Monitoring programme: Biodiversity - Water column habitats, Eutrophication, Hydrographical changes
Programme topic: Hydrography

SUB-PROGRAMME: WATER COLUMN PHYSICAL CHARACTERISTICS

Styles

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **partly coordinated** between the national operational oceanographic institutes (within BOOS/ Copernicus marine service).

- Common monitoring guidelines: national operational oceanographic institutes.
- Common quality assurance programme: national operational oceanographic institutes.
- Common database: missing

Fully coordinated program will be developed and implemented by Copernicus marine service and its in-situ component.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Eutrophiction Biodiversity Maritime activities
	Ecological objectives	Natural distribution and occurrence of plants and animals Natural oxygen levels Natural landscapes and seascapes Safe maritime traffic without accidental pollution
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D5 Eutrophication D7 Hydrographical changes D11 Energy, including underwater noise
	Criteria (Q5a)	1.4 Habitat distribution 1.5 Habitat exten 1.6 Habitat condition 6.1. Physical damage, having regard to substrate characteristics 7.1. Spatial characterisation of permanent alterations 7.2. Impact of permanent hydrographical changes
	Features (Q5c)	Physical and chemical features: Annual and seasonal temperature regime and ice cover, current velocity, upwelling, wave exposure, mixing characteristics, turbidity, residence time Habitat types : The predominant seabed and water column habitat type(s) with a description of the characteristic physical and chemical features, such as depth, water temperature regime, currents and other water movements, salinity, structure and substrata composition of the seabed .
	Pressures and impacts (Q5c)	Physical loss: Sealing (e.g. by permanent constructions).
	Activities (Q7a, Q7b)	Man-made structures: land claim Man-made structures: Port Man-made structures: Offshore structures
Other relevant legislation (Q8a)	Habitats Directive WFD	

Assessment of: (Q4K)

State/Impacts	x	Temporal trends Spatial distribution State classification
Pressures	x	
Human activities causing the pressures	X	
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	**X**
HELCOM assessment unit Level 2: Subbasin	**X**
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	**X**
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	**X**

MONITORING CONCEPTS

Coordination	**Elements** Q9a (Q5c)	**Parameter** Q9a (Q5c)	**Method** Q9c, Q9d	**QA/QC** Q9e, 9f	**Frequency** Q9h, 9i	**Spatial resolution** Q9g, 9i	**Link to HELCOM core indicators**	**Link to MSFD GES characteristics** Q5b	**Spatial scope** Q4i	**Monitoring started** Q4h	**CPs monitoring**
Other	Waves	Wave action	Wave buoys, numerical modelling (WAM, SWAN)	Other	Continually	1-2 stations per sub-basin	-	-	EEZ	2001	DE, EE, FI, SE
Other	Currents	Current velocity	Current meters, numerical modelling (HIROMB, HBM, NEMO)	Other	Continually	1-2 stations in connectinmg straits	-	-	EEZ	2001	DE, DK, SE
Other	Seal level	Other parameter	Tide gauges, numerical modelling (HIROMB, HBM, NEMO)	Other	Continually	5-6 stations per sub-basin	-	-	WFD CW	2001	All HELCOM Contracting Parties

National	Physical oceanography	Sea level	Tide gauge, observe	National	Depends on a station type and sensor type (10 min. …. 1 per day)	Hydrological stations	-	-	Coastal Waters		PL
National	Physical oceanography	Sea level	Automatic measurements	National	Continous	12 devices	-	-	Coastal Waters	1887	FI
National	Physical oceanography	Wave height	Automatic measurements	National	Continous	4 buoys	-	-	EEZ	1973	FI

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Physical oceanography / Sea level**
Method	Measured by mareographs on the shore
QA/QC	The first check is automatic and the second step is manual. Service to the device is made regularly.
Frequency	Continuous measurements.
Spatial Scope	Along the coastline.
Spatial resolution	12 mareograph devices along the Finnish coastline.

Element / parameter	**Physical oceanography / Waves**
Method	Measured by buoys in open sea areas. In Finland one buoy per sub-basin.
QA/QC	The first check is automatic and the second step is manual. Service to buoys is made regularly.

Frequency	Continuous measurements.
Spatial Scope	Gulf of Finland, Northern Baltic Proper, Bothnian Sea, Bothnian Bay.
Spatial resolution	4 buoys

Element / parameter	**Waves/ Significant wave height, period and direction**
Method	Wave measurements using wave buoys. Modelling of wave characteristics using numerival models (WAM; SWAN).
QA/QC	Routines of institutes
Frequency	Period and direction – continuous (statistical parameters with a time step 1 hour)
Spatial Scope	Period and direction – whole Baltic Sea, can be used also for sub-basins.
Spatial resolution	Period and direction; numerical modelling – 3 nm. For observation see Waves Baltic Sea Environmental Fact Sheet.

Element / parameter	**Currents/ Current speed and direction**
Method	Current measurements using moored current meters. Circulation modelling using 3D numerical models (HIROMB, HBM, NEMO)
QA/QC	Described in MyOcean publication: Quality information document for near real time in situ products.
Frequency	Continuous, time step 1 hour
Spatial Scope	Whole Baltic Sea, can be used also for sub-basins.
Spatial resolution	Period and direction; numerical modelling – 1 nm. For observation see EMODNET map service.

Element / parameter	**Sea level/ Height**

Method	Automatic measurements of sea level by tide gauges (mainly based on pressure measurements). Circulation modelling using 3D numerical models (HIROMB, HBM, NEMO)
QA/QC	Described in MyOcean publication: Quality information document for near real time in situ products.
Frequency	Time step 15 minutes (1 hour)
Spatial Scope	Whole Baltic Sea, can be used also for sub-basins.
Spatial resolution	Numerical modelling 1 nm. For observation BOOS sea level stations.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

Monitoring is to be carried out to fulfill assessment requirements of HELCOM ecological objectives that are specified through HELCOM core indicators. The requirements on monitoring can include number of stations, the sampling frequency and replication.

Monitoring requirements	Monitoring of waves, currents and sea level has to be conducted in relevant spatial and temporal resolution, e.g. coastal sea level stations (tide gauges) are placed at an appropriate distance from each other in all Baltic sub-basins, wave buoys – at least 1-2 buoys in each Baltic sub-basin, current measurements, at least in the sea areas connecting the Baltic Sea and North Sea as well as different Baltic Sea sub-basins. Numerical models are used for all listed parameters to be able to assess the spatial distribution and temporal trends at the Baltic Sea and its sub-basin scales. Monitoring (and modelling) is conducted in the frames of BOOS and Copernicus marine service provision (at the moment via MyOcean project; starting from April 2015 as a permanent service).
Gaps	Waves monitoring gives a reliable overview of the parameters but it does not cover all sub-basins (Gulf of Riga) or parts of them (Baltic Proper); currents monitoring is done mostly in the southwestern Baltic Sea. Good temporal and spatial coverage in Poland coastal waters. There was proposed to set up 1 (one) new station.

Adequacy for assessment of GES (Q5d)

Monitoring should provide adequate data and information to enable the periodic assessment of environmental status, and distance from and progress towards GES as required by MSFD under Article 9 and 11.

Adequate data?	Yes

Established methods for assessment?	Yes
Adequate understanding of GES?	Irrelevant
Adequate capacity to perform assessments?	Yes

Assessment of natural variability (Q5e)

Quantitative. Numerical modelling is used, e.g. reanalysis for long enough periods (40 years, see MyOcean products).

DATA PROVIDERS AND ACCESS

Data access point	BOOS, Copernicus marine service (MyOcean) Finnish data is open and accessible (In Finnish). For Polish data: Institute of Meteorology and Water Management (IMGW)
Data type (Q10c)	Processed Modelled data
Data availability (Q10c)	EMODnet Finnish data is open and accessible (In Finnish). For Poland: IMGW database
Data access (Q10c)	Open access. Free and open in Finland. In Poland it is restricted, it depends on purpose and users.
INSPIRE standard (Q10c)	Hydrography
When will data become available? (Q10c)	Already available in Finland and Poland
Data update frequency (Q10c)	Depends on measurement method / device
Describe how the data and information from the programmewill be made accessible to the EC/EEA	In-situ data is available via EMODnet Physics portal; modelled data is available via MyOcean portal (Copernicus marine service in the future)

Contact points in the Contracting Parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes
Data is used in the following Baltic Sea Environment Fact Sheets (BSEF)	Wave climate in the Baltic Sea

REFERENCES