GES REG

Final report on gaps in knowledge and needs for capacity building

by the three GES-REG partner countries

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Project	GES-REG
Work package	WP2
Preparation date	25/09/2013
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Introduction

Main focus of the Final report on gaps in knowledge is to depict a detailed analysis of data, knowledge and methodological gaps which are hampering the assessment of ecological statuss in marine waters of three GES-REG partnering countries: Estonian, Latvian, and Finnish. Thereby the identified needs illustrate the potential for capacity building.

Descriptor 1

Latvia

Data gaps:

On species level, in case of Latvia, benthic species distribution is insufficiently covered. Spatial coverage of data is sufficient only in soft substrates of Gulf of Riga, number of stations is insufficient in hard bottoms of open part of Baltic Sea.

Furthermore, data are missing to assess benthic species demographic characteristics. In case of pelagic communities, knowledge on species seasonal spatial coverage is also insufficient, especially in the open Baltic Sea. There are no data to assess genetic structure of any population.

On habitat level, spatial coverage of data to characterize benthic habitat distribution pattern and habitat area is not sufficient. Data resolution on physical, hydrological and chemical condition is not sufficient as well.

On ecosystem level, in case of Latvia, data is insufficient to assess relative proportion of ecosystem components.

Knowledge gaps:

On species level, there is lack of scientific knowledge on how to link species distribution range and pattern as well as abundance with pressures, e.g., eutrophication, contaminants, physical stressors (waves, currents, abrasion), climatic forcing and non-indigenous species. Poor knowledge on how much of poor status can be attributed to natural pressures and how much to anthropogenic. Furthermore, scientific knowledge is needed to assess, how much established steady state situation is preventing recovery of coastal benthic habitats to target conditions due to internal processes. Expert on genetic structure is not available.

On habitat level, there is no sufficient knowledge to describe condition of the typical species and communities and to link this to the pressures. The impact of physical and hydrological conditions (e.g., wave and current impact, abrasion, burial under sand and debris, etc.) on habitat conditions at present can be assessed mostly qualitatively. The quantitative assessment is not possible due to lack of knowledge.

On ecosystem level, in case of Latvia, there is no sufficient knowledge to determine target for composition and relative proportions of ecosystem components.

Methodological gaps:

On species level, method to present the image of species distribution and extent is needed. Commonly agreed indicators to assess deviation from target distribution pattern and range, as well as demographic conditions and genetic structure are needed. The existing zooplankton

species indicator is not fully tested and inter-calibrated yet. There is no commonly agreed indicator of hard bottom zoobenthos and phytobenthos species available. Indicator of phytoplankton is still in the development phase.

On habitat level, there are no indicators to assess habitat distribution, habitat extent and habitat condition.

On ecosystem level, in case of Latvia, there is no indicator to assess composition and relative proportions of ecosystem components.

Estonia

Data gaps:

On species level, there is no data available regarding area covered by sessile/benthic species.

Knowledge gaps:

On species level, there is insufficient scientific knowledge for reliably estimating population abundance for one indicator out of two.

On habitat level, there is insufficient scientific knowledge for reliable estimates regarding habitat distributional pattern, condition of the typical species and communities, relative abundance and/or biomass.

Methodological gaps:

On species level, there are no indicators available for monitoring population demographic characteristics (e.g. body size or age class structure, sex ratio, fecundity rates, survival/ mortality rates) and population genetic structure.

On habitat level, there are no indicators for monitoring habitat volume, as well as physical, hydrological and chemical conditions.

Finland

Data gaps concerning the spatial distribution on benthic species and habitats are obvious partly due to the very complex archipelago and coastal geography in Finland. The diversity of information needed at species, population and ecosystem levels to quantitatively, even qualitatively, assess biodiversity is challenging for science and for monitoring and assessment practices. Knowledge gaps are mainly related to the development of reliable indicators: GES limit values and pressure-impact relationship.

Gaps related to species, habitats and ecosystems:

-       Distribution of habitat forming species (data gap),

-       Ecological coherence of the marine protected areas (data & scientific knowledge gap),

-       Distribution of habitats (related to EUNIS/HELCOM classification) (data gap),

-       Status of species typical for habitats (data gap),

-       Information on threatened species (data gap),

-       Populations of coastal fish (data gap),

-       Abundance of wintering as well as fish and mussel eating water birds (data gap),

-       Reproduction potential of sea trout populations and the fishing pressure on sea trout (scientific knowledge gap),

-       Sea safe fishing gears,

-       Distribution and abundance of small flatfish and white fish in shallow sandy bottoms (data gap),

-       Ratio of perennial and annual algae (data gap).

Descriptor 2

Latvia

Data gaps:

Data spatial coverage is not sufficient to address trends in abundance, occurrence and distribution in relation to the main vectors and pathways of non-indigenous species spreading. No monitoring carried out in ports.

Knowledge gaps:

Knowledge is not sufficient to assess impact of non-indigenous species on native species.

Methodological gaps:

There is no indicator to assess impact of non-indigenous species on native species, including ratio between species. Data collection method is not efficient to assess trends in abundance and temporal occurrence.

Estonia

Data gaps:

There is no data available regarding distribution of non-indigenous species.

Knowledge gaps:

No gaps.

Methodological gaps:

There are no Estonian indicators for assessing distribution of non-indigenous species.

<div align="center">Finland</div>

High-quality taxonomic expertise is a prerequisite to detect non-indigenous species and that is often lacking.

There is currently no specific monitoring system for non-indigenous species making the assessment of distribution, abundances and especially their impacts partly impossible. The gaps are related to the following topics:

-        Impacts of the non-indigenous species (scientific knowledge gap),

-        Detection of changes in the distribution and abundance of the harmful non-indigenous species (data gap),

-        Ratio of non-indigenous species to indigenous species among fish, shrimps and mussels (data gap),

-        Abundances and distribution of mink and raccoon dog (data gap),

-        Indicator of ballast water (scientific knowledge gap).

Descriptor 3

<div align="center">Latvia</div>

Data gaps:

Data rows are too short to assess trends in occurrence and abundance of several coastal fish species. Insufficient spatial coverage to assess population age and size distribution.

Knowledge gaps:

Currently the knowledge on target population age and size distribution is not sufficient.

Methodological gaps:

Assessment methods are not available for all relevant fish species, consequently several indicators are not elaborated yet.

Estonia

Data gaps:

No gaps.

Knowledge gaps:

No gaps.

Methodological gaps:

There are no Estonian indicators available for estimating catch/biomass ratio and mean maximum length across all species found in research vessel surveys.

Finland

There are knowledge gaps concerning coastal commercial fish populations, that makes it difficult to reliable assess the status of their stocks.

The gaps are related to

- Amount of MSY stocks,

- Stock-specific mortality in various age classes for pikeperch, perch and white fish (scientific knowledge gap),

- Information of maturity age and age specific length of coastal species (scientific knowledge gap),

- Fishing pressure on coastal fish populations (data gap),

- Accurate river specific information on migratory species (data gap).

Descriptor 4

Latvia

Data gaps:

Data on productivity of key species or trophic groups are not available. Spatial coverage of functionally important groups/species is not sufficient.

Knowledge gaps:

Understanding of important functional aspects (energy flows and structure of food web) is insufficient.

Methodological gaps:

Indicators on productivity, performance of key species, viable food web structure is not available.

Estonia

Data gaps:

No gaps.

Knowledge gaps:

There is insufficient scientific knowledge for assessing environmental status as Estonian indicator for abundance trends in functionally important selected species/groups is under development.

Methodological gaps:

Estonian indicators are not available for assessing abundance trends in functionally important/selected groups.

Finland

For D4, severe knowledge gaps have been detected concerning the structure and especially functioning of the food webs, especially how that should be monitored and assessed for the health status of the Baltic ecosystem.

The specific gaps are related to

- Heath status of seals, amount of grey seal puppies, demography of seal populations (data gap)

- Reproduction capacity of water birds (data gap)

- Amount of predatory and cyprinid fishes (data gap),

- Post-smolt mortality of migratory species (data gap),

- Plankton indicators related to the functioning of the system (scientific knowledge gap),

- Benthic indicators related to size distribution (scientific knowledge gap)

- Benthic indicators for hard bottom habitats (scientific knowledge gap).

Descriptor 5

Latvia

Data gaps:

Spatial and temporal coverage of several (e.g., abundance of seaweeds, opportunistic macroalgae, phytoplankton, oxygen conditions, nutrient concentrations and nutrient load in water column) key parameters is not sufficient.

Knowledge gaps:

Pressure/impact relationship is not always quantified at the desired level. Species shift as a result of eutrophication is not sufficiently linked to eutrophication signals.

Methodological gaps:

Phytoplankton, hard bottom macrozoobenthos and phytobenthos species composition indicators are not available. Soft bottom macrozoobenthos indicators are not tested in coastal areas of the open sea part. No indicators are developed for hard bottom macrozoobenthos. Method is not tested to assess dissolved oxygen, spatial and temporal resolution is also bad for this parameter.

Estonia

Data gaps:

There is no data available for two Estonian indicators out of four to assess nutrient concentrations in the water column.

Knowledge gaps:

No gaps.

Methodological gaps:

An evaluation system suitable for Estonian conditions needs to be developed for nutrient ratios and dissolved oxygen.

Finland

Eutrophication is probably the best known problem and most studied and assessed phenomenon in Finland and in the Baltic Sea region. Insufficiency is mainly related to the current sparse number of indicators by Criterion, lack of oxygen deficiency indicator for shallow archipelago areas and the lack of national and international experiences of aggregation of information spatially and temporally.

Additional work is to be carried out to make operational the following indicators (scientific knowledge gaps):

- N:P ratio

- Concentration of organic carbon,

- Distribution, intensity and species composition of cyanobacterial and dinoflagellate blooms,

- PST and DST toxins,

- Health of the bladder-wrack belt,

- Oxygen deficiency in shallow bottoms,

- Length of filamentous algae,

- Reeds.

Furthermore, the assessment tool needs more development and harmonization with the WFD classification (methodological gap).

Descriptor 6

Latvia

Data gaps:

Information on spatial distribution and extent of physical pressure is not sufficiently detailed. Extent of seabed community affected by physical disturbance is insufficiently identified.

Knowledge gaps:

Understanding of physical disturbance effects (natural and anthropogenic) on seabed community is not sufficient.

Methodological gaps:

Indicators to assess physical damage are not developed.

Estonia

Data gaps:

There is insufficient spatial data coverage regarding physical damage of the seafloor and proportion of biomass or number of individuals in the macrobenthos above some specified length/size in Estonian marine areas.

Knowledge gaps:

No gaps.

Methodological gaps:

There are no assessment guidelines available for 4 indicators regarding physical damage of the seafloor and proportion of biomass or number of individuals in the macrobenthos above some specified length/size in Estonian marine areas.

Finland

The high spatial variability in the coastal areas makes it difficult to have reliable assessments due to the lack of data. Also the lack of good and well tested indicators is a problem.

Additional data and study is needed to finalise and develop the following indicators:

-        Amount of dredging and disposal of the dredged material (scientific knowledge gap),

-        Resilience of the impacts of dredging and disposal of the dredged material (scientific knowledge gap),

-        Further development of the BBI index (scientific knowledge gap),

-        Cumulative benthic index of human impacts (scientific knowledge gap),

-        Index related to geologic stability of the sea bed (scientific knowledge gap).

Descriptor 7

Latvia

Data gaps:

Spatial and temporal resolution of data is not sufficient to assess effect of alteration of hydrographic conditions.

Knowledge gaps:

CENTRAL BALTIC
INTERREG IV A
PROGRAMME
2007-2013

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
INVESTING IN YOUR FUTURE

Pressure/impact relationship is insufficiently understood.

Methodological gaps:

There is no indicator to assess impact of alteration of hydrographical conditions.

Estonia

Data gaps:

Data available locally, spatial coverage is not sufficient.

Knowledge gaps:

No gaps.

Methodological gaps:

Indicators and methods for evaluating environmental status regarding spatial characterization of permanent alternations and impact of permanent hydrographical changes are under development.

Finland

The proper interpretation of the descriptor is still scrutinized. In general, the permanent changes caused by human activities are currently considered only few and locals. Additionally, potential permanent changes in the stratification of water column caused by the climate change are considered appropriate to monitor under this descriptor. Especially the impacts on species and habitats are to be studied in order to find suitable indicators.

Descriptor 8

Latvia

Data gaps:

Spatial resolution of data is not sufficient. Data do not cover all required compounds.

Knowledge gaps:

Contaminant impact on biota is not sufficiently quantified. Information on threshold values is not sufficient.

Methodological gaps:

No indicator to assess contaminant effects is available.

Estonia

Data gaps:

Not possible to reliably estimate environmental status for effects of contaminants for 3 indicators out of 18 and concentration of contaminants for 2 indicators out of 9 due to the lack of spatial data coverage.

Knowledge gaps:

No gaps.

Methodological gaps:

Methods used under this descriptor need further development in order to increase credibility of the data.

Finland

Knowledge, data and expertise related to the monitoring and assessment of the effects of the pollutants is still the main gap. Extensive monitoring of all pollutants has neither been possible. Monitoring of the new pollutants will be planned based on the revision of the Directive on Environmental Quality Standards.

More development is needed to develop indicators for the following topics (scientific knowledge gaps):

-       Biological effects of hazardous substances (such as disturbances in micronucleus, reproduction disturbances of invertebrates and fish

-       Phycotoxins,

-       Toxicity test for sediments.

Descriptor 9

Latvia

Data gaps:

Available information does not cover all relevant compounds. There is also an insufficient temporal coverage to assess actual levels of contaminants.

Knowledge gaps:

No gaps.

Methodological gaps:

No gaps.

Estonia

Data gaps:

There is insufficient data coverage regarding frequency of regulatory level of contaminants being exceeded for 1 indicator out of 4.

Knowledge gaps:

No gaps

Methodological gaps:

No gaps

Finland

Spatial coverage of data and number of matrices could be increased.

Descriptor 10

Latvia

Data gaps:

There are no data on spatial and temporal distribution of marine litter as well as no data on marine litter characteristic.

Knowledge gaps:

There is no knowledge on marine litter impact on biota.

Methodological gaps:

There is no indicator to assess characteristic or impact of marine litter.

<div align="center">Estonia</div>

Data gaps:

There is insufficient data coverage regarding Estonian marine areas regarding characteristics of litter in the marine and coastal environment as well as impacts of marine litter.

Knowledge gaps:

There are knowledge gaps regarding the impact of microlitter.

Methodological gaps:

Methods under this descriptor need further development and a pilot study should be commenced.

<div align="center">Finland</div>

So far, monitoring of litter has been very sporadic and campaign-based. The quantity, quality and origin of litter on shores and especially in sea bed are mainly unknown and information on micro as well as nano sized litter is very limited. No monitoring and assessment methods have been established. Research project on the aforementioned topics are planned to gather information on the phenomenon and the impacts of litter, e.g. ghost nets, as well as to develop the following indicators (scientific knowledge gaps):

- Quantity and quality of visible litter on shores and sea bed,

- Amount of micro-litter.

Descriptor 11

<div align="center">Latvia</div>

Data gaps:

There is no data on spatial and temporal distribution of introduction of energy as well as no data on introduced energy characteristic.

Knowledge gaps:

There is no knowledge on impact of introduced energy on marine biota.

Methodological gaps:

There is no indicator to assess impact of introduced energy.

Estonia

Data gaps:

There is no previous data available regarding noise in marine areas for distribution in time and place of loud, low and mid frequency impulsive sounds as well as for continuous low frequency sounds.

Knowledge gaps:

There are knowledge gaps regarding impact of noise on marine organisms in the Baltic.

Methodological gaps:

There are gaps in methodology for assessing environmental status regarding noise.

Finland

Information on the spatial and temporal distribution as well as trends of quantities and quality of underwater noise and its effects on indigenous animals are currently not known. Additionally, indicators related to the input of cooling waters are considered (scientific knowledge gaps).