ANNEX B: DRAFT PAPER

Proposal for a simplified method for the quantification of emissions to water

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Document being drafted under CIS WG Chemicals activity, sub-group on emissions.

List of abbreviations

AR	Activity Rate
CIS	Common Implementation Strategy
EC	European Commission
EEA	European Environmental Agency
EF	Emission Factor
E-PRTR	European Pollutant, Release and Transfer Regulation
ETC/ICM	European Topic Centre for Inland, Coastal and Marine Waters
EU	European Union
EQS	Environmental Quality Standards
ICPR	International Commission for the Protection of the Rhine
IWWTP	Industrial Waste Water Treatment Plant
MS	EU Member States
OECD	Organisation for Economic Cooperation and Development
PAH	Polycyclic Aromatic Hydrocarbons
p.e.	population equivalent
PHS	Priority Hazardous Substances
PS	Priority Substances

RBD	River Basin District
RBDSU	River Basin District Sub-Unit
RBMP	River Basin Management Plan
RBSP	River Basin Specific Pollutant
TGD	Technical Guidance Document
UWWTD	Urban Waste Water Treatment Directive
UWWTP	Urban Waste Water Treatment Plant
WFD	Water Framework Directive
WG	Working Group
WISE-SoE	Water Information System Europe – State of the Environment

1. Summary

Under the Water Framework Directive, Member States are required to report an inventory of emissions, discharges and losses of priority substances. Such information can give information on the success of measures to reduce emissions and indicate whether further efforts may be needed to deliver good chemical status. However, reporting of the inventory under the second river basin management plans was patchy and largely incomparable between Member States. While there is a Technical Guidance Document on the preparation of the inventory[1], it appears that further information is needed to help Member States report in a consistent and comparable way. This paper aims to provide steps towards that, to enable improved quality of reporting in the third river basin management plans. A simplified method for the quantification of emissions to water is proposed, which will be used as a basis for discussion at the Water Framework Directive[2] (WFD) Working Group Chemicals sub-group meeting on emissions, to be held in September 2020.

This activity is carried out by the European Topic Centre for Inland, Coastal and Marine Waters (ETC/ICM) for the European Environment Agency (EEA), with support from Member States under the Water Framework Directive CIS WG Chemicals activity on emissions.

[1] *CIS WFD Guidance document No. 28 Preparation of Priority Substances Emission Inventory, EC 2012: https://circabc.europa.eu/sd/a/6a3fb5a0-4dec-4fde-a69d-ac93dfbbadd/Guidance%20document%20n28.pdf*
[2] *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, OJ, No. L 327, p. 1 ff.*

2. Introduction

Several projects related to emissions to water, carried out in recent years for the European Commission[3] (EC) and the EEA[4,5,6,7], show serious problems regarding consistency, completeness and quality of the EU reported emission data. More specific, the EEA reports have shown:

- very little reporting on diffuse sources;
- limited (incomplete) reporting on urban wastewater treatment plant (UWWTP) effluents (not all UWWTPs, not all relevant pollutants);
- unclear quality of emission data of industrial sources (not all facilities, not all relevant pollutants);
- inconsistent reporting in time and space (no comparable and consistent time ranges and not all river basin districts reported);
- some double reporting or reporting gaps between the most important EU emission reporting requirements: WFD, E-PRTR[8], Water Information System Europe – State of the Environment[9] (WISE-SoE) and the Urban Waste Water Treatment Directive[10] (UWWTD).

As a consequence of this, regarding the EU reported emission data (but not limited to the EU: these problems are recognized also on a global scale, see recent OECD[11] and World Bank[12] publications), there is:

- no EU wide overview of relevant emission sources/pollutants;
- no consistent time series, so no idea of trends;
- limited insight in the effects of emission reduction measures carried out in the past;
- no clear relation between emissions and water quality;
- no insight which future measures are needed to meet the water quality targets;
- extra effort for EEA and others in evaluation reports and comparison of different datasets.

[3] *Roovaart, J., et al., 2013a/b, Diffuse water emissions in E-PRTR, Report No 1205118-000-ZWS0016/18, Deltares, Netherlands* https://circabc.europa.eu/sd/a/dd20cdae-c76a-49b1-bf75-675c15a454d4/Diffuse%20water%20emissions%20in%20E-PRTR%202013%20background%20document.pdf

[4] *Roovaart, J. van den et al., 2016, E-PRTR completeness checks – water, ETC/ICM Technical Paper, version November 2016.*

[5] *ETC/ICM Technical Report 3/2017 Emissions of pollutants to Europe's waters:* *http://icm.eionet.europa.eu/ETC_Reports/EmissionsOfPollutantsToEuropeanWaters_SourcesPathwaysAndTrends*

[6] *EEA Report No 18/2018 Chemicals in European Waters:* https://www.eea.europa.eu/publications/chemicals-in-european-waters

[7] *EEA Report No 7/2018 European Waters, Assessment of status and pressures 2018:* *https://www.eea.europa.eu/publications/state-of-water*

[8] *Regulation (EC) No. 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EEC (Reg. (EC) No. 166/2006), OJ L 33, p. 1.*

[9] *http://cdr.eionet.europa.eu/help/WISE_SoE/wise1*

[10] *https://ec.europa.eu/environment/water/water-urbanwaste/index_en.html*

[11] *Diffuse pollution, Degraded Waters, OECD 2017 https://www.oecd.org/environment/resources/Diffuse-Pollution-Degraded-Waters-Policy-Highlights.pdf*

[12] *Damania, R. et al., Quality Unknown, The Invisible Water Crises, World Bank 2019* *https://openknowledge.worldbank.org/handle/10986/32245*

Aim of the work

The aim of the work is to support MS with the WFD reporting on emissions to water for the 3rd cycle of the River Basin Management Plans (RBMPs), to be published by the MS by December 22nd, 2021. This work has regrettably been delayed for various reasons, so some MS are already close to completion in their emission inventories for the 3rd RBMP. Nevertheless, the work can be useful to those less advanced in progress and may help in cases where there is still missing data. In any case, new data or shared knowledge can be used in improving emissions data both for the next RBMP cycle and in other data collections, e.g. WISE-1 emissions[13].

Technical Guidance Document no.28 (TGD) was developed for the WFD inventory. However, reporting of 2nd RBMPs showed only a few MS succeeded in reporting on diffuse sources and for more than a few pollutants – as summarized in the EEA chemicals in water report[14] (2018). To help support emissions reporting by MS, this proposal is drafted as supplementary advice, and is not intended to replace the existing TGD.

We see use of this proposal at two levels. For MS with limited data or capacity to develop quantification methods for diffuse emissions, information, data and methods already used by others is being made accessible. For MS already reporting diffuse emissions, the proposal provides an opportunity to benchmark emission factors and quantification methods. Use of the proposed approach and/or the data is optional.

This proposal must be seen as an attempt to make a step forward in the quality of the RBMP reporting of emissions to water. The proposal may also contribute to the harmonization of the methods used for the quantification of emissions to water and in that way improve the EU wide comparability of the reported emission data. The proposed method has been deliberately designed to be as simple as possible. It is still an incomplete version: not all the details have been fully worked out. It is not intended that simple methods override more detailed approaches already being used by MS: rather, the proposal is targeted towards those MS which currently lack data and or methods.

3. Simplified method for the quantification of emissions to water

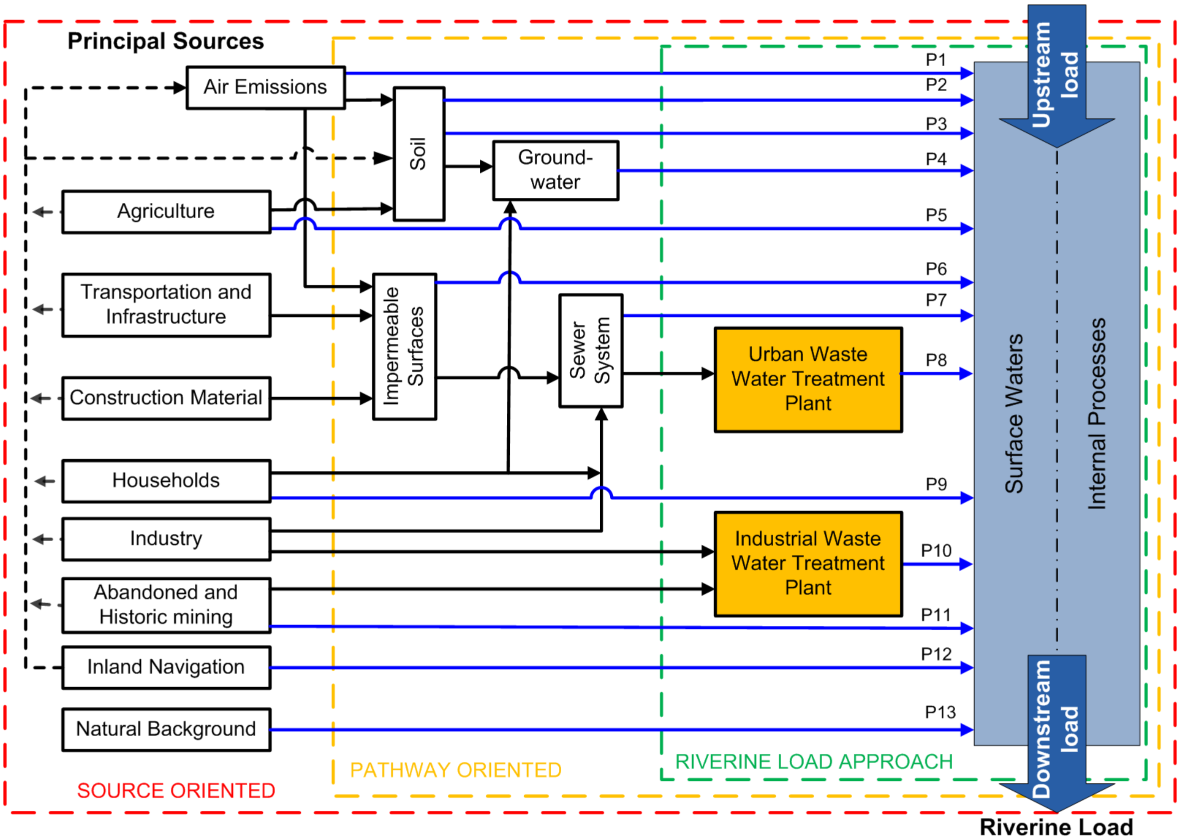
General scheme

A general scheme in which the main principal sources, pathways and intermediates of emissions to water are represented was developed under the WFD Common Implementation Strategy[15] (see Figure 1 below).

[13] *http://dd.eionet.europa.eu/datasets/latest/Emissions*

[14] *EEA Report No 18/2018 Chemicals in European Waters: https://www.eea.europa.eu/publications/chemicals-in-european-waters*

[15] *CIS WFD Guidance document No. 28 Preparation of Priority Substances Emission Inventory, EC 2012: https://circabc.europa.eu/sd/a/6a3fb5a0-4dec-4fde-a69d-ac93dfbbadd/Guidance%20document%20n28.pdf*



P1 Atmospheric Deposition directly to surface water	P8 Urban Waste Water treated
P2 Erosion	P9 Individual - treated and untreated- household discharges
P3 Surface runoff from unsealed areas	P10 Industrial Waste Water treated
P4 Interflow, Tile Drainage and Groundwater	P11 Direct Discharges from Mining
P5 Direct discharges and drifting	P12 Direct Discharges from Navigation
P6 Surface Runoff from sealed Areas	P13 Natural Background
P7 Storm Water Outlets and Combined Sewer overflows + unconnected sewers	

Figure 1 Relationship between the different surface water compartments and pathways (P1-P13) (EC, 2012)

On the left in the scheme, the principal sources of the pollutants are shown, representing groups of sources which can be related to economic sectors or activities. The natural background is also represented as a separate source. In fact, this is a rather complicated source because natural background concentrations can be a part of the other pathways too and double counting must be avoided (see also under P13, page 14). Emissions, discharges or loads can follow different pathways, either directly to surface water, or to other compartments of the environment (air, soil, groundwater). A specific place is given to urban areas with the impermeable surfaces, the sewer system and the waste water treatment plants, both urban (UWWTPs) and industrial (IWWTPs).

Although different approaches are shown in the scheme (riverine load approach, source oriented approach and pathway oriented approach), the quantification of the different pathways (P1-P13) can be seen as the core of a complete emission inventory. Most of the existing emission reporting requirements can be related to one or more of these defined pathways.

Although the riverine load approach is more simple than the pathway approach (and is, of course, better than no inventory at all) and it is known several MS use this method, it is not chosen as preferred method in this proposal, mainly because it doesn't give insight in the different sources behind the pathways. As a result, it would not be easy to make a connection with possible mitigation measures. Of course the riverine load approach stays available as a separate method and the calculation of river loads can play an important role in the quality assurance of the pathway approach, but this proposal will focus on the quantification of the pathways P1-P13.

It is interesting to have information on the primary sources (use of products, processes) within households and small and medium enterprises (SME's) which end up in the sewer and the UWWTP's, but this rather complicated exercise is something likely to be more appropriate in more advanced stages of emission inventories. The results of an ongoing research project (led by Sean Comber, University of Plymouth), investigating the source apportionment of metals into UWWTPs) might be useful in this perspective.

Simplified emission factor method

It is proposed to use a simplified emission factor method as developed in the International Commission for the Protection of the Rhine (ICPR), using a limited number of emission factors and statistical data. This method has been described, including the data used, in Water, Science and Technology, 2001[16]. The method has been applied for 7 metals for the Rhine catchment. The estimated loads agreed rather good with the loads of the river Rhine, as measured at the Dutch-German border.

This emission factor method has also been the basis for the EC project: *Diffuse water emissions in E-PRTR*[17]. In this project diffuse emissions to water have been quantified for a selection of 40 key sources – key substance combinations, covering the EU Member States and the EFTA countries on a River Basin District sub-unit scale. The report and maps are available on the E-PRTR website[18]. A good explanation of emission factors used in emission inventories can be found in a publication of TNO: *The Art of Emission Inventorying*[19]. Although this publication is related to air emission, a lot of the problems and solutions are also recognized in emissions to water inventories.

Emissions of a pollutant for an activity are calculated by multiplying an activity rate (AR_a) for a specific activity (or pathway) by an emission factor for this activity and a certain pollutant ($EF_{p,a}$), expressed in emission per AR unit. An example for an activity is the production of urban waste water. The AR will then be the number of inhabitants producing waste water. The EF for a pollutant, e.g. total-Nitrogen, will then be the yearly load total-Nitrogen in urban waste water per inhabitant.

The calculation method is shown in the formula below:

$$E_{p,a} = AR_a \times EF_{p,a}$$

[16] *V. Mohaupt, U. Sieber, J. van den Roovaart, C.G. Verstappen, F. Langenfeld and M. Braun, Diffuse sources of heavy metals in the Rhine basin, 2001, Water Science and Technology: https://iwaponline.com/wst/article/44/7/41/6428/Diffuse-sources-of-heavy-metals-in-the-Rhine-basin, https://doi.org/10.2166/wst.2001.0385*

[17] *Roovaart, J., et al., 2013a/b, Diffuse water emissions in E-PRTR, Report No 1205118-000-ZWS0016/18, Deltares, Netherlands, https://circabc.europa.eu/sd/a/dd20cdae-c76a-49b1-bf75-675c15a454d4/Diffuse%20water%20emissions%20in%20E-PRTR%202013%20background%20document.pdf*

[18] *http://prtr.ec.europa.eu/*

[19] *Pulles, T. and D. Heslinga, The Art of Emission Inventorying, TNO: https://webdosya.csb.gov.tr/db/necen/editordosya/file/NEC/CollectER_Training/The_Art_of_Emission_Inventorying.pdf*

Where:

$E_{p,a}$	=	*Emission of a pollutant for an activity*
AR_a	=	*Activity Rate for an activity*
$EF_{p,a}$	=	*Emission factor of a pollutant for an activity*

The emission calculated in in this way is referred to as the total emission. For an activity where all emissions are released directly into surface waters (e.g. P12 Inland Navigation), the total emission equals the net emission to surface waters. When only a part of the calculated emissions ends up in the surface water, and the other part for example in soil, an extra factor needs to be introduced which describes the percentage of the emissions to surface water.

Not all the pathways can be covered with the simplified emission factor method. Some pathways are too complex to be described with only an AR and an EF. For those pathways (e.g. P1 and P3) models are often used. Some models used by MS for the quantification of emissions to water are: MONERIS[20], MoRE[21], WEISS[22] and Pegase[23]. Different models may use different definitions of pathways, combine pathways or split up pathways in relevant sub pathways. All these models make use in a way of emission factors. When EU-wide models are known for specific pathways and quantified emissions are available, these models are mentioned in this paper.

Activity Rates (AR)

It is proposed for the AR's to make use of freely-available statistical data, which are updated on a regular basis (e.g. the Eurostat Database[24]). This will facilitate the regular updating of the emission inventory and limit the overall burden of emissions reporting. Examples of an activity rate are: inhabitant, population equivalent (p.e.), amount of km driven by cars. In an ideal situation, the chosen AR is as close to the real polluting activity or process as possible (e.g. km driven by cars).

In some cases, appropriate data for the ideal AR are not available. In other cases, the available data sets might contain gaps for specific areas or time periods. In such cases, application of a so-called "proxy variable" can help to derive at least a rough estimate of the AR.

- A proxy variable is a variable that is not directly related to the data that are needed, but might have a good correlation with such data. Such proxy data could be the population size or gross domestic product or other high-level indicators of the size and the economic activities in a country.

When using a proxy, one has to assume or derive a relationship between the value of the data searched for and the value of the proxy in countries or years where data are available. The estimates for the gaps then follow from the application of this relationship (adapted text from TNO publication: *The Art of Emission Inventorying* (see footnote 19).

Emission Factors (EF)

Emission factors are related to a specific AR (and pathway) and are pollutant-specific.

An EF may vary in time and space, mainly as a result of:

- implementation of new technologies;

[20] https://www.igb-berlin.de/en/moneris
[21] https://www.mdpi.com/2073-4441/9/4/239
[22] https://weiss.vmm.be/
[23] https://orbi.uliege.be/bitstream/2268/35224/1/Towards%20e_envi_ULG%20Aquapole%20Pegase%20paper_2009-03-26_vf.pdf
[24] https://ec.europa.eu/eurostat/data/database

- implementation of mitigation measures (like banning or limiting specific products or uses);
- national or regional differences in the use of products or appliance of processes.

One of the big challenges for a simple emission inventory is to find an optimum between using general EFs where possible, but with the ability to differentiate if necessary.

Spatial scale

The easiest way of using the simplified emission factor method is to apply it at a country level, as a lot of statistical data is available at a country level. While rather high level, for some countries this would be a good place to start for the emission inventory. However, it should be noted that pollutants not relevant to the river basin do not need to be quantified and reported (see TGD 28).

As a first attempt the emission quantification on the country level and (for the moment) not detail the calculations to the level of River Basin District (RBD).

Temporal scale

Most emission inventories aim to estimate the total mass of one or more emitted pollutants within one specified year. Therefor the quantified emissions will be expressed in mass units per year, corresponding to a specific year (not to be confused with the year in which the inventory is compiled and reported).

Pollutants

The WFD inventory applies to the list of priority substances and other pollutants (EQS Directive[25], 2008 Article 5), which means that the inventory will have to address all inputs of those substances into the environment that are likely to reach surface waters. Though, as a first step within this proposal, it might be necessary to prioritise the work on a smaller group of priority substances.

A recent overview of reported emission data by EEA[26] (see Table 1) shows the 17 pollutants most frequently causing failure to achieve good chemical status for the WFD. This Table also shows the limited number of MS reporting diffuse sources, with only about one third of MS reporting diffuse sources of metals. For other pollutants, even fewer MS manage to report.

[25] *https://eur-lex.europa.eu/legal-content/EN/AUTO/?uri=celex:32008L0105*

[26] *EEA Report No 18/2018 Chemicals in European Waters: https://www.eea.europa.eu/publications/chemicals-in-european-waters*

Table 3.2 **Number of Member States in which data are available for emissions of the 15 priority substances most frequently causing failure to achieve good chemical status**

	Source or pathway		
Pollutant	**Industry**	**UWWTP**	**Diffuse sources**
Cadmium	24	22	8
Lead	26	22	9
Mercury	22	23	8
Nickel	26	26	9
Anthracene	9	9	7
Benzo(a)pyrene	7	4	5
Benzo(b)fluoranthene	5	2	3
Benzo(k)fluoranthene	5	2	3
Indeno(1,2,3-cd)-pyrene	5	2	3
Benzo(g,h,i)perylene	9	7	2
Fluoranthene	14	11	6
4-Nonylphenol	11	16	5
DEHP	14	17	5
pBDEs	3	3	4
Tributyltin-cation	5	3	2
Isoproturon	7	3	5
HCH	6	4	3

■ 14 or more Member States reporting ■ Between 7 and 14 Member States reporting ■ Fewer than 7 Member States reporting

Source: EEA, 2015, 2017b, 2018b.

Table 1 From: EEA Report No 18/2018 Chemicals in European Waters (see footnote 25)

It will not be possible to achieve a complete overview of all relevant pollutants within this project. If we start trying to complete inventories for pollutants about which we should know a lot, learning from that process can be applied to those pollutants where emissions are less clear. Besides, it can be more encouraging to show a limited number of pollutants for which the inventory of all the (relevant) pathways is more or less complete, than a larger list of pollutants with a lot of missing pathways. We propose to focus on a subset of substances most frequently exceeding the EQS targets, supplemented with the most important (and well reported) ecological parameters total Nitrogen and total Phosphorus.

Assessing pesticides will be difficult due to the large regional differences in the use of these substances, so these substances will not be considered at this stage in the work.

This results in a preliminary list of 10 pollutants (see Table 2).

Pollutant
total – Nitrogen*
total – Phosphorus*
Cadmium
Lead
Mercury
Nickel
Benzo(a)pyrene
Fluoranthene
4-Nonylphenol
DEHP

Table 2 Proposed selection of pollutants (: no priority substances, but added because of their ecological relevance)*

Overview per pathway

In this paragraph, the 13 pathways and the accompanying activity rates and emission factors will be discussed briefly. A general remark is, there seems to be no clear definition of the different pathways in the TGD.

A clear definition of the individual pathways would be helpful considering the possibility of using appropriate data in the correct manner and enhancing the possibility of comparing results among MS.

Table 3 (added as a separate spreadsheet) gives an overview of the relevant details and background information of the proposed methods for the different pathways. In the tab "*Formula*" the formulas for the calculation of the emissions are given, definitions of the ARs, the EFs and other factors used and the references to the data. In the tab "*EF*" the EFs are given per pathway for the selection of pollutants (as far as available).

Although not all pathways seem to be equally important for the selected pollutants, we try to collect data for all pathways and do not deselect specific pathways à priori. For some pathways (like P5 and P12) no quantification of emissions has yet been worked out in this version of the proposal.

For some pathways not all the selected pollutants seem to be relevant. For those pathways a proposal is given as to which pollutants are relevant and thus needed to be quantified. In Table 3, tab "*EF*" those pollutants are indicated with a green color. Pollutants proposed as not relevant are indicated with blue-grey color. When it is not quite clear in which of these two categories a pollutant fits, a yellow color is given. Should data become available for pollutants currently indicated as not relevant, they can be added in the spreadsheet.

P1 Atmospheric Deposition directly to surface water

Atmospheric deposition can be described as the load of substances to surface water or soil via the atmosphere. Once emissions to air from sources (e.g. traffic, shipping, industries) have entered the atmosphere, the substances are distributed through the atmosphere and end up in the water and on the soil as a result of deposition in wet (precipitation) and dry form.

For the calculation of emissions EMEP modelling results[27] can be used. For Total – Nitrogen, cadmium, lead, mercury and benzo(a)pyrene modelled fluxes are available for Europe on a 50x50 km level. The average calculated flux (mg/ha/year) per MS can be multiplied with the total area of inland surface water per MS.
For the other PAHs, no EMEP modelling results are available. Instead of these results, the ratio between BaP and the other PAH can be derived from the dry deposition measurements per country. The ratiofactor BaP/PAH could be used for the quantification of the deposition of the other PAHs. For all other substances, it might be checked if deposition measurements have been made by MS. If a flux (mg/ha) is available, it can be multiplied by the area of inland surface water.

A number of MS (BE, AT, DK) and Eurometaux offered relevant data sources that can be used to complete and improve the present EFs in the spreadsheet.

P2 Erosion

Erosion creates a load to water owing to the erosion of substances from the rocks in the subsoil or from (heavy) rainfall or wind which removes soil, rock or dissolved material and transports material to the surface water.

The load of pollutants to surface water as a result of erosion might be calculated by multiplying the substance content of fine soil by the soil erosion (Eurostat) in tonnes/hectare. It is noted that for some pollutants (like metals) there is a natural background component to the total.

This pathway is a complicated one. Soil type (sand, clay, etc.), soil characteristics (pH, minerology), soil age and topology (type of crop, plant cover) can all influence the availability/binding of pollutants (like metals and nutrients) within the soil matrix and vary a lot between different areas. Besides, often only a part of the pollutants binds to the sediment, which also needs calculating. Although Eurometaux mentions a valuable repository on metals in agricultural soils throughout the EU, it may be necessary to rethink the quantification method

P3 Surface runoff from unsealed areas

The nutrient emissions are calculated by the JRC's GREEN model[28]. The GREEN (Geospatial Regression Equation for European Nutrient losses) is based on a simplified conceptual approach distinguishing the different pathways in which nutrients reach surface waters. For the surface runoff from unsealed areas diffuse sources, including fertiliser applications (both mineral and organic forms), scattered dwelling and atmospheric deposition could be considered.

For other substances no model is available. It mainly consists of surface runoff from agricultural and natural soils. In Mohaupt et al (2001) a simplified method is described to calculate the surface runoff. For the calculation, the mass of organic and mineral fertilizers (t/year) per country should be identified. The used mass per MS can be multiplied with the metal content of fertilizers (mg/kg). Factors as seepage, spray drift and runoff play a key role in the diffuse emissions to water.

More recent data for the metal content of fertilisers are available from AT[29].

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[27] *EMEP: Convention on Long Range Transboundary Air Pollution, https://www.emep.int/*
[28] *JRC, 2006. Grizzetti, B.,Bouraoui, F., Assessment of Nitrogen and Phosphorus Environmental Pressure at European Scale, EUR Report 22526 EN, 2006*
[29] *https://www.bmlrt.gv.at/wasser/wasserqualitaet/fluesse_seen/stobimo-spurenstoffe.html*

A main question stays if it useful to use common factors for seepage, spray drift and runoff since they very much depend on local soil physics, chemistry and hydrology and therefor will vary a lot in time and space.

P4 Interflow, Tile Drainage and Groundwater

This pathway is about the leaching of substances from unsealed areas, whereas pathway P3 describes the runoff of the unsealed areas.

For the nutrients this pathway is covered in the JRC Green model. For the metals a method is described for the drainage in Mohaupt, 2001 (see ref. 16). The discharge of drained area per MS will be multiplied with the concentration in drainage water. Information about drained areas is available at Eurostat[30].

P5 Direct discharges and drifting

This pathway is especially important for pesticides (which is not enclosed in our selection), but may also be relevant for nutrients and metals. So far, no data seem to be available.

P6 Surface Runoff from sealed Areas

This pathway describes the loads that end up in the surface water through surface runoff from sealed areas. The part of the loads that goes to the sewer system (mainly in urban areas) is covered by the pathways P7 and P8. It is not easy to distinguish between these pathways and for now, there is no methodology available to quantify this pathway.

It is confirmed that this pathway might have a significant contribution to surface water, especially in large urban areas, mainly from road traffic and construction material. Several studies are available, but at least two important factors are quite uncertain: the proportion of the water (and the pollution loads) that goes to sewer or to surface water and the effects of retention of the pollutants during this pathway. Several MS do use this pathway in their models.

P7 Storm Water Outlets and Combined Sewer overflows + unconnected sewers

Storm water outlets

In this pathway, rainwater will be collected separately. To calculate loads for the storm water outlets information per MS is necessary about the paved urban area, precipitation per year, the percentage of the separate sewer systems and the percentage specific runoff. These factors will be multiplied with the measured concentration in storm sewer outflows.

Combined sewer overflows

If the sewer system can't handle the large amount of precipitation, the combined sewers may overflow.

Unconnected sewers

Waste water in a collecting system is not connected to any treatment plant. The waste water will be discharged without treatment. Loads to surface water can be calculated by using the load entering an UWWTP for not connected UWWTPs in the Waterstat – UWWTD database[31]. The total load per MS will be calculated with measured concentration in sewer and treatment plants overflows.

[30] *Eurostat. Share of irrigable and irrigated areas in utilised agricultural area (UAA) by NUTS 2 regions*

[31] *Waterbase - UWWTD: Urban Wate Water Treatment Directie - reported data, 2017*

[to be added: check work done by JRC in BLUE 2 project]

It is confirmed that the quantification of the storm water outlets and the combined sewer overflows is not easy, due to the (regional) specific data needed. Compared with this, the quantification of the unconnected sewers will be much easier.

P8 Urban Waste Water treated

For UWWTPs with a capacity above 100,000 p.e. this pathway should be covered under E-PRTR reported loads.

EEA has been supporting the coming WFD reporting by providing E-PRTR data at RBD level already reported by MS. Several MS confirm this would be helpful. EEA will not be pre-filling the WFD reporting formats.

However, evidence [32,33] shows that many pollutants are not reported by certain countries or not reported for specific facilities, although releases above the pollutant thresholds would be expected, owing to the size of the UWWTP. In these situations, emission factors (based on reported E-PRTR data) can be used to quantify pollutant releases from UWWTPs not reported under E-PRTR but above the capacity threshold of 100,000 p.e. and above the E-PRTR pollutant threshold.

Besides, a recent study[34] shows that the total sum of all UWWTPs below the E-PRTR reporting threshold may contribute in a significant way to the total loads from all UWWTPs. Also, these loads of pollutants from UWWTPs below the capacity threshold of 100,000 p.e. can be quantified using the same EFs as mentioned above.

In the separate UWWTP document (also to be discussed on the 9th September web-meeting) available data is collected and presented. Specific attention is given to level of detection of the pollutants in the UWWTP effluent. The emission factors[35] used in Table 3 will be updated with this information. For the metals, a comparison will have to be made with available data from Eurometaux.

P9 Individual - treated and untreated- household discharges

This source contains the discharges of domestic wastewater not connected to a sewer system. The wastewater loads will reach the surface water directly, will infiltrate in the soil or will be collected and treated in e.g. septic tanks.

For the untreated waste water from households, the number of 'untreated' inhabitants per MS is multiplied with the emission per inhabitant per year. For the treated waste water households, the number of 'treated' inhabitants is used with a removal efficiency for the septic tank in which the

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[32] *de Smet et al, E-PRTR data review methodology, 2018. E-PRTR data review methodology - Eionet - Europa* *https://www.eionet.europa.eu/etcs/etc-atni/products/etc-atni-reports/eionet_rep_etcacm_2018_3_e-prtr_data_rev_methodology/@@download/file/EIONET_Rep_ETCACM_2018_3_E-PRTR_data_rev_meth.pdf*

[33] *Roovaart, J., et al., 2013a/b, Diffuse water emissions in E-PRTR, Report No 1205118-000-ZWS0016/18, Deltares, Netherlands https://circabc.europa.eu/sd/a/dd20cdae-c76a-49b1-bf75-675c15a454d4/Diffuse%20water%20emissions%20in%20E-PRTR%202013%20background%20document.pdf*

[34] *Roovaart, J. van den et al., 2016, E-PRTR completeness checks – water, ETC/ICM Technical Paper, version November 2016.*

[35] *Roovaart, J. and N. van Duijnhoven. 2018, Development of quality checks for E-PRTR data on releases to water*

wastewater is collected. The last step is to estimate the load to surface water and to soil, no figures seems to be available. The ratio of surface water to soil may be used in a MS instead. Major question here is if this calculation method isn't oversimplified.

P10 Industrial Waste Water treated

This pathway is already covered by the E-PRTR reported loads. In theory, all emissions to water are reported on a yearly basis by the MS under 3 conditions:

- they fall under the activities selected for reporting in the E-PRTR;
- they are released from activities with capacities above the capacity thresholds mentioned in the E-PRTR and
- the loads are above the pollutant thresholds mentioned in the E-PRTR.

EEA has been supporting the coming WFD reporting by providing E-PRTR data at RBD level already reported by MS. Some MS confirm this will be helpful, but for another MS this would complicate things because this info is already included in the WFD data, so this might result in double counting.EEA will not be pre-filling the WFD reporting formats.

It is very difficult to check if the reported loads are complete. There are indications some pollutants might be under-reported by certain sectors. A comparison has been made between the expected pollutants per activity in the E-PRTR Guidance document and eleven most reported pollutants[36]. It shows a number of activity-pollutant combinations for which no loads are reported but might be expected to be reported according the Guidance document. E.g. the PAHs are reported only to a very limited extent, which could be a signal of underreporting. The use of emission factors to quantify these releases instead of, or in combination with, regular monitoring could be considered.

Only one MS agrees it would be useful to carry out an analysis, together with the sector on a selected number of industrial activities for which facilities and/or pollutants seem to be missing. A recent EEA publication on industrial waste water[37] and stakeholder data might be useful in such an action. Since this kind of actions need resources not available within the writing of this proposal, this might not be seen as a priority action for our subgroup.

P11 Direct Discharges from Mining

Only historical mining sites are part of this pathway. Operational mining sites have to be reported under E-PRTR (P10). Although it is confirmed this might be a relevant pathway, especially for metals, it is not clear yet how to quantify emission from abandoned mining sites. A study on this at European level would be useful.

P12 Direct Discharges from Navigation

In the general scheme (see Figure 1), only inland navigation is mentioned as primary source. Also, sea shipping should be included here, since this will be an important activity in specific WFD transitional and coastal waterbodies. Navigation might be a relevant source for PAHs and metals, so when data and a quantification method are available, this should be included in the proposal.

[36] *Roovaart, J. van den et al., 2016, E-PRTR completeness checks – water, ETC/ICM Technical Paper, version November 2016.*

[37] *https://www.eea.europa.eu/publications/industrial-waste-water-treatment-pressures*

P13 Natural Background

This will be a relevant pathway, at least in some areas, for metals, total Nitrogen and total Phosphorus. In Mohaupt et al (2001) the loads from natural background are calculated as the difference of the loads in the river discharge of a RBD and the known anthropogenic loads (sum of industrial and communal discharges, drainwater and stormwater overflows).

This pathway isn't easy to quantify. For metals, the soon to be published CIS Technical Guidance Document for Implementing Metal Environmental Quality Standards includes a chapter on how to derive natural background concentrations. Besides, also DK is awaiting a national report on this subject.

4. Follow-up

This updated draft paper will be input for the workshop coming September. At the workshop it will be discussed how to proceed with the paper and other possible follow-up activities.