

Monitoring Specifications

Date: 2010-01-25

Morphology Bathymetry





ARGE BLMP - Working Group for the North Sea and Baltic Sea Monitoring Programme

At the 34th North German Environmental Ministerial Meeting held on 17 April 1997, the competent departments of the German Federal Government and of the federal states of Hamburg, Mecklenburg-Vorpommern, Lower Saxony and Schleswig-Holstein agreed to establish a joint working group co-ordinating the monitoring of the marine environment of the North and Baltic Seas (ARGE BLMP Nord- und Ostsee).

Members of ARGE BLMP are:

- Federal Ministry of Food, Agriculture and Consumer Protection
- Federal Ministry of Transport, Building and Urban Development
- Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
- Federal Ministry of Education and Research
- Authority for Urban Development and Environment of the Free and Hanseatic City of Hamburg
- Mecklenburg-Vorpommern Ministry for Agriculture, the Environment and Consumer Protection
- Lower Saxony Ministry for the Environment and Climate Protection
- Schleswig-Holstein Ministry for Agriculture, the Environment and Rural Areas

The Monitoring Manual describes the current measuring programme implemented under BLMP. The monitoring requirements of the different EC Directives (Marine Strategy Framework Directive, Water Framework Directive, FFH, Birds Directive), marine protection conventions (OSPAR, HELCOM, Trilateral Monitoring and Assessment Program) and other bodies of regulations have been taken into account in the Manual. The Monitoring Manual is available free of charge on the BLMP website at www.blmp-online.de/Seiten/Monitoringhandbuch.htm

Editorial information

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1 General

1.1 Subject area

Physical Monitoring - Morphology - Bathymetry

1.2 Definition

Description of morphological conditions

- Depth variation
- Topography
- Morphodynamic changes

1.3 Competent authority/ies

Federal Government:	WSV , BSH
Mecklenburg-Vorpommern:	LUNG , STAUN
Lower Saxony:	NLWKN
Schleswig-Holstein:	LLUR , LKN-SH

1.4 Working group

Ad Hoc Working Group on Hydrography, Hydrology and Morphology

2 Monitoring requirements

2.1 Necessity

[MSFD \[1\]](#)

Article 11, Annexes III and V

Comments

Monitoring programmes that survey the following morphological parameters must be drawn up under the Marine Strategy Framework Directive:

- Topography and bathymetry of the seabed

Article 8(1) [2]

Comments

The results of morphological surveys are also required for the initial assessment of marine waters. The parameters mentioned in Article 11 must be surveyed for this purpose.

[HD \[3\]](#)

Article 11 [4]

Comments

The Member States shall undertake surveillance of the conservation status of the natural habitats and species referred to in Article 2 with particular regard to priority natural habitat types and priority species.

Hydromorphology also plays an important role in the assessment of typical habitat structures (see assessment schemes (in preparation)) and the designation of HD habitats. E.g., bathymetry is used for the definition of sandbank habitats.

[WFD \[5\]](#)

Article 8(1)

Comments

Under the WFD, morphological changes are to be surveyed as a quality element every six years. These include:

- depth variation and
- the structure of intertidal zones

[TMAP \[6\]](#)

Wadden Sea Plan (Stade Declaration, 1997)

Comments

The monitoring of the geomorphological characteristics of the Wadden Sea has the objective of assessing possible changes in the climate (e.g. rising sea levels, increased frequency of storm events) and their impacts on habitats, species and communities. (See on this topic [TMAP Manual, section 1.1, Geomorphology.](#))

Technical necessity

Overview of monitoring frequencies and cycles:

	WFD	HD	OSPAR	HELCOM	TMAP	MSFD
Frequency	Once	N.a.	?	?	N.a.	Coherent
Monitoring cycle	Every six years	N.a.	?	?	N.a.	Coherent

Bathymetric investigations are carried out above all to maintain the safety and ease of shipping.

As far as the biological components are concerned, temporal trends in particular play a major role in bathymetry as additional parameters for assessment purposes. These trends may have both natural and anthropogenic causes.

2.2 Environmental targets

MSFD

Article 10

'On the basis of the initial assessment made pursuant to Article 8(1), Member States shall, in respect of each marine region or subregion, establish a comprehensive set of environmental targets and associated indicators for their marine waters [...], taking into account the indicative lists of pressures and impacts set out in [...] Annex III.'

WFD

Annex 5, 1.2.3 and 1.2.4:

Transitional waters:

Depth variation, substrate conditions, and both the structure and condition of the intertidal zones correspond to conditions consistent with the achievement of the values specified for the biological quality elements.

Coastal waters:

Depth variation, the structure and substrate of the coastal bed, and both the structure and the condition of the intertidal zones correspond to conditions consistent with the achievement of the values specified for the biological quality elements.

2.3 Threats

Construction measures, deepening projects

2.4 Spatial allocation

	EEZ	12- nm zone	Coastal waters 1)	Transitional waters
MSFD	x	x	x	-
HD	x	x	x	x
WFD	-	-	x	x
HELCOM	-	-	-	-
OSPAR	-	-	-	-
TMAP	-	-	x	x

1) Under the WFD: baseline plus one nautical mile

3 Monitoring concept

3.1 Description of monitoring network

General

Traditionally, the bathymetry of the seabed in the sublittoral zone and the parts of the eulittoral zone that are navigable with boats has been surveyed by means of depth soundings, for which (single beam) echosounders are used, although this is increasingly being done using multibeam echosounder technologies. In the shallow eulittoral and supralittoral zones, the measurements are still carried out largely using levelling techniques at present. Here too, however, a shift in methodology towards remote sensing procedures such as laser scanning has been apparent for several years.

The results of the surveys are compiled in the Coastal Depth Sounding Database (PDBK) and made available by the individual providers in analogue and digital forms as bathymetric maps of the seabed with depth figures, depth contours and, sometimes, colour depth layers. Until the end of 2004, all the depth data in the sea maps were based on Mean Low Water Springs. Since 2005, they have been based on LAT (Lowest Astronomical Tide).

North Sea

In the context of synoptic surveying, the coastal waters of the North Sea are depth sounded at least once in a six-to-12-year cycle (see the BSH depth soundings in the North Sea during the period 2000-2005, the surveys carried out by the State Agency for Agriculture, Environment and Rural Areas of the Land Schleswig-Holstein at Husum and the annual depth soundings carried out by WSV in the North Sea and the Kiel Canal).

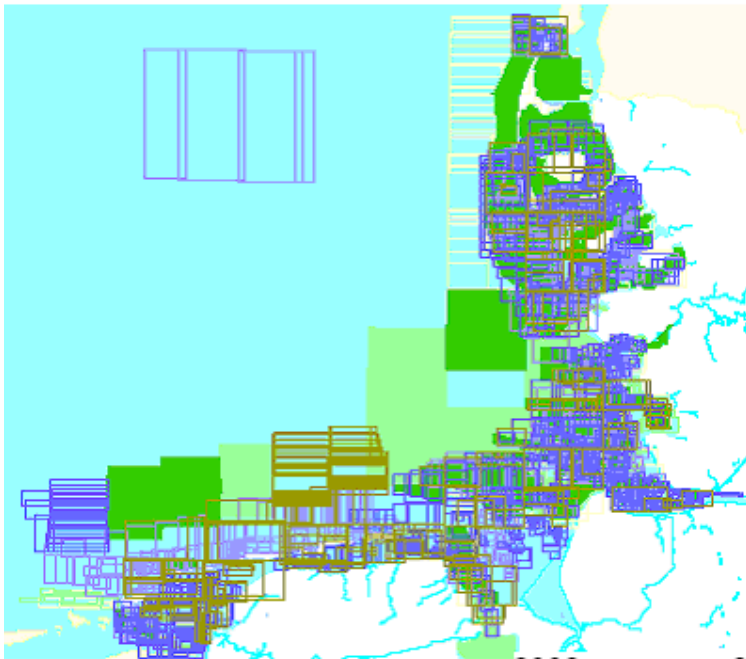


Figure 1: Depth soundings carried out by BSH in the North Sea during the period 2000-2005

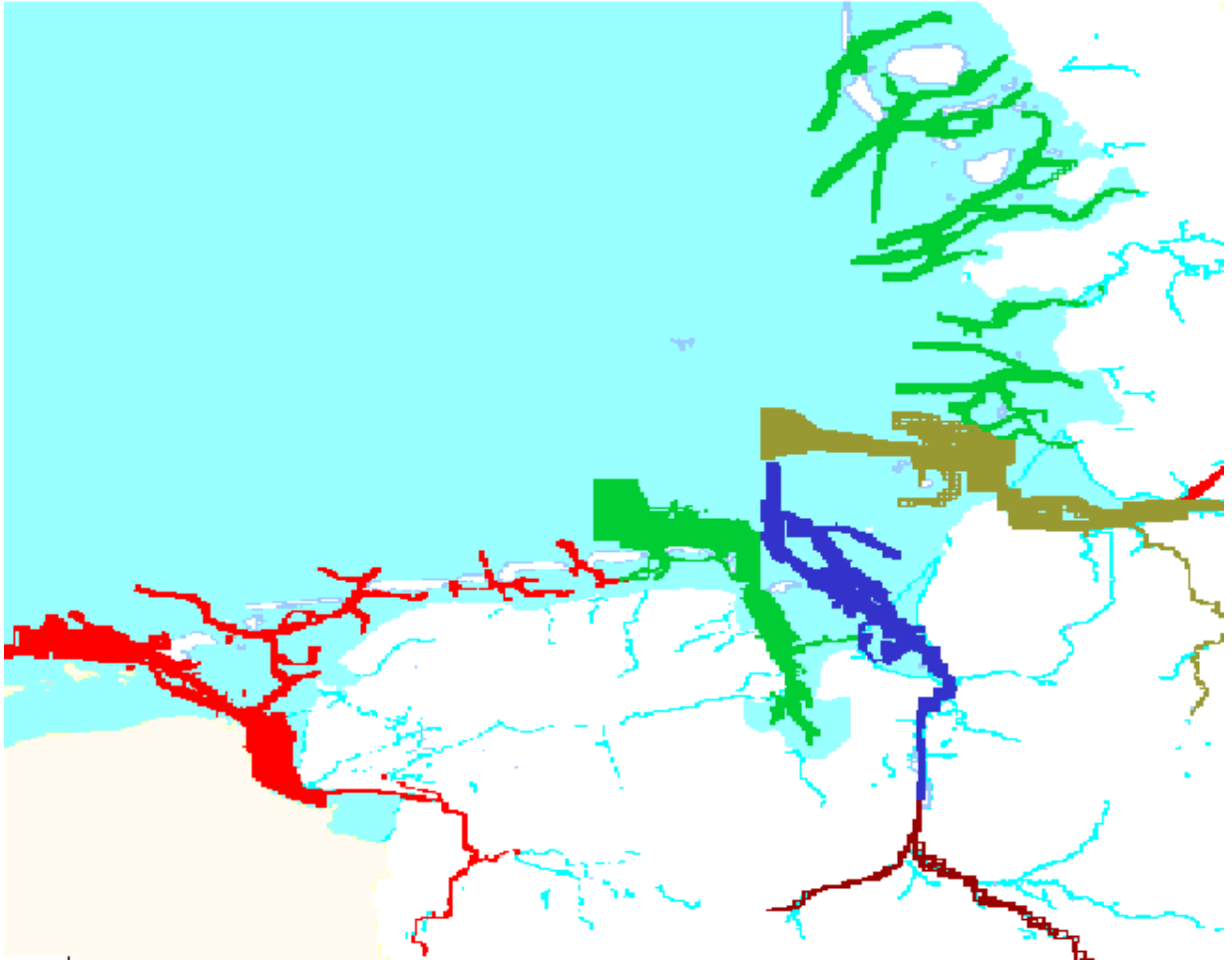


Figure 2: Depth soundings carried out by the Emden, Wilhelmshaven, Bremerhaven, Cuxhaven, Brunsbüttel and Tönning Waterways and Shipping Offices in the North Sea and Kiel Canal (2004 and 2005)

Baltic Sea

The coverage of the Baltic Sea coast is markedly less thorough than that of the North Sea (see the BSH and WSV depth soundings in the Baltic Sea). In consequence, there is a clear need for additional depth soundings.

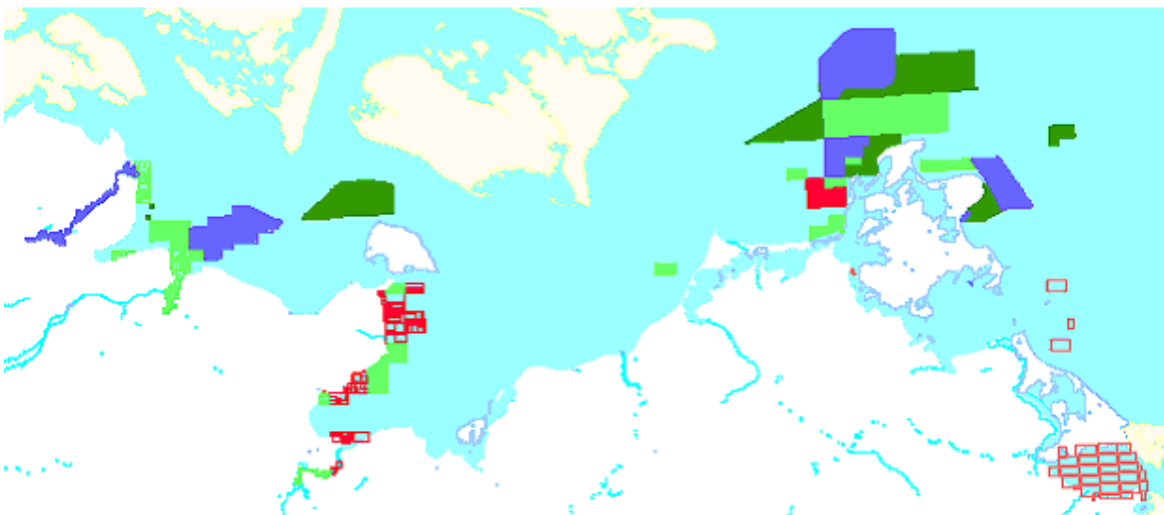


Figure 3: Depth soundings carried out by BSH in the Baltic Sea during the period 2000-2004



Figure 4: Depth soundings carried out by the Lübeck and Stralsund Waterways and Shipping Offices in the Baltic Sea, 2004

3.2 Monitoring activities

North Sea and Baltic Sea

Morphology: Bathymetry

Methods:

Morphology: Bathymetry

Echosound and multibeam echosound depth soundings in the sublittoral zone - terrestrial and laser scan surveying in the eulittoral zone. If possible combined with side-scan-sonar investigations (approx. every six to 12 years; see also Monitoring Specifications: Substrate).

Intertidal zone

The structure of the intertidal zone has been delineated to some extent in the literature using morphodynamic parametrisations, e.g. the ratio of the cross-section of a channel to the tidal volume of the associated river basin district. Providing the natural morphodynamic equilibria for an area can be determined on the basis of time series of sufficient quality, it is possible to identify deviations from these states using a parametrisation of this kind.

The primary hydrological and morphological parameters water level and depth are therefore to be surveyed and evaluated in order to monitor the structure of the intertidal zone.

WFD Reporting Summary Sampling Method (2000 Characters):

As a rule, bathymetry is surveyed using hydroacoustic, levelling and laser scanning procedures. Depending on the technical capacities of the authority that is conducting the measurements, the following state of the art methods are deployed: echosounding and multibeam echosounding (sublittoral zone), laser scanning (eulittoral zone) and terrestrial survey procedures.

WFD Reporting Summary Analysis Method (2000 Characters):

The results of the hydrographic surveys are compiled in decentralised and central archives and databases, the Coastal Depth Sounding Database (PDBK) for example, and made available by the individual providers in analogue or digital form as bathymetric maps of the seabed.

Operative monitoring:

WFD Reporting Summary Frequency Method (2000 Characters):

The operative monitoring of morphological conditions is only required in the outer coastal waters of the Baltic Sea. It is carried out once a year at selected points.

WFD Reporting Summary Cycle Description (2000 Characters):

The operative monitoring of morphological conditions in the outer coastal waters of the Baltic Sea is carried out each year.

Surveillance monitoring:

WFD Reporting Summary Frequency Method (2000 Characters):

The surveillance monitoring of morphological conditions in coastal and transitional waters is carried out quasi-synoptically.

WFD Reporting Summary Cycle Description (2000 Characters):

At present, the surveillance monitoring of morphological conditions in the coastal and transitional waters of the German river basin districts does not comply with the prescribed minimum cycles of six years.

Frequency:

Hitherto, the frequencies have been scheduled in such a way that it has been possible for significant changes in the bathymetry of the North Sea and Baltic Sea to be surveyed within six years. It is not possible for the frequencies recently specified for the synoptic surveying of the seabed to deliver the information required in all fields.

Parameter:

- Depth
- Position

3.3 Additional parameters

4 Assessment

4.1 Assessment procedures

North Sea and Baltic Sea

Title

Assessment of Depth Variation under the WFD

Authors

Ad Hoc Working Group on the Hydrography, Hydrology and Morphology of Coastal Waters

Guideline:

Various directives

Comments:

The depth variations and structure of the intertidal zone are assessed using the assessment matrix put forward by the Ad Hoc Working Group on Hydrography, Hydrology and Morphology.

5 Quality assurance

Comments

5.1 Monitoring institutions

5.2 Guidance documents

5.3 Standards

- WFD Reporting Summary Confidence (2000 Characters): *Has not yet been completed - but would be desirable in future!*
- WFD Reporting Summary Standards (2000 Characters): The hydrographic surveys comply with the state of the art and are carried out using comparable methods. IHO Special Publication 44 is applicable.

5.4 Current status

6 Literature

7 Activities required to implement the concept

7.1 Changes to the current monitoring programme

The depth sounding data from the North Sea coast will be recorded by the institutions involved in the KFKI Synoptic Surveying Working Group in a six-to-12-year cycle.

7.2 Working steps required

Priorities

- Integration of depth-sounding data from the Coastal Depth Sounding Database
- Provision of differential topographies

Depth-sounding data

- The BSH and WSV depth-sounding data are required in the context of German marine monitoring. Structures for the use of the data have been put in place in the form of the Coastal Depth Sounding Database (PDBK) administered by the BAW Information Technology Service Centre in Ilmenau. The database can be used to search for and order data online. It would be desirable for the relevant specialist institutions to be able to download data online, and this is already possible on the WSV Intranet.
- Comprehensive plausibilisation is desirable and should already be undertaken in the institutions that carry out the depth sounding. E.g. identical measured values appear at several successive positions in some data sets.
- Information about changes, i.e. erosion and sedimentation processes in particular, is required for the purposes of the WFD. These differential topographies should be delivered centrally by the data suppliers along with their other information, and should cover various periods between one and six years. A uniform resolution, e.g. a 50 x 50 m grid, would have to be specified for this purpose.

Footnotes

(1) Marine Strategy Framework Directive; Directive 2008/56/EC of 17 June 2008. This also applies to transitional waters and coastal waters covered by Directive 2000/60/EC, where pertinent aspects of the protection of the marine environment not dealt with in Directive 2000/60/EC are at issue.

(2) Version: proposal of the General-Secretariat of 13 November 2006.

This also applies to transitional waters and coastal waters covered by Directive 2000/60/EC, where pertinent aspects of the protection of the marine environment not dealt with in Directive 2000/60/EC are at issue.

(3) Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

(4) Article 11 (monitoring of habitats and all species listed in Annexes II, IV and V) imposes the obligation to monitor the conservation status of all habitats (listed in Annex I) of Community interest. In consequence, this provision is not limited to NATURA 2000 areas, but habitat types outside the Habitat Directive areas are also to be included in the monitoring as appropriate.

(5) EC Water Framework Directive; Directive 2000/60/EC. The coastal waters subject to ecological assessment under the WFD extend 1 nautical mile beyond the baseline.

(6) The monitoring requirements under TMAP were specified in the Wadden Sea Plan ([Sylt, 2010](#)) (see also [TMAP Manual, section 2](#)).