Attachment 1

HELCOM Joint Coordinated Monitoring System

1. Principles

1.1 By high degree of coordination, cooperation, sharing and harmonisation Contracting Parties aim at a system where data is produced once and used many times. Mutual benefit is one of the driving forces of HELCOM joint monitoring system.

1.2 HELCOM joint monitoring is scientifically sound. It is also cost-efficient, dynamic, adaptive, operational and pragmatic.

1.3 The HELCOM Joint Monitoring System is also balanced and functional and leads to a higher degree of harmonization and increased quality of data and ensures optimizing and rationalizing of monitoring activities in the Baltic Sea region.

1.4 Monitoring activities are coordinated between the countries and, where possible, shared within the region. This is achieved through using:

a) increased joint initiatives such as surveys, campaigns, cruises and shared stations,
b) use of remote sensing and autonomous measuring devices to complement ship cruise data and thereby enhanced data coverage and shared data products,
c) use of modelling to combine data and produce optimised data layers,
d) sharing of infrastructure, and
e) quality gains from specialization of countries and national institutes.

1.5 While recognizing the conservative nature of monitoring, this framework enhances and enables efficient adaptation of monitoring and observation activities to technological development.

1.6 The joint monitoring system supports an adaptive process which is fit for this purpose and helps Contracting Parties to jointly maximize the potential of their marine observation, sampling and surveying programmes.

1.7 The system is fully coordinated with corresponding data collection activities carried out by other organisations, such as EMEP, ICES and BOOS. For those Contracting Parties being also EU Member States these activities support the implementation of data and information collection frameworks at European level (e.g. EMODNET, GMES, SeaDataNet, WISE-Marine) as well as relevant EU directives such as the MSFD and WFD, as well as the EU Data Collection Framework.

1.8 The joint monitoring system also supports Contracting Parties' capacity to identify emerging environmental challenges.

1.9 The joint monitoring system enables the channelling of information collected outside the environmental sector to the HELCOM data and assessment products. Integrating data into a regional data pool and assessment products from other monitoring and observation activities such as fisheries surveys, Automatic Identification System (AIS) for vessel traffic, Vessel Monitoring System (VMS) for fishing vessels and compliance monitoring related to licensing of companies' operations is a vital part of the system.

1.10 Contracting Parties are primarily responsible for organising the monitoring for the on-going assessment of their catchments, territorial waters and exclusive economic zones. Coordination between the countries is a prerequisite for comparable data and assessments and for region-wide assessment products. In addition, there are clear cost-efficiency and improved quality benefits that can be achieved by pooling the efforts.

1.11 In order to have a sustainable marine data infrastructure the Contracting Parties ensure financial support to the process of collection, assembly, processing and dissemination of data.

1.12 HELCOM provides the platform for

a) deciding which observations are needed to be made,
b) how to make the observations,
c) which platforms and methods to apply,
d) deciding where and when to make the observations and by whom,
e) choosing which data products to create,
f) agreeing which external data to be integrated to the common regional pool and assessment products,
g) arranging financial support for collecting, assembling, processing and dissemination of data with the objective to have a sustainable marine data infrastructure, and for
h) applying for additional funding for developing and implementing the joint monitoring activities laid out in this Strategy.

1.13 Good governance of the joint monitoring system requires HELCOM to dedicate a specific HELCOM subsidiary body for the implementation of this Strategy.

2. Focus of monitoring

2.1 HELCOM monitoring focuses on parameters, which are indicative of the state of the environment, the prevailing anthropogenic pressures and their impacts, the progress towards objectives and targets, and the effectiveness of measures. HELCOM monitoring is carried out in such a way that an assessment with adequate confidence and precision is achieved.

2.2 The requirement for HELCOM monitoring arises from the BSAP and the MSFD and can be induced from the commonly agreed and Baltic-Sea-wide applicable set of HELCOM core indicators. The regional joint coordinated monitoring programme is hence primarily serving, in an integrated manner, the methodological elements laid out by these core indicators.

2.3 The set of parameters monitored enables the production of regional assessment products described in **Attachment 3** HELCOM assessment system.

2.4 The monitoring system consists of manageable components to enable assessment of
a) biological diversity: population trends, distribution and condition of species and changes in quality and quantity of habitats and biotopes,
b) trends in arrival, quantities and impacts of non-indigenous species,
c) trends in populations of all commercially exploited fish and shellfish and their age and size structure,
d) marine food webs, and to the extent that they are known, their occurrence at normal abundance and diversity, and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity,
e) human-induced eutrophication and its effects such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters,
f) sea-floor integrity, including benthic ecosystems,
g) concentrations and biological effects of contaminants, including radioactive substances, and
h) quantities and properties of marine litter and levels of underwater noise.

2.5 In addition, the monitoring system enables assessing:
a) physical loss of, or damage to, habitats, e.g. through smothering, sealing, siltation, abrasion and selective extraction of living and non-living resources,
b) inputs of heavy metals and synthetic hazardous substances,
c) inputs of radioactive substances,
d) inputs of nitrogen and phosphorus as well as organic matter,
e) introduction of energy, including underwater noise,
f) alteration of hydrological and hydrographical conditions through human activities, including a change in salinity and temperature, as well as acidification,
g) introductions of non-indigenous species,

h) introduction of microbial pathogens,
i) introduction of marine litter, and
j) selective extraction of species, including incidental non-target catches (e.g. by commercial and recreational fishing.)

2.6 The monitoring system is structured along themes/thematic programmes (e.g. biodiversity, hydromorphology, eutrophication, hazardous substances, litter, noise, non-indigenous species, physical loss and/or damage) in such a way that its structure meets national needs for easy reference and facilitates reporting obligations in particular those of the HELCOM EU member states that report under the MSFD.

3. Distribution of monitoring activities

3.1 The joint monitoring system covers the entire marine area of the Baltic Sea responding to the needs of the HELCOM BSAP and EU MSFD which both require a Baltic Sea-wide coordinated approach.

3.2 The use of sub-divisions of the Baltic Sea may be jointly agreed for the needs of a particular monitoring programme according to one of the hierarchical levels of the HELCOM sub-division (**Attachment 4**).

3.3 The set of parameters to be monitored can differ between sub-divisions depending on the natural conditions such as distribution of species as well as intensity and extent of pressures and impacts and monitoring purposes.

3.4 Cooperation and coordination of monitoring efforts are needed especially for the open sea areas in order to acquire representative data, covering the whole Baltic Sea and the spatial and temporal variability of the ecosystem.

3.5 For sampling in the open sea using research vessels, there is potential for cost-efficiency gains by temporal sharing of monitoring activities between the countries and, if possible, between thematic programmes. The countries bordering a sub-basin should coordinate their monitoring cruises and make arrangements for e.g. taking turns in sampling certain areas or sharing responsibilities of monitoring of certain parameters with the idea that monitoring methods are harmonised and all data will end up in a common pool and can be used by all. Effectively this means that each country will have available not only its own data but also data produced by eight other countries. See **Attachment 2** for HELCOM Data and Information Strategy.

3.6 Sampling is designed to take into account temporal and spatial scales of management in addition to the spatial and temporal variability of the marine environment. Furthermore, assessment needs may drive the timing of sampling campaigns.

3.7 Spatial and temporal frequency of sampling can differ between sub-regions, and they can be related to the environmental state and pressures with the least intensive monitoring in cases where good environmental status has been reached and is to be maintained, with little foreseen risk of degradation. A common approach to differentiate monitoring efforts should be developed depending on:

- the intensity and extent of pressures and environmental problems with areas with environmental problems requiring more intensified monitoring,

- the risk of failing to achieve or maintain good environmental status, and

- the purpose of monitoring (in relation to good environmental status; environmental targets; characteristics, pressures and impacts; acute events; knowledge gaps and investigations).

3.8 Monitoring of emissions of pollutants on land is organised by the Contracting Parties. Monitoring of emissions supports modelling of emissions and depositions by EMEP with which HELCOM cooperates with regard to emissions and depositions of nutrients and hazardous substances.

3.9 National authorities responsible for different sectors introducing pressures on the environment cooperate to provide HELCOM with data on those pressures and human activities driving them. In the long run, HELCOM aims to establish data streams on human pressures which enable regular updating of pressure overviews (e.g. Baltic Sea Pressure and Impact Indices) and socio-economic analyses.

4. Regional coordination and cooperation

4.1 Contracting Parties plan and implement their monitoring activities so that the activities form a complementary, mutually supportive and cost-effective monitoring system.

4.2 HELCOM provides the platform for coordination and cooperation and necessary bodies and expert groups are secured for coordination and cooperation.

5. High quality and cost-efficiency as the main drivers of joint monitoring

5.1 It is recommended that sampling should be carried out using certified methods and analyses of the samples are carried out by laboratories with introduced quality assurance procedures according to EN ISO/IEC 17025 (General requirements for the competence of testing and calibration laboratories) or ISO 9001 (Quality management systems - Requirements) or by laboratories performing close to these standards.

5.2 Sharing of responsibilities has potential to yield higher quality and economic gains with lower input of resources. Currently, all countries run their own monitoring programmes and produce data for national needs as well as joint assessments. This system is still too much of a patchwork with a certain level of harmonisation through e.g. HELCOM sampling and analytical guidelines and training in HELCOM expert groups. This distributed and detached system makes it necessary for all countries to maintain costly monitoring infrastructure and personnel in order to cover all issues.

5.3 There is potential to increase efficiency and harmonisation through:

a) joint surveys, cruises and campaigns: they enable full cooperation in practice, harmonization of practices, efficient exchange of knowledge and best practices as well as full use of monitoring infrastructure,
b) increasing automatisation of monitoring and running the programmes or devices cooperatively, and
c) increasing thematic specialisation: increased thematic specialization of the Contracting Parties or their institutes could increase cost-efficiency.

5.4 Potential for increased specialisation applies to biological, chemical and biochemical laboratory analyses. Special laboratory equipment and training of staff is usually required. For example:

a) Increased use of specialised laboratories for e.g. analyses of hazardous substances could be useful and help ensure high quality.

b) Analysis of biological samples could be carried out in specialised laboratories where both cost-efficiency and quality are the greatest.

5.5 There are also opportunities for lowering costs and increasing the quality of results by increasing specialisation cost-optimising the division of responsibilities within and between the countries in a transparent manner. Specialisation can lead to higher cost-efficiency through more efficient use of infrastructure and personnel, larger size and throughput of the analytical units. Cost-optimising the division of responsibilities within and between the countries could benefit from the differences in the costs of laboratory analytics between the countries which opens for opportunities for countries with higher costs.

6. Using autonomous and other new observation techniques

6.1 Remote sensing and autonomous measuring devices already in use in environmental monitoring and operational oceanography, such as ferry-boxes, buoys, passive samplers, fixed platforms, and coastal radars are efficient means to increase spatial and temporal coverage of observations.

6.2 Automated measuring devices, sensors and other equipment are costly and usually need regular maintenance. Sharing of investments, maintenance and data is the way to increase cost-efficiency and reliability of the measurements. There is also a clear advantage to share the platforms between institutes responsible for meteorological, oceanographic and environmental observations.

6.3 Data collected by the already operational unattended systems, such as the Alg@line ferry-box network, could be used more efficiently by national institutes for the monitoring of their territorial and EEZ waters by increasing joint planning of sampling, sharing of laboratory analysis and the data exchange.

6.4 Joint production of remote sensing images and assessment products should be agreed and responsibilities should be divided between the partners, including delivery of ground truth data.

6.5 Observations made by the public, accompanied by appropriate QA procedures, could be used for HELCOM monitoring purposes.

7. Use of models

7.1 Mathematical models should be used to combine data from various sources to produce combined new data layers, to make hind casts to complement data sets and to produce scenarios e.g. to forecast effects of management actions. In addition, models could be used to spatially and temporally aggregate data.

8. Reducing uncertainty in informing policy making

8.1 Effective observation networks and optimised data collection will enhance data coverage and hence make assessments more robust. This can contribute to strengthening the knowledge basis for agreeing on measures to improve the state of the marine environment in the Baltic Sea region. The more robust knowledge basis has potential to increase certainty and cost-effectiveness of the measures.

8.2 To improve the understanding of climate change and enable assessment of the ability of the marine environment to cope, adapt to or recover from the effects of climate change, there is a need to maintain and acquire data and knowledge of climate risks in the Baltic Sea region and in the marine environment and to increase data collection that serves this purpose.

9. Maintenance of long-term data sets

9.1 Systematic, harmonised and continuous monitoring, which produces long-term data sets, is needed to better understand systemic changes and to project the future of the marine environment. HELCOM monitoring should be configured also to detect climate change and its impacts on the Baltic Sea marine ecosystem. Therefore, sites with relevant long-term data records will be sustained, whilst accommodating improved data collection techniques where appropriate. National long-term data series should be integrated to this region-wide framework.