

Home / Action areas / Monitoring and assessment / Monitoring Manual / Inputs /
Contaminant inputs from atmosphere

Monitoring programme: Contaminants
Programme topic: Inputs

SUB-PROGRAMME: CONTAMINANT INPUTS FROM ATMOSPHERE

TABLE OF CONTENTS

[Regional coordination](#)

[Purpose of monitoring](#)

[Monitoring concepts table](#)

[Assessment requirements](#)

[Data providers and access](#)

[References](#)

REGIONAL COORDINATION

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

- Common monitoring guidelines: at [EMEP](#)
- Common quality assurance programme: at [EMEP](#)
- Common database: [EMEP](#)

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Hazardous substances
	Ecological objectives	Concentrations of hazardous substances close to natural levels
Marine strategy framework directive (MSFD)	Descriptors	D8 Contaminants
	Criteria (<u>Q5a</u>)	8.1 Concentration of contaminants
	Pressures and impacts (<u>Q5c</u>)	<p>Contamination by hazardous substances: Introduction of synthetic compounds (e.g. priority substances under Directive 2000/60/EC which are relevant for the marine environment such as pesticides, antifoulants, pharmaceuticals, resulting, for example, from losses from diffuse sources, pollution by ships, atmospheric deposition and biologically active substances).</p> <p>Introduction of non-synthetic substances and compounds (e.g. heavy metals, hydrocarbons, resulting, for example, from pollution by ships and oil, gas and mineral exploration and exploitation, atmospheric deposition, riverine inputs), water abstraction).</p>
Other legislation (<u>Q8a</u>)	<p>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</p> <p>1998 Aarhus Protocol on Persistent Organic Pollutants (POPs) and Kiev Protocol on Pollutant Release and Transfer Registers of the UNECE Convention on Long-Range Transboundary Air Pollution (CLRTAP)</p> <p>Directive 2008/1/EC of the European Parliament and the Council concerning integrated pollution prevention and control; Minamanta Convention on Mercury</p>	

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 <u>Q9a</u> (<u>Q5c</u>)	Parameter <u>Q9a</u> (<u>Q5c</u>)	Method <u>Q9c, Q9d</u>	QA/QC <u>Q9e, 9f</u>	Frequency <u>Q9h, 9i</u>	Spatial resolution <u>Q9g, 9i</u>	Link to HELCOM core indicators	Link to MSFD GES characteristics <u>Q5b</u>	Spatial scope <u>Q4i</u>	Monitoring started <u>Q4h</u>	CPs monitoring
Regional	Cd	Input level of chemical/nutrient/pollutant from atmosphere	<u>EMEP/MSC - W TECHNICAL REPORT 2 / 2013</u>	Other	Monthly	EMEP grid 50x50 km	-			1998	All HELCOM Contracting Parties (modelling covers whole drainage area)
Regional	Pb	Input level of chemical/nutrient/pollutant from atmosphere	<u>EMEP/MSC - W TECHNICAL REPORT 2 / 2013</u>	Other	Monthly	<u>EMEP grid 50x50 km</u>	-			1998	All HELCOM Contracting Parties (modelling covers whole drainage area)

Regional	Hg	Input level of chemical/nutrient/pollutant from atmosphere	<u>EMEP/MSC - W TECHNICAL REPORT 2 / 2013</u>	Other	Monthly	<u>EMEP grid 50x50 km</u>	-	1998	All HELCOM Contracting Parties (modelling covers whole drainage area)
Regional	Dioxines / Furans	Input level of chemical/nutrient/pollutant from atmosphere	<u>EMEP/MSC - W TECHNICAL REPORT 2 / 2013</u>	Other	Monthly	<u>EMEP grid 50x50 km</u>	-	1998	All HELCOM Contracting Parties (modelling covers whole drainage area)

Brief description of monitoring

Full description in EMEP/MSC - W TECHNICAL REPORT 2 / 2013 (Appendix B).

Element / parameter

Cd / Input level of chemical/nutrient/pollutant from atmosphere
Pb / Input level of chemical/nutrient/pollutant from atmosphere
Hg / Input level of chemical/nutrient/pollutant from atmosphere
Dioxines / Furans / Input level of chemical/nutrient/pollutant from atmosphere

Method

Annual total emissions of Pb, Cd, Hg and Dioxines/Furanes are officially reported every year to the UN ECE Secretariat by the HELCOM Contracting Parties and compiled by EMEP/MSC-E. The methodology for data collection is based on combination of emission measurements and emission estimates based on activity data and emission factors.

The atmospheric depositions of Pb, Cd, Hg and Dioxines/Furanes are calculated with the latest version of EMEP/MSC-E Eulerian Heavy Metal transport model MSCE-HM in Moscow. The latest available official emission data for the HELCOM countries are used in the model computations. Both official data and expert estimates were used for [modeling atmospheric transport and deposition of contaminants to the Baltic Sea](#). Atmospheric depositions of Pb, Cd, Hg and Dioxines/Furanes were computed for the entire EMEP domain, which includes Baltic Sea basin and catchment.

EMEP/MSC-E Eulerian Heavy Metal transport model MSCE-HM is a multi-pollutant, three-dimensional Eulerian model which takes into account processes of emission, advection, turbulent diffusion, chemical transformations, wet and dry depositions and inflow of pollutants into the model domain. Complete description of the model and its applications is available on the [EMEP web](#). Calculations of atmospheric transport and depositions of Pb, Cd, Hg and Dioxines/Furanes are performed annually two years in arrears on the basis of emission data officially submitted by Parties to CLRTAP Convention and expert estimates.

QA/QC

There are gaps in time series of national emissions which have to be corrected by experts. No official information about the uncertainty of provided contaminants emission data have been sent to EMEP from both EMEP and HELCOM Contracting Parties and hence further work on emission uncertainty is required. Submitted emissions data are passing through QA/QC procedure and stored in the EMEP Centre for Emission inventories and Projections CEIP in Vienna, Austria. There are gaps in time series of national emissions which have to be corrected by experts.

The results of the MSC-E Eulerian Heavy Metal transport model (MSCE-HM) are routinely compared with available measurements at EMEP and HELCOM stations. The comparison of calculated versus measured data indicates that the model predicts the observed air concentrations of Cadmium, Lead and Mercury within the accuracy of approximately 70%, 40% and 10% respectively with measured concentrations.

PCDD/Fs are not regularly measured by the EMEP monitoring network. Evaluation of modelling results on PCDD/Fs against measurements was performed in framework of the studies of EMEP region pollution by dioxins and furans ([Shatalov et al., 2012](#); [Gusev et al., 2013](#)). For this purpose available measurements made by various national and international campaigns reported in literature were used. It was found that the agreement between calculated and measured total PCDD/F toxicities was within a factor of two for more than 50% of available measurements at background locations. More detailed information on the comparison of model estimates and observed PCDD/F concentrations can be found in the EMEP Status Reports ([Shatalov et al., 2012](#); [Gusev et al., 2013](#)). Further work is required on reducing uncertainties in emission data and better parameterization of physical processes in the EMEP Unified model.

Frequency

Every year

Spatial Scope

EMEP uses a 50×50 km grid cell for calculation of deposition and input data are also aggregated using the PLC water sub-basin division to allow for harmonized HELCOM pollution load assessments covering both air- and waterborne inputs.

Spatial resolution

Data from monitoring stations are used to validate and calibrate the deposition model. The spatial resolution of monitoring data are so scarce that only 6-14 stations provide data of the concentrations in air and precipitation for Hg, Pb and Cd. Dioxines are not regularly measured by EMEP monitoring network.

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 atmospheric deposition of nitrogen is needed to assess the amount of nutrient input to the sea to allow for follow-up of effectiveness of implemented measures (under e.g. BSAP, Gothenburg Protocol, National Emission Ceiling Directive), 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).

Deposition data is calculated as total annual inputs per 50*50 km grid (available via the [EMEP website](#)).

(EMEP Steering Body has decided to have this 0.1x0.1 degree grid as the official reporting resolution by 2017 where all countries are requested to deliver emission data in this resolution by then. So until then HELCOM submission will still be in 50km resolution, same as the official emission reporting submissions.)

Gaps

Air emission and atmospheric deposition monitoring are coordinated by EMEP. Although there are rather many stations, not all of those are measuring all components. Also not all stations have long time series. Not all national monitoring stations are included in the list of "HELCOM stations" but could be used by EMEP. According to EMEP there are some problems with the representativeness of the stations that cause challenges when verifying the EMEP model results. Thorough analysis of the monitoring data would improve the understanding of the development in the atmospheric deposition and also offer recommendations on how to improve and possibly expand monitoring.

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
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Established methods for assessment?	Yes
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Adequate capacity to perform assessments?	Yes
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Will the data and information collected enable the regular updating of targets? (Q6c)	Yes
Description of Targets (Q6d)	There has been no formal agreement on targets for atmospheric deposition of hazardous substance. Annual deposition (including normalized input) are reported by EMEP to HELCOM annually. The Baltic Sea Environment Fact Sheet " Atmospheric deposition of heavy metals on the Baltic Sea " contains data on annual deposition and once targets are agreed on, appropriate figure(s) could be produced. No sufficient emission assessment or deposition modeling exist for numerous substances.
Gap-filling date Targets (Q6e)	Currently no plan
Plans for targets (Q6f)	There is a need to develop a HELCOM core indicator on inputs of contaminants and associated targets for such indicator. The contaminants input indicator may combine atmospheric and waterborne inputs into one report. There is no time table for development of such indicator or associated target.

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	EMEP Contracting Parties report emissions of heavy metals from different sources and these data are used to model deposition on the Baltic Sea. Data covers the whole EMEP domain . Allows assessment of the main contributors to the deposition to the Baltic Sea – of the substances listed in the parameters table.
Intensity of activity	Data on annual emissions reported by countries to EMEP annually
Temporal changes in activity	Data series available covering emissions and deposition since 1995
Type of activity (within broad category f, e.g. fisheries, tourism/recreation)	Emissions from e.g. industries, agriculture, combustion and other sources (more information in EMEP report).

Measures - Adequacy dor 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?	No
Adequate capacity to perform assessments?	Yes
Addresses activities/pressures?	Yes
Addresses effectiveness of measures?	Yes
Gap-filling date Activities and Measures (Q7f)	Considered adequate in 2014

DATA PROVIDERS AND ACCESS

Data access point	EMEP Database
Data type (<u>Q10c</u>)	Processed Data sets, Modelled data
Data availability (<u>Q10c</u>)	<u>EMEP website</u>
Data access (<u>Q10c</u>)	Open access
INSPIRE standard (<u>Q10c</u>)	
When will data become available? (<u>Q10c</u>)	Results are approved at the EMEP steering group meetings in September (2 years in arrears)
Data update frequency (<u>Q10c</u>)	Yearly

Describe how the data and information from the programme will be made accessible to the EC/EEA

Data is available at [EMEP website](#)

Contact points in the Contracting parties

Contact point to national monitoring programmes will be added

Has the data been used in HELCOM assessments?

Yes

REFERENCES

EMEP/MSC - W TECHNICAL REPORT 2 / 2013 as well as previous annual reports by EMEP to HELCOM

Baltic Sea Environment Fact Sheet on emissions and depositions of heavy metals and PCDDF

Recommendation 24-1 Monitoring of airborne pollution load

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