# German Working Group on Water Issues of the Federal States and the Federal Government

**Permanent working group**

**‘Surface and coastal waters’**

**LAWA-AO**

**Part A**

# Position paper

# The need for sediment management plans in river basin management

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German Working Group on Water Issues of the Federal States and the Federal Government (LAWA)

Permanent working group ‘Surface and coastal waters’ (LAWA-AO)

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# 1 Background and methodology

At the 89th session of the German Environment Minister Conference, the environment ministers commissioned the German Working Group on Water Issues of the Federal States and the Federal Government (LAWA) under item 24 to discuss the need for and contents of integrated sediment management plans in the large river basins. On the basis of the results of the LAWA consultation, the next steps will then be decided upon at one of the next Environment Minister Conferences.

The 155th LAWA General Assembly decided to set up an expert group of the LAWA-AO in order to implement the resolution by the Environment Minister Conference. The aim is to prepare (by the 158th LAWA General Assembly) a report on the need for integrated sediment management plans for large river basins as well as proposals for their implementation.

The management regime of the EU Water Framework Directive (WFD) is designed to achieve good ecological status respectively a good ecological potential and good chemical status for each water body. Good environmental status according to the Marine Strategy Framework Directive (MSFD) is orientated towards spatially defined marine reporting units based on descriptors.

Deficits in sediment balance and sediment quality could be reasons why the objectives of the WFD and MSFD are not achieved as scheduled. An improvement in sediment quality as well as in the sediment budget and water body structure (hydromorphological characteristics) is hence indispensable to achieve the given environmental objectives against the background of relevant water uses. This leads to the need for integrated sediment management for certain river basins.

This recommendation applies to large river basins with their marine environment.

Integrating sediment[1] management in the above-mentioned field of application combines spatial, functional (quantity, hydromorphology, quality, ecology) and use-related sediment aspects (hydropower, navigation, fisheries, agriculture, etc.) whilst also considering the timing of events. Integrated sediment management has to be river basin related and hence has to be in line with the need to coordinate interaction of the necessary measures both in the water body as well as in the river basin. It meets long-term objectives and considers both quantitative and qualitative aspects as well as the resources and costs required to these ends. It follows the principle of controlling sources of pollution and combating root causes as the best (sustainable) solution. It is science-based and draws on a profound understanding of processes and systems. However, this does not replace the analysis that is orientated towards the respective reference areas under water law and which is also necessary in sediment management. Integrated river basin-related sediment management additionally requires transregional transport and impact processes.

All measures required within a framework of integrated sediment management in order to achieve the given objectives must take the specific conditions of the entire catchment area

[1] Use of terminology in this paper:

- Integral sediment management: ‘Due to the problems identified in the river basin, sediment management is a necessary component of river basin management.
- Sediment management is part of integrated management plans (i.e. integrated into a larger whole).
- Integrating sediment management: Sediment management integrates, i.e. it (actively) encompasses different aspects.
- [Integrated sediment management: Sediment management is designed in such a way that different aspects are (passively) combined and united.]

into account. This calls for a differentiation between fresh waters, tidal waters and coastal areas as well as for consideration of local reference areas and the interaction of these sections, including issues of upstream/downstream sites.

The contents of the present proposal are based on river basin-wide process, system and effect relationships, including the reference areas defined under the WFD and MSFD. The recommendation is designed as a compilation and summary presentation of the methodological and conceptual fundamentals for integration of the ‘sediment management’ topic into water management planning and practice of river basins reflecting its overall ecological significance.

The selection of suitable strategies and measures within the scope of sediment management should always be related to the specific body of water in question. Apart from methodology recommendations, general recommendations with nationwide validity are only possible to a limited extent since both the sediment budget and the characteristics of a river basin are subject to many (individually different) influence variables. Relevant parameters include not only hydrographic, hydrological, morphological and sedimentological characteristics of the water body, but also information regarding ecology, construction and maintenance measures, flood protection and, where appropriate, water use. In light of this, the use of a ‘modular system’ is recommended (see part B).

The LAWA KG proposes the following definitions:

**Sediment management concepts:** A concept is a comprehensive compilation of objectives and resultant strategies, options for measures and a description of the procedure for implementing sediment management in the river basin which requires strategic planning.

**Sediment management plans:** A plan contains action steps for the implementation of a sediment management concept. It is (at best) designed as a chronological sequence and contains site-specific measures.

# 2 Management regime of the Water Framework Directive (WFD)

The principle of river basin-based management introduced by the WFD aims at a holistic view and triggered a paradigm shift in European water policy. Under the WFD, the European Member States committed themselves to a fundamental structural change in water management. A sectoral view was replaced by an integral recording and assessment approach, calling for river basin-based management that is consistent with ecological and socio-economic aspects (Art. 3 and 4 WFD). The focus is on the demand for sustainable water use based on long-term protection of natural resources (Art. 1b WFD).

The management regime of the WFD is designed to achieve good ecological status and/or a good ecological potential and good chemical status for surface waters.

**Ecological status/potential:** The biological quality elements – fish, benthic invertebrates, phytobenthos/macrophytes and phytoplankton – determine the **good ecological status/potential**. The so-called hydromorphological quality elements –morphological conditions (including structure), river continuity and hydrological regime (including runoff and runoff dynamics) – and the physico-chemical quality elements (PCQE) must be additionally included to support the biological assessment. The PCQE include water temperature, oxygen content, TOC, BOD, iron, chloride, sulphate, pH and nutrients (phosphorus and nitrogen compounds). Accordingly, the guidance values for the PCQE mentioned in Annex 7 of the ordinance on surface waters (*Oberflächengewässerverordnung – OGewV (2016)*) lay down concrete technical requirements for water quality which are typically a prerequisite for good status of the biological quality elements; their violation alone does not yet mean that the objectives are not met.

The hydromorphological quality elements have a supporting function for assessing the biological quality elements. According to Annex V of the WFD respectively Appendix 4, Table 2 of the ordinance on surface waters (2016), fully undisturbed sediment transport is only required as a precondition for classification as high ecological status of a (natural) water body. High ecological status is defined for river continuity as a hydromorphological quality element as follows: '*The* continuity *of the river is not disturbed by anthropogenic activities and allows undisturbed migration of aquatic organisms and sediment transport*.' When defining good ecological status of a (natural) water body (= target status according to the WFD), the criteria of the biological quality elements are taken into account also with regard to river continuity. Unobstructed sediment passability is not expressly required as a separate criterion.

Furthermore, no violation of environmental quality standards (EQSs) may be found for river basin-specific pollutants (OGewV (2016), Appendix 6; 67 substances/substance groups). Even if the EQS for one river basin-specific pollutant is exceeded at representative monitoring stations, the ecological status can at best be classified as 'moderate'.

The criteria for **good chemical status** of surface waters are the EQSs for priority substances/substance groups, other pollutants and nitrate for which a uniform Europe-wide definition exists (OGewV (2016), Appendix 8; 58 substances/substance groups). The EQSs are specified as annual average values (AA-EQSs) and additionally as maximum allowable concentrations for substances with acute toxicity (MAC-EQSs). From a legal perspective, these EQSs are thresholds which, when exceeded, always constitute failure to meet the respective objectives.

The ordinance on surface waters (2016) defines a total of 125 substances/substance groups for assessing ecological and chemical status, in most cases exclusively for the water phase. Furthermore, EQSs are defined in the 'Sediment/suspended matter' matrix for certain

substances, such as arsenic, copper, chromium, zinc, polychlorinated biphenyls and an organotin compound. EQSs are also defined for the 'Biota' matrix for mercury, perfluorooctane sulfonic acid (PFOS), benzo(a)pyrene, fluoranthene, dioxins and hexachlorobutadiene, etc.

## 2a. Description of the relevance of sediments for achieving the WFD objectives

Sediments and their transport (sediment dynamics) have a key role to play in the morphology of water bodies and their solid matter and substance budget. They are the basis for marine and estuarine as well as fluvial and limnic ecosystems, they provide specific habitats for aquatic communities and therefore contribute to the biodiversity of water bodies.

Besides their vital natural functions, sediments can also store pollutants temporarily or permanently, depending on the environmental condition of the water and its hydrological course. These 'immobilised' pollutants in deposited sediments can be remobilised under certain conditions (such as flood events, anthropogenic intervention in the sediment balance, etc.). Sediments can hence act as secondary sources of pollution at the original deposition site and for downstream river sections.

The WFD sets the framework for the management of surface waters and groundwater. A disturbed sediment balance or polluted sediments can be particularly relevant if this affects and jeopardises the achievement of objectives. This concerns both good ecological and good chemical status. Sediment quantity, the grain size distribution typical for river systems and the sediment quality of a water body are hence key aspects of the necessary overall consideration of all (influence) factors that crucially (co-)determine the status of a water body.

- **Relevance of sediments for achieving good ecological status (ecology)**

Hydromorphological features, such as river continuity or bank structure, strongly influence sediment balance. Sediment surpluses or deficits or grain size distributions which are atypical for a given water body also have a direct or indirect impact on its hydromorphological status, for instance, in the form of increased depth erosion in the case of persistent sediment deficits or as a loss of valuable habitats in the case of long-term sediment surpluses and/or insufficient physical sediment properties (such as grain size-related porosity). It goes without saying that the sediment balance and hydromorphological status of a water body are closely related and strongly influence the status and diversity of aquatic habitats and hence the presence or absence of animal and plant species.

### Relevance of sediments for achieving good ecological and chemical status (as material quality)

During the course of the WFD implementation, chemical analyses focus primarily on the water phase. As a result, EQSs for sediments/suspended matter and/or biota were established for only a few pollutants (see Appendices 6 of OGewV 2016 resp. Ecological Quality Status, $EQS_{ecol}$ in accordance with No. 1.2.6 of Annex V to the WFD and 8 of OGewV 2016 resp. standards of Directives 2008/105/EC and 2013/39/EU ($EQS_{(chem)}$). However, inorganic and organic pollution of a water system cannot be adequately reflected by the water phase alone. The entirety of the environmental hazard caused by the inventory of pollutants must be considered.

Besides water with its dissolved constituents, sediments/suspended matter and biota are essential components of aquatic ecosystems (see above). The material and biological quality of all compartments in its totality and with its interactions influences the aquatic habitat and is therefore also responsible for achieving the WFD objectives. The additional focus on sediments as an environmentally relevant matrix facilitates the identification of problems (in

terms of substances, spaces and time) within a river basin. Due to the composition and chemical-physical properties of pollutants, sediments act as the hydromorphological memory of a body of water and 'store' pollutants on their surface. Contaminated industrial and mining sites as well as today's diffuse and point emissions are considered to be sources of contaminated sediments. Depending on the given environmental conditions, pollutants which are adsorbed onto sediments can find their way into the biosphere and the food web. Polluted sediments can therefore pollute downstream river sections, floodplains, forelands and marshes (Elbe River Basin Community 2013, International Commission for the Protection of the Elbe River 2014).

The substances used to assess chemical and ecological status include substances that belong to a specific group of particularly hazardous pollutants (POPs = persistent organic pollutants) known as the 'dirty dozen' which were banned worldwide by the Stockholm Convention of May 2001 (United Nations 2001). The Stockholm Convention provides for the termination or restriction of the production, use and release of POPs worldwide. The use of certain POPs has been banned since the early or mid-1980s. Some of these substances are still relevant due to their low degradability and their occurrence as residues in the environment, as remainder of stock and in contaminated chemical production sites. These include, in particular, polychlorinated biphenyls (PCBs), dichlorodiphenyltrichloroethane (DDT), polychlorinated dibenzodioxins and furans (PCDD/F, 'dioxins and furans') or hexachlorobenzene (HCB). These substances/substance classes are bioaccumulative, adsorptive and persistent organochlorine compounds. Although they can also be detected in the aqueous phase, they preferably accumulate in fatty tissue and suspended solids.

Due to the use of the substances over decades, in conjunction with their longevity, these substances have now become ubiquitously distributed in the environment (UBA 1999). The persistence of the substances in the environment means that their burden will not decrease significantly in the coming decades. A harmful effect on the environment indicated by violation of EQS can hence only be reduced by suitable management measures (such as removal, encapsulation).

**Good sediment status in terms of quantity and quality is important for achieving good ecological and chemical status.**

## 2b. Sediments in the ordinance on surface waters (OGewV) and in the planning of measures for WFD implementation

**Ordinance on surface waters:** Pursuant to the ordinance on surface waters (OGewV) of 20 June 2016, certain highly accumulating pollutants in solids are being investigated with the following aim:

a) to assess the status of water bodies (derivation of EQSs for sediment and suspended solids, only Appendix 6, OGewV (2016) resp. Ecological Quality Status, $EQS_{ecol}$) in accordance with No. 1.2.6 of Annex V to the WFD)
b) to identify long-term trends (only Appendix 8, OGewV (2016) resp. standards of Directives 2008/105/EC and 2013/39/EU ($EQS_{chem}$))

$EQS_{ecol}$) currently exist for the following substances which are used to asses sediment or suspended matter (Appendix 6, OGewV (2016)):

- Arsenic
- Chromium
- Copper

- PCB
- Triphenyltin cation
- Zinc

Furthermore, the trends of certain priority substances must also be monitored. The long-term trend for priority substances is identified in biota, sediment or suspended solids. An increase in concentration is not acceptable.

**Measure planning:** The LAWA has adopted a catalogue of types of measures (programme measures – PM) that was coordinated at national level, so that the programmes of measures drawn up by the federal states (*Länder*) can be compared. These programme measures must be concretised locally by individual measures. Few of these PMs expressly address sediments. Some examples are given below:

- *PM 77 – Measures to improve bedload balance and/or sediment management*

  Measures to develop bedload sources in the longitudinal and transverse course of the water bodies and to retain sand and fine sediment transported from lateral waters, for instance, transferring bedload from the reservoir head zone of river barrages and reservoirs into the tailwater, providing gravel deposits, installation of a sand and sediment trap, installation of gravel locks on transverse structures

- *PM 82 – Measures to reduce bedload/sediment removal in coastal and transitional waters*

  Measures to reduce adverse effects in conjunction with bedload removal (maintenance dredging) in coastal and transitional waters, for instance, reduction or restriction of dredging operations

- *PM 85 – Measures to reduce other hydromorphological pressures*

  Measures to reduce hydromorphological pressures on water bodies, which do not belong to one of the above-mentioned sub-areas, such as measures to reduce the pressure from fish ponds in the retention basin, reduction/elimination of siltation in the river bed due to soil erosion (fine sediments, iron clogging)

- *PM 96 – Measures to reduce other anthropogenic pressures*

  Measures to reduce other anthropogenic pressures on surface water bodies, which do not belong to one of the above-mentioned pressure groups (see Nos. 1 to 95), for instance, for the restoration of lakes (oxygenation of water or sediment, deep water drainage, removal of plants, chemical precipitation of nutrients, biomanipulation)

These measures were used very differently by the federal states in the programmes of measures for the 2016 to 2021 management period:

| PM | Title | Number of water bodies with these PMs |
|---|---|---|
| 77 | Measures to improve bedload balance and/or sediment management | 1,879 |
| 82 | Measures to reduce bedload/sediment removal in coastal and transitional waters | 3 |
| 85 | Measures to reduce other hydromorphological pressures | 1,741 |
| 96 | Measures to reduce other anthropogenic pressures | 74 |

The selection of measures related to sediment management reflects a strong consideration of measures in the field of hydromorphology. Aspects of pressures caused by substances

are still often covered by preparatory concept measures of PM 501 to 510, which will not be considered separately in this document. In the future, PM 101 (measures to reduce pressures caused by substances from sediments, measures to reduce uncontrolled diffuse pollution, for instance, by removing sediments, including subsequent treatment, recycling and disposal, if necessary), which is now included in the catalogue of measures, will make it possible to address such projects directly.

Summing up, it must be noted that in order to enable a better and more transparent demonstration of the importance of sediment as an integral component when it comes to planning measures under the WFD, separate plans for integrated sediment management (which may also be applicable to spatially different perimeters) should be drawn up as required – see Art. 13 (5) WFD.

# 3 Management regime of the Marine Strategy Framework Directive (MSFD)

The requirements of the management regime according to the MSFD, the water law aspects of which are addressed by the Water Resources Act (*Wasserhaushaltsgesetz – WHG*), refer to marine waters. These requirements include not just the water column, but explicitly also the seabed and subsoil and hence marine sediments. General management of marine waters is dealt with in section 45a (1) of the Water Resources Act, pursuant to which marine waters must be managed in such a way that deterioration of their status is avoided and good environmental status is maintained or achieved by 31 December 2020 at the latest. This means that there are overlaps between the WFD and the MSFD with regard to the basic concept of good status (WFD) and good environmental status (MSFD) and in essential individual aspects. A concrete example is the assessment and management of anthropogenic pollution.

Pursuant to the MSFD, no pollution effects may result from the concentration of pollutants in the marine environment. This is where the MSFD refers to the WFD since the latter also aims to progressively reduce discharges of hazardous substances into the aquatic environment and/or, to eliminate hazardous substances in order to achieve concentrations near background levels in the marine environment for naturally occurring substances and near zero for anthropogenic synthetic substances. Although marine waters only cover part of Germany's river basins, sediment transports and their quantity and quality have a considerable impact on coastal waters. This also leads to target requirements and a need to manage the entire river system, especially if violations of objectives in coastal waters are not caused there, but instead in inland areas.

The MSFD pursues an overall ecological approach in the marine area and therefore complements the requirements of the WFD in coastal waters within the meaning of Directive 2000/60/EC, including the seabed and subsoil, unless certain aspects of the environmental status of the marine environment are already covered by this Directive or other European legislation.

Especially with regard to issues of pollutants, the WFD also has a decisive role to play for management as contemplated by the MSFD. The objectives for river basin management and related measures under the WFD also serve to achieve the objectives of the MSFD. These are referred to in the programmes of measures under the MSFD, supplemented by specifically marine-related objectives and measures. With regard to river-borne pollutant discharges, the MSFD programme of measures hence expects that the updating of the WFD programme of measures in accordance with the management cycle will also contribute to an improvement in the status of the marine environment. In the North Sea area, the special protection requirements for the Wadden Sea National Park must also be included. The MSFD therefore also considers the contribution that existing national measures, for instance, under EU environmental law, as well as regional and international agreements, can make to the achievement of the MSFD objectives and complements these with new measures, including those aimed at reducing ship emissions and pollutant discharges.

Differences between the MSFD and the WFD exist, for example, in the way the environmentally relevant matrices are addressed. Whilst the WFD daughter directive on environmental quality standards (Directive 2013/39/EU – transposed into national law in 2016 by the ordinance on surface waters) focuses on the aqueous phase and whilst EQSs for biota and/or sediments have so far been established for only a few substances (see above), these substances are an integral part of the MSFD. Contamination of sediments and biota is one of the characteristics that must be addressed in the assessment of the marine

environment. Any loopholes in the WFD must be filled by other fundamental documents, such as those of the regional HELCOM or OSPAR marine conventions, or by developing new standards and norms. This specifically applies to pollutants that cannot be detected in the water phase due to their low water solubility or to pollutants with environmental quality objectives that cannot be verified due to insufficient limits of quantification. If there are indications of pollution, due to German reporting requirements under the transposition of the MSFD into German law , substances that tend to accumulate must also be measured at suitable monitoring sites in sediments and/or biota. Substances which, due to their chemical properties, are predominantly bound to particles are classified as sediment relevant.

## 3a. Description of the relevance of sediments with regard to sediment-related descriptors of the MSFD

The descriptors crucial for achieving the German MSFD environmental objective of 'Oceans without pollutant contamination' and the related individual[2] operational objectives as well as measures for achieving good environmental status in accordance with the MSFD include, at the level of the respective marine region or sub-region (or further subdivisions), the qualitative descriptors 8 (pollutants) and 9 (pollutants in food) listed in Annex I. Pursuant to the MSFD, these descriptors must be assessed in the environmentally relevant matrix, i.e. water, sediments and/or biota. Pursuant to Annex III, a status description is among others based on the examination of sediment contamination. In order to describe and achieve good environmental status, quality and assessment criteria in accordance with the legally binding COMMISSION DECISION of 17 May 2017 laying down criteria and methodological standards on good environmental status of marine waters (2017/848 /EU) have to be applied in a descriptor-related manner.

The sedimentological and hydromorphological conditions form the basis for an assessment adapted to the basic characteristics and processes of the water bodies under consideration. The hydrographic conditions in the North Sea, for example, are primarily defined by temperature, salinity and seasonal stratification. In contrast, water levels, swell, near-bottom currents and, in particular, the sedimentological inventory are the main determinants for the development of the sedimentological conditions. In their interaction with the atmosphere, the relief and the composition and structure of the seabed, they determine the composition of the marine ecosystem communities.

Pollutants reach water bodies via direct discharges, rivers and air as well as from direct sources within the sea and accumulate in sediments and/or marine organisms. According to the most recent MSFD status assessment, pollutants are still detected in environmentally harmful concentrations in German marine waters. Many of the persistent, bioaccumulative and toxic substances can still be found in significant concentrations in the marine environment even decades after their ban (MSFD baseline assessment 2012).

[2] See https://www.meeresschutz.info/berichte-art-8-10.html; specifically: "Schadstoffkonzentrationen in der Meeresumwelt und die daraus resultierenden Verschmutzungswirkungen sind weiter zu reduzieren und auf einen guten Umweltzustand zurückzuführen" (*concentrations of pollutants in the marine environment and the resulting pollution effects must be further reduced and returned to good environmental status*). The associated indicator also identifies concentrations of pollutants in water, organisms and sediments.

# 4 Interactions between target requirements of water protection with other legal areas and uses

Sediment quantity and quality can influence water uses and vice versa.

From a quantitative point of view, flood protection/land reclamation measures and the expansion of rivers have had a major impact over the past centuries. This has fundamentally changed not only runoff conditions, but also the sediment balance. Sediment balance and water body structure (hydromorphological characteristics) are closely related and mutually influence each other. Sediment surpluses or deficits due to disturbed sediment balance can have negative effects on the ecosystem, water management, flood protection and navigation.

Different claims for use with different impacts on sediments and their management exist in and around the body of water. Under a holistic approach, **relevant protection aspects and uses** (including diverging use interests) of a river and its floodplains can be:

- Nature conservation and environmental protection in the broader sense (for instance, protected areas)
- Water abstraction for water supply
- Water abstraction for commercial use
- Sewage disposal
- Agriculture and forestry
- Fisheries
- Energy sector
- Navigation
- Flood control
- Mining
- Tourism

In conjunction with particle-bound inorganic and organic pollutants, conflicts arise not only in relation to protection objectives, but also to the various forms of use. Lipophilic, persistent properties of many pollutants, for instance, lead to marketing restrictions for contaminated fish destined for human consumption. When floods occur, particle-bound pollutants are discharged from the river and carried into the floodplain, where they are deposited and enter the food chain via direct adhesion or via roots. Agricultural use of floodplains, for instance, as mowing and grazing areas, involves considerable additional costs for society, due to restrictions on use. The reverse path must also be considered if previously bound pollutants re-enter water bodies during flood events, especially from renatured secondary water bodies (such as oxbow lake connections) and floodplains.

**Navigation:** Rivers serve as shipping routes (federal and federal-state waterways); federal waterways, such as the Rhine or the tidal Elbe and their ports, are of paramount transport and macroeconomic importance. An appropriate nautical depth is one of the preconditions for ensuring smooth and safe navigation. The Federal Waterways and Shipping Administration, port authorities or other agencies continuously perform maintenance dredging operations. Continuous sediment transport is expected to minimise maintenance dredging operations and supports the stability of fairway conditions (safe and smooth navigation). However, contaminated sediments cannot always be re-introduced into the body of water. Restrictive administrative requirements lead to increased effort and costs.

Heavily polluted sediments decisively restrict the ability of sediments to be accommodated in the body of water since a considerable risk to the aquatic ecosystem must then be expected.

These sediments cannot be deposited in the water body in such a way that sediment deficits and surpluses can be compensated for by targeted placement. The removal, processing and safe disposal of contaminated sediments required for navigation and port management is a much more complex and cost-intensive procedure than placement in the water. Furthermore, sediment land disposal space is limited. The removal of pollutants and source-related remediation are therefore extremely important and urgent because, unlike costly and time-consuming land disposal, this would allow the targeted use of sediments in the water body, for instance, in the area of the tidal Elbe in order to stabilise the Wadden Sea sediments in coastal areas (coastal/flood protection), especially with regard to the climate-induced sea level rise.

Furthermore, rivers and spaces along rivers are increasingly used as leisure, residential and recreation space. In this context, the direct health risk is less important than the 'clean water/unspoilt nature' label as an image and economic factor. Various pieces of legislation at international and national level regulate the protective functions of water bodies and their adjacent habitats. This legislation directly or indirectly includes the sediment status. The following regulations are particularly relevant besides the WFD and the MSFD:

**Soil protection:** Pollutants from contaminated sites and harmful soil changes as contemplated by the Federal Soil Protection Act (*Gesetz zum Schutz vor schädlichen Bodenveränderungen und zur Sanierung von Altlasten – BBodSchG*) in the area of floodplains and embankments can have a negative impact on sediment quality in a body of water. Contaminated sites and harmful soil changes are sources of pollutants that enter water bodies via the relevant discharge paths. Pollutants that have accumulated over time in floodplains and embankments can be remobilised by erosion, particularly during floods, and can be carried into the body of water.

Preventing the release of pollutants from contaminated sites respectively preventing possible remobilisation of pollutants from floodplains and the release of erosive material is of fundamental importance for a sustainable improvement of sediment quality in a river basin. The requirements for the remediation of such contaminated sites or handling harmful soil changes in the area of floodplains are derived from the Federal Soil Protection Act and the Federal Soil Protection Ordinance (*Bundes-Bodenschutz- und Altlastenverordnung – BBodSchV*).

**Nature and species conservation:** Pursuant to the Federal Nature Conservation Act (*Gesetz über Naturschutz und Landschaftspflege – BNatSchG*), surface waters, including their riparian strips and riparian zones, must be preserved as habitats for native animal and plant species and developed in such a way that they can fulfil their expansive networking function in the long term. Habitat and species protection regulations (Nature 2000 Directive, Federal Nature Conservation Act) directly protect semi-natural water body structures (for instance, Habitats Directive habitat types 3270 'Rivers with muddy banks with Chenopodion rubri pp and Bidention pp vegetation' and 1130 'Estuaries', steep banks with breeding tubes of sand martins and other breeding and resting places of specially protected species, biotope protected under section 30 of the Federal Nature Conservation Act, ('natural or semi-natural areas of flowing and standing inland waters, including their banks and the natural or semi-natural vegetation along their banks, as well as their natural or semi-natural siltation areas, oxbow lakes and regularly flooded areas') and therefore also indirectly reduce pollutant exposure and improve the material quality of the body of water.

Sediments are an integral part of the aquatic ecosystem and/or its habitats worthy of protection and are hence of great importance. They are a habitat, a place of mineralisation of biomass and resultant nutrient release, a spawning ground for fish and a place where organisms seek protection and food. Sediment management plans must therefore incorporate the objectives of nature and wildlife conservation as well as water protection as a basis for sustainable sediment management that is compatible or consistent with these

objectives. In this case too, anthropogenic pressures, such as impaired sediment quality or sediment balance, can lead to target conflicts.

# 5 Summary and recommendation

Sediments are original, essential and dynamic components of aquatic systems. They fulfil basic functions as riverbeds and aquatic habitats and in the biogeochemical cycles of water bodies. They are hence vital components of ecosystems and of crucial relevance for ecosystem services and functions (e.g. habitat, substrate) and water uses.

In accordance with the principles of proportionality, the removal of pollutants and the elimination of secondary contamination and harmful soil changes in the vicinity of the body of water are of paramount urgency since they are preconditions for enabling targeted uses in the body of water in the long term for large quantities of sediment in tidal waters (for instance, stabilisation of Wadden Sea sediments in coastal areas).

Sustainable sediment management must be organised on a river basin scale, including the relevant reference areas and in line with the required environmental objectives.

Existing sediment management concepts and plans (for instance, Rhine, Elbe) have shown that deficits in sediment balance and sediment quality are significant obstacles for achieving good status of water bodies. Improving sediment quality status as well as the solid matter budget and water body structure (hydromorphological characteristics) is hence indispensable when it comes to achieving the given environmental objectives and relevant water uses. These findings should be reflected more than before in the updates of the management plans and programmes of measures under the WFD if relevant problem situations are identified.

**In conclusion, it is recommended that integrated sediment management plans be established in the implementation of the WFD for the large river basins. The establishment and concretisation requirement should be discussed, evaluated and decided upon in the respective river basin districts.**

# 6 References


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# 7 Annex

**Appendix to chapter 2b (derivation of EQSs, determination of trends, implementation)**

**1. Additional information regarding the derivation of EQSs**

EQSs are derived according to the Commission's recommendation (Guidance Document No. 27 – Technical Guidance For Deriving Environmental Quality Standards (TGD EQS)) for different compartments: water, suspended solids, sediments and/or biota.

No sediment EQSs currently exist for priority substances (Appendix 8, OGewV (2016)) even though the TGD EQS (chapter 2.3, Fig. 2.2) foresees this possibility:

| | | **Matrix** | | |
|---|---|---|---|---|
| | | **Water** | **Sediment** | **Biota** |
| **Risk groups** | **Human health** | Yes | No | Yes (consumption of fisheries products) |
| | **Benthic organisms** | No | Yes | No |
| | **Pelagic organisms** | Yes | No | Yes (secondary poisoning) |
| | **Top predators (birds, mammals)** | Yes | No | Yes (secondary poisoning) |

Sediment EQSs can be derived to protect benthic organisms.

**2. Trend determination in accordance with section 15 'Determination of long-term trends' (OGewV (2016))**

The long-term trend is identified in biota, sediment or suspended solids. An increase in concentration is not acceptable. The trends of the following substances of Appendix 8 (OGewV (2016) 2016 resp. standards of Directives 2008/105/EC and 2013/39/EU ($EQS_{chem}$)) are assessed:

- Anthracene
- PBDE
- Cadmium
- C10-C13 chloroalkanes
- DEHP
- Fluoranthene
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachlorocyclohexane
- Lead
- Mercury
- Pentachlorobenzene
- PAH
- TBT
- Dicofol
- PFOS
- Quinoxyfen
- Dioxins and dioxin-like compounds

- HBCDD
- Heptachlor and heptachlorepoxide

These pollutants must be typically monitored in biota, sediment or suspended solids at least every three years unless the competent authority determines a different interval based on the latest state of information.

### 3. Implementation of the sediment requirements of the ordinance on surface waters – requirements of the LAWA

The German Working Group on Water Issues of the Federal States and the Federal Government (LAWA) has prepared two framework concept (*RaKon*) papers for the coordinated and realistic implementation of the requirements under the ordinance on surface waters regarding sediment and suspended matter analysis as well as trend assessment:

- RaKon Working Paper IV.2 – Recommendations for long-term trend identification
- RaKon Working Paper IV.4 – Recommendation for suspended matter and sediment investigations

RaKon Working Paper IV.4 also refers to other specific questions for which the investigation of sediments is of particular importance:

- Exploration of sources and sinks of certain pollutants
- Understanding of the distribution equilibrium of pollutants (dissolved/undissolved) and hence also of the relevant transport processes

### Appendix to Chapter 3 (MSFD)

In the field of water policy, the WFD and, in particular, the MSFD address the aspect of sediment status by declaring the conservation and protection of the marine environment as the subject matter of the Directive in Article 1 and calling for the achievement of 'good environmental status' for all European seas by 2020 at the latest[3]. Member States (MS) are called upon to develop marine strategies, to update their scheduled elements every six years and to document these in reports to the European Parliament and to the Council. The MSFD also applies to coastal waters as contemplated by the WFD in as far as certain aspects of the environmental status of the marine environment are not covered by this directive or other community legislation. This is why Germany and several other MS largely refer to the WFD as a basis for material discharges and pressures and related measures and supplement these measures where the WFD has loopholes (for instance, in relation to pollution/pressures due to navigation).

The methodological approach of the WFD and MSFD is sustainable river basin and marine (sub)regional management. Furthermore, MS can divide marine waters further (for instance, into subdivisions, assessment units, marine reporting units) as is also the case with water bodies under the WFD. The MSFD hence complements the requirements of the WFD in spatial and material terms and requires that harmful discharges into the oceans be prevented or at least reduced, so that any risk to the marine environment and human health can be ruled out. In German marine waters, good environmental status is achieved when the concentrations of pollutants in biota, sediment and water comply with the EQSs applicable under the WFD, the EQS Directive 2008/105/EC and the ordinance on surface waters, as

[3] It is already very unlikely that this status will be achievable by 2020 in various marine waters, including Germany. It remains to be clarified how the directive and its implementation will be handled after 2020.

well as the ecological quality objectives and environmental quality objectives of OSPAR JAMP/CEMP. In light of the considerable uncertainties and gaps in knowledge that still exist with the current EQSs, OSPAR-BACs (background assessment criteria), EACs (environmental assessment criteria) and ERLs (effects range low), the precautionary principle should be used as an additional assessment criterion.

Thresholds, in particular for assessing pollutant concentrations in the sediment and biota matrices, are still lacking for certain pollutants and should be established through regional or sub-regional cooperation, as announced in the 2012 description of good environmental status. Furthermore, other specific requirements resulting from the MSFD must be met for good environmental status, in particular, compliance with further derived environmental quality standards/environmental quality objectives for sediment and biota as well as consideration of biological pollutant effects.

With regard to anthropogenic pollution, full implementation of the MSFD requires that the existing quality and assessment criteria be reviewed in this respect and supplemented as required with regard to sediment and biota. This specifically applies to substances or substance groups that must be taken into consideration for descriptor 8, 'Pollutants', in accordance with the amended COMMISSION DECISION of 17 May 2017 laying down criteria and methodological standards on good environmental status of marine waters (Decision (EU) 2017/848). These are substances or substance groups which, within coastal and territorial waters, are

a) pollutants selected in accordance with Directive 2000/60/EC: i) pollutants for which an environmental quality standard was established pursuant to Part A of Annex I to Directive 2008/105/EC; (ii) river basin-specific pollutants in coastal waters as defined in Annex VIII to Directive 2000/60/EC
b) other pollutants, where relevant, such as pollutants from offshore sources not already referred to in lit. a, which may cause pollution effects in the region or sub-region concerned. Member states compile this list of pollutants through regional or sub-regional cooperation.