3 'New' substances - Substances to watch

The European Inventory of Existing Commercial Chemical Substances (EINECS) lists over 100,000 chemical compounds. Little is known about the toxicity of about 75% of these chemicals. Several hundred new substances are marketed each year after some basic pre-market toxicity testing and these are registered in the European List of Notified Chemical Substances (ELINCS), which presently contains about 2,000 chemicals.

In this context, the task to identify compounds which are hazardous with regard to the aquatic ecosystem or human health via the aquatic exposure route, such as the consumption of drinking water or fish, is challenging. The implementation of monitoring programmes and conduction of risk assessments for this 'chemical universe' is not feasible and not appropriate.

In order to conduct monitoring-programmes or risk assessments and subsequently to implement quality standards and reduction measures, such as emission control of point and diffuse sources or phasing-out of certain chemicals, the usual approach is to establish lists of so-called 'priority chemicals'.

This approach has a long tradition, e.g. the US-EPA priority pollutants list, established in the late 70s, or the European 'list of chemicals dangerous to the aquatic environment' (EEC, 1976a & 1976b), dating as well from the late 70s.

Currently of most importance in Europe or for the North-East Atlantic, including the North Sea, are the new European Water Framework Directive (EU-WFD, chapter C 4.1.1) and the OSPAR (chapter C 4.2.1.3) activities towards the definition of priority chemicals.

The lists of priority chemicals and the subsequently implemented immission and emission control measures have a direct impact on the quality of sediments and dredged material respectively and are therefore of relevance with regard to dredged material management.

Naturally the question arises which 'new' substances, at present not implemented as criteria for dredged material quality, are currently discussed as priority chemicals or might arise in future.

The following chapters give a short overview of the EU-WFD and OSPAR approaches and subsequently compare different derived ranking lists and lists of priority chemicals with the internal Rhine monitoring programme and Rhine relevant substances, as well with current chemical criteria for dredged material. This comparison focuses on substances which have the tendency to bind to sediments; substances with high aqueous solubilites which occur mainly in the water phase were omitted. Finally a few substance classes of current or maybe future concern are highlighted.

3.1 EU-WFD approach

The European Water Framework Directive (EU-WFD) was adopted by the European Parliament and Council in September 2000. Article 16 of the EU-WFD (Council of the EC, 2000) demands to establish a 'list of priority substances'. For the priority substances the European Commission shall submit proposals for:

- quality standards applicable to surface water, sediments or biota (within 2 to 6 years);
- controls for the progressive reduction of discharges, emissions and losses;

- the controls of cessation or phasing out of discharges, emissions and losses (the timetable should not exceed 20 years).

The proposed 'list of priority substances' (Commission of the EC, 2000) is given in appendix 3.1. It has not been adopted yet by the European Parliament and the Council, although significant changes before adoption are unlikely. The list shall be reviewed at least every four years.

For the selection and prioritisation of chemicals a procedure, called COMMPS (combined monitoring-based and modelling-based priority setting) has been elaborated in collaboration with a consultant (Fraunhofer Institute for Environmental Chemistry and Ecotoxicology, IUCT, Germany) in order to rank substances for which sufficient data are available according to their relative risk to the aquatic environment and apply expert judgement for the final selection of priority substances.

An overview of the approach of ranking and prioritisation of substances in the scope of the EU-WFD is depicted in figure 3-1 (according to IUCT, 1999; Commission of the EC, 2000 and Lepper, 2000). It consists basically of four main steps:

1. Initial selection of candidate substances
2. Exposure and effect scoring
3. Risk-based ranking
4. Final assessment and prioritisation

The underlying basic principle for the ranking of substances is the calculation of risk-based priority indices (I_PRIO) by multiplying the exposure indices (I_EXP) and the corresponding effect indices (I_EFF) for the individual substances.

$$I\_PRIO = I\_EXP * I\_EFF$$

Candidate substances subjected to the COMMPS procedure were selected from official lists and monitoring programmes:

- List 1 and 2 of Council Directive 76/464/EEC[1]
- Annex 1A and 1D of the Third North Sea Conference[2]
- Priority lists 1-3 identified under Council Regulation No 793/93[3]
- OSPAR list of candidate substances[4]
- HELCOM list of priority substances[5]

[1] OJ No. C 176 of 14.7.1982

[2] Annex 1A (List of priority substances agreed by the Third North Sea Conference, Annex 1D (Reference list of substances agreed by the Third North Sea Conference for further selection of priority substances. In: DIFF 97/19/E-1. OSPAR, Working Group on Diffuse Sources (DIFF), Oslo, 20-24 October 1997.

[3] List 1: OJ No. L 31/4 of 26.5.1994. List 2: OJ No. L231/19 of 28.9.1995. List 3: OJ No. L25/13 of 28.1.1997.

[4] OSPAR 98/14/1, Annex 34 (Ref. No 1998-16), Sintra, 22-23 July 1998)

[5] HELCOM 12/18, Annex 6, HELCOM 14/18, paragraph 6.40 and HELCOM recommendations 19/5, Appendix 3.

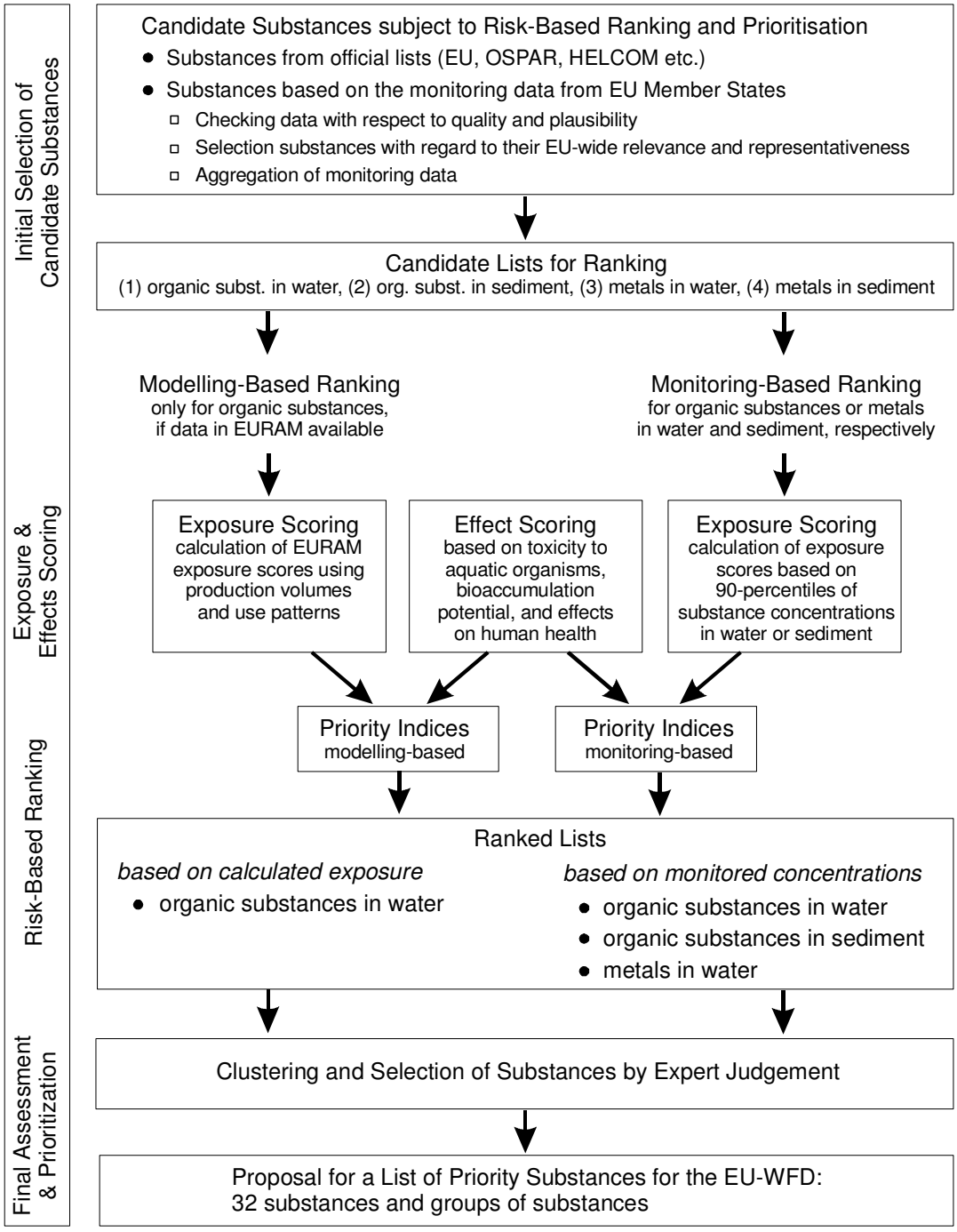


Figure 3-1: Flow diagram of ranking and prioritisation of substances in the scope of the EU-WFD

- Pesticides prioritised under Council Directive 91/414/EEC[1]
- In addition all substances for which monitoring data were available from the Member States.

[1] OJ No. L230 of 19.8.1991, p.1. OJ No. L366 of 15.12.1992, p.10.

In total 658 substances were compiled. The number of initial candidate substances, originating from monitoring data (water: 314, sediment: 221) was reduced by approx. 70% after checking the monitoring data with respect to their quality, plausibility and EU-wide relevance.

Exposure indices (I_EXP) were calculated from monitoring data using 90-percentiles of data sets. In addition, exposure indices were provided by the European Chemicals Bureau (ECB) by using the EURAM exposure model. EURAM is a Mackay Level I model, basically evaluating the distribution of substances between different environmental compartments as surface water, sediments, suspended solids, and atmosphere. The calculation was done on a basis of known production volumes, use patterns, and degradation of the individual substances. For 318 of the 658 initially selected candidate substances information was available in the IUCLID database at the ECB. Due to confidentiality restrictions as well as the exclusion of plant protection products and inorganic metal compounds from the modelling-based prioritisation, EURAM-based exposure indices were available for only 123 substances.

Effect indices for the aquatic phase and sediments were calculated taking into account direct toxic effects and indirect effects (bioaccumulation) on aquatic organisms as well as effects to human health (as carcinogenicity, mutagenicity, teratogenicity) via the aquatic exposure route, such as drinking water consumption. A major limitation for calculating sediment effect indices is the scarce availability of data on the effects on sediment-dwelling organisms or "bottom-feeding" fish. Therefore, sediment related 'predicted no-effect concentrations' (PNECs) for organic substances were computed through a transformation of aquatic PNEC data by using the known water-sediment partition coefficients ($K_{sed/water}$). However, this approach is not feasible for metals as the calculation of a unique $K_{sed/water}$ for a metal and its species (different inorganic compounds) is not appropriate.

The automated risk-based assessment (multiplying exposure and effect indices) resulted in two different types of ranking lists: modelling-based and monitoring-based ranking lists. Because of the unavailability of appropriate models and the uncertainties inherent in both the effects and exposure calculations, no modelling approach was applied for the sediment monitoring data.

For the final assessment and prioritisation a subset of substances with the highest scores was extracted from the ranking lists. Substances occurring normally as mixtures were clustered into single groups (such as trichlorobenzenes or PAHs). Substances which are widely restricted based on Council Directives or not in use in Member States (such as DDT, aldrin, dieldrin, isodrin, PCBs), regarded as 'historic pollutants', were reviewed by expert judgement and excluded on a case-by-case basis. The proposed priority substances were discussed with experts from Member States, industry and other stakeholders as the Scientific Committee on Toxicity, Ecotoxicity and the Environment (CSTEE) and the European Chemicals Bureau (ECB) resulting in a list of 32 priority substances or substance groups (incl. indicative substances) proposed for adoption by the European Parliament and Council (appendix 3.1).

3.2 OSPAR DYNAMEC approach

OSPAR adopted the so-called 'OSPAR List of Chemicals for Priority Action' including 15 substances and substance groups (OSPAR, 1998, Annex 2). In order to review this list, OSPAR established an ad hoc working group on the development of a dynamic selection and prioritisation mechanism for hazardous substances (DYNAMEC). As a result twelve new substances were added to the list in June 2000 (OSPAR, 2000). The 'List of Chemicals for Priority Action' is given in appendix 3.2.

Action with regard to hazardous substances, defined in the 'List of Chemicals for Priority Action' should include (OSPAR, 1998, § 5.3):

- Identifying sources of hazardous substances and their pathways to the marine environment
- Assessing with the help of a combination of monitoring, modelling, and risk assessment techniques the scope of the problem (local, regional, widespread)
- Identification of relevant measures including the adoption of measures to reduce discharges, emissions etc.

The DYNAMEC approach for selection and prioritisation is depicted in figure 3-2 (according to OSPAR PRAM, 2000). The approach generally follows the COMMPS procedure (chapter 3.1) which had been established in the context of the EU-WFD, calculating exposure and effect scores and combining them to priority indices used for ranking.

The main differences to the EU-WFD approach are described in the following.

Candidate substances were selected from:

- the Nordic Substance Database (approx. 18,000 substances),
- the Danish EPA QSAR database (more than 166,000 substances),
- the Data base of the Netherland's BKH/Haskoning report (approx. 180,000 substances),
- the OSPAR 1998 List of Candidate Substances.

For establishing a list of substances of possible concern PTB selection criteria and cut-off values were applied which incorporate intrinsic properties of substances (persistency (P), toxicity (T), bioaccumulation potential (B)). In addition a safety net procedure addressing e.g. metals, inorganic compounds, and endocrine disrupters was incorporated (selection by expert judgement).

The calculation of priority indices leads to 4 ranking lists from which a 'Selection Box' of 80 substances were extracted in a pragmatic way by (i) combining a selection of the 48-top-ranked substances from each of the 4 ranked lists, (ii) excluding substances already on Annex 2 of the strategy (list of priority chemicals) and (iii) adding those initially selected substances which fulfilled the selection criteria I (most stringent PBT criteria) or which were flagged as endocrine disrupters. In addition to the 80 substances in Group I-VI another 12 substances were listed in Groups I* and II*, for which QSAR or experimental data were doubtful. The 12 substances from Group I and II were added to the 'List of Chemicals for Priority Action' in June 2000.

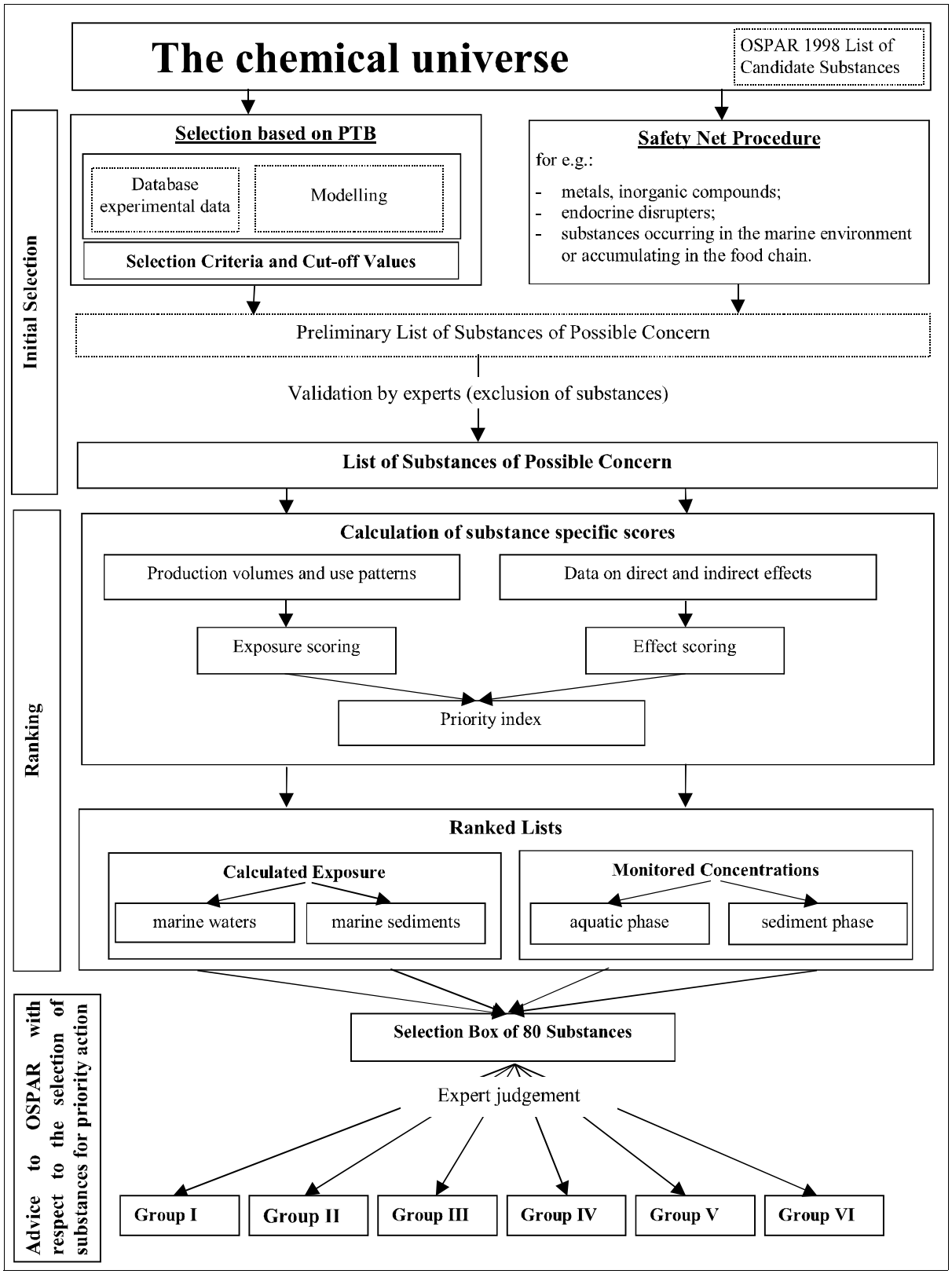


Figure 3-2: Flow diagram of the DYNAMEC mechanism for selection and prioritisation of substances in the scope of OSPAR

3.3 Comparison of ranking and prioritisation lists

In order to give an overview and discuss substances and substance groups derived from the OSPAR and EU-WFD ranking and prioritisation approaches a number of lists were combined (appendix 3.3). As the discussion shall focus on sediments and related dredged material, appendix 3.3 includes the EU and OSPAR ranking lists for sediments as well as resulting lists from prioritisation: OSPAR ‘Selection Box’, OSPAR 'Substances for Priority Action' and the proposed EU-WFD 'List of Priority Substances'. In addition substances from the ‘International Rhine Monitoring Programme’ and 'Rhine relevant' substances are included in appendix 3.3. Substances which are not included in e.g. sediment ranking lists and can be expected to occur mainly dissolved in the water phase - substances with log Pow < 5 - were omitted (detailed information is given in the appendix 3.3).

The combined lists in appendix 3.3 comprise a total number of 295 substances or substance groups. They were classified according to chemical substance classes as PAHs or according to their main use, e.g. flame retardants, which is depicted in figure 3-3.

Taking a closer look at the sediment ranking lists of OSPAR and EU it is obvious from figure 3-4 that:

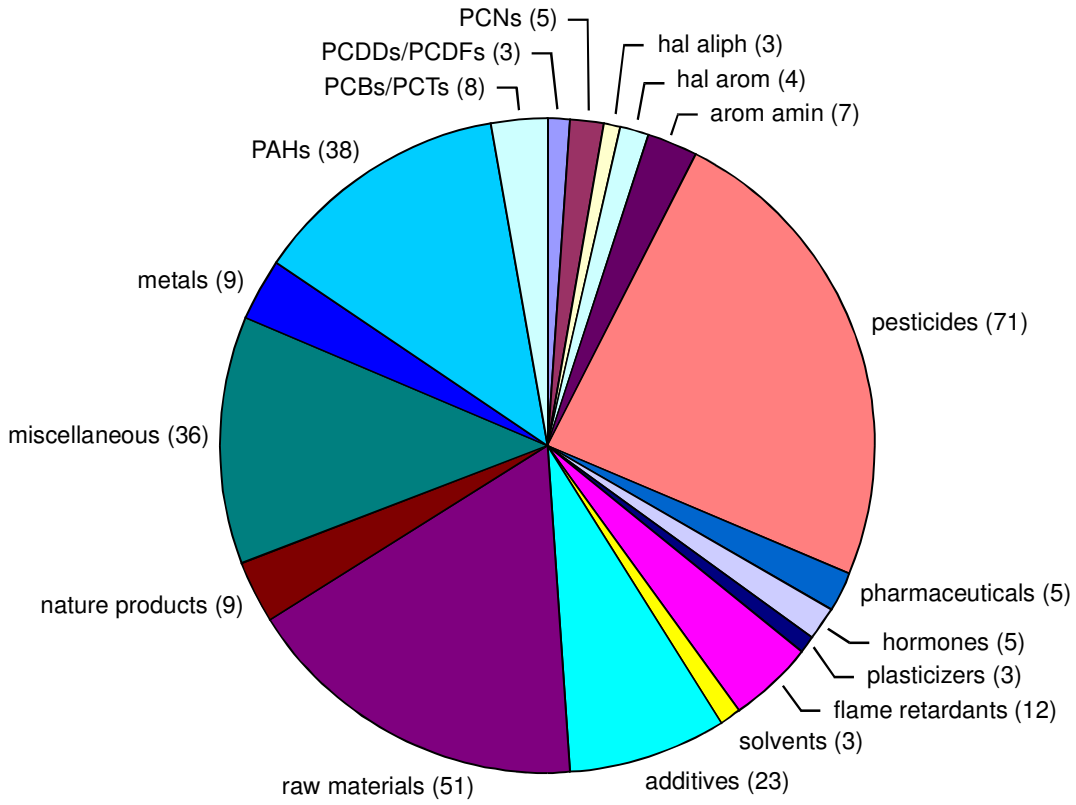
1. The combined OSPAR sediment lists compiled a larger number of compounds (220) than the EU sediment list (54)
2. Both lists overlap only to some extent (30 out of 240 substances or substance groups)

This can be explained to some extent by the following facts:

- The EU-COMMPS procedure compiled candidate substances from a number of official lists and monitoring programmes (chapter 3.1) whereas the OSPAR DYNAMEC approach initially selected substances from databases on chemicals (chapter 3.2).
- The effect scoring of the EU-COMMPs approach was mainly directed towards direct and indirect effects on freshwater organisms, whereas OSPAR intended to address marine organisms explicitly.

A comparison of both lists with the International Rhine Monitoring Programme reveals that 29 substances or substance groups, listed in the EU and/or OSPAR lists, are currently monitored in the Rhine river (figure 3-4).

The lists of 'Priority Chemicals' of OSPAR and the EU-WFD overlap to a larger extent (25 out of 51 substances and substance classes, figure 3-5). For the comparison, 10 substances, assumed to be of no or low relevance for sediments, have been omitted from the EU-WFD list in figure 3-5 and appendix 3.3. 14 substances and substance groups, considered as relevant in the Rhine river (ICPR, 2000), are included in the EU and/or OSPAR lists of 'Priority Chemicals'.



Total number of substances and substance groups: 295

metals: metals including inorganic metal compounds, **PAHs:** polycyclic aromatic hydrocarbons

PCBs: polychlorinated biphenyls, **PCTs:** polychlorinated terphenyls

PCDDs: polychlorinated dioxins, **PCDFs:** polychlorinated dibenzofurans

PCNs: polychlorinated naphtalenes, **hal aliph:** halogenated aliphatic compounds

hal arom: halogenated aromatic compounds, **arom amin:** aromatic amines

pesticides: including technical mixtures and metabolites/tranformation products of pesticides

hormones: including synthetic hormones and konjugates

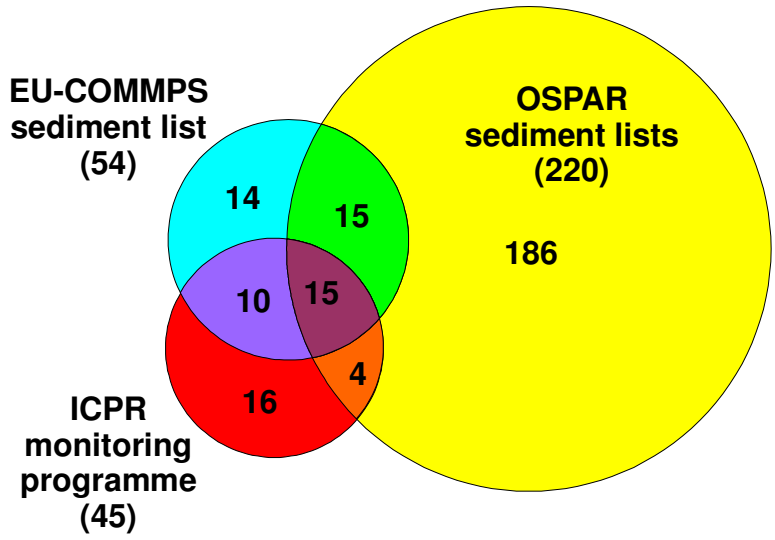
flame retardants: brominated and chlorinated compounds

additives: including stabilisers, antioxidants, pigments, fragrances, flavours etc.

raw materials: raw materials used in chemical industry including intermediates and by-products

nature products: naturally occurring substances, partially produced as well by chemical synthesis

Figure 3-3: Classification of substances and groups of substances according to use and chemical classes



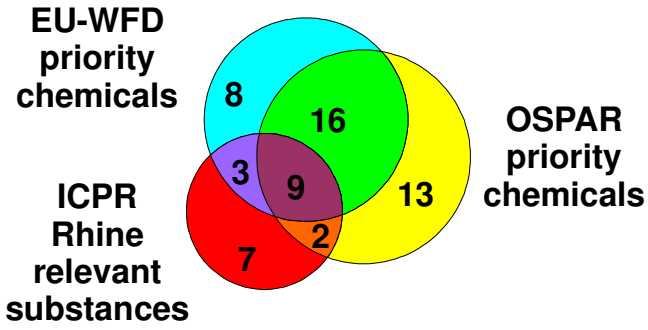
Total number of substances and substance groups: 260

OSPAR: combined ranking lists for sediments; monitoring- and modelling-based (OSPAR DYNAMEC 2000, p. 17-25)

EU-COMMPS: ranking list for sediments, monitoring-based (IUCT 1999, table 15, p.47-48)

ICPR: International monitoring programme of the ICPR (ICPR 2000, p.4-15, column B), substances with log Pow < 5 which are not included in other lists were omitted.

Figure 3-4: Comparison of sediment ranking lists with monitored substances in the Rhine[1]



Total number of substances and substance groups: 58

OSPAR: list of chemicals for priority action (OSPAR 1998, OSPAR 2000)

EU-WFD: proposed priority substances (Commission of the EC, 2000, Annex, p.27-28), substances with log Pow < 5 which are not included in sediment ranking lists were omitted.

ICPR: Rhine relevant substances (ICPR 2000, p.4-15, column E), substances with log Pow < 5 which are not included in sediment ranking lists were omitted.

Figure 3-5: Comparison of lists of priority substances with Rhine relevant substances[1]

[1] The numbers in figures 3-4 and figure 3-5 differ from the number of entries in the different lists as a comparison had to be made between substance groups and single substances.

3.4 Discussion of 'new' chemicals according to substance classes

The term 'new chemicals' in the context of this report, as outlined in the introduction, is related to the question which 'new' substances, at present not implemented as criteria for dredged material quality, are currently discussed as priority chemicals or might arise in future.

Before discussing individual groups of 'new' chemicals as classified in the previous chapter according to their chemical structure or use we come back to the dredged material issue in the Port of Rotterdam.

Chemical criteria for North Sea disposal in the Netherlands

As a starting point it shall be summarised if the current Dutch chemical criteria for disposal of dredged material in the North Sea (table C 5-2) are covered by the priority lists of chemicals discussed in the previous chapters. With regard to the present regulation zinc, copper, PCBs and individual PAHs are of concern, i.e. that concentrations of these substances frequently exceeded the sea/slufter limit (disposal in the North Sea) in dredged material from the eastern parts of the Port of Rotterdam.

Metals: Cadmium, mercury and lead are included in both OSPAR and EU-WFD priority lists, Nickel only in the latter. Zinc and copper are not prioritised by OSPAR or EU-WFD.

PAHs: covered by OSPAR and EU-WFD priority lists.

PCBs: only included in OSPAR priority list

Aldrin, dieldrin, endrin: not prioritised by OSPAR or EU-WFD

HCHs (Lindane): included in OSPAR and EU-WFD priority lists

Heptachlor (incl. ~epoxide): not prioritised by OSPAR or EU-WFD

Hexachlorobenzene: only covered by EU-WFD

'Historic' pollutants

The term 'historic' pollutants is coined in this context for chemicals for which production, marketing and/or use is prohibited or largely restricted nowadays in Europe. A number of these substances regulated under EC Directives have been ranked in the EU-WFD approach but excluded from prioritisation. In the OSPAR prioritisation approach a number of high-ranked substances which are heavily regulated or withdrawn from the market have been classified as 'Group V substances' (OSPAR Selection Box) which are not included in the priority list.

Some of these substances, like persistent chlorinated chemicals as PCBs, have reached elevated concentrations in the environment which will continue to be of concern in future due to the persistency of these compounds.

PCBs: Polychlorinated biphenyls, used e.g. as dielectrics in capacitors and transformers, as hydraulic oil in mining, restricted in marketing and use by Council Directive 76/769/EEC, excluded from EU-WFD prioritisation.

PCTs: Polychlorinated terphenyls, similar use as PCBs, restricted under Directive 76/769/EEC or 79/117/EEC, OSPAR Selection Box: Group V.

HCHs: Insectide, marketing and use of technical HCH prohibited under Council Directive 79/117/EEC, only one production site in Europe (located in Eastern Europe), included in EU-WFD and OSPAR priority lists.

DDT, aldrin, dieldrin, isodrin: Insecticides widely restricted under Council Directives 76/769/EEC and 79/117/EEC or not used in EU Member States, excluded from EU-WFD prioritisation.

Heptachlor: An insecticide, included in POP list adopted under the UN-ECE Convention on 'Long-Range Transport of Air Pollutants', marketing and use prohibited under Council Directive 79/117/EEC, excluded from EU-WFD prioritisation.

PAHs - Polycyclic aromatic hydrocarbons

Naphtalene and anthracene are intentionally produced in chemical industry. Combustion of fossil fuels and related processes are responsible for the majority of PAH releases to the environment. PAHs are included the OSPAR and EU-WFD priority lists and are as well chemical criteria for dredged material quality in the Netherlands. In the last years emissions from point sources have successfully been reduced in Western Europe; nowadays the releases from diffuse sources are dominating (chapter B 3.2).

Pesticides

Some persistent chlorinated pesticides which are banned or heavily regulated have already been discussed above as 'historical' pollutants. A number of pesticides are included in the OSPAR and/or EU-WFD priority lists.

Prioritised pesticides:

Atrazine (EU-WFD): Herbicide

Alachlor (EU-WFD): Herbicide

Chlorfenvinphos (EU-WFD): Insecticide

Chlorpyrifos (EU-WFD): Insecticide

Dicofol (OSPAR): Acaricide, potential for endocrine disrupting effects

Diuron (EU-WFD): Herbicide

Endosulfan (OSPAR, EU-WFD): Insecticide, potential for endocrine disrupting effects

HCHs (OSPAR, EU-WFD): Insecticide, 'historic' pollutant

Isoproturon (EU-WFD): Herbicide

Methoxychlor (OSPAR): Insecticide, production and use volumes thought to be low

Trifluralin (EU-WFD): Insecticide

Some prioritised pesticides, e.g. atrazine (log Pow 2.6), diuron (log Pow 2.7), isoproturon (log Pow 2.9), can be expected to prevail dissolved in the aquatic phase and thus be of no or only minor relevance with regard to sediments/dredged material.

Flame retardants

There are different families of flame-retardants, used e.g. in polymers, textiles and wood, giving these materials a higher fire safety by inhibition or suppression of fire. Some chlorinated and brominated substances/substance groups are included in the EU-WFD and OSPAR priority lists:

Short chained chlorinated paraffins (EU-WFD, OSPAR): C_{10-13} chlorinated alkanes

Brominated flame retardants (OSPAR): broad group including brominated diphenyl-ethers, biphenyls, bisphenols etc., individual classes or indicator substances not defined.

Brominated diphenylethers (EU-WFD)

Tetrabromobisphenol A (OSPAR)

The current world-wide demand of brominated flame retardants is estimated at 350,000 tonnes/year with tetrabromobisphenol A (TBBPA) as the major compound. Chlorinated paraffins and polybrominated flame retardants as brominated biphenyls, diphenylethers and TBBPA have the tendency to adsorb to sediments. This tendency increases with the degree of halogenation (TBBPA log Pow 4.5, decabromodiphenylether log Pow 10).

Alkylphenols & polyethoxylates

Alkylphenolethoxylates (APEOs) are mainly used in detergents. Nonylphenolethoxylate come to 70-90% of the total production volume of APEOs. The major isomers of the technical products are the para-isomers of nonylphenol and tert-octylphenol. Nonylphenols and octylphenols are reported as suspected endocrine disrupters and occur in surface water as degradation products of APEOs. Alkylphenols are used in the chemical industry as well as intermediates, e.g. for the production of formaldehyde resins.

Prioritised alkylphenols and related compounds:

Octylphenols (EU-WFD)

4-tert-Octylphenol (OSPAR, EU-WFD, indicator substance)

Nonylphenol/ethoxylates (OSPAR)

Nonylphenols (EU-WFD)

4-nonylphenol (EU-WFD, indicator substance)

Tin-organic compounds

Dibutyltin and tetrabutyltin compounds are used as additives, stabilisers and catalysts in chemical industry. Tributyltin (TBT) is used as an additive to ship paints to prevent fouling (antifouling agent). Besides other modes of action, for TBT endocrine disrupting effects are reported for marine organisms (androgenic potency, imposex of snails etc.). Other organic tin compounds are used as pesticides (acaricides, insecticides, fungicides).

Prioritised organic tin compounds:

Organic tin compounds (OSPAR): individual substances or classes not specified

Tributyltin, 'TBT' (EU-WFD): Tributyltin cation as indicator substance

Hormones - endocrine disrupters

A large number of compounds (more than 100) are currently discussed having a potential for endocrine disrupting effects. Besides natural hormones as estradiol or estrone synthetic hormones (e.g. ethinylestradiol) and natural compounds a large number of chemicals are known or are suspected having a potential for endocrine disrupting effects (UBA, 1997 & 1999).

In the OSPAR prioritisation approach a few natural and synthetic estrogens (estrone, estradiol, diethylstilbestrol (DES), ethynylestradiol) were selected as Group VI substances (OSPAR Selection Box). They were only ranked because of their endocrine disrupting potential and are not listed as priority chemicals. Estrone, estradiol and ethynylestradiol are mainly released via domestic waste waters and sewage treatment plants into surface waters.

Besides certain alkylphenols and TBT a number of pesticides e.g. dicofol, endosulfan, methoxychlor, *p*,*p*'-DDT and toxaphene are suspected to act as endocrine disrupters as well (see above).

Raw materials, intermediates and byproducts in chemical industry

In the sediment ranking lists of OSPAR and EU more than 50 substances or substance groups are listed which occur in chemical industry as raw materials, intermediates or byproducts. Exposure scoring and therefore ranking of these type of compounds is difficult as monitoring data are scarce or not available and data of production volumes often are restricted for reasons of confidentiality. A typical example are trichlorbenzenes which are used as intermediates in chemical synthesis, degreasing solvents and other purposes. Trichlorbenzenes are of concern because of their high toxicity to aquatic organisms, their bioaccumulation potential and their relatively high persistence. They are expected to occur dissolved in the water phase but as well to some extent sorbed to sediments.

Raw materials/intermediates prioritised by OSPAR or EU-WFD:

Trichlorobenzenes (EU-WFD): 1,2,4-Trichlorobenzene as indicator substance

1,2,4-Trichlorobenzene, 1,2,3-Trichlorobenzene, 1,3,5-Trichlorobenzene (OSPAR)

Pentachlorobenzene (EU-WFD): Byproduct in chemical industry used to produce tetrachlorophenols or anisoles.

Hexachlorobenzene (EU-WFD): Intermediate for the production of pentachlorothiophenol, use as insecticide restriced in the EU under Directive 76/796/EEC or 79/117/EEC.

p-tert-Butyltoluene (OSPAR): used in the manufacture of plastics and as additive to lubricants.

Hexamethyldisoloxane (OSPAR): used as intermediate in the production of silicones and as raw material in personal care products.

Hexachlorocyclopentadiene (OSPAR): intermediate in chemical industry

3.5 Future perspectives with regard to sediments/dredged material

As 'new' chemicals become of concern and are/will be prioritised it can be expected that the list of chemical criteria for the quality of sediments/dredged material will be updated in future. The ultimate goal should be to implement measures in order to reduce emissions and related concentrations in sediments/dredged material below the defined quality standards. This would enable to keep dredged sediments in the aquatic system and allow cost-effective maintenance dredging and relocation in rivers, estuaries and the North Sea without imposing unacceptable risks to the environment.

The ranking and prioritisation of chemicals is restricted for several reasons. As discussed before, for the majority of existing commercial chemicals little is known about their toxicity or other parameters needed for exposure and effects scoring in the ranking process. A significant obstacle is that data on production/use volumes of certain substances are confidential, i.e. the access to these data is restricted to a limited number of experts during ranking and prioritisation (OSPAR PRAM, 2000).

The ranking and prioritisation of chemicals is an on-going task on the regional/national (river catchments) and international level. For the Rhine catchment and the North Sea the EU-WFD and OSPAR DYNAMEC approaches are the most important international ones.

Ideally relevant substances are identified for the river catchment area (e.g. as done by the ICPR for the Rhine) which will be influenced by the new EU-WFD by adopting the list of priority chemicals for which the setting of quality standards applicable to surface water, sediments and biota is demanded within 2 to 6 years. Priority chemicals defined by OSPAR which mainly enter the North Sea via rivers like the Rhine should ideally be included in the EU-WFD list of priority chemicals or at least be implemented on the catchment level.

Including additional priority chemicals, defined under OSPAR, in the proposed EU-WFD list is currently under discussion although no or only minor changes before the adoption by the European Parliament and the Council are expected. In the proposal for establishing the list of

priority pollutants in the field of water policy' (Council of the EC, 2000) it is stated that: *"The marine environment is not addressed in the proposed WFD per se ... The Commission takes an active part in the present work of prioritisation of substances under the OSPAR convention. If this exercise identifies the need for action on other substances than those proposed for the first priority list, the Commission will consider, on a case-by-case basis either the amendment of the priority list or the application of Article 16, paragraph 7 of the proposed WFD."*

(Article 16, paragraph 7 of the EU-WFD states that the Commission may prepare strategies against pollution of water by any other pollutants, i.e. substances not prioritised under the EU-WFD.)

In the past, ICPR 'Action Programmes' achieved large reductions of emissions mainly via point sources. In the future it will be of high importance to what extend effective reduction measures for priority chemicals on the catchment level or demanded by the EU-WFD will be implemented successfully. This will be a challenging task especially for chemicals as PAHs which mainly are emitted by diffuse sources.

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List of abbreviations

CSTEE	Scientific Committee on Toxicity, Ecotoxicity and the Environment
COMMPS	Combined monitoring-based and modelling-based priority setting
DYNAMEC	OSPAR ad hoc working group on the 'Development of a Dynamic Selection and Prioritisation Mechanism for Hazardous Substances'
ECB	European Chemicals Bureau
EINECS	European Inventory of Existing Commercial Chemical Substances
ELINCS	European List of Notified Chemical Substances
EU-WFD	European Water Framework Directive
HELCOM	Helsinki Commission/Convention
ICPR	International Commission for the Protection of the Rhine
IUCT	Fraunhofer Institute for Environmental Chemistry and Ecotoxicology
$K_{sed/water}$	sediment-water partitioning coefficient
OSPAR	Oslo Paris Commission/Convention
P_{OW}	Octanol-Water Partitioning Coefficient
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PRAM	OSPAR Programmes and Measures Committee
PNEC	predicted no-effect concentration
PTB criteria	Criteria for persistency (P), toxicity (T) and bioaccumulation potential (B)
QSAR	Quantitative structure activity relationship
US-EPA	Environmental Protection Agency, United States