

UNDP/GEF Danube Regional Project
Strengthening the Implementation Capacities for Nutrient
Reduction and Transboundary Cooperation
in the Danube River Basin

Analysis of the results of the EMIS inventory
and their comparison with TNMN and JDS
results with particular attention to the EU
Priority List of Pollutants

Project Component 2.2: Development of operational tools for
monitoring, laboratory and information management with
particular attention to nutrients and toxic substances

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Abbreviations

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| TNMN | Trans-National Monitoring Network |
| EMIS | Emission Sources Expert Group |
| JDS | Joint Danube Survey |
| WFD | Water Framework Directive |
| ICPDR | International Commission for the Protection of the Danube River |
| DRPS | Danube River Priority Substances |
| DRB | Danube River Basin |
| MLIM | Monitoring and Laboratory Information Management |
| EG | Expert Group |
| DRP | UNDP/GEF Danube Regional Project |
| EAF | Expert Advisory Forum |
| PS | Priority Substances |

Executive Summary

The main objective of this activity was to prepare a background material for future harmonization of the ICPDR databases (EMIS, TNMN). Therefore, a comparative analysis of determinands (i) included in the EMIS inventories/database, (ii) routinely measured in the TNMN and (iii) analysed within the Joint Danube Survey (JDS) was made. A particular attention was given to a comparison with the determinands from the EU Water Framework Directive (WFD) List of Priority Substances. The analysis made also a comparison with the recently agreed provisional Danube List of Priority Substances.

At present, for water matrix 26 determinands from EU & Danube Priority Lists are not in the analytical programme of TNMN and 29 are not in the EMIS inventories. In the JDS, 17 out of these 26 determinands were included in the analytical programme for the water matrix. Eight JDS determinands that are listed in the Decision No. 2455/2001/EC showed results below detection limit (n.d.). Mercury was below detection limit in the JDS datasets (due to relatively high LOD of the analytical method applied), however, it is reported in the TNMN list. For 14 determinands (all organic micropollutants) listed in the Decision No. 2455/2001/EC no data in water exists in the ICPDR databases (TNMN and JDS; data from PHARE Applied Research Programme for DRB exist for PAHs).

For sediment / suspended solids altogether 20 determinands of the EU WFD Priority Substances Lists are not in the analytical programme of TNMN while 22 are not in the EMIS inventories. Ten, out of these 20 non-TNMN determinands, were included in the analytical programme of the JDS for sediments/suspended solids. For ten determinands present in the EU WFD Priority Substances list no data are available in suspended solids/sediments analysed within the TNMN and JDS.

In the technical report results are discussed in detail for each (group of) determinand(s). Considerations are presented for each determinand whether to include it or not in either the EMIS inventories or the analytical programme of TNMN. Comments on possible emission sources were made as well, based on current versions of respective EC documents (source screening). The considerations were used as a basis for the recommendations. Recommendations referred also to monitoring matrices agreed until now by EAF PS.

1. Introduction

A comparative analysis of determinands (i) included in the EMIS inventories/database, (ii) routinely measured in the TNMN and (iii) analyzed within the Joint Danube Survey (JDS) was made. A particular attention was given to a comparison with the determinands from the EU Water Framework Directive (WFD) List of Priority Substances. The analysis includes also a comparison with the recently agreed provisional Danube List of Priority Substances.

The main objective of this activity was to prepare a background material for future harmonization of the ICPDR databases (EMIS, TNMN). Recommendations for the harmonization of the databases are therefore presented, taking into account findings of the JDS as well as the Danube List of Priority Substances.

2. Methodology

A matrix was produced for five sets of parameters (EU WFD List of Priority Substances, Danube List of Priority Substances, EMIS, TNMN and JDS), displaying also units associated with each of the determinands. Both water and suspended solids/sediments (two matrices) were taken into account. The matrix provided a basis for the comparative analysis. The EU WFD and the Danube lists of Priority Substances have been included without changes. For the TNMN determinands in both matrices, the lists presented in the TNMN Yearbook 2000 were used. However, six determinands (Na, K, Ca, BOD5, COD-Mn and DOC) were excluded in the water matrix; these parameters were considered as not relevant for the study. Similarly, seven determinands (Ca, Mg, Mn, Fe, Al, TOC and Total extractable matter) were excluded from the TNMN list for the suspended solids/sediments matrix. For the JDS list of determinands, the lists in Chapter 2 of the JDS Technical Report were used in both matrices. For the water matrix, the list stayed unchanged; for suspended solids/sediment, similarly as for TNMN data set, seven determinands were excluded.

Determinands, that are not compatible with EMIS were excluded from the TNMN and JDS lists in both matrices. These parameters relate to: general physical conditions (e.g., temperature), hydrology (e.g., flow), biology (e.g., chlorophyll-A), microbiology (e.g., Salmonella) and general chemical determinands (e.g., alkalinity). A specific group of compounds excluded from the comparison were pharmaceuticals. The reason was current unavailability of sufficient information on their occurrence in surface waters in the Danube River Basin as well as their absence in the Decision No. 2455/2001/EC. However, owing to the increasingly frequent detection of pharmaceuticals in surface waters (mainly due to upgrade of analytical capabilities of water laboratories) it is advisable to focus on their occurrence in the future.

The matrices clearly indicate differences among the five investigated data sets. These differences are discussed for each (group of) determinand(s) and considerations are given on consequences for the set up of the EMIS database and the analytical programme of TNMN. Based on the above, recommendations have been developed for harmonization of EMIS and TNMN with the EU WFD and Danube Priority Substances lists. The EU list is a legal document, approved and adopted by the EU Member States and may be revised/amended in the future at the EU level. The Danube list of Priority Substances has recently been agreed by the ICPDR at its 1st Standing Working Group meeting, however, still being considered only as provisional National screenings for EU WFD Priority Substances will have to be performed in order to draft the final list of the Danube Priority Substances. The current Danube list is based on the determinands contained in the Decision No. 2455/2001/EC. In total eight parameters have been added (COD, NH₄-N, N_{tot}, P_{tot}, and four heavy metals). The JDS was a single, specific survey and provided additional information for recommendations to harmonize EMIS and TNMN.

3. Results

The discussed determinands in the five data sets are presented for water and suspended solids/sediments matrices in Annex 1 and 2, respectively.

3.1 Water (Annex 1)

The columns for the EU and the Danube Lists of Priority Substances show 33, resp. 41 substances, (44, resp. 52 considering all individual determinands). At present, 26 determinands of these Priority Lists are not in the analytical programme of TNMN and 29 are not in the EMIS inventories. In the JDS, 17 out of these 26 determinands were included in the analytical programme for the water matrix. Eight JDS determinands that are listed in the Decision No. 2455/2001/EC showed results below detection limit (n.d.). Mercury was below detection limit in the JDS datasets (due to relatively high LOD of the analytical method applied), however, it is reported in the TNMN list. For 14 determinands (all organic micropollutants) listed in the Decision No. 2455/2001/EC no data in water exists in the ICPDR databases (TNMN and JDS; data from PHARE Applied Research Programme for DRB exist for PAHs).

3.2 Suspended solids/sediments (Annex 2)

The columns for the EU and the Danube Lists of Priority Substances comprise of 25 and 31 substances, respectively. Here, it must be stressed that the selection of parameters relevant for the solid phase matrices was based on the current status in elaboration of quality standards by the Expert Advisory Forum of Priority Substances (EAF PS; as of summer 2003). As this issue is not concluded yet, some amendments in the solid phase matrices may be expected in near future. At present, 20 determinands of the EU WFD Priority Substances Lists are not in the analytical programme of TNMN while 22 are not in the EMIS inventories. Ten, out of these 20 non-TNMN determinands, were included in the analytical programme of the JDS for sediments/suspended solids. For ten determinands present in the EU WFD Priority Substances list no data are available in suspended solids/sediments analysed within the TNMN and JDS.

3.3 Discussion of the results with recommendations

The results are discussed for each (group of) determinand(s). Considerations are presented for each determinand whether to include it or not in either the EMIS inventories or the analytical programme of TNMN. Comments on possible emission sources were made as well, based on current versions of respective EC documents (source screening). The considerations were used as a basis for the recommendations. Recommendations will refer also to monitoring matrices agreed until now by EAF PS.

It is expected that the considerations will be discussed with the MLIM/EMIS expert groups and this discussion may result to adjustments of the recommendations. Moreover, the evaluation of 5--Years TNMN will most likely provide additional considerations/recommendations. Therefore, the discussion presented here can be considered only as a first step in the process and certainly cannot lead to final conclusions.

Alachlor

This polar pesticide is EU WFD priority substance and is suspected to affect endocrine regulation. Its major sources/pathways in quantitative terms of total releases are agricultural activities (diffuse emission to surface waters and emission to atmosphere). AMPS agreed on recommendation to monitor alachlor in water. Alachlor is not included in the EMIS inventory or TNMN programme. It was measured in water during the JDS, but not detected in any of the samples.

It is recommended to check whether alachlor is manufactured in the Danube River Basin and/or used as a pesticide. In reference to its potential major pathways it should be included into EMIS inventory of agricultural diffuse sources and of industrial point sources. If it is used in considerable quantities,

further targeted investigations/surveys are necessary to check for its presence in specific stretches in the basin, close to these regions where it is produced/used. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include alachlor in the TNMN programme as a separate determinand in water.

Anthracene

This polycyclic aromatic hydrocarbon is a EU WFD priority substance under review. Anthracene has several major sources/pathways in quantitative terms of total releases. Its major point sources are run off from buildings and constructions in paved urban area (creosote treated timber) and large industrial sites (mainly production of creosote). The main non-point source is release from materials and constructions in non-urban area (creosote treated timber). Its emissions to atmosphere predominantly origin from traffic and infrastructure, households and other consumer use, and from industry. AMPS has not agreed on recommendation on monitoring matrices, yet. Anthracene is not included in the EMIS inventory or TNMN programme. It was measured in suspended solids/sediments during the JDS and detected in all but two sediment samples at concentration levels of 0.0008 – 1.648 mg/kg and in all but one suspended solid samples at concentration levels of 0.0012 – 0.212 mg/kg.

It is recommended to check whether anthracene is produced/used in industrial technologies in the Danube River Basin. In reference to its potential major pathways it should be included into EMIS inventory of municipal and industrial point sources. Based on the emission data, further targeted investigations/surveys to check for its presence in specific stretches in the basin should be performed. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include anthracene in the TNMN programme for water and solid phase (suspended solids).

Atrazine

This polar pesticide is EU WFD priority substance under review and it is a substance with evidence on endocrine disrupting potential. Atrazine metabolites are considered significantly less toxic than atrazine itself. In terms of exposure, in surface water atrazine itself is the only environmentally significant residue where contamination results from spray drift.

Its major sources/pathways in quantitative terms of total releases are agricultural activities (diffuse emission to surface waters and emission to atmosphere). An important role is attributed also to atmospheric deposition of atrazine on the water surface. AMPS agreed on recommendation to monitor atrazine in water. Atrazine was detected within both TNMN and JDS in water samples. During JDS it was detected in majority of water samples at concentration levels of 0.02 – 0.78 µg/l.

It is recommended to check where atrazine is manufactured in the Danube River Basin (e.g., JDS Technical Report refers to manufacturing site in Sisak in Croatia) and/or used as a pesticide. In reference to its potential major pathways it should be included into EMIS inventory of agricultural diffuse sources and of industrial point sources. It is recommended to keep atrazine among TNMN determinands to be analyzed in water. It seems to be not relevant to analyze atrazine in solid phase, due to its polarity.

Benzene

This aromatic hydrocarbon is EU WFD priority substance. Its major point source is emission from atmosphere from traffic and infrastructure. Direct non-point and point emission sources to surface waters are of minor importance. AMPS agreed on recommendation to monitor benzene in water. Benzene is not included in the EMIS inventory or TNMN programme. It was measured in water during the JDS, and detected only in seven from 99 water samples at concentration levels of 0.1 – 0.5 µg/l.

It is recommended to check whether benzene is produced/used in industrial technologies in the Danube River Basin. In reference to its potential major pathways it should be included into EMIS inventory of municipal and industrial point sources. Based on the emission data, further targeted investigations/surveys to check for its presence in specific stretches in the basin should be performed.

This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include benzene in the TNMN programme for water.

Brominated diphenylethers

There are 209 theoretical congeners of polybrominated diphenylethers (PBDE), out of which only few are present in technical mixtures. The individual congeners are numbered according to the IUPAC system used for the numbering of PCBs. The most frequent congeners are penta-, octa- and decabrominated diphenylethers. Pentabromodiphenylether is EU WFD priority hazardous substance, octabromodiphenyl ether is considered as priority substance. Major sources/pathways in quantitative terms of total releases of PBDEs are (i) point sources to surface water caused by households and consumer use of flexible polyurethane foam (furniture/upholstery), resins, polyesters, textiles, ABS plastics in castings and covers for electric and electronic equipment, synthetic carpets; and (ii) large industrial point sources (either production/formulation of PBDEs or industrial use of PBDEs as flame retardants in the production of flexible polyurethane foam, resins, polyesters, textiles, etc.). AMPS agreed on recommendation to monitor bis(pentabromophenyl)ether, pentabromodiphenylether and octabromodiphenyl ether in suspended particulate matter (SPM), settled sediment and biota. Polybrominated diphenylethers are not included in the EMIS inventory or TNMN programme. They were analyzed in the JDS in suspended solids and sediment, but not detected in any of the samples.

It is recommended to check whether PBDEs are produced/used in industrial technologies in the Danube River Basin. In reference to their potential major pathways they should be included into EMIS inventory of municipal and industrial point sources. Based on the emission data, further targeted investigations/surveys to check for their presence in specific stretches in the basin should be performed. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include PBDEs in the TNMN programme for solid phase (and biota).

Cadmium and its compounds

This heavy metal is EU WFD priority hazardous substance. Cadmium has a wide range of major sources/pathways in quantitative terms of total releases – (i) diffuse sources (atmospheric deposition on the water surface, agricultural activities, transport and infrastructure without connection to canalisation), (ii) point sources (households, consumer use, industrial activities such as zinc mining, lead and zinc refining, manufacture of cadmium compounds, primary and secondary batteries, pigments, stabilisers, phosphoric acid and/or phosphatic fertiliser from phosphatic rock, etc.), as well as (iii) emissions to atmosphere from industry. AMPS has not agreed on recommendation on monitoring matrices, yet. Cadmium is included in all reviewed data sets and detected in all matrices.

For a proper assessment of occurrence of cadmium of anthropogenic origin in the Danube River Basin the estimation of natural background concentrations of cadmium in water, suspended particulate matter (and sediments) should be done (including issues related to the spatial and temporal variability of these background concentrations). Nevertheless, it is recommended to keep cadmium in all ICPDR programmes (emission inventories of municipal and industrial point sources, TNMN monitoring in water and suspended solids).

C₁₀₋₁₃-Chloroalkanes

C₁₀₋₁₃-Chloroalkanes (short-chain chlorinated paraffins, SCCPs) are polychlorinated alkanes with chlorine content ranging from 49 to 70% by weight. The theoretical maximum number of positional isomers calculated for $nC_nH_{2n+2-z}Cl_z$, assuming no more than one bound chlorine atom on a carbon atom, for SCCPs is 7820. However, the complexity of mixture of C₁₀₋₁₃-Chloroalkanes is further enhanced because chlorine substitution at a secondary carbon atom usually produces a chiral carbon atom so that enantiomers and diastereomers are generated. Furthermore, although the source hydrocarbon skeletons are primarily alkanes, they can contain branched alkanes and also other hydrocarbons, which increase the complexity of mixtures. Hence, it can be expected that commercial mixtures of C₁₀₋₁₃-chloroalkanes contain several thousands of compounds.

C₁₀₋₁₃-Chloroalkanes are categorised as EU WFD priority hazardous substances. Major sources/pathways in quantitative terms of total releases of C₁₀₋₁₃-chloroalkanes are industrial point sources to surface water (manufacture of metal working fluids, leather applications). AMPS has not agreed on recommendation on monitoring matrices, yet. C₁₀₋₁₃- Chloroalkanes are not included in the EMIS inventory or TNMN programme.

It is recommended to check whether C₁₀₋₁₃-chloroalkanes are produced/used in industrial technologies in the Danube River Basin. In reference to their potential major pathways they should be included into EMIS inventory of industrial point sources. Based on the emission data, further targeted investigations/surveys to check for their presence in specific stretches in the basin should be performed. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include C₁₀₋₁₃-chloroalkanes in the TNMN programme for water and solid phase.

Chlorfenvinphos

This polar pesticide is EU WFD priority substance. Its major sources/pathways in quantitative terms of total releases are agricultural activities (diffuse emission to surface waters and emission to atmosphere including following atmospheric deposition on the water surface). AMPS agreed on recommendation to monitor chlorfenvinphos in water. Chlorfenvinphos is not included in the EMIS inventory or TNMN programme. It was measured in water during the JDS, but not detected in any of the samples.

It is recommended to check whether chlorfenvinphos is manufactured in the Danube River Basin and/or used as a pesticide. In reference to its potential major pathways it should be included into EMIS inventory of agricultural diffuse sources and of industrial point sources. If it is used in considerable quantities, further targeted investigations/surveys are necessary to check for its presence in specific stretches in the basin, close to these regions where it is produced/used. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include chlorfenvinphos in the TNMN programme as a separate determinand in water.

Chlorpyrifos

This polar pesticide is categorised as EU WFD priority substance under review. Its major sources/pathways in quantitative terms of total releases are agricultural activities (diffuse emission to surface waters and emission to atmosphere). AMPS agreed on recommendation to monitor chlorpyrifos in water. Chlorpyrifos is not included in the EMIS inventory or TNMN programme. It was measured in water during the JDS, but not detected in any of the samples.

It is recommended to check whether chlorpyrifos is manufactured in the Danube River Basin and/or used as a pesticide. In reference to its potential major pathways it should be included into EMIS inventory of agricultural diffuse sources and of industrial point sources. If it is used in considerable quantities, further targeted investigations/surveys are necessary to check for its presence in specific stretches in the basin, close to these regions where it is produced/used. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include chlorpyrifos in the TNMN programme as a separate determinand in water.

1,2-Dichloroethane

This volatile chlorohydrocarbon is categorised as EU WFD priority substance. 1,2-Dichloroethane is primarily released into atmosphere by industrial point sources (production of 1,2-dichloroethane and its processing into, e.g., ethylene diamine, ethylene polyamine, 1,1,1-trichloroethane, trichloroethylene and perchloroethylene; degreasing of metals). AMPS agreed on recommendation to monitor 1,2-dichloroethane in water. 1,2-Dichloroethane is not included in the EMIS inventory or TNMN programme. It was measured in water during the JDS and it was detected in 18 from 99 the samples at concentration levels of 0.1 – 10 µg/l.

It is recommended to check whether 1,2-dichloroethane is manufactured in the Danube River Basin. In reference to its potential major pathways it should be included into EMIS inventory of industrial point

sources. If it is used in considerable quantities, further targeted investigations/surveys are necessary to check for its presence in specific stretches in the basin, close to these regions where it is produced/used. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include 1,2-dichloroethane in the TNMN programme as a separate determinand in water.

Dichloromethane

This volatile chlorohydrocarbon is categorised as EU WFD priority substance. Dichloromethane is primarily released into atmosphere by industrial point sources (pharmaceutical industry). Direct industrial point sources to surface waters are of minor importance. AMPS agreed on recommendation to monitor dichloromethane in water. Dichloromethane is not included in the EMIS inventory or TNMN programme. It was measured in water during the JDS, but not detected in any of water samples.

It is recommended to check whether dichloromethane is manufactured in the Danube River Basin. In reference to its potential major pathways it should be included into EMIS inventory of industrial point sources. If it is used in considerable quantities, further targeted investigations/surveys are necessary to check for its presence in specific stretches in the basin, close to these regions where it is produced/used. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include dichloromethane in the TNMN programme as a separate determinand in water.

Di(2-ethylhexyl)phthalate (DEHP)

This alkyl derivative of phthalic acid is categorised as EU WFD priority substance under review. Major sources/pathways in quantitative terms of total releases of di(2-ethylhexyl)phthalate are industrial and municipal point sources to surface water (run off from buildings and constructions in paved urban area, e.g. from roofs containing PVC with DEHP; households & consumer use of PVC with DEHP as stabiliser; production of DEHP and of PVC with DEHP as stabiliser). AMPS has not agreed on recommendation on monitoring matrices, yet. Di(2-ethylhexyl)phthalate is not included in the EMIS inventory or TNMN programme. It was measured in suspended solids/sediments during the JDS and it was detected in almost all sediment samples at concentration levels of 0.032 – 170 mg/kg and in all suspended solids at concentration levels of 0.021 – 3 mg/kg.

It is recommended to check whether di(2-ethylhexyl)phthalate is manufactured in the Danube River Basin. In reference to its potential major pathways (especially a frequent consumer use) it should be included into EMIS inventory of industrial and municipal point sources. If it is used in considerable quantities, further targeted investigations/surveys are necessary to check for its presence in specific stretches in the basin, close to these regions where it is produced/used. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include di(2-ethylhexyl)phthalate in the TNMN programme as a separate determinand in water and solid phase.

Diuron

This polar pesticide is a EU WFD priority substance under review. Its major sources/pathways in quantitative terms of total releases are agricultural activities (diffuse emission to surface waters and emission to atmosphere). AMPS agreed on recommendation to monitor diuron in water. Diuron is not included in the EMIS inventory or TNMN programme. It was measured in water during the JDS, but not detected in any of water samples.

It is recommended to check whether diuron is manufactured in the Danube River Basin and/or used as a pesticide. In reference to its major pathways it should be included into EMIS inventory of agricultural diffuse sources and of industrial point sources. If it is used in considerable quantities, further targeted investigations/surveys are necessary to check for its presence in specific stretches in the basin, close to the regions where it is produced/used. This should be taken into account during

national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include diuron in the TNMN programme as a separate determinand in water.

Endosulfan (alpha-endosulphan)

This polar pesticide is a EU WFD priority substance under review. Its major sources/pathways in quantitative terms of total releases are agricultural activities (diffuse emission to surface waters). AMPS has not agreed on recommendation on monitoring matrices, yet. Alpha-endosulphan is not included in the EMIS inventory or TNMN programme. It was measured in water during the JDS, but not detected in any of water samples.

It is recommended to check whether alpha-endosulphan is manufactured in the Danube River Basin and/or used as a pesticide. In reference to its major pathways it should be included into EMIS inventory of agricultural diffuse sources and of industrial point sources. If it is used in considerable quantities, further targeted investigations/surveys are necessary to check for its presence in specific stretches in the basin, close to these regions where it is produced/used. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include alpha-endosulphan in the TNMN programme as a separate determinand in water.

Fluoranthene

This polycyclic aromatic hydrocarbon is a EU WFD priority substance. Fluoranthene has several major sources/pathways in quantitative terms of total releases. Its major point sources are run off from buildings and constructions in paved urban area (creosote treated timber) and large industrial sites (power generation; primary aluminium production; iron and steel industry; production of creosote and creosote treated timber; waste incineration; industrial combustion). The main non-point sources are releases from materials and constructions in non-urban area (creosote treated timber), accidental oil spills, transport and infrastructure without connection to canalisation and atmospheric deposition on the water surface. Its emissions to atmosphere predominantly origin from traffic and infrastructure, households and other consumer use, and from industry. AMPS has not agreed on recommendation on monitoring matrices, yet. Fluoranthene is not included in the EMIS inventory or TNMN programme. It was measured in suspended solids/sediments during the JDS and detected in all sediment samples at concentration levels of 0.001 – 0.876 mg/kg and in all suspended solid samples at concentration levels of 0.0046 – 0.467 mg/kg.

It is recommended to check whether fluoranthene is produced/used in industrial technologies in the Danube River Basin. In reference to its potential major pathways it should be included into EMIS inventory of municipal and industrial point sources. Based on the emission data, further targeted investigations/surveys to check for its presence in specific stretches in the basin should be performed. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include Fluoranthene in the TNMN programme for water and solid phase (suspended solids).

Hexachlorobenzene

This chlorinated aromatic hydrocarbon is categorised as EU WFD priority hazardous substance. Its major sources/pathways in quantitative terms of total releases are agricultural activities (diffuse emission to surface waters) and losses from historically contaminated (aquatic) soils. AMPS has not agreed on recommendation on monitoring matrices, yet. Hexachlorobenzene is not included in the EMIS inventory or TNMN programme. It was measured both in water and in suspended solids/sediments during the JDS. During this survey hexachlorobenzene was not found in water and it was detected in most of the sediment samples at concentration levels of 0.0001 – 2.6 mg/kg and in most of the suspended solid samples at concentration levels of 0.002 – 0.0069 mg/kg.

It is recommended to check whether hexachlorobenzene is manufactured in the Danube River Basin and/or used as a pesticide. In reference to its potential major pathways it should be included into EMIS inventory of agricultural and industrial point sources. Based on the emission data, further targeted

investigations/surveys to check for its presence in specific stretches in the basin should be performed. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include hexachlorobenzene in the TNMN programme for solid phase (suspended solids).

Hexachlorobutadiene

Hexachlorobutadiene is categorised as EU WFD priority hazardous substance. There were identified no major sources/pathways of total releases of hexachlorobutadiene. The industrial point-sources (production of trichloroethylene and perchloroethylene; solid waste treatment) and losses from historically contaminated (aquatic) soils are considered to have only a minor importance. AMPS has not agreed on recommendation on monitoring matrices, yet. Hexachlorobutadiene is not included in the EMIS inventory or TNMN programme. It was measured in suspended solids/sediments during the JDS and its concentrations were below the detection limit in all analyzed samples.

It is recommended to check whether hexachlorobutadiene is manufactured in the Danube River Basin. In reference to its potential major pathways it should be included into EMIS inventory of industrial point sources. Based on the emission data, further targeted investigations/surveys to check for its presence in specific stretches in the basin should be performed. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include hexachlorobutadiene in the TNMN programme for solid phase (suspended solids).

Hexachlorocyclohexane (Lindane)

This chlorinated hydrocarbon is categorised as EU WFD priority hazardous substance. There is evidence suggesting that lindane caused hormonal disruption. Its major sources/pathways in quantitative terms of total releases are agricultural activities (diffuse emission to surface waters, emission to atmosphere including following atmospheric deposition on the water surface). Losses from historically contaminated (aquatic) soils are considered to be of a minor importance. AMPS agreed on recommendation to monitor lindane in water. Lindane is not included in the EMIS inventory. Within TNMN programme it is monitored in sediments and water. Lindane was also measured in water and in suspended solids/sediments during the JDS. During this survey Lindane was not found in water and it was detected in 60% of the sediment samples at concentration levels of 0.0001 – 2.4 mg/kg and in 50% of the suspended solid samples at concentration levels of 0.0001 – 0.0058 mg/kg.

It is recommended to check whether Lindane is manufactured in the Danube River Basin and/or used as a pesticide. In reference to its potential major pathways it should be included into EMIS inventory of agricultural and industrial point sources. It is recommended to keep lindane among TNMN determinands to be analyzed in water and in solid phase.

Isoproturon

This polar pesticide is a EU WFD priority substance under review. Its major sources/pathways in quantitative terms of total releases are agricultural activities (diffuse emission to surface waters and emission to atmosphere). AMPS agreed on recommendation to monitor isoproturon in water. Isoproturon is not included in the EMIS inventory or TNMN programme. It was measured in water during the JDS, but not detected in any of water samples.

It is recommended to check whether isoproturon is manufactured in the Danube River Basin and/or used as a pesticide. In reference to its major pathways it should be included into EMIS inventory of agricultural diffuse sources and of industrial point sources. If it is used in considerable quantities, further targeted investigations/surveys are necessary to check for its presence in specific stretches in the basin, close to these regions where it is produced/used. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include isoproturon in the TNMN programme as a separate determinand in water.

Lead and its compounds

This heavy metal is categorised as EU WFD priority substance under review. Lead has a wide range of major sources/pathways in quantitative terms of total releases – diffuse sources (atmospheric deposition on the water surface), industrial point sources (zinc production; calcium carbide production; mining), as well as emissions to atmosphere from industry, traffic and infrastructure. AMPS has not agreed on recommendation on monitoring matrices, yet. Lead is included in all reviewed data sets and detected in all matrices.

For a sound assessment of occurrence of lead of anthropogenic origin in the Danube River Basin, an estimation of natural background concentrations of lead in water, suspended particulate matter (and sediments) should be done (including issues related to the spatial and temporal variability of these background concentrations). Nevertheless, it is recommended to keep lead in all ICPDR programmes (emission inventories of municipal and industrial point sources, TNMN monitoring in water and suspended solids).

Mercury and its compounds

This heavy metal is categorised as EU WFD priority hazardous substance. Mercury has a wide range of major sources/pathways in quantitative terms of total releases – diffuse sources (atmospheric deposition on the water surface), industrial point sources (chemical industry using mercury catalysts; processes involving the manufacture of organic and non-organic mercury compounds; mercury recovery plants and extraction and refining of non-ferrous metals; plants for the treatment of toxic waste containing mercury; production of steel; dental technologies), as well as emissions to atmosphere from industry. AMPS has not agreed on recommendation on monitoring matrices, yet. Mercury is included in all reviewed data sets and detected in all matrices. In JDS water samples mercury was not detected due to high LOD of the applied analytical method.

For a proper assessment of occurrence of mercury of anthropogenic origin in the Danube River Basin an estimation of natural background concentrations of mercury in water, suspended particulate matter (and sediments) should be done (including issues related to the spatial and temporal variability of these background concentrations). Nevertheless, it is recommended to keep mercury in all ICPDR programmes (emission inventories of municipal and industrial point sources, TNMN monitoring in water and suspended solids).

Naphthalene

This polycyclic aromatic hydrocarbon is categorised as EU WFD priority substance under review. The major source in quantitative terms of total release of naphthalene is its emission to atmosphere. Direct emissions from point and non-point sources into surface waters are considered to have only minor importance. AMPS has not agreed on recommendation on monitoring matrices, yet. Naphthalene is not included in the EMIS inventory or TNMN programme. It was measured in suspended solids/sediments during the JDS and detected in most of the sediment samples at concentration levels of 0.0001 – 0.02 mg/kg and in approx. 60% of suspended solid samples at concentration levels of 0.001 – 0.039 mg/kg.

It is recommended to check whether naphthalene is produced/used in industrial technologies in the Danube River Basin. In reference to its potential major pathways it should be included into EMIS inventory of municipal and industrial point sources. Based on the emission data, further targeted investigations/surveys to check for its presence in specific stretches in the basin should be performed. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include naphthalene in the TNMN programme for water and solid phase (suspended solids).

Nickel and its compounds

This heavy metal is categorised as EU WFD priority substance. Nickel is primarily released by emissions to atmosphere from industry, traffic and infrastructure with following deposition to surface

waters. AMPS has not agreed on recommendation on monitoring matrices, yet. Nickel is included in all reviewed data sets and detected in all matrices.

For a proper assessment of occurrence of nickel of anthropogenic origin in the Danube River Basin an estimation of natural background concentrations of nickel in water, suspended particulate matter (and sediments) should be done (including issues related to the spatial and temporal variability of these background concentrations). Nevertheless, it is recommended to keep nickel in all ICPDR programmes (emission inventories of municipal and industrial point sources, TNMN monitoring in water and suspended solids).

Nonylphenols

4-Nonylphenol (branched) and nonylphenol are categorised as EU WFD priority hazardous substances. Nonylphenol and nonylphenol ethoxylates do exhibit estrogenic activity. For nonylphenol ethoxylates the activity was found to increase with decreasing chain length, with nonylphenol showing the greatest activity. Most of the tests indicate that estrogenic effects may start to occur at around 10-20 µg/l. Commercially produced nonylphenols contain predominantly 4-nonylphenol with a varied and undefined degree of branching in the alkyl group. Nonylphenols found in the environment do not originate directly from a production process and from their direct use but they are usually degradation products of the nonylphenol polyethoxylates (non-ionic surfactants).

Major sources/pathways in quantitative terms of total releases of nonylphenols are industrial and municipal point sources to surface water (domestic cleaning; use of water-based paints; use as detergent / cleaning agent in industry; use in emulsion polymerisation and as auxiliaries by industrial sectors for production of polymers, pulp- and paper, textiles, leather, paints, adhesives and plastics; nonylphenols are absorbed by sewage sludge in treatment plants). AMPS has not agreed on recommendation on monitoring matrices, yet. Nonylphenols are not included in the EMIS inventory or TNMN programme. 4-iso-Nonylphenol was measured in suspended solids/sediments during the JDS and it was detected in almost all sediment samples at concentration levels of 0.006 – 160 mg/kg and in almost all suspended solids at concentration levels of 0.015 – 1.4 mg/kg.

It is recommended to check whether nonylphenols are manufactured and/or used at manufacturing of non-ionic surfactants in the Danube River Basin. In reference to their potential major pathways they should be included into EMIS inventory of industrial and municipal point sources. If they are used in considerable quantities, further targeted investigations/surveys are necessary to check for their presence in specific stretches in the basin, close to these regions where they are produced/used. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include nonylphenols in the TNMN programme as a separate determinand in a solid phase.

Octylphenols

Octylphenols (para-tert-octylphenol) are categorised as EU WFD priority substances under review. Para-tert-octylphenol is a substance with evidence of endocrine disrupting potential. Octylphenols found in the environment do not originate directly from a production process and from their direct use but they are usually degradation products of the octylphenol polyethoxylates (non-ionic surfactants).

Major sources/pathways in quantitative terms of total releases of octylphenols are industrial and municipal point sources to surface water (domestic cleaning; use of water-based paints; use as detergent / cleaning agent in industry; use in emulsion polymerisation and as auxiliaries by industrial sectors for production of polymers, pulp- and paper, textiles, leather, paints, printing inks and pesticides). AMPS has not agreed on recommendation on monitoring matrices, yet. Octylphenols are not included in the EMIS inventory or TNMN programme. Para-tert-octylphenol was measured in suspended solids/sediment during the JDS and it was detected in ca. half of the sediment samples at concentration levels of 0.005 – 1.7 mg/kg. It was not detected in suspended solids.

It is recommended to check whether octylphenols are manufactured and/or used in manufacturing of non-ionic surfactants in the Danube River Basin. In reference to their potential major pathways they should be included into EMIS inventory of industrial and municipal point sources. If they are used in

considerable quantities, further targeted investigations/surveys are necessary to check for their presence in specific stretches in the basin, close to these regions where they are produced/used. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include octylphenols in the TNMN programme as a separate determinand in a solid phase.

Pentachlorobenzene

This chlorinated aromatic hydrocarbon is categorised as EU WFD priority hazardous substance. Its major sources/pathways in quantitative terms of total releases are agricultural activities (diffuse emission to surface waters and emissions to atmosphere). AMPS has not agreed on recommendation on monitoring matrices, yet. Pentachlorobenzene is not included in the EMIS inventory or TNMN programme. It was measured in suspended solids/sediments during the JDS. During this survey pentachlorobenzene was detected in almost all sediment samples at concentration levels of 0.0001 – 3.5 mg/kg and in most of the suspended solid samples at concentration levels of 0.001 – 0.028 mg/kg.

It is recommended to check whether pentachlorobenzene is manufactured in the Danube River Basin and/or used as a pesticide (also to check its possible occurrence as impurity in pesticide quintozone). In reference to its potential major pathways it should be included into EMIS inventory of agricultural and industrial point sources. Based on the emission data, further targeted investigations/surveys to check for its presence in specific stretches in the basin should be performed. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include pentachlorobenzene in the TNMN programme for monitoring of a solid phase.

Pentachlorophenol

Pentachlorophenol is categorised as EU WFD priority substance under review. Its major sources/pathways in quantitative terms of total releases are industrial activities (point source emission to surface waters from production of wood and heavy textile). AMPS agreed on recommendation to monitor pentachlorophenol in water. Pentachlorophenol is not included in the EMIS inventory or TNMN programme. It was measured in suspended solids/sediments during the JDS and its concentrations were below the detection limit in all analyzed samples.

It is recommended to check whether pentachlorophenol is manufactured in the Danube River Basin. In reference to its potential major pathways it should be included into EMIS inventory of industrial point sources. Based on the emission data, further targeted investigations/surveys to check for its presence in specific stretches in the basin should be performed. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include pentachlorophenol in the TNMN programme for monitoring of a solid phase.

Polyaromatic hydrocarbons

The polycyclic aromatic hydrocarbons are EU WFD priority hazardous substances. They have several major sources/pathways in quantitative terms of total releases. Their major point sources are run off from buildings and constructions in paved urban area and large industrial sites (power generation; production of creosote and creosote treated timber; waste incineration; industrial combustion). The main non-point sources are releases from materials and constructions in non-urban area (creosote treated timber), accidental oil spills, transport and infrastructure without connection to canalisation and atmospheric deposition on the water surface. Their emissions to atmosphere predominantly origin from traffic and infrastructure, households and other consumer use, as well as from industry. AMPS has not agreed on recommendation on monitoring matrices, yet. PAHs are not included in the EMIS inventory. They are included TNMN programme (analysis in sediments). They were measured in suspended solids/sediments during the JDS and detected in all sediment / suspended solid samples. Their summary concentrations in sediments were mostly below 2 mg/kg, none of the samples had PAH contamination higher than 20 mg/kg.

It is recommended to assess the use of PAHs in the Danube River Basin. In reference to their potential major pathways they should be included into EMIS inventory of municipal and industrial point sources. It is recommended to keep PAHs among TNMN determinands to be analyzed in a solid phase.

Simazine

This polar pesticide is a EU WFD priority substance under review and it is a substance with evidence on endocrine disrupting potential. Its major sources/pathways in quantitative terms of total releases are agricultural activities (diffuse emission to surface waters and emission to atmosphere). AMPS agreed on recommendation to monitor simazine in water. Simazine is not included in the EMIS inventory or TNMN programme. It was measured in water during the JDS, but not detected in any of water samples.

It is recommended to check where simazine is manufactured in the Danube River Basin and/or used as a pesticide. In reference to its potential major pathways it should be included into EMIS inventory of agricultural diffuse sources and of industrial point sources. If it is used in considerable quantities, further targeted investigations/surveys are necessary to check for its presence in specific stretches in the basin, close to these regions where it is produced/used. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include simazine in the TNMN programme as a separate determinand in water. It seems to be not relevant to analyze simazine in solid phase, due to its polarity.

Tributyltin compounds (tributyltin cation)

Tributyltin compounds (tributyltin cation) are categorised as EU WFD priority hazardous substances. Major sources/pathways in quantitative terms of total releases of tributyltin compounds are diffuse sources to surface water from transport and infrastructure without connection to canalisation (leaching antifouling on ship hulls). AMPS has not agreed on recommendation on monitoring matrices, yet. Tributyltin compounds are not included in the EMIS inventory or TNMN programme. They were measured in suspended solids/sediments during the JDS and it was detected in approx. half of sediment samples at concentration levels of 0.002 – 0.04 mg/kg and in approx. half of suspended solids at concentration levels of 0.002 – 0.02 mg/kg.

It is recommended to check whether tributyltin compounds are manufactured in the Danube River Basin (even though their manufacturing plants are considered to have negligible importance as emission sources). In reference to their potential major pathways they should be included into EMIS inventory of industrial point sources. Their inclusion into inventory of diffuse sources is also recommended. Regardless to results of emission inventories further targeted investigations/surveys are necessary to check for the presence of tributyltin compounds in specific stretches in the basin. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include tributyltin compounds in the TNMN programme as a separate determinand in a solid phase.

Trichlorobenzenes (1,2,3-TCB; 1,2,4-TCB; 1,3,5-TCB)

These chlorinated aromatic hydrocarbons are categorised as EU WFD priority substances under review. Their major sources/pathways in quantitative terms of total releases are industrial activities (large industrial point sources - production and or processing of chlorobenzenes via chlorination and/or using TCB as chemical intermediate). AMPS agreed on recommendation to monitor trichlorobenzenes in water. Trichlorobenzenes are not included in the EMIS inventory or TNMN programme. They were measured in water during the JDS and detected only in three samples at concentration levels of 0.1 – 0.6 µg/l (summary concentration) and 0.1 – 0.5 µg/l (1,2,4-TCB).

It is recommended to check whether trichlorobenzenes are manufactured in the Danube River Basin. In reference to their potential major pathways they should be included into EMIS inventory of industrial point sources. Based on the emission data, further targeted investigations/surveys to check for its presence in specific stretches in the basin should be performed. This should be taken into

account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include trichlorobenzenes in the TNMN programme for water.

Trichloromethane

This volatile chlorohydrocarbon is categorised as EU WFD priority substance. Trichloromethane is primarily released by point sources to surface waters (industrial sources - production of chloroform; plants using chloroform as solvent or in which cooling water or effluents are chlorinated) and it is also released into atmosphere by industrial point sources with following atmospheric deposition on the water surface. Emissions from households and consumer use are of minor importance. AMPS agreed on recommendation to monitor trichloromethane in water. Trichloromethane is not included in the EMIS inventory. It is monitored within TNMN programme in water. It was measured in water during the JDS and detected in ca. 40% of samples at concentration levels of 0.1 – 1.3 µg/l.

It is recommended to check whether trichloromethane is manufactured in the Danube River Basin. In reference to its potential major pathways it should be included into EMIS inventory of industrial point sources. It is recommended to keep trichloromethane among TNMN determinands to be analyzed in water.

Trifluralin

This polar pesticide is categorised as EU WFD priority substance under review. Its major sources/pathways in quantitative terms of total releases are agricultural activities (diffuse emission to surface waters and emission to atmosphere with following atmospheric deposition on the water surface). AMPS has not agreed on recommendation on monitoring matrices, yet. Trifluralin is not included in the EMIS inventory or TNMN programme. It was measured in water during the JDS, but not detected in any of the samples.

It is recommended to check whether trifluralin is manufactured in the Danube River Basin and/or used as a pesticide. In reference to its potential major pathways it should be included into EMIS inventory of agricultural diffuse sources and of industrial point sources. If it is used in considerable quantities, further targeted investigations/surveys are necessary to check for its presence in specific stretches in the basin, close to these regions where it is produced/used. This should be taken into account during national EU WFD monitoring surveys. Based on these findings it can be decided whether or not to include trifluralin in the TNMN programme as a separate determinand in water.

Danube Specific Priority Substances (As, Co, Zn, Cr)

These heavy metals are not EU WFD priority substances but were agreed upon as specific for the Danube River Basin. They are included in all reviewed data sets and were detected in all matrices.

For a sound assessment of occurrence of As, Co, Zn, Cr of anthropogenic origin in the Danube River Basin an estimation of natural background concentrations of these heavy metals in water, suspended particulate matter (and sediments) should be performed (including issues related to the spatial and temporal variability of these background concentrations). Nevertheless, it is recommended to keep As, Co, Zn, Cr in all ICPDR programmes (emission inventories of municipal and industrial point sources, TNMN monitoring in water and suspended solids).

General Parameters (COD, NH₄, N, P)

These determinands are included as a special category in the Danube List of Priority Substances. They are included in all reviewed data sets and detected in all investigated matrices (with the exception of COD within the JDS). Nitrogen is in EMIS inventories reported to as total N, in the TNMN data it is expressed in terms of organic N and its inorganic forms (NH₄, NO₃, NO₂).

It is recommended to keep COD, NH₄, N and P in the ICPDR programmes under current structure. In case of nitrogen it is worth of consideration to provide information on total N from TNMN / load programme (Yearbooks) so that a better comparison with EMIS data could be done.

Annexes

Annex 1

Table 1 – Comparison of data in the ICPDR Information System – water.

| | EU WFD priority substances | Danube priority substances | TNMN | JDS | Emission inventories |
|--|----------------------------------|-------------------------------|------|------|-------------------------|
| Alachlor | µg/l | µg/l | | n.d. | |
| Anthracene | µg/l | µg/l | | | |
| Atrazine | µg/l | µg/l | µg/l | µg/l | |
| Benzene | µg/l | µg/l | | µg/l | |
| Brominated diphenylethers | µg/l | µg/l | | | |
| Cadmium and its compounds | µg/l | µg/l | µg/l | µg/l | t/a |
| C ₁₀₋₁₃ -chloroalkanes | µg/l | µg/l | | | |
| Chlorfenvinphos | µg/l | µg/l | | n.d. | |
| Chlorpyrifos | µg/l | µg/l | | n.d. | |
| 1,2-Dichloroethane | µg/l | µg/l | | µg/l | |
| Dichloromethane | µg/l | µg/l | | n.d. | |
| Di(2-ethylhexyl)phthalate (DEHP) | µg/l | µg/l | | | |
| Diuron | µg/l | µg/l | | n.d. | |
| Endosulfan | µg/l | µg/l | | n.d. | |
| (alpha-endosulfan) | µg/l | µg/l | | n.d. | |
| Fluoranthene | µg/l | µg/l | | | |
| Hexachlorobenzene | µg/l | µg/l | | n.d. | |
| Hexachlorobutadiene | µg/l | µg/l | | | |
| Hexachlorocyclohexane | µg/l | µg/l | | | |
| (gamma-isomer, Lindane) | µg/l | µg/l | µg/l | n.d. | |
| Isoproturon | µg/l | µg/l | | n.d. | |
| Lead and its compounds | µg/l | µg/l | µg/l | µg/l | t/a |
| Mercury and its compounds | µg/l | µg/l | µg/l | n.d. | t/a |
| Naphthalene | µg/l | µg/l | | n.d. | |
| Nickel and its compounds | µg/l | µg/l | µg/l | µg/l | t/a |
| Nonylphenols | µg/l | µg/l | | | |
| (4-(para)-nonylphenol) | µg/l | µg/l | | | |
| Octylphenols | µg/l | µg/l | | | |
| (para-tert-octylphenol) | µg/l | µg/l | | | |
| Pentachlorobenzene | µg/l | µg/l | | | |
| Pentachlorophenol | µg/l | µg/l | | | |
| Polyaromatic hydrocarbons | µg/l | µg/l | | | |
| (Benzo(a)pyrene) | µg/l | µg/l | | | |
| (Benzo(b)fluoranthene) | µg/l | µg/l | | | |
| (Benzo(g,h,i)perylene) | µg/l | µg/l | | | |
| (Benzo(k)fluoranthene) | µg/l | µg/l | | | |
| (Indeno(1,2,3-cd)pyrene) | µg/l | µg/l | | | |
| Simazine | µg/l | µg/l | | n.d. | |
| Tributyltin compounds | µg/l | µg/l | | | |
| (Tributyltin-cation) | µg/l | µg/l | | | |
| Trichlorobenzenes | µg/l | µg/l | | µg/l | |
| (1,2,4-Trichlorobenzene) | µg/l | µg/l | | µg/l | |
| Trichloromethane (Chloroform) | µg/l | µg/l | µg/l | µg/l | |
| Trifluralin | µg/l | µg/l | | n.d. | |
| Chemical Oxygen Demand (COD) | | mg/l | mg/l | | t/a |
| Ammoniacal Nitrogen (NH ₄ -N) | | mg/l | mg/l | mg/l | t/a |
| Organic Nitrogen | | | mg/l | mg/l | |
| Total Nitrogen (tot N) | | mg/l | | | t/a |
| Total Phosphorus (tot P) | | mg/l | mg/l | mg/l | t/a |
| Arsenic and its compounds | | µg/l | µg/l | µg/l | t/a |
| Copper and its compounds | | µg/l | µg/l | µg/l | t/a |
| Zinc and its compounds | | µg/l | µg/l | µg/l | t/a |
| Chromium and its compounds | | µg/l | µg/l | µg/l | t/a |
| p,p'DDT | | | µg/l | | |
| Carbon tetrachloride | | | µg/l | µg/l | |
| Trichloroethylene | | | µg/l | µg/l | |
| Tetrachloroethylene | | | µg/l | µg/l | |
| Iron | | | mg/l | | t/a |
| Manganese | | | mg/l | | t/a |
| Magnesium | | | mg/l | | t/a |
| Aluminium | | | µg/l | µg/l | t/a |
| Sulphates | | | mg/l | | t/a |
| Phenols | | | mg/l | | t/a |
| Fluorides | | | | | t/a |

Table 1 – cont.

| | | | | | |
|--------------------------------------|--|--|------|------|-----|
| Petroleum Hydrocarbons | | | mg/l | | t/a |
| Chlorides | | | mg/l | | t/a |
| Detergents | | | mg/l | | t/a |
| Sulfide | | | | | t/a |
| Formaldehyde | | | | | t/a |
| Methanol | | | | | t/a |
| AOX | | | µg/l | | t/a |
| Nonpolar extractables | | | | | t/a |
| Dissolved inorganic substances | | | | | t/a |
| Chlorinated hydrocarbons | | | | | t/a |
| Suspended solids | | | mg/l | mg/l | t/a |
| Nitrate (NO ₃ -N) | | | mg/l | mg/l | t/a |
| Nitrite (NO ₂ -N) | | | mg/l | mg/l | t/a |
| Ortho-phosphate (PO ₄ -P) | | | mg/l | mg/l | t/a |
| Active chlorine | | | | | t/a |
| Dissolved silicate | | | | mg/l | t/a |

Annex 2

Table 2 - Comparison of data in the ICPDR Information System – suspended solids and sediments.

| | EU WFD priority substances | Danube priority substances | TNMN | JDS | Emission inventories |
|-----------------------------------|----------------------------------|-------------------------------|-------|-------|-------------------------|
| Anthracene | µg/kg | µg/kg | | mg/kg | |
| Atrazine | µg/kg | µg/kg | | | |
| Brominated diphenylethers | mg/kg | mg/kg | | n.d. | |
| Cadmium and its compounds | mg/kg | mg/kg | mg/kg | mg/kg | t/a |
| C ₁₀₋₁₃ -chloroalkanes | µg/kg | µg/kg | | n.a. | |
| Chlorpyrifos | µg/kg | µg/kg | | | |
| Di(2-ethylhexyl)phthalate (DEHP) | mg/kg | mg/kg | | mg/kg | |
| Endosulfan | µg/kg | µg/kg | | | |
| (alpha-endosulfan) | µg/kg | µg/kg | | | |
| Fluoranthene | µg/kg | µg/kg | | mg/kg | |
| Hexachlorobenzene | µg/kg | µg/kg | | mg/kg | |
| Hexachlorobutadiene | µg/kg | µg/kg | | mg/kg | |
| Lindane (gamma HCH) | µg/kg | µg/kg | mg/kg | mg/kg | |
| Lead and its compounds | mg/kg | mg/kg | mg/kg | mg/kg | t/a |
| Mercury and its compounds | mg/kg | mg/kg | mg/kg | mg/kg | t/a |
| Naphthalene | µg/kg | µg/kg | | mg/kg | |
| Nickel and its compounds | mg/kg | mg/kg | mg/kg | mg/kg | t/a |
| Nonylphenols | µg/kg | µg/kg | | mg/kg | |
| (4-(para)-nonylphenol) | µg/kg | µg/kg | | mg/kg | |
| Octylphenols | µg/kg | µg/kg | | mg/kg | |
| (para-tert -octylphenol) | µg/kg | µg/kg | | mg/kg | |
| Pentachlorobenzene | µg/kg | µg/kg | | mg/kg | |
| Pentachlorophenol | µg/kg | µg/kg | | n.d. | |
| Polyaromatic hydrocarbons | µg/kg | µg/kg | mg/kg | mg/kg | |
| (Benzo(a)pyrene) | µg/kg | µg/kg | mg/kg | mg/kg | |
| (Benzo(b)fluoranthene) | µg/kg | µg/kg | mg/kg | mg/kg | |
| (Benzo(g,h,i)perylene) | µg/kg | µg/kg | mg/kg | mg/kg | |
| (Benzo(k)fluoranthene) | µg/kg | µg/kg | mg/kg | mg/kg | |
| (Indeno(1,2,3-cd)pyrene) | µg/kg | µg/kg | mg/kg | mg/kg | |
| Simazine | µg/kg | µg/kg | | | |
| Tributyltin compounds | µg/kg | µg/kg | | mg/kg | |
| (Tributyltin-cation) | µg/kg | µg/kg | | mg/kg | |
| Trichlorobenzenes | µg/kg | µg/kg | | | |
| (1,2,4-Trichlorobenzene) | µg/kg | µg/kg | | | |
| Trichloromethane (Chloroform) | µg/kg | µg/kg | | | |
| Trifluralin | µg/kg | µg/kg | | | |
| Organic Nitrogen | | | mg/kg | mg/kg | |
| Total Nitrogen (tot N) | | mg/kg | | | t/a |
| Total Phosphorus (tot P) | | mg/kg | mg/kg | mg/kg | t/a |
| Arsenic and its compounds | | mg/kg | mg/kg | mg/kg | t/a |
| Copper and its compounds | | mg/kg | mg/kg | mg/kg | t/a |
| Zinc and its compounds | | mg/kg | mg/kg | mg/kg | t/a |
| Chromium and its compounds | | mg/kg | mg/kg | mg/kg | t/a |
| p,p'DDT | | | mg/kg | mg/kg | |
| PCB | | | mg/kg | mg/kg | |
| Petroleum Hydrocarbons | | | mg/kg | mg/kg | t/a |

