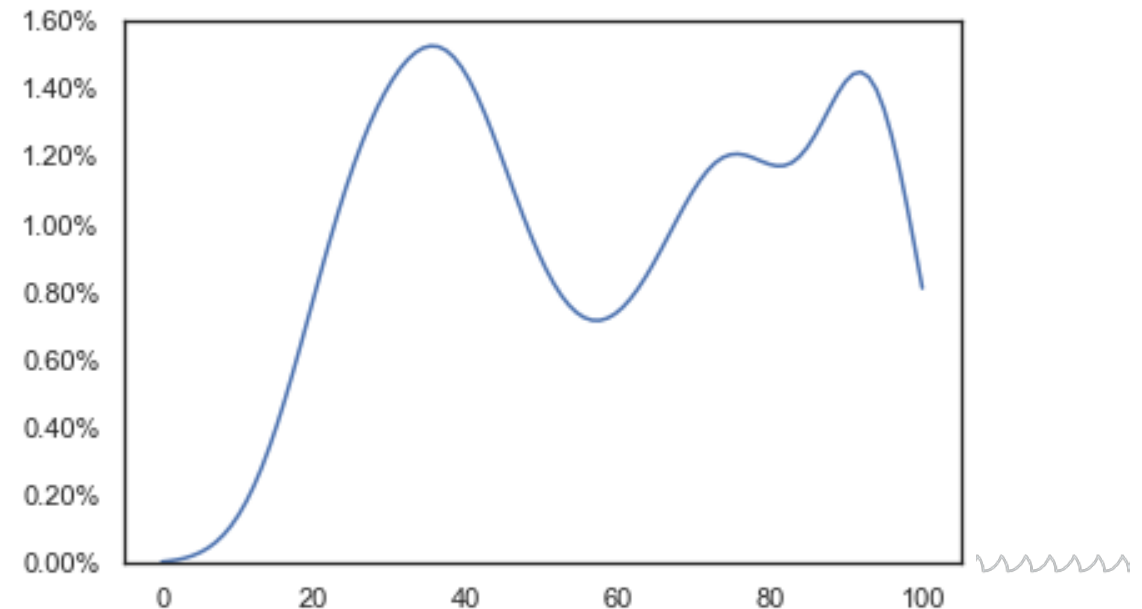
Expected pressure reduction

-2 – 8%

Required pressure reduction

to achieve GES: 55%

(standard deviation: 27%)



Consensus and uncertainty in the same figure

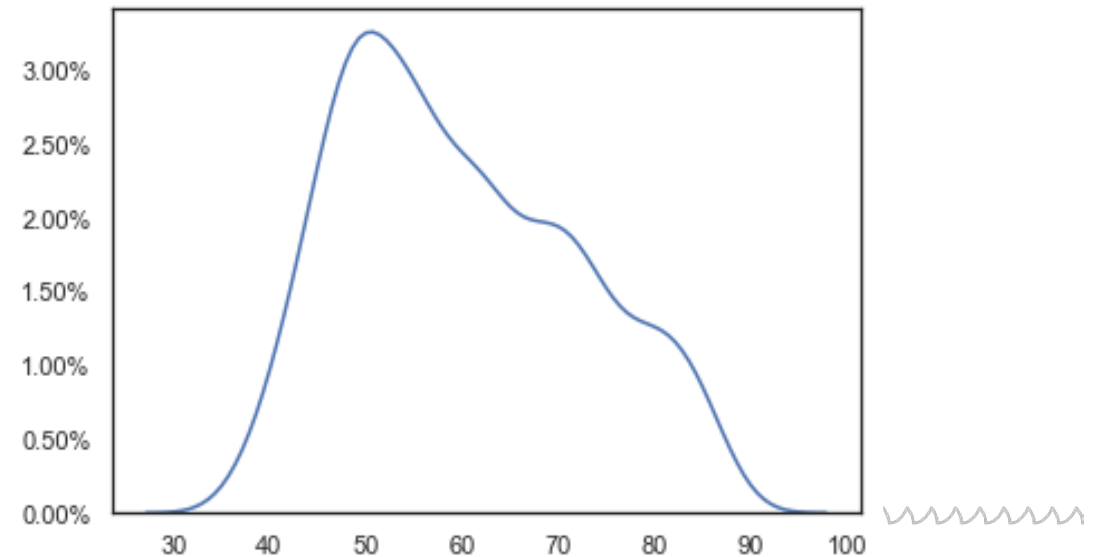
Example from marine mammals

Probability to achieve noticeable state improvement for the western Baltic population of harbour porpoise is...

Very low

Expected pressure reduction
0 – 15%

Required pressure reduction to achieve state improvement:
52%
(standard deviation: 16%)



Effect of development of human activities scenarios

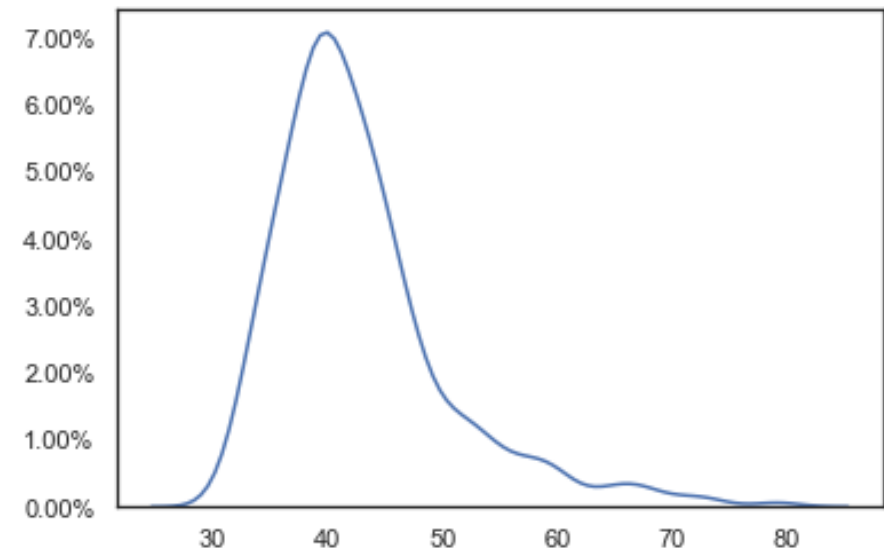
Example from birds

Probability to maintain
GES for great black-backed
gull is...

Very low

Expected pressure reduction
-40 – 17%

Required pressure reduction
to maintain GES: 42%
(standard deviation: 1.5%)



Projected changes in waterbird collisions

Collisions
Very high increase (-160 – -150%)

Most effective measure types to reduce collisions

Activity: Renewable energy generation
Seasonal or real time (e.g. radar based) closures of wind farms
MSP considers migratory patterns and other sensitive areas
Environmentally sound lighting of offshore installations

Changes in pressure inputs result from existing measures and changes in human activities (e.g. offshore wind energy production)



Projected reductions in pressure inputs

Input of continuous noise 63/125 Hz	Input of continuous noise 2 kHz	Input of impulsive noise with peak energy below 10 kHz
Low increase (-18 – -6 %)	Low to moderate increase (-21 – -2%)	Low to moderate reduction (12 – 20 %)*

Changes in pressure inputs result from existing measures and changes in human activities (e.g. shipping, tourism and leisure activities)

*Development of human activities scenarios only cover 0 – 10% of activities relevant to impulsive noise input compared to >80% for continuous noise. Options currently under review to increase coverage.

Interesting result: very high projected pressure reduction

Example from marine litter

Projected reduction in pressure inputs

Input of top 15 litter items to the beach

High reduction
(70-100%)

Top 15 litter items
comprise 67% of all
beach litter items
around the Baltic Sea

Changes in pressure inputs result from existing measures and changes in human activities (e.g. waste waters, shipping infrastructure)



Interesting result: very high projected pressure reduction, continued

Example from marine litter

Activity	Fish and shellfish harvesting (all gears; professional, recreational)	Transport – shipping (incl. anchoring, mooring)
More stringent controlling and reporting of ships' delivery of waste in ports	NA	34.1 (19.0) ○●●
Implementation of ISO standard for port waste reception facilities	NA	26.6 (15.2) ○●●
Full implementation of the no-special fee system for waste reception in all Baltic Sea ports	NA	45.5 (24.2) ○●●
Implementing ecolabel schemes and/or incentive systems for environmentally friendly shipping	NA	26.0 (14.8) ○●●
Including marine litter issues in educational programs and materials for professional sea use sectors	NA	40.6 (20.7) ○●●
No-special fee system for waste reception in ports from fishing vessels, including for the litter caught in fishing nets	44.2 (23.7) ○●●	NA
Information and education to fishermen about management and environmental impacts of fishing gear containing plastics and best practice in waste management within fishing sector	40.5 (24.4) ○○●	NA
Improvement in the marking of fishing gear and reporting on lost fishing gear	0.7 (0.7) ○○●	NA
Confidence	Moderate	Moderate
Number of experts	10-13	8-12

Topic-specific issues for marine mammals

- Very low number of participating experts for most populations in the pressure-state expert survey
 - 0 experts: 2 populations
 - 1 expert: 1 populations
 - 2 experts: 2 populations
 - 3 experts: 1 population
 - 4+ experts: 2 populations
- Complete analysis not possible for harbour seal in Kattegat or Kalmarsund
- Somewhat unexpected results



Unexpected result

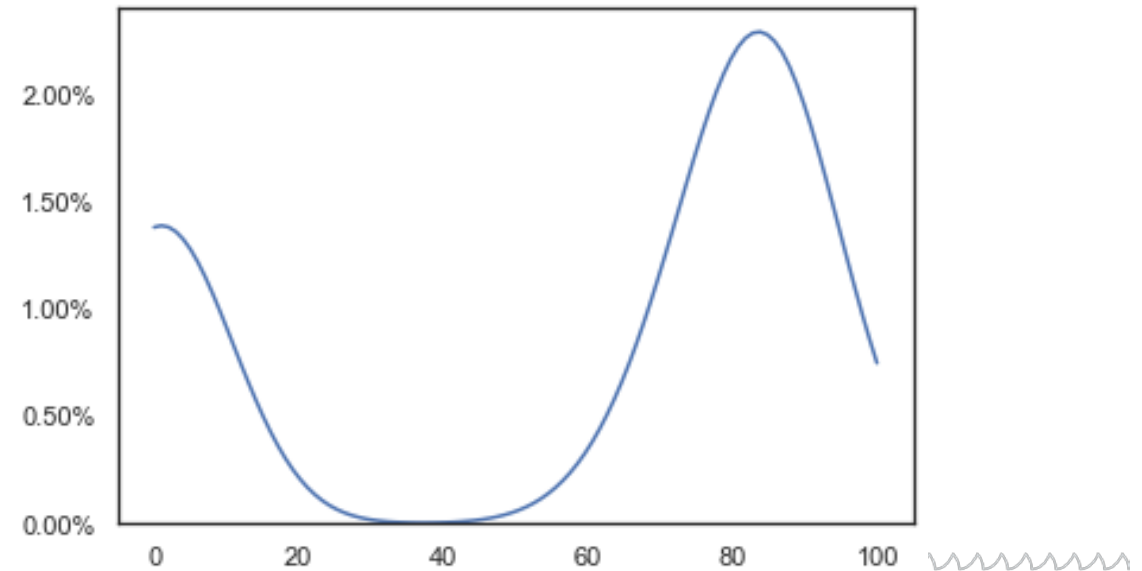
Example from marine mammals

Probability to achieve GES
for the southern
population of ringed seal
is...

Moderate

Expected pressure reduction
-1 – 7%

Required pressure reduction
to achieve GES: 55%
(standard deviation: 39%)



Unexpected result

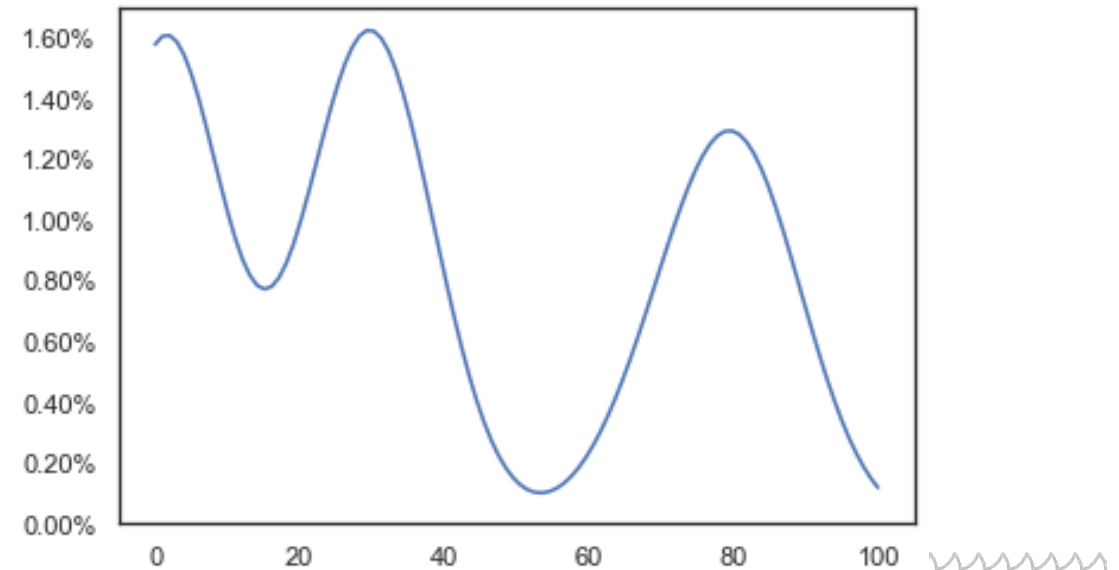
Example from marine mammals

Probability to maintain
GES for **grey seal** is...

Moderate

Expected pressure reduction
2 – 8%

Required pressure reduction
to maintain GES: 37%
(standard deviation: 34%)



Unexpected low likelihood to maintain GES

Example from migratory fish

Probability to achieve or maintain GES for **salmon** is...

Very low –
Moderate

Expected pressure reduction
4 – 19%

Required pressure reduction
to achieve GES: 41 - 63%
(standard deviation: 7 - 18%)

Very low	Low	Moderate
<ul style="list-style-type: none">• AU 4• AU 5• AU 6	<ul style="list-style-type: none">• AU 3	<ul style="list-style-type: none">• AU 1-2

Unexpected low likelihood to maintain GES: issue of unquantified pressures

Example from migratory fish

The most significant pressures affecting the abundance of each species

Salmon

1. River, lake, or land habitat loss/degradation
2. Extraction of fish (includes prey depletion)
3. Species disturbance: obstructions

Eel

1. Effects of pressures occurring outside the Baltic Sea region
2. River, lake, or land habitat loss/degradation
3. Extraction of fish (includes prey depletion)

Sea trout

1. River, lake, or land habitat loss/degradation
2. Extraction of fish (includes prey depletion)
3. Species disturbance: obstructions

Interesting result: similarities and differences in sub-regional pressure sources

Example from underwater noise

Activity	Fish and shellfish harvesting	Restructuring of seabed morphology	Tourism and leisure activities	Transport – shipping	Military operations	Research, survey and educational activities	Marine and coastal construction	Marine and coastal infrastructure*	Extraction of minerals
Noise type and area									
Continuous noise 63/125 Hz Western Baltic	Orange	Orange	Orange	Purple	Orange			Orange	
Continuous noise 63/125 Hz Central Baltic	Orange	Orange	Orange	Purple	Orange	Orange	Orange	Orange	
Continuous noise 63/125 Hz Gulf of Riga	Yellow	Orange	Light Green	Teal	Orange	Orange	Orange	Orange	
Continuous noise 63/125 Hz Gulf of Finland	Orange	Orange	Orange	Purple	Orange	Orange	Orange	Orange	
Continuous noise 63/125 Hz Gulf of Bothnia	Orange	White	Light Green	Teal	White	White	White	White	
Continuous noise 2 kHz Western Baltic	Orange	Orange	Yellow	Teal	Yellow	White	White	Orange	
Continuous noise 2 kHz Central Baltic	Orange	Orange	Orange	Purple	Orange	Orange	Orange	Orange	
Continuous noise 2 kHz Gulf of Riga	Yellow	Orange	Light Green	Teal	Orange	Orange	Orange	Orange	
Continuous noise 2 kHz Gulf of Finland	Orange	Orange	Yellow	Purple	Orange	Orange	Orange	Orange	
Continuous noise 2 kHz Gulf of Bothnia	Orange	White	Yellow	Purple	White	White	White	White	
Impulsive noise Western Baltic	White	White	White	White	Light Green	Light Green	Light Green	White	
Impulsive noise Central Baltic	Orange	Yellow	Orange	White	Yellow	Light Green	Yellow	White	Orange
Impulsive noise Gulf of Riga	White	Yellow	White	White	Purple	Yellow	Orange	White	Orange
Impulsive noise Gulf of Finland	White	Orange	White	White	Purple	Yellow	Orange	White	Orange
Impulsive noise Gulf of Bothnia	White	White	White	White	Yellow	Purple	Yellow	White	

Results are preliminary – improvements in autumn 2020

- Internal review
- Input from SOM Topic Teams and BSAP UP workshops
- Review by SOM Platform and Working Groups
- Validation of input data by HELCOM Working Groups and Expert Networks



Identified changes and additions

- General, topic-specific and editorial changes
- Changes to activity-pressure input data – will affect most results
- Selected major changes
 - Literature data on effectiveness of measures
 - Alternative scenarios on development of human activities and descriptions
 - Information on the state components most affected by the pressure in question
 - Impacts of measure types
 - Interpretation and contextualization of results
 - Improved figures



Timeline for SOM analysis of existing measures

Task	Responsible	Timing (month in 2020)
Validation of input data	Working Groups, Expert Groups	September
SOM Platform 4-2020 meeting	SOM Platform/Secretariat	September
Providing results to Working Group meetings	ACTION/Secretariat	August-October
Preparing overall and topic-specific reports to support BSAP update	ACTION/Secretariat	June-December
Potential SOM Platform 5-2020 meeting	SOM Platform/Secretariat	November

