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Nutrient inputs from landbased sources

Monitoring programme: Eutrophication
Programme topic: Inputs

SUB-PROGRAMME: NUTRIENT INPUTS FROM LANDBASED SOURCES

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **fully coordinated**.

- Common monitoring guidelines: Waterborne Pollution Load Compilation (PLC) guidelines for monitoring and reporting of data.
- Common quality assurance programme: recommendations included in the PLC Guidelines.
- Common database: PLC database - presently being modernized by MAI CART OPER project to operationalize assessments and access via online web application.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Eutrophication
	Ecological objectives	Concentrations of nutrients close to natural levels
	<u>Nutrient reduction scheme</u> : Maximum Allowable Inputs (MAI) and Country-Allocated Reduction Targets (CART)	
Marine strategy framework directive (MSFD)	Descriptors	D5 Eutrophication
	Criteria (<u>Q5a</u>)	5.1 Nutrient levels
	Pressures and impacts (<u>Q5c</u>)	Nutrient and organic matter enrichment: Inputs of fertilisers and other nitrogen — and phosphorus-rich substances (e.g. from point and diffuse sources, including agriculture, aquaculture, atmospheric deposition). Inputs of organic matter (e.g. sewers, mariculture, riverine inputs).
	Activities (<u>Q7a</u> , <u>Q7b</u>)	Land based activities/industries: industry discharges Land based activities/industries: agricultural run-off Land based activities/industries: municipal waste water Uses Activities Other
Other relevant legislation (<u>Q8a</u>)	Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources	
	Council Directive 91/271/EEC concerning urban waste-water treatment	
	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy	
	Directive 2008/1/EC of the European Parliament and the Council concerning integrated pollution prevention and control	

Assessment of: (Q4k)

State/Impacts		
Pressures	X	temporal trends, spatial distribution
Human activities causing the pressures	X	temporal trends, spatial distribution
Effectiveness of measures	X	temporal trends, spatial distribution

Scale of data aggregation for assessments: (Q10a)

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

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c , Q9d	QA/QC Q9e , 9f	Frequency Q9h , 9i	Spatial resolution Q9g , 9j	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
PLC	NTot	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 un- monitored areas in the Baltic Sea catchment			WFD TW	1994	Most of the CPs - missing only from some un- monitored areas
PLC	PTot	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment			WFD TW	1994	Most of the CPs - missing only from some unmonitored areas

PLC	Water discharge	Freshwater input rates from rivers		Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment	WFD TW	1994	Most of the CPs - missing only from some unmonitored areas
PLC	NH4-N	Input level of chemical/nutrient/pollutant from land-based sources	<u>PLC Water Guidelines</u>	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment	WFD TW	1994	Most of the CPs - missing only from some unmonitored areas
PLC	NO2-N	Input level of chemical/nutrient/pollutant from land-based sources	<u>PLC Water Guidelines</u>	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment	WFD TW	1994	Most of the CPs - missing only from some unmonitored areas
PLC	NO3-N	Input level of chemical/nutrient/pollutant from land-based sources	<u>PLC Water Guidelines</u>	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment (can be reported as sum of NO2 and NO3)		1994	Most of the CPs - missing only from some unmonitored areas

PLC	NO3-N	Input level of chemical/nutrient/pollutant from land-based sources	<u>PLC Water Guidelines</u>	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment	WFD TW	1994	Most of the CPs - missing only from some unmonitored areas
PLC	PO4-P	Input level of chemical/nutrient/pollutant from land-based sources	<u>PLC Water Guidelines</u>	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment	WFD TW	1994	Most of the CPs - missing only from some unmonitored areas
PLC	Ntot	Input level of chemical/nutrient/pollutant from land-based sources	<u>PLC Water Guidelines</u>	Other	Large point sources: 12 Small point sources: 2-6	Direct Municipal wastewater treatment plants (MWWTP), either individually or as aggregated			All HELCOM Contracting Parties
PLC	Ptot	Input level of chemical/nutrient/pollutant from land-based sources	<u>PLC Water Guidelines</u>	Other	Large point sources: 12 Small point sources: 2-6	Direct Municipal wastewater treatment plants (MWWTP), either individually or as aggregated			All HELCOM Contracting Parties
PLC	PO4-P	Input level of chemical/nutrient/pollutant from land-based sources	<u>PLC Water Guidelines</u>	Other	Large point sources: 12 Small point sources: 2-6	Direct Municipal wastewater treatment plants (MWWTP), either individually or as aggregated			Only partially reported – often missing

PLC	NH4-N	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Municipal wastewater treatment plants (MWWTP), either individually or as aggregated	Only partially reported – often missing
PLC	BOD5/7	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Municipal wastewater treatment plants (MWWTP), either individually or as aggregated	Only partially reported – often missing
PLC	FLOW	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Municipal wastewater treatment plants (MWWTP), either individually or as aggregated	Most of the Contracting Parties
PLC	Ntot	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Industrial plants (INDUSTRY), either individually or as aggregated	All HELCOM Contracting Parties
PLC	Ptot	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Industrial plants (INDUSTRY), either individually or as aggregated	All HELCOM Contracting Parties

PLC	FLOW	Input level of chemical/ nutrient/ pollutant from land-based sources	<u>PLC Water Guidelines</u>	Other	Large point sources: 12 Small point sources: 2-6	Direct Industrial plants (INDUSTRY), either individually or as aggregated	Most of the Contracting Parties
PLC	Ntot	Input level of chemical/ nutrient/ pollutant from land-based sources	<u>PLC Water Guidelines</u>	Other	Large point sources: 12 Small point sources: 2-6	Direct Fish farm (FISH FARM) either individually or as aggregated	Most of the Contracting Parties
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PLC	BOD5/7	Input level of chemical/ nutrient/ pollutant from land-based sources	<u>PLC Water Guidelines</u>	Other	Large point sources: 12 Small point sources: 2-6	Direct Fish farm (FISH FARM) either individually or as aggregated	Only partially reported - often missing
PLC	Ntot	Input level of chemical/ nutrient/ pollutant from land-based sources	<u>PLC Water Guidelines</u>	Other	Every 6 years	Loads by sources (diffuse and point sources) of ~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment	Most of the Contracting Parties

PLC	Ptot	Input level of chemical/ nutrient/ pollutant from land-based sources	<u>PLC Water Guidelines</u>	Other	Every 6 years	Loads by sources (diffuse and point sources) of ~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment	Most of the Contracting Parties
PLC	Ntot	Other parameter	<u>PLC Water Guidelines</u>	Other	Every 6 years	Retention of ~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment	Most of the Contracting Parties
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Brief description of monitoring

Element / parameter	Annual nutrient loads, loads of organic matter, water discharges and river flows/ Input level of chemical/nutrient/pollutant from land-based sources (annually reported)
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Method	<p>Parameters have been monitored from rivers as well as from direct point sources. Inputs from unmonitored areas are estimated.</p> <p>Annual total loads of nitrogen, phosphorus and their fractions are reported every year by the HELCOM Contracting Parties and compiled by the PLC Data Manager at the Marine Research Centre, Finnish Environment Institute (MK/SYKE). The data collection is based on combination of monitored data (measurements at monitoring stations close to river mouth) and estimates of unmonitored areas. Monitored data are collected on flows and concentrations and total loads calculated. The estimates of unmonitored areas are based on proportion calculations of surfaces of monitored and unmonitored areas and monitored loads. These estimates / calculations have been carried out by the Contracting Parties.</p>
QA/QC	<p>No official information about the uncertainty of nutrient loads, loads of organic matter or flow data have been reported to HELCOM (PLC Data Manager). Further work on input uncertainty is required. The QA/QC procedure has been developed when modernizing the PLC database (HELCOM PLUS). There are gaps in time series of national inputs which will be corrected by the HELCOM Load Core Group.</p> <p>National sampling QA/QC, coordinated HELCOM QA/QC for input calculations.</p>
Frequency	<p>Annual reporting of river catchments is based on continuous flow and weekly/monthly concentration (a few time a year) concentration analysis. Sampling frequency of point sources varies from continuous to occasional sampling.</p> <p>Frequency 1/year to 1/week. An overview of monitoring by the Contracting Parties in 2012 was compiled by the PLC-6 project.</p>
Spatial scope	<p>Covers most of the inputs from the drainage area divided by nine Baltic Sea sub-basins (based on the PLC division).</p>
Spatial resolution	<p>Reported by country, sub-basin and river catchment. Point sources as either as aggregated by sub-basin and by country or by river catchment and as best point sources are reported individually with known location. This varies between the Contracting Parties.</p>

Element / parameter	Ntot and Ptot / Input level of chemical/nutrient/pollutant from land-based sources (reported periodically)
Method	<p>For periodic assessments, the total N and total P are reported by sources, i.e. diffuse sources (agriculture, scattered dwellings, atmospheric deposition to fresh water, storm water and overflow and natural background load) and from point sources (MWWTP, INDUSTRY and Fish farm).</p> <p>Periodic nutrient loads by sources have been calculated by well-known and described methods or by using a country specific method.</p>
QA/QC	<p>No official information about the uncertainty of nutrient loads have been reported to HELCOM (PLC Data Manager). Further work on input uncertainty is required. The QA/QC procedure was developed when modernizing the PLC data base (HELCOM PLUS). There are gaps in time series of national inputs which will be corrected by HELCOM Load Core Group.</p> <p>National sampling QA/QC, coordinated HELCOM QA/QC for input calculations.</p>
Frequency	<p>Based on calculations and periodically carried out every six years (next assessment (PLC-6) will be based on data collected during 2012 (Germany and Poland) and 2014 (all other Contracting Parties)).</p>
Spatial scope	<p>Covers most of the inputs from the drainage area divided by nine Baltic Sea sub-basins (based on the PLC division).</p>
Spatial resolution	<p>Reported by country, sub-basin and river catchment. Point sources as either as aggregated by sub-basin and by country or by river catchment and as best individually with location. This varies between the Contracting Parties.</p>
Element / parameter	Retention of nutrients (periodically) / other parameter
Method	<p>Nutrient retention have been calculated by either <u>well-known and described methods</u> or by using a country specific method.</p>

QA/QC	No official information about the uncertainty of nutrient retention has been reported to HELCOM (PLC Data Manager). The QA/QC procedure was developed when modernizing the PLC data base (HELCOM PLUS). There are gaps in time series of national inputs which will be corrected by HELCOM Load Core Group. National sampling QA/QC, coordinated HELCOM QA/QC for input calculations
Frequency	Based on calculations and periodically carried out every six years (of 2012/2014 data).
Spatial scope	Covers most of the inputs from the drainage area divided by nine Baltic Sea sub-basins (based on the PLC division).
Spatial resolution	Reported by country, sub-basin and river catchment.

Assessment of natural variability ([Q5e](#))

A description of the methodology used for normalizing input data is given in the PLC-5 report ([BSEP 128](#)), and the PLC-6 project has produced a [report](#) on statistical methods to calculate uncertainties on national datasets including methodology for filling in data gaps and missing data and development of standardized methodology for evaluating countries progress in fulfilling BSAP nutrient reduction targets.

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	Data on waterborne inputs of nutrients are needed to assess the amount of nutrient input to the sea to allow for follow-up of effectiveness of implemented measures (under e.g. river basin management plans, BSAP), for the core pressure indicator on nutrient inputs as well as follow-up of progress towards the agreed BSAP country-wise nutrient reduction targets (CART). Pressure data should also be useable for HELCOM holistic assessments (i.e. pressure index). Regular annual reporting of waterborne nutrient inputs is needed from all the Contracting Parties in order to ensure a reliable MAI/CART follow-up scheme.
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Gaps	There are gaps in data reported by the Contracting Parties to the HELCOM PLC database. PLC projects have on a case-by-case basis filled in data gaps, but this is time consuming and requires separate endorsement of the data by the countries. A description of the latest PLC dataset (for PLC-5.5) is given in chapter 1.2 in BSEP 141 .
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Targets - Adequacy for assessment of progress with targets (Art. 10) ([Q6b](#))

This section indicates whether the programme provides suitable and sufficient data and information to enable assessment of progress towards achievement of the relevant environmental targets (using indicators identified by MS under Art. 10).

Suitable and sufficient data?	Yes
Established methods for assessment?	Yes
Adequate capacity to perform assessments?	Yes
Will the data and information collected enable the regular updating of targets? (Q6c)	Yes
Description of Targets (Q6d)	<p>The BSAP nutrient reduction scheme's maximum allowable inputs (MAI) of nutrients can be implemented by measures taken to reduce waterborne and airborne nutrient inputs. Also the effects of reductions in air emissions outside the HELCOM area (following implementation of Gothenburg Protocol) are expected to contribute to fulfillment of MAI. Annual datasets of contributions for different sources (countries and shipping) to N deposition to the Baltic, allows for follow-up of progress towards MAI and country-wise allocation of nutrient reduction (CART).</p> <p>It should be noted that the MAI (which can be considered as an "environmental targets") do not include separate targets for waterborne and airborne inputs. Also the core pressure indicator on nutrient inputs combine airborne and nutrient inputs.</p>
Gap-filling date Targets (Q6e)	Considered adequate in 2014
Plans for targets (Q6f)	Not applicable. Targets exist.

Measures - nature of the activity and/or pressure covered by the programme (spatial distribution, frequency of activity)

How the monitoring is considered adequate to identify which activities and pressures that are causing environmental degradation and how it can help identifying new measures ([Q7b](#))

Spatial distribution/extent of activity	The last periodic PLC assessment (PLC-6) assessed inputs from point sources, monitored and unmonitored areas in 2014 (2012 for DE and PL). Countries reported calculated inputs from different sources within the Baltic Sea catchment area, e.g. point sources (WWTP, industry, fish farms), diffuse (agriculture, scattered swellings, storm waters, atmospheric deposition), and natural background sources.
Intensity of activity	By assessing the contribution of different sources to the inputs as well as trends in inputs from different sources, it is possible to identify where measures have resulted in reduced inputs and where there is still potential to reduce pollution.
Temporal changes in activity	Data series available covering emissions and deposition since 1994
Type of activity (within broad category f, e.g. fisheries, tourism/recreation)	Municipalities, industry, agriculture, fish farms

Measures - Adequacy for assessments of measures (Art. 13) ([Q7e](#))

The monitoring supports assessment of follow up measures.

Adequate data?	Yes
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes
Adequate capacity to perform assessments?	Yes
Addresses activities/pressures?	Yes
Addresses effectiveness of measures?	No

Gap-filling date Activities and Measures (Q7f)

Considered adequate in 2014. NOTE: Already “adequate” but can be improved. The implementation of the new HELCOM PLUS database is expected to improve data reporting by the Contracting Parties as well as facilitate filling in of data gaps.

Assessment of natural variability (Q5e)

Quantitative.

DATA PROVIDERS AND ACCESS

Data access point	<u>HELCOM PLC</u>
Data type (<u>Q10c</u>)	Processed data sets, Modelled data: Total inputs are estimated based on measurements, modelling is used for periodic assessments of e.g. inputs from diffuse sources
Data availability (<u>Q10c</u>)	The MAI CART OPER project is modernizing the PLC database to operationalize assessments and access via online web application.
Data access (<u>Q10c</u>)	Open (moratorium for quality checking and verifying data)
INSPIRE standard (<u>Q10c</u>)	
When will data become available? (<u>Q10c</u>)	Data reporting deadline is 31 October each year (e.g. 2012 data should be reported by 31 Oct 2013). For periodic assessments, reporting of monitored data is also 31 October, but modelled results should be reported by the end of the year (31 December).
Data update frequency (<u>Q10c</u>)	Yearly, Every 6 years
Describe how the data and information from the programme will be made accessible to the EC/EEA	Currently an MS Access database containing the data is hosted by the Database Manager Finnish Environment Institute (SYKE). The on-going <u>HELCOM PLUS</u> project is working to transfer the database to an SQL database and building a web interface to allow for reporting and quality checking of the data as well as open access for viewing and downloading approved datasets.
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes, e.g. <u>BSEP128</u> Fifth Baltic Sea Pollution Load Compilation (PLC-5).

REFERENCES

Review of the Fifth Baltic Sea Pollution Load Compilation for the 2013 HELCOM Ministerial Meeting (2013) ([BSEP 141](#))

Fifth Baltic Sea Pollution Load Compilation (PLC-5) An Executive Summary ([BSEP 128A](#))

Fifth Baltic Sea Pollution Load Compilation (2011) ([BSEP 128](#))

[Recommendation 26-2](#) Compilation of waterborne pollution load (PLC Water)

IMAGE RIGHTS