Review of E-PRTR implementation and related guidance

Final Report

Service Request No. 14 under framework contract No. ENV.C4/FRA/2015/0042

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A report submitted by ICF Consulting Services

In association with Aether, INERCO, Ökopol and RPA

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List of abbreviations

AEL	Associated emission level
AER	Annual Environmental Report
ALT	Alternative measurement methods
AMR	Antimicrobial resistance
AOX	Adsorbable organically bound halogens
APIs	Active pharmaceutical ingredients
BAT	Best available techniques
BOD	Biochemical oxygen demand
BREF	BAT reference document
C	Calculation (release quantification method class)
CAS	Chemical Abstracts Service
CAK	Production of chlor-alkali (BREF)
CEM	Continuous emission monitoring
CEN	European Committee for Standardization
CLP	Classification, labelling and packaging
CLM	Production of cement, lime and magnesium oxide (BREF)
CLRTAP	Convention on Long-Range Transboundary Air Pollution
CMR	Carcinogenic, mutagenic or reprotoxicant
COD	Chemical oxygen demand
CORINAIR	Core Inventory Air Emissions
CRM	Certified reference materials (for measurement methodologies)
CWW	Chemical waste water and waste gas treatment/management systems in the chemical sector (BREF)
DDT	Dichlorodiphenyltrichloroethane
DEHP	Di(2-ethylhexyl)phthalate
DTPA	diethylenetriamine pentaacetic acid
E	Estimation (release quantification method class)
EDCs	Endocrine disrupting compounds
EDTA	Ethylenediamine tetraacetic acid
EC	European Commission
EEA	European Environment Agency
EEC	European Economic Community
EFS	Emissions from storage (BREF)
EMAS	Eco-Management and Audit Scheme (EC 1221/2009)

EMEP	European Monitoring and Evaluation Programme
EPA	Environmental Protection Agency
EPER	European Pollutant Emission Register
E-PRTR	European Pollutant Release & Transfer Register
EQS	Environmental quality standards
ETS	Emissions Trading System
GEREP	Annual Release Report (France)
GLS	Manufacture of glass (BREF)
HBCDD	Hexabromocyclododecane
HCB	Hexachlorobenzene
HCH	1,2,3,4,5,6-hexachlorocyclohexane
HOI	Hydrocarbon oil index
IED	Industrial Emissions Directive (2010/75/EU)
ILQ	*Inférieure à la limite de quantification*
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated pollution prevention and control
IPPCD	Integrated Pollution Prevention and Control Directive (1996/61/EC)
IS	Iron and steel production (BREF)
ISIC	International Standard Industrial Classification of All Economic Activities
ISO	International Organisation for Standardization
JRC	Joint Research Centre
LANUV	State Agency for Nature, Environment and Consumer Protection
LCP	Large combustion plant
LoD	Limit of detection
LoQ	Limit of quantification
LSU	Livestock units
M	Measurement (release quantification method class)
MAB	Mass balance
M/C/E	Measurement, calculation or estimation
MCPD	Medium Combustion Plant Directive (2015/2193/EU)
MS	Member State
NACE	Statistical Classification of Economic Activities in the European Community
NECD	National Emissions Ceilings Directive (2016/2284/EU)
NFM	Non-ferrous metals industries (BREF)
NFR	Nomenclature for reporting

NMVOC	Non-methane volatile organic compounds
NRB	National or regional binding (quantification methodology)
NRW	North Rhine-Westphalia
OECD	Organisation for Economic Co-operation and Development
OTH	Other quantification methodology
PAH	Polycyclic aromatic hydrocarbon
PBBs	Polybrominated biphenyls
PBDE	Polybrominated diphenylether
PBT	Persistent, bioaccumulative and/or toxic
PCDD	Polychlorinated dibenzodioxin
PCDF	Polychlorinated dibenzofuran
p.e.	Population equivalents
PER	Quantification methodology prescribed by licence or permit
PFHxS	Perfluorohexane sulfonic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
PFOS-F	Perfluorooctane sulfonyl fluoride
PM_{10}	Particulate matter (with aerodynamic diameter <10 µm)
$PM_{2.5}$	Particulate matter (with aerodynamic diameter <2.5 µm)
POP	Persistent organic pollutant
PP	Production of pulp, paper and board (BREF)
PPP	Plant protection products
PRTR	Pollutant release and transfer register
PU	Polyurethane
PVC	Polyvinylchloride
QA/QC	Quality Assurance/Quality Control
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals (EC 1907/2006)
REF	Refining of mineral oil and gas (BREF)
REFIT	Regulatory Fitness and Performance Programme
RET	Release estimation technique
SCCPs	Short-chain chlorinated paraffins
SPRI	Scottish Pollutant Release Inventory
SSC	Sector specific calculation method
TAN	Tanning of hides and skins (BREF)
Teq	Toxic equivalent

TOC	Total organic carbon
TPT	Triphenyltin
TRI	Toxics Release Inventory
TRS	Total reduced sulphur
TSP	Total suspended particulate
TSS	Total suspended solids
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
UNITAR	United Nations Institute for Training and Research
UWWTD	Urban Waste Water Treatment Directive (1991/271/EEC)
UWWTP	Urban waste water treatment plants
vPvB	Very persistent and very bioaccumulative
WBP	Wood-based panel production (BREF)
WFD	Water Framework Directive (2000/60/EC)
WI	Waste incineration (BREF)
WT	Waste treatment (BREF)

Abstract

The European Pollutant Release and Transfer Register (E-PRTR) provides an important dataflow on reported industrial pollutant releases to air, water and land as well as waste transfers. Following extensive analysis, this project identified suggestions for possible amendments to the scope of E-PRTR activities and pollutants, as well as to guidance regarding release quantification and pollutants expected to be reported for different activities. This work will inform any European Commission (EC) future considerations of the E-PRTR Regulation and Guidance document. Changes in E-PRTR activity definitions are suggested to ensure greater coherence with the Industrial Emissions Directive (IED). Lower capacity thresholds for combustion plants and waste water treatment plants would capture a greater share of industrial releases. Thirty-eight (38) pollutants are suggested for addition to the E-PRTR pollutant list to improve alignment with the IED, other European media-specific legislation and international pollutant release and transfer registers. Reporting thresholds could be lowered for eleven (11) pollutants to air and fourteen (14) pollutants to water to ensure that 90% of industrial releases of these pollutants are captured. Improvements in validation by competent authorities and revisions to the E-PRTR Guidance document are suggested to improve data consistency and comparability, in particular with regards to the use of method classes and methodologies for quantification of releases.

Executive summary

The European Pollutant Release and Transfer Register (E-PRTR) enables public access to information on pollutant releases to air, water, soil and waste transfers from over 34,000 of Europe's largest industrial facilities. The E-PRTR Regulation specifies the scope of activities and pollutants to be included, as well as activity capacity thresholds and pollutant release thresholds that must both be exceeded to trigger reporting. The E-PRTR aims to capture 90% of the total releases of each pollutant from industrial sources. The pollutant release thresholds should limit the reporting burden for small sources but without jeopardising the 90% capture objective for the E-PRTR as a whole.

The E-PRTR Guidance document supports implementation of the Regulation by clarifying the methods, data sources and assumptions to be used by facility operators when reporting. The **E-PRTR Regulation and associated Guidance document both date from 2006** and have not been updated since then.

The project consisted of two main components. **The first part of this project reviewed the E-PRTR activities plus the pollutants to be reported and their thresholds.** It identified and suggested the inclusion of additional activities and pollutants to improve the E-PRTR's alignment with the Industrial Emissions Directive (IED) and other European Union medium-specific legislation. **The second part of this project prepared possible revisions to the Guidance document** that aim at improving the consistency, coherence and quality of data reported to the E-PRTR by Member States (MS). This work provides evidence to support any future European Commission (EC) considerations on the E-PRTR Regulation and the supporting Guidance document.

The project developed its findings through the following tasks:

- **Analysis of releases and transfers included in data from the North Rhine-Westphalia (NRW) inventory and the Spanish PRTR**. These registers cover more activities than the E-PRTR and do not have pollutant reporting thresholds. They can help assess the degree of capture of industrial releases by the current E-PRTR list of activities and pollutant reporting thresholds.
- **Weibull analysis of the 2016 E-PRTR data set to evaluate pollutant release thresholds** with cross checking of results against the NRW inventory and Spanish PRTR.
- **Analysis of relevant activities and pollutants not currently in the E-PRTR** but which are covered by a number of initiatives focussed on environmental protection such as:
  - The IED's Annex II;
  - Pollutants with associated emission levels in best available techniques (BAT) conclusions;
  - The Water Framework Directive (WFD) priority substances and watch lists;
  - The Stockholm Convention and Gothenburg Protocol;
  - The Organisation for Economic Co-operation and Development (OECD) harmonised list of pollutant release and transfer register (PRTR) activities and short list of PRTR pollutants;
  - Substances of concern in other scientific literature.
- **An expert review of the method classes (measurement, calculation or estimation; M/C/E)** and specific methodologies used for quantifying releases. This included reviews of national guidance and consultation with industry trade associations.
- **Review of the indicative pollutant lists** in the Guidance document to ensure that they reflect and prioritise the pollutants expected from different activities.

Suggested revisions to the list of **E-PRTR activities** include:

- **Adding magnesium oxide production** to the E-PRTR activity list would enhance coherence with the IED and add some 14 facilities. Likewise, adding carbon capture and storage to the E-PRTR would also increase IED coherence although the additional number of facilities is uncertain as only pilot-scale plants currently operate in the EU.
- **Adding a new metal-working activity** would ensure a more complete E-PRTR coverage of the manufacture of motor vehicles, computer, electrical, transport and other equipment. Comparison with international PRTRs shows high releases of metals to air and water from these sectors, for which further investigation of source processes is needed.
- **Revising E-PRTR sub-activity definitions** to align with the IED for cement and lime production and hazardous waste management would allow a separate assessment of releases from subsectors for which specific BAT conclusions have been published.
- **Lowering the capacity threshold** for combustion plants to 20 MW to include larger facilities covered by the Medium Combustion Plant Directive. This would add approximately 9% of additional NOx releases to air through adding around 6,300 facilities but would require lowering of the pollutant reporting threshold.
- **Lowering the capacity threshold** from 100,000 population equivalents (p.e.) to 15,000 p.e. to capture 90% of releases from plants covered by the Urban Waste Water Treatment Directive. This would involve reporting by an additional 4,700 facilities.
- Whilst a source of notable releases to air and water, **intensive cattle rearing does not appear to warrant addition as an E-PRTR Annex I activity.** This is based on the assumption that a capacity threshold of 100 livestock units would only cover 50% of the releases from this activity while resulting in a new reporting obligation for about 250,000 additional facilities.

Suggested revisions to the list of **E-PRTR pollutants and reporting thresholds** include**:**

- **Adding 38 pollutants to the E-PRTR pollutant list** would improve alignment with the IED, European media-specific legislation, and other PRTRs, enabling more comprehensive tracking of environmental initiatives.
- **Retaining 24 existing pollutants in the E-PRTR pollutant list.** Although the use of these pollutants has been banned and they have been reported in low quantities in recent years, their removal would impact historical time series as well as international comparisons of environmental pressures. Consequently, their retention is advised.
- **Retaining the 90% capture target of all industrial releases.** Completely removing reporting thresholds was judged to have a significant additional burden that was not justified by the associated expected improvement in the completeness of the E-PRTR dataset.
- **Lowering the reporting threshold for 11 pollutants to air and 14 pollutants to water** would enable 90% capture of all industrial releases of these pollutants. In contrast, the Weibull analysis indicated that there is already 90% capture of all industrial releases for 30 pollutants to air and 35 pollutants to water.

Suggested improvements to the **E-PRTR Guidance document** include:

- **Providing more detailed criteria for the selection of method class** (measurement, calculation or estimation), requiring more complete information about the specific methodology used for quantifying releases, and defining valid combinations of method class and methodologies. These changes should improve data consistency and comparisons between facilities and countries.
- **Including guidance on what approach to adopt when measured values are below the limits of detection or quantification.** This would ensure consistency in determining whether releases are above or below reporting thresholds and improve data comparability.
- **Considering establishing a data reliability indicator** to rank the credibility of reported releases. This would facilitate data quality review and improvement efforts.

- **Providing additional guidance on quality checking of reported data** to improve validation by competent authorities, including minimum requirements for quality checks and assessing quantification method credibility. This would improve comparability of data reported to the E-PRTR.
- **Considering establishing sector-specific indicative pollutant lists** for releases to air and water based on the frequency of E-PRTR reporting. This would enable operators and competent authorities to allocate resources to quantifying and reviewing releases more effectively.

1 Introduction

1.1 The E-PRTR

The European Pollutant Release and Transfer Register (E-PRTR) Regulation[1] established an integrated register of pollutant release and transfers at the EU level and thus implemented the United Nations Economic Commission for Europe (UNECE) Kiev Protocol[2]. The E-PRTR enables public access to environmental information on pollutant releases and transfers from over 34,000 of Europe's largest industrial facilities. This coherent, integrated database of the annual mass of releases and transfers of pollutants is intended to support closer public involvement in environmental decision-making.

Article 5 of the E-PRTR Regulation defines its scope through references to:

- Annex I – which describes the activities covered;
- Annex II – which defines the pollutants and the release thresholds that trigger reporting.

Operators report annual releases to their Member State competent authority when an activity is above the Annex I capacity threshold and that activity emits pollutants above the Annex II thresholds.

A European Commission Guidance document[3], among other resources, supports consistent implementation of the E-PRTR Regulation (by facility operators and by Member States). Both the Regulation and the Guidance date from 2006 and reflect the technical and scientific understanding at that time.

The European Pollutant Emission Register (EPER), which was created to provide the first EU-wide inventory of releases arising from activities under the Integrated Pollution Prevention and Control Directive (IPPCD; 1996/61/EC), preceded the E-PRTR[4]. Originally, the activities covered by the EPER mapped directly onto Annex I of the IPPCD. Whilst there continues to be a broad mirroring, two key factors have led to a divergence of activities covered by the inventory and the regulatory regime:

- In 2006 the EPER evolved into the E-PRTR in order to deliver Annex 1 of the Kiev PRTR Protocol. This resulted in an extended scope for the Annex I activities, e.g. urban wastewater treatment plants, aquaculture and mining/quarrying.
- In 2010, the Industrial Emissions Directive (IED; 2010/75/EU) replaced the IPPCD and introduced additional activities for regulatory control, e.g. waste recovery, carbon capture and storage.

The EU's industry and economic activities, as well as the pollutants it emits continue to change. Research provides new insights into the impacts of new and existing pollutants. New legislation (including the development of the IED) continues to focus

[1] 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/EC.

[2] http://www.unece.org/env/pp/prtr.html

[3] http://ec.europa.eu/environment/industry/stationary/eper/implementation.htm

[4] https://prtr.unece.org/

on the minimisation of industrial releases and associated reporting needs. The E-PRTR, as the key avenue for industrial environmental impact reporting, must continue to be a relevant tool for tracking releases of environmental pollutants.

1.2 E-PRTR support to environment protection

1.2.1 Supporting the Industrial Emissions Directive

While the E-PRTR will continue to deliver on the Kiev Protocol requirements, it now also needs to support fully the delivery of the IED.

The IED provides a basis for improving the environmental performance of regulated industrial activities. It establishes the main principles for permitting and controlling large industrial installations. The application of best available techniques (BAT)[5] targets the achievement of a high level of environmental protection while accounting the costs and benefits.

The IED requires the development of BAT conclusions. BAT conclusions identify the emission levels associated with the best available techniques for pollutants of concern. Reporting through the E-PRTR can provide important input at the start of the process to develop or review BAT reference documents (BREFs).

The IED also requires reporting of air releases for large combustion plants (LCPs) as well as administrative information (e.g. names, locations, key activities, regulatory activities). Reporting to the E-PRTR, alongside with the LCP inventory, provides the backbone for information on quantitative releases and transfers from industrial activities. Progress in achieving the objectives of the IED can be tracked through an analysis of trends in releases.

The development of the E-PRTR happened after the adoption of the IPPCD, but before the IED. This means that the wording used in the IED for some activities should be compared to E-PRTR Annex I activity definitions.

Whilst the E-PRTR includes releases from activities that align with most IED activities, there are some discrepancies between the scope and definitions of some activities in the two legal instruments. It is important that the activity definitions included under the E-PRTR fully represent releases from IED activities.

1.2.2 Supporting other environmental legislation and agreements

In addition to the IED, there is a range of other related directives and regulations that require the reduction or moderation of industrial impacts on the environment. E-PRTR data supports the analysis of trends and impacts from facilities for relevant legislation and wider conventions and agreements, most notably:

- Air Quality Directive (2008/50/EC)
- National Emissions Ceiling Directive (2016/2284/EU)
- Medium Combustion Plant Directive (2015/2193/EU)
- Urban Waste Water Treatment Directive (1991/271/EEC)

[5] https://eippcb.jrc.ec.europa.eu/reference/

- Water Framework Directive (2000/60/EC)
- Priority Substances Directive (2013/93/EU)
- Nitrates Directive (1991/676/EEC)
- Extractive Industries Directive (2006/21/EC)
- Waste Framework Directive (2008/98/EC)
- Landfill Directive (1999/31/EC)
- Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC 1907/2006)
- Stockholm Convention – Persistent Organic Pollutants (POPs) Regulation (EU 757/2010)
- Minamata Convention - Minamata Regulation (EU 852/2017)
- Gothenburg Protocol
- Organisation for Economic Co-operation and Development (OECD) shortlist of pollutants in major PRTRs outside Europe.

The above legislation and agreements may highlight additional areas where industrial activities and pollutants of concern exist, to which the E-PRTR should be aligned.

1.3 This project – Review of the E-PRTR

This report is the output of a project that assessed the state of the E-PRTR Regulation and Guidance considering recent advances in the understanding of environmental releases and their impacts. The report provides a series of findings that can allow the Commission to support any future legislative development of E-PRTR reporting and related guidance.

The findings presented in this report will also inform the current IED evaluation process and are timely regarding ongoing UNECE discussions on possible development of the Kiev Protocol. Some findings may also be useful in assisting operators and competent authorities with checking and reviewing data quality.

The key goal of this project is ensuring that the E-PRTR continues to provide an accurate and comprehensive inventory of pollutant releases and transfers from Europe's most environmentally important industrial and agro-industrial activities. This report is structured into four sections covering each of the four tasks outlined in the Terms of Reference.

- **Task 1:** Review of, and suggest updates to, E-PRTR Regulation Annex I activities (see Section 2);
- **Task 2:** Review of, and suggest updates to, E-PRTR Regulation Annex II substances and thresholds (see Section 3);
- **Task 3:** Identify improvements for the guidance for methods to quantify pollutant releases to enhance the quality of the reported data (see Section 4);
- **Task 4:** Identify updates to the indicative air and water pollutants lists in Appendices 4 and 5 of the guidance to provide better information on likely pollutants (see Section 5).

The report describes analyses undertaken by the project team to support the above tasks and to inform suggestions for improvements. It also integrates a range of views, comments and suggestions from Member States, industry representatives and other stakeholders from engagements undertaken throughout the project.

Sections 2 to 5 of the report address each of the four tasks defined above, referring to cross-cutting issues where necessary. Each section includes the following elements:

- Objectives – A description of the key goals of the task;
- Key findings – Summary of the main outcomes and results of the analysis;
- Discussion – A more detailed description of the methodology and resulting conclusions that led to the key findings.

Section 6 presents the conclusions that summarise key findings for each task and the headline findings for the project.

Annexes provide detailed analyses and results supporting each of the four tasks, as well as a report of the E-PRTR Expert Group workshop held on 20 June 2019 to discuss the initial findings of this project, and a summary of Member State comments made after this workshop.

2 Review of E-PRTR Annex I Activities

2.1 Objectives

An important consideration for the E-PRTR is the scope and size of industrial activities that qualify for reporting. Annex I of the E-PRTR Regulation provides these definitions. This section of the report highlights and provides discussion on key findings for the E-PRTR activities and/or capacity thresholds based in the following assessments:

- Inclusion of E-PRTR activities that are important for the analysis of **releases from IED activities**. Addressing differences in activities and their definitions will ensure that the E-PRTR supports the objectives of the IED more closely.
- Inclusion of E-PRTR activities that are important for the analysis of industrial activities relevant to **other medium-specific EU legislation.** Alignment will help to support the monitoring of releases for other medium-specific EU legislation on air, water and waste (listed in Section 1.2.2) where understanding the magnitude and trends of industrial releases is an important factor.
- **Comparison** of the E-PRTR activities with **more detailed and complete PRTRs** in selected EU countries (Spain and Germany) **and other international PRTRs** to identify possible emerging activities or different capacity thresholds that would improve the completeness and currency of the E-PRTR.
- **Assessment of the sufficiency of existing capacity thresholds in the E-PRTR**. This involves analysing whether the existing activity capacity thresholds (listed in Annex I of the E-PRTR Regulation) capture the required share, i.e. greater than 90% of releases from industrial operations in Europe.

The E-PRTR should provide a suitably complete inventory of releases and transfers from Europe's most environmentally important industrial (and agro-industrial) activities to support legislation focused on improving the environment.

2.2 Key findings

This section summarises key suggestions for future development of the E-PRTR Annex I list of industrial activities and their associated capacity thresholds. Suggestions for new activities, and changes to existing activity definitions and capacity thresholds are detailed in Table 2.1 with a rationale for their inclusion. Section 2.3 provides further discussion and Annex 1 provides detailed analysis and findings.

- **New priority activities for possible addition** include:
  - Magnesium oxide production: suggested for inclusion with no capacity threshold;
  - CO_2 capture and storage: suggested for inclusion with no capacity threshold;
  - Metal-working: further evaluation needed to define the exact activities and their capacity thresholds;
  - Battery manufacturing: further evaluation of a capacity threshold required.

- **Changes to definitions/scopes and capacity thresholds in the E-PRTR** which would help to better align the E-PRTR with the IED and other EU environmental legislation. The key suggested changes are presented below with a full list of suggestions in Table 2.1:
  - Including sub-categorisation of fuel inputs for gasification and liquefaction;
  - Decreasing the capacity threshold for combustion plants to 20 MW;
  - Reorganising subdivisions in the cement and lime sectors;
  - Specifying activities within the hazardous waste management sector;
  - Specifying activities within the non-hazardous waste management sector and including the recovery of waste;
  - Explicitly including the flaring of landfill vent gas;
  - Decreasing the threshold for urban waste water treatment plants (UWWTP) to 15,000 population equivalents (p.e.).
- Various analyses, including most EU Member States (MS) air pollutant and greenhouse gas inventories, identify **cattle rearing as an important source of ammonia and methane releases.** Neither the E-PRTR nor the IED include the majority of these releases. Analysis during this project identified that, due to the small, dispersed and numerous cattle facilities, even a low capacity threshold of 100 livestock units would not capture a significant proportion of releases, and a disproportionate number of cattle rearing facilities would need to report. Furthermore, operators would have to use emission factors that are already used for national and international emission reporting; therefore, there would be no net improvement to the accuracy of release trends through E-PRTR reporting compared to most national inventories. Whilst a source of notable releases to air and water, **intensive cattle rearing does not appear to warrant addition as an E-PRTR Annex I activity.** Still, some form of simple, less burdensome farm registration and top-down reporting approach is worth consideration.
- With regards to the **alignment between E-PRTR and IED**, a key difficulty exists where more than one type of activity listed in E-PRTR Annex I is carried out by an operator. In these cases, the total aggregated facility releases are reported to the E-PRTR rather than the activity-specific releases. This prevents the separation of releases needed for an IED activity-specific assessment.
- It is worth noting that **reducing activity capacity thresholds to capture smaller facilities will not necessarily increase the amount of release reported**. This is because although smaller installations are more numerous, they will individually release smaller amounts of substances and may therefore be below the pollutant reporting thresholds. The current E-PRTR annexes (I and II) do not set activity-specific pollutant reporting thresholds.

Table 2.1 shows the full list of proposals by activity, with reasons for inclusion or revision.

Table 2.1 Activities not currently included in E-PRTR Annex I or cases for better alignment with the IED and other EU legislation

Activity	Proposed activity threshold	Reason for listing	Suggestion
Priority new activities for inclusion in Annex I of the E-PRTR			
Production of magnesium oxide in kilns	>50 t/day	To align with IED activity 3.1(c)	Include in E-PRTR to monitor BAT implementation
Capture of CO_2 streams for geological storage	No threshold	To align with IED activity 6.9	Include in E-PRTR to cover releases of CO_2 and other pollutants from these facilities
Metal working	No threshold identified[1]	Global PRTR harmonisation. Significant contributions to U.S. The E-PRTR does not include various manufacturing sectors that are in the Toxics Release Inventory (TRI).	Evaluate further as a new activity in the E-PRTR
Battery manufacturing	No threshold identified[1]	Potential releases to water and soil of heavy metals, lithium and acids. Growing industrial sector considering expanding sales e.g. electric vehicles.	Evaluate further as a new activity in the E-PRTR
Revision of definitions and capacity thresholds in Annex I of the E-PRTR			
1.(b) Installations for gasification and liquefaction	No change	Better alignment with the IED, higher level of detail	Separation of sub-categories for E-PRTR activity 1.(b) to include coal and 'other fuels in installations' to better reflect releases from IED subcategories
1.(c) Thermal power stations and other combustion installations	20 MW	National emission inventories show high contributions of several pollutants which are a focus for the Medium Combustion Plant Directive and the National Emissions Ceiling Directive. Also, capturing installations covered by the Emissions Trading System[6].	Lower the existing 50 MW activity threshold to 20 MW to include the largest medium combustion plants
3.(c).(i) Cement clinker in rotary	No change	Product related categorisation in IED	Alignment with the IED activity definitions would

[6] https://ec.europa.eu/clima/policies/ets_en

Activity	Proposed activity threshold	Reason for listing	Suggestion
kilns (ii) Lime in rotary kilns (iii) Cement clinker or lime in other furnaces		activities 3.1(a) and 3.1(b) but not in E-PRTR	enable disaggregation of releases for cement and lime
5.(a) Installations for the recovery or disposal of hazardous waste	No change	Annex I of the IED splits this single E-PRTR category into multiple categories. For each of these subcategories, specific BAT has been defined.	Alignment with the IED activity definitions would clarify that disposal covers incineration and co-incineration and to disaggregate releases of IED subsectors 5.1, 5.2(b) and 5.6
5.(b) Installations for the disposal of non-hazardous waste	No change	This single E-PRTR category is split into sub-categories in Annex I of the IED that also cover recovery. For each of these sub-categories specific BAT has been defined.	Alignment with IED to include sub-sectors in 5.3(b) and to add 'recovery' to the definition to ensure that this activity is included.
5.(d) Landfills	No change	EU Landfill Directive requires after-care regarding landfill gas releases. National emissions inventories show significant releases of several pollutants from the flaring of vent gas.	Clarify definition by adding 'including flaring of vent gas' to explicitly include releases from flaring at open and closed landfill sites.
5.(f) Urban waste-water treatment plants	15,000 p.e.	Increase overlap with scope of the Urban Waste Water Treatment Directive and capture 90% of releases	Lower the existing threshold from 100,000 p.e. to 15,000 p.e. to include plants most likely to handle industrial releases

[1] Further evaluation work is needed to identify a capacity threshold.

2.3 Discussion

The assessments used to identify and prioritise the activities and thresholds presented in Table 2.1 build on a range of analysis and reference material including:

- Activities listed in the IED;
- Activities identified in other EU medium-specific legislation on air, water and waste;
- Activities included in a sample of more detailed Member State PRTRs (specifically, the North Rhine-Westphalia inventory and the Spanish PRTR);
- Activities in international PRTRs.

2.3.1 E-PRTR activity alignment with the IED

IED and E-PRTR activities are not fully aligned in some cases. As a general premise, it should be possible to evaluate the type and amount of releases from activities regulated by the IED using the E-PRTR. Alignment between E-PRTR activities and IED activities is therefore crucial. Annex I of the IED lists activities similar to those in Annex I of the E-PRTR Regulation although there are small differences in definitions and thresholds.

A review of all activities in Annex I of the E-PRTR Regulation and Annex I of the IED has been undertaken with the goal of checking for correspondence between categories, sub-categories, textual definitions and capacity thresholds. For activities not currently covered by the E-PRTR, data from BREFs were used, where available, to estimate releases to understand the importance of these activities. Annex A1.1 of this report provides full details on the identified differences.

Where an operator carries out more than one type of activity listed in Annex I of the E-PRTR, difficulties with reporting can occur. In those cases, reporting includes only total aggregated facility releases rather than individual activity-specific releases. This prevents some of the required separation of releases needed for IED activity-specific assessment.

The types of issues identified in the alignment of IED and E-PRTR activities are:

- **Activities not covered by the E-PRTR but included in the IED**. There are three activities in the IED but not in the E-PRTR. Only two of them – magnesium oxide production (IED activity 3.1(c)) and CO_2 capture and storage installations (IED activity 6.9) – are considered appropriate for inclusion in the E-PRTR due to their high emission potential. It is suggested that waste storage (IED activity 5.5) should not be added to the E-PRTR as releases are expected to be relatively small.
- **Activities covered by both the E-PRTR and IED but with different capacity thresholds.** There were no cases where IED thresholds were lower than the E-PRTR thresholds. For production of wood-based panels (IED activity 6.1(c)), the production of food products from vegetable raw materials (IED activity 6.4(a)(ii)), and wood impregnation (IED activity 6.10) the capacity thresholds in the E-PRTR are lower than in the IED and therefore cover more facilities. The E-PRTR capacity thresholds for these activities should be retained to maintain consistency of the E-PRTR time series and to provide a complete picture of releases from these sectors.
- **Activities covered by the E-PRTR and the IED with different sub-categories**. In two cases there are inconsistent sub-categories for IED and E-PRTR activities. For these, adopting the sub-categories of the IED for the E-PRTR could be considered:
  - **Gasification and liquefaction** with two types of fuel category in IED activity 1.4 and only one in E-PRTR activity 1.(b).
  - **Cement and lime production** is divided into product-related categories in IED activity 3.1, whereas the E-PRTR divides activity 3.(c) by processes, mixing cement and lime production in different categories.
- **Activities with missing sub-categories**. The IED includes more detailed breakdown of disposal or recovery of hazardous and non-hazardous waste than the E-PRTR. The E-PRTR activities could be extended in detail to align with the

IED sub-categories for both hazardous and non-hazardous waste, along with explicitly including the recovery, as well as disposal, of non-hazardous waste.

- **For hazardous waste**: **Activity 5.(a) of the E-PRTR** is defined as 'Installations for the recovery or disposal of hazardous waste' without listing any sub-categories. **Three activities are included within the IED**: **5.1** 'Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day' (with multiple sub-categories), **5.2(b)** 'Disposal or recovery of waste in waste incineration plants or in waste co-incineration plants' (with multiple sub-categories), and **5.6** 'Underground storage of hazardous waste with a total capacity exceeding 50 tonnes'.
- **For non-hazardous waste: Activity 5.(c) of the E-PRTR** is defined as 'Installations for the disposal of non-hazardous waste with a capacity of 50 tonnes per day' without listing sub-categories. There are **two IED activities**, **5.3(a)** 'Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day' and **5.3(b)** 'Recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day', each with multiple sub-categories such as 'biological treatment'.

2.3.2 E-PRTR activity alignment with EU medium-specific legislation on air, water and waste

Industrial activities relevant to the EU medium-specific legislation on air, water and waste were identified and compared to the E-PRTR's Annex I list of activities. Full details of this assessment are presented in Annex A1.2.

The legislation assessed, and the alignment of industrial activities to the list of E-PRTR activities is summarised in Table 2.2 (***bold italics*** text in Table 2.2 identifies gaps). This table also provides some details of alignment with substances/pollutants for completeness. More detail on pollutants is elaborated in Section 3.

Table 2.2 Coverage of the E-PRTR compared to medium-specific EU legislation

EU Legislation	Relevance to the E-PRTR
Air	
Air Quality Directive (2008/50/EC)	All substances are covered by the E-PRTR.
Medium Combustion Plant Directive (2015/2193/EU)	***Activities are not covered by the E-PRTR***
Surface Water	
Urban Waste Water Treatment Directive (1991/271/EEC)	***Activities with a capacity of 2,000 to 100,000 p.e. are not covered by the E-PRTR***
Water Framework Directive (2000/60/EC)	***Small industrial activities directly emitting to water bodies are not covered if capacity is below E-PRTR thresholds***
Priority Substances Directive (2013/93/EU)	***Some substances are not covered by the E-PRTR (see Section 3)***

EU Legislation	Relevance to the E-PRTR
Nitrates Directive (1991/676/EEC)	***Small animal rearing and cattle rearing are not covered by the E-PRTR***[7]
Waste / Ground water and soil	
Extractive Industries Directive (2006/21/EC)	All activities are covered by the E-PRTR
Waste Framework Directive (2008/98/EC)	***Non-hazardous waste recovery activities are not included in the E-PRTR***
Landfill Directive (1999/13/EC)	***Flares at landfills are not covered by the E-PRTR***
Chemicals	
REACH Regulation (EC 1907/2006)	***Not all substances are covered (see Section 3)***
Stockholm Convention – POPs Regulation (EU 757/2010)	***Not all substances are covered (see Section 3)***
Minamata Convention – Minamata Regulation (EU 852/2017)	All substances are covered by the E-PRTR ***Gypsum industry is not covered***

Key elements from Table 2.2 are discussed in more detail below:

Medium combustion plant between 20 MW and 50 MW

The Medium Combustion Plant Directive (MCPD; 2015/2193/EU) recognises these facilities as important contributors to air pollutant releases and focuses on means to reduce them. Currently the E-PRTR only includes combustion facilities with capacity of 50 MW or higher.

Activities relevant to the MCPD would be included by reducing the threshold to 20 MW. However, pollutant thresholds would also need reducing to capture releases from these 20 to 50 MW activities.

This is complicated by the fact that E-PRTR activity thresholds and pollutant thresholds are currently independent. Since the E-PRTR does not list activity-specific pollutant thresholds, changes to the pollutant thresholds would need to be applied to all E-PRTR activities.

Urban waste water treatment plants (UWWTP) with a capacity of 15,000-100,000 p.e.

Reporting by these UWWTP to the E-PRTR would enable improved tracking of releases and help monitor the implementation of the Urban Waste Water Treatment Directive (UWWTD; 1991/271/EEC). Currently under the UWWTD, reporting of discharges is on a voluntary basis. It is mandatory to report other information under the UWWTD every second year (such as design capacity and operation description).

A recent European Environment Agency (EEA) report[8] recommended reducing the E-PRTR capacity threshold for UWWTP in order to increase the percentage of

[7] Whilst the source of notable emissions to air and water, intensive cattle rearing does not appear to warrant addition as an E-PRTR Annex I activity.

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

discharges that are included within the scope of the E-PRTR. A reduction in the capacity threshold to 15,000 p.e. for the E-PRTR is estimated to increase the number of reporting facilities from about 1,300 to about 6,000. This would capture 50% to 70% of UWWTP releases of most pollutants. Lower activity thresholds would need to be accompanied by decreases in pollutant reporting thresholds for many pollutants, to between 25% and 0.5% of the current thresholds, in order to cover more than 90% of releases of each pollutant from this activity.

Reduced reporting obligations under the UWWTD would remain for small UWWTP with capacities between 2,000 and 15,000 p.e. (which are unlikely to serve industrial facilities). Annex A1.7 provides further detail on the assessment that resulted in this suggestion.

Cattle rearing and the Nitrates Directive

Cattle rearing generates significant releases to air of ammonia and methane. Inclusion of these activities in the E-PRTR would support the Nitrates Directive by providing information on releases of nitrogen.

To capture a significant percentage of releases from this sector a 'capacity threshold' of 100 livestock units (LSU) would be needed. However, this would imply an additional administrative burden of reporting from a quarter of a million holdings and would require a decrease of the current pollutant reporting thresholds.

Given that no BAT conclusions have been published for cattle rearing, and that operators would have to calculate releases for the E-PRTR with emission factors that are also used for national and international emission reporting, little benefit is expected to be created with the inclusion of a direct E-PRTR reporting obligation for cattle rearing facilities.

Whilst a source of notable releases to air and water, intensive cattle rearing does not appear to warrant addition as an E-PRTR Annex I activity. However, some form of simple, less burdensome farm registration and top-down emissions reporting may be considered beneficial. Annex A1.6.1 provides full details of the assessment of inclusion and related thresholds for this activity.

2.3.3 E-PRTR activities and thresholds compared to the NRW inventory and Spanish PRTR

Both the Spanish PRTR and the North Rhine-Westphalia (NRW) emissions inventory[9] contain broader activity lists than the E-PRTR. To determine if they merited (due to large release contributions) inclusion in the E-PRTR, the significance of the additional activities and their releases was assessed. For the complete analysis of these potential new activities, refer to Annex A1.3. Analysis of these inventories provided the following insights that have informed the key findings:

- **The Spanish PRTR activity list aligns with the Annex I activity list of the IED**. Facilities for **cement grinding with a production capacity exceeding 500 tonnes per day** are included as an additional activity. These additional activities **do not contribute significantly to releases** from E-PRTR activities.

[9] Emissionserklärungen 2016 nach 11. BImSchV, and the 2016 NRW Waste Water Database; hereafter referred to as the NRW inventory.

- The **German North Rhine-Westphalia (NRW) inventory** requires reporting every fourth year of an extended list of activities and on additional substances. The additional reporting covers 77 activities not included in the E-PRTR. The assessment of releases from these additional NRW activities shows that most do not contribute significantly to E-PRTR releases. However, the inclusion of **combustion plants covered by the Medium Combustion Plant Directive and flaring of waste disposal gas from landfills show significant additional releases.**
- The NRW inventory analysis shows that **activities covered by the Medium Combustion Plant Directive (1 MW to <50 MW) contribute significantly to releases of greenhouse gases (CH_4, N_2O) and of NO_X.** An assessment of appropriate capacity thresholds was undertaken for these activities (see Annex A1.6.2 for details) which indicates that a 20 MW threshold would capture over 90% of releases assuming there was no pollutant reporting threshold. For example, this would increase reported NO_x releases by 9.2% of total NO_x releases from combustion plants (based on analysis of the NRW inventory) and increase the number of new facilities covered by the E-PRTR by about 6,300. For facilities of 20 to 50 MW, the current reporting pollutant thresholds would result in very limited additional reporting of releases above the threshold. Therefore, the inclusion of medium combustion plants with a capacity threshold of 20 to 50 MW would also require the lowering of the pollutant reporting thresholds for this activity to capture the additional releases.
- The NRW inventory analysis also shows **that flaring of waste disposal gas from landfills produces releases of multiple pollutants exceeding the current E-PRTR reporting thresholds**. Since reporting of releases from landfills is already covered by 5.(d) in Annex I of the E-PRTR, explicit inclusion of waste disposal site flares would ensure fuller release reporting and cover significant releases of SO_2 and greenhouse gases (CH_4, N_2O).
- Finally, the NRW inventory analysis shows that other activities contributed relatively few releases, often only of single pollutants.

2.3.4 Activities in other international PRTRs

Analysis of other international PRTRs highlighted potential changes to the list of E-PRTR activities that would improve the completeness of the E-PRTR and its coherence with the PRTRs of Australia, Canada, Japan, and the United States. The main challenge facing analyses of these PRTRs is that each PRTR is designed to meet its country- or region-specific needs, with less attention given to comparability among different PRTRs.

The OECD has produced a harmonised list of PRTR reporting sectors[10]. This analysis assessed the OECD 'short list' of harmonised sectors and identified activities that may be of benefit to include in the E-PRTR for improved global harmonisation. The E-PRTR and the PRTRs of Australia, Canada, Japan, and the United States align with approximately half of the 'short list' sectors.

10 http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=env/jm/mono(2013)5&doclanguage=en

Typically, international PRTRs report based on sector designation, which translates to the International Standard Industrial Classification of All Economic Activities (ISIC)[11]. These classifications do not align easily with the E-PRTR Annex I activities. Therefore, this analysis has identified which sectors (rather than activities) align with the E-PRTR. Annex A1.4 provides further details on the matter.

Based on high reporting of releases across the four international PRTRs benchmarked, the **E-PRTR** could consider including the **following ISIC sectors**:

- ISIC 25: Manufacture of fabricated metal products, except machinery and equipment
- ISIC 27: Manufacture of electrical equipment
- ISIC 26: Manufacture of computer, electronic and optical products
- ISIC 28: Manufacture of machinery and equipment not covered elsewhere
- ISIC 29: Manufacture of motor vehicles, trailers and semi-trailers
- ISIC 30: Manufacture of other transport equipment.

Currently, the E-PRTR only includes a few selected activities within these sectoral classifications and reported releases mostly relate to E-PRTR Annex I activities 2.(f) and 9.(c) – which cover surface treatment of metals and plastic materials using an electrolytic or chemical process, and surface treatment of products using organic solvents.

Relatively high E-PRTR capacity or release thresholds for these sectors may result in the low observed reporting of releases in the E-PRTR. The most significant missing elements from the E-PRTR compared to the U.S. Toxics Release Inventory (TRI) appears to be the release of metals to air and water for the above sectors. This is especially notable for ISIC 27: Manufacture of electrical equipment.

The E-PRTR does not include metal-working activities across the ISIC 25, 26, 27, 28, 29, and 30 sectors. From a risk-screening perspective, releases of metals and metal compounds typically drive toxicity scores for both human health and ecotoxicity and could therefore be a significant omission from the E-PRTR activities.

One potential approach to improving global harmonisation could be to include a new metal-working activity in Annex I of the E-PRTR. Such an addition would fill a potential gap in reported releases and better align the E-PRTR activities with other PRTRs' coverage of releases from these sectors. Meaningful additional data for global PRTR harmonisation, particularly from a risk-screening perspective would result from the addition of a metal-working activity to Annex I of the E-PRTR. Further investigation of the specific processes at U.S. facilities in these sectors that generates releases of metals to air and water, and of potential capacity and release thresholds, should be considered.

[11] https://stat.unido.org/content/learning-center/international-standard-industrial-classification-of-all-economic-activities-%2528isic%2529

3 Review of E-PRTR Annex II Pollutants and Reporting Thresholds

Provided that thresholds specific to each pollutant and medium (i.e. to air, to water and to land) are exceeded, Annex II of the E-PRTR Regulation defines what should be reported. These pollutants and thresholds are almost identical to those in Annex I of the Kiev PRTR Protocol, adopted in 2003. The reporting thresholds were originally set up to capture 'the majority' of releases and transfers from human activities, and to minimise the reporting burden for smaller facilities. During negotiations for the Kiev Protocol, due to uncertainty and gaps in the data available at the time, no quantitative definition of this majority was ever agreed on. Later, scientific studies and policy assessments of PRTRs have often used a benchmark of 90% of total releases and transfers for each pollutant.

Since the E-PRTR was first published in 2006, new pollutants and environmental issues have become significant, but the Annex II pollutant list and thresholds have not been updated to reflect these changes. In addition, recent improvements to environmental performance of industry (e.g. through deployment of abatement measures) have resulted in generally smaller releases. Therefore, more facilities now fall below the Annex II thresholds and their releases are not captured by the E-PRTR, potentially undermining the aim of capturing the 'majority' of releases and transfers and therefore reducing the effectiveness of the E-PRTR in supporting the implementation of environmental legislation such as the IED.

3.1 Objectives

An important element of the E-PRTR is the scope of pollutants that facilities need to report. Annex II of the E-PRTR Regulation defines this scope and includes thresholds above which installations are required to report releases of certain pollutants. This section of the report suggests possible changes to Annex II of the E-PRTR Regulation (to pollutants and/or pollutant thresholds). Specific objectives of the work included:

- An assessment of the **extent to which the Annex II list of pollutants covers all pollutants that are currently considered important for industrial releases** identified in:
  - The IED;
  - BAT conclusions;
  - European environmental legislation and international conventions (listed in Section 1.2.2);
  - Other PRTRs;
  - The scientific literature.
- A statistical analysis of the full 2016 E-PRTR data set to assess the **effectiveness of current reporting thresholds** in capturing the 'majority' (90%) of pollutant releases and transfers.
- An assessment of **the implications of removing pollutant reporting thresholds,** in terms of the reporting burdens (costs) for industrial facilities and the benefits (i.e. of improved inventories of industrial releases). The E-PRTR is compared with the NRW inventory and the Spanish PRTR – both of which do not contain pollutant reporting thresholds.

The objectives focus on ensuring that the E-PRTR provides a suitably complete inventory of releases and transfers from Europe's most environmentally important industrial (and agro-industrial) activities to support environmental legislation.

3.2 Key findings

A summary of the priority new pollutants, suggested threshold changes, and other key findings is presented below:

- The existing Annex II list of 91 pollutants covers a substantial proportion of pollutants listed in other environmental protection initiatives. Analysis of the IED and BAT conclusions, European environmental legislation and international conventions (listed in Section 1.2.2), other PRTRs and the scientific literature **identified 38 new pollutants of potential interest to the E-PRTR**. Table 3.1 details these pollutants and Table 3.2 suggests reporting thresholds. Sections 3.3.1 and 3.3.2 provide further details on the approach and rationale for the selected pollutants and reporting thresholds.
- Other pollutants of concern may emerge in the future, most notably **through the Water Framework Directive (WFD) watch-list process** where new potential priority substances are identified. Future assessments of the scope of the E-PRTR pollutant list are encouraged to **track** this existing process.
- **No E-PRTR Annex II pollutants are suggested for removal**. However, there are 24 pollutants whose usage is no longer permitted in Europe and for which releases have been reported in low quantities in recent years (see Annex A2.3 for further details). Still, there is merit in retaining these pollutants in the Annex II list since their **retention** enables historical time series to be tracked and global comparisons to be made,
- A Weibull statistical analysis of the 2016 E-PRTR data highlighted that, of the 60 air pollutants and 71 water pollutants present in the E-PRTR database, around half **of pollutants have thresholds restrictive enough to capture >90% of releases**. For the remaining half of pollutants, enough data was available to suggest that the **reporting thresholds should be lowered for 11 air pollutants and 14 water pollutants**. Table 3.3, Table 3.4 and Table 3.5 provide details on the revised threshold suggestions and the estimated additional facilities that would need to report under the suggested revised thresholds. Section 3.3.2 provides further details of the approach and rationale for the proposed revised reporting thresholds.
- The **benefit of removing pollutant thresholds** is high when the current capture-rate in the E-PRTR is low, and the impacts of the pollutant are large. The **burden of removing thresholds relates to additional reporting requirements**. Analysis of the NRW inventory and the Spanish PRTR (which have no reporting thresholds) identified that in these datasets 75% and 45% of facilities, respectively, currently have releases that are below the existing E-PRTR reporting thresholds. Extrapolated to all of Europe, **eliminating reporting thresholds completely** would result in a **substantial increase in numbers of facilities** required to report releases. In 2016 14,799 facilities reported releases under the E-PRTR. This number should increase to between 26,925 and 58,157 facilities if thresholds were to be removed (see Section 3.3.3).

Table 3.1 Candidate air, water and land pollutants for consideration as additions to Annex II of the E-PRTR (in alphabetical order).

Candidate Pollutant	OECD Shortlist high priority	IED Annex II[1]	WFD Priority	Gothenburg Protocol	Stockholm Convention	Basel Convention	BAT conclusions >2 sectors	NRW Inventory	Spanish PRTR	UK PRTR	French PRTR	Swedish PRTR
2-Ethoxyethanol / ethylene glycol monoethyl ether	✓											
Acetaldehyde	✓											
Aclonifen			✓									
Acrolein	✓											
Acrylamide	✓							✓				
Acrylic acid and its waster-soluble salts	✓											
Acrylonitrile	✓							✓				
Antimony and compounds (as Sb)	✓					✓	✓		✓			
Beryllium and compounds (as Be)								✓		✓		
Bifenox			✓									
Black carbon (BC)				✓								
Carbon disulphide	✓											
Chromium (VI) compounds (as Cr)	✓					✓						
Cobalt and compounds (as Co)	✓						✓	✓	✓			
Cybutryne			✓									
Cypermethrin			✓									
Dichlorvos			✓									
Dicofol			✓		✓							
Formaldehyde (formalin)	✓						✓	✓				
Hexabromocyclododecane (HBCDD)			✓									
Hydrogen sulphide							✓	✓			✓	

Candidate Pollutant	OECD Shortlist high priority	IED Annex II[1]	WFD Priority	Gothenburg Protocol	Stockholm Convention	Basel Convention	BAT conclusions >2 sectors	NRW Inventory	Spanish PRTR	UK PRTR	French PRTR	Swedish PRTR
Manganese and compounds (as Mn)	✓						✓	✓	✓	✓		
n-Hexane	✓											
Perfluorohexane sulfonic acid (PFHxS), its salts and PFHxS-related compounds					✓							
Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F)					✓							
Perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds					✓							
$PM_{2.5}$		✓		✓				✓		✓		
Polychlorinated naphthalenes					✓							
Quinoxyfen			✓									
Selenium and compounds (as Se)	✓			✓		✓		✓		✓		
Short-chain chlorinated paraffins (SCCPs)					✓							
Sulphates							✓				✓	
Terbutryn			✓									
Thallium and compounds (as Tl)						✓	✓	✓	✓			
Tin and tin compounds (as Sn)								✓		✓		
Total suspended particulate (TSP)				✓					✓	✓		✓
Total suspended solids (TSS)		✓					✓					
Vanadium and compounds (as V)							✓	✓	✓	✓		

[1]Annex II of the IED contains generic categories that include many of the candidate pollutants in this list.

Table 3.2 Suggested reporting thresholds for candidate pollutants for consideration as additions to Annex II of the E-PRTR (in alphabetical order).

Candidate pollutant	Threshold for releases			Comment
	to air (kg/year)	to water (kg/year)	to land (kg/year)	
2-Ethoxyethanol / ethylene glycol monoethyl ether	50	*	-	Air threshold consistent with TRI release data
Acetaldehyde	1,000	200	200	Same as benzene thresholds
Aclonifen	-	1	1	Same as pesticide thresholds
Acrolein	500	*	*	Air threshold consistent with TRI release data
Acrylamide	200	*	*	Air threshold consistent with TRI release data
Acrylic acid and its waster-soluble salts	500	*	*	Air threshold consistent with TRI release data
Acrylonitrile	1,000	*	*	Air threshold consistent with TRI release data
Antimony and compounds (as Sb)	20	5	5	Same as arsenic thresholds, consistent with TRI release data
Beryllium and compounds (as Be)	10	1	1	Same as the most stringent thresholds for metals
Bifenox	-	1	1	Same as pesticide thresholds
Black carbon (BC)	*	-	-	Needs further evaluation
Carbon disulphide	*	*	*	Needs further evaluation
Chromium (VI) compounds (as Cr)	10	1	1	Same as the most stringent thresholds for metals
Cobalt and compounds (as Co)	20	5	5	Same as arsenic thresholds, consistent with TRI release data
Cybutryne	-	1	1	Same as pesticide thresholds
Cypermethrin	-	1	1	Same as pesticide thresholds
Dichlorvos	-	1	1	Same as pesticide thresholds
Dicofol	1	1	1	Same as pesticide thresholds
Formaldehyde (formalin)	200	100	*	Air and land thresholds consistent with TRI release data
Hexabromocyclododecane (HBCDD)	-	1	1	Persistent substance, same as pesticide thresholds

Candidate pollutant	Threshold for releases			Comment
	to air (kg/year)	to water (kg/year)	to land (kg/year)	
Hydrogen sulphide	200	-	-	Same as hydrogen cyanide threshold
Manganese and compounds (as Mn)	10	1	1	Same as the most stringent thresholds for metals
n-Hexane	1,000	200	200	Same as benzene thresholds
Perfluorohexane sulfonic acid (PFHxS), its salts and PFHxS-related compounds	-	1	1	Very persistent substance, same as pesticide thresholds
Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F)	-	1	1	Very persistent substance, same as pesticide thresholds
Perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds	-	1	1	Very persistent substance, same as pesticide thresholds
$PM_{2.5}$	50,000	-	-	Same as PM_{10} threshold
Polychlorinated naphthalenes	0.1	0.1	0.1	Same as PCBs thresholds
Quinoxyfen	-	1	1	Same as pesticide thresholds
Selenium and compounds (as Se)	10	1	1	Same as the most stringent thresholds for metals
Short-chain chlorinated paraffins (SCCPs)	-	1	1	Persistent substance, same as pesticide thresholds
Sulphates	*	*	*	Needs further evaluation
Terbutryn	-	1	1	Same as pesticide thresholds
Thallium and compounds (as Tl)	10	1	1	Same as the most stringent thresholds for metals
Tin and tin compounds (as Sn)	10	1	1	Same as the most stringent thresholds for metals
Total suspended particulate (TSP)	50,000	-	-	Same as PM_{10} threshold
Total suspended solids (TSS)	-	*	-	Needs further evaluation
Vanadium and compounds (as V)	10	1	1	Same as the most stringent thresholds for metals

** Needs further evaluation*

Table 3.3 Results of Weibull statistical analysis: Releases to air – threshold reductions required to capture 90% of releases *(colour coding represents the confidence listed in the final column)*

Existing E-PRTR Pollutant	Current reporting threshold (kg/year)	% releases captured	Requirements to achieve 90% capture rate		Confidence
			Threshold required (kg/year)	Additional facilities reporting	
Arsenic and compounds (as As)	20	87%	12	63	High
Copper and compounds (as Cu)	100	83%	38	121	High
Fluorine and inorganic compounds (as HF)	5,000	89%	3,942	13	High
Non-methane volatile organic compounds (NMVOC)	100,000	82%	49,590	564	High
Ammonia (NH_3)	10,000	43%	447	120,593	Medium
Cadmium and compounds (as Cd)	10	89%	7	20	Medium
Particulate matter (PM_{10})	50,000	82%	17,309	330	Medium
1,1,2,2-tetrachloroethane	50	33%	1	265	Low
Chromium and compounds (as Cr)	100	90%	57	18	Low
Di-(2-ethyl hexyl) phthalate (DEHP)	10	69%	4	31	Low
Vinyl chloride	1,000	76%	1,289	40	Low

Table 3.4 Results of Weibull statistical analysis: Releases to water – threshold reductions required to capture 90% of releases *(colour coding represents the confidence listed in the final column)*

Existing E-PRTR Pollutant	Current reporting threshold (kg/year)	% releases captured	Requirements to achieve 90% capture rate		Confidence
			Threshold required (kg/year)	Additional facilities reporting	
Total phosphorus	5,000	81%	2,042	1,566	Medium
Asbestos	1	78%	0.3	107	Medium
Lead and compounds (as Pb)	20	84%	11	329	Medium

Existing E-PRTR Pollutant	Current reporting threshold (kg/year)	% releases captured	Requirements to achieve 90% capture rate		Confidence
			Threshold required (kg/year)	Additional facilities reporting	
Total organic carbon (TOC) (as total C or COD/3)	50,000	82%	41,381	1,085	Low
Copper and compounds (as Cu)	50	89%	48	50	Low
Total nitrogen	50,000	85%	26,233	764	Low
Zinc and compounds (as Zn)	100	85%	86	818	Low
1,2,3,4,5,6-hexachlorocyclohexane (HCH)	1	84%	0.7	4	Low
Aldrin	1	85%	0.9	3	Low
Anthracene	1	82%	0.4	67	Low
Chlorpyrifos	1	51%	0.1	40	Low
Diuron	1	30%	0.004	28,186	Low
Isoproturon	1	62%	0.1	87	Low
Trichloroethylene	10	84%	5	18	Low

Table 3.5 Results of Weibull statistical analysis: Releases to land – threshold reductions required to capture 90% of releases *(colour coding represents the confidence listed in the final column)*

Existing E-PRTR Pollutant	Current reporting threshold (kg/year)	% releases captured	Requirements to achieve 90% capture rate		Confidence
			Threshold required (kg/year)	Additional facilities reporting	
Nickel and compounds (as Ni)	20	48%	0.3	432	Low

3.3 Discussion

This section first summarises a comparison of the E-PRTR pollutant list against pollutants covered in the IED, other environmental legislation and initiatives, and national and international PRTRs. For the assessment of reporting thresholds, an overview of the methodology used for the Weibull analysis is first provided, followed by a discussion of the key results where reporting thresholds for releases to air, water and land may need to be changed to capture 90% of industrial releases. Finally, the implications of completely removing reporting thresholds are discussed. Annex 2 gives fuller details of the analyses carried out and findings.

3.3.1 Assessment of Annex II coverage of pollutants relevant to environmental initiatives

38 pollutants (see Table 3.1) were identified for possible inclusion in the E-PRTR. This is justified by a range of literature sources, environmental legislation including the IED and EU legislation to protect air, water and land, other international conventions and more comprehensive EU MS PRTRs and other PRTRs including:

- IED Annex II[12]
- BAT conclusions
- Water Framework Directive
- Stockholm Convention – POPs Regulation
- Gothenburg Protocol
- OECD shortlist of pollutants in major PRTRs outside Europe
- Basel Convention
- NRW Inventory
- Spanish PRTR
- UK PRTR
- French PRTR
- Swedish PRTR.

Substances were identified that met key criteria, such as:

- Their inclusion in different environmental initiatives;
- Ecotoxicological properties;
- Persistency in the environment;
- Bio-accumulation properties;
- Widespread use or release;
- Provision of a more complete and comprehensive tracking of environmental issues where industry has a role to play.

Annex 2 provides further details on the methods, data sources and assumptions used to arrive at the suggested 38 pollutants in Table 3.1.

A review of **IED BAT conclusions suggested the inclusion of 9 pollutants** in Annex of II of the E-PRTR Regulation. These are pollutants where associated emission levels (AELs) have been set for at least two BAT sectors.

For air, these pollutants are:

- formaldehyde
- hydrogen sulphide
- antimony
- cobalt

[12] Annex II of the IED contains generic categories that and include many of the candidate pollutants in Table 3.1.

- manganese
- thallium
- vanadium.

For water, these pollutants are:

- total suspended solids (TSS)
- sulphates.

In addition, the IED identifies fine particulates ($PM_{2.5}$) as an important pollutant for industrial regulation.

The **Water Framework Directive lists eight priority substances** not currently in the E-PRTR. These compounds, listed below, could be included in the E-PRTR.

- aclonifen
- bifenox
- cybutryne
- cypermethrin
- dichlorvos
- hexabromocyclododecane (HBCDD)
- quinoxyfen
- terbutryn
- dicofol.

Apart from HBCDD and dicofol, which are also identified by the Stockholm Convention list, none of these substances is included in other environmental initiatives.

The E-PRTR does not include some persistent organic pollutants that are listed in the Stockholm Convention (i.e. **polychlorinated naphthalenes and short-chain chlorinated paraffins, dicofol, HBCDD and perfluorinated compounds**). These compounds could be included in the E-PRTR to ensure coherence and consistency with the Stockholm Convention.

The **Gothenburg convention** focuses on global climate and long-range transboundary pollutants. The priority pollutants listed in the Gothenburg Convention (i.e. **black carbon, $PM_{2.5}$, total suspended particulates and selenium**) are not included in the E-PRTR. $PM_{2.5}$ is also covered by a number of EU Member State national PRTRs and the IED's Annex II. These compounds could be included in the E-PRTR.

The **heavy metals antimony, cobalt, manganese, selenium, thallium, and vanadium** are the most frequently listed pollutants across a range of environmental initiatives, Member State national PRTRs and international PRTRs, and are also suggested for inclusion in the E-PRTR Annex II list.

In addition to the 38 pollutants suggested for inclusion in the E-PRTR, a screening of the scientific literature and other relevant European strategies and action plans identified **additional substances for potential future inclusion** in Annex II of the E-PRTR Regulation (see Annex 2 for further details). Many of these substances are in the WFD watch lists. These lists are useful horizon-scanning tools and part of an

existing formal process for the tracking, review and ultimately potential designation of new priority substances or priority hazardous substances. To assist future assessments of the scope of the E-PRTR pollutant list, tracking the existing WFD watch-list process, along with new designations under the Stockholm Convention is encouraged.

24 E-PRTR pollutants, despite being severely restricted or banned for many years, are reported under the E-PRTR. There is a strong argument for retaining these pollutants in Annex II – to track continued reducing releases and for comparison with other parts of the world, as well as to demonstrate compliance with international conventions such as the Stockholm Convention. Furthermore, since there is little to no reporting of such releases, no significant reduction in reporting burden should be expected following their removal (see Annex 2 for more details).

Potential E-PRTR reporting thresholds for the 38 candidate pollutants are suggested for inclusion and identified in Table 3.2. The current E-PRTR reporting thresholds for similar pollutants are suggested where available. For pollutants not considered similar to E-PRTR pollutants and included in the U.S.TRI, thresholds are based on TRI facility-level data. Where existing reporting is unavailable, neither from the U.S.TRI nor from similar pollutants in the E-PRTR, further investigation of potential reporting thresholds should be considered. E-PRTR thresholds should be reviewed periodically when new pollutants are added to determine if the reporting thresholds should be adjusted.

3.3.2 Assessment of pollutant reporting thresholds in Annex II of the E-PRTR

A Weibull analysis was used to assess the effectiveness of the current Annex II reporting thresholds in capturing 90% of pollutant releases from activities covered under Annex I of the E-PRTR (hereafter referred to as the '90% capture rate'). Annex A2.4.2 provides further detail on this statistical methodology.

As the E-PRTR does not contain data on releases below the reporting thresholds, the percentage of total releases captured by current thresholds cannot be directly calculated. An assessment of whether each Annex II pollutant release threshold is expected to achieve a 90% capture rate used an indirect statistical (Weibull) approach.

This approach extrapolates the reported releases in the E-PRTR to estimate the quantity of unreported below-threshold releases, and hence calculate the capture rate for each pollutant. The technique plots cumulative E-PRTR releases from facilities ordered from largest to smallest release, then fits a Weibull distribution function to the data. The parameters of the Weibull distribution provide an **estimate of 'total' releases**, assuming that the below-threshold releases follow the same smooth distribution. Additionally, the fitted curve can infer the threshold, and number of facilities that are needed to capture 90% of releases.

Weibull analysis was performed for each combination of pollutant and release media (i.e. to air, to water and to land), with 2016 data from all MS and all activities considered together. For some pollutants, outlying data were corrected or removed (see Annex A2.4.2.2 for details).

2016 data from the Spanish PRTR and the NRW inventory were used to validate the results of the Weibull analysis. In these national data sets, the percentage of total releases captured by E-PRTR reporting thresholds can be directly calculated as no

release reporting thresholds exist. The Spanish PRTR and the NRW inventories were used to indicate the adequacy of the E-PRTR thresholds where Weibull analysis could not be undertaken due to lack of data (see Annex A2.4.2.2 and A2.4.2.3 for details).

For each release medium, the results for pollutants were grouped into statistical confidence categories according to the level of correspondence between the Weibull analysis results and results from analysis of the NRW inventory and Spanish PRTR:

- **High confidence:** The estimate of releases captured from the Weibull analysis is within 20 percentage points of the NRW inventory and Spanish PRTR results and is greater than or equal to the target 90% capture rate.
- **Medium confidence:** The Weibull analysis estimate is more than 20 percentage points away from either the NRW inventory **or** the Spanish PRTR **and** is less than or equal to the target 90% capture rate; or if there is no data available to validate the Weibull results in the NRW inventory and the Spanish PRTR.
- **Low confidence:** The Weibull analysis estimate is more than 20 percentage points away **or** on less than or equal to the target 90% capture rate from both the NRW inventory and the Spanish PRTR.
- **No estimate:** There is not enough data to fit the Weibull approach.

Table 3.3, Table 3.4 and Table 3.5 summarise the main results, highlighting the statistical confidence levels of the analysis. Annex A2.4.3 presents detailed tables.

3.3.2.1 Releases to Air

- **Current thresholds were found to be sufficient to achieve the target 90% capture rate for 30 out of the 60 air pollutants** (see Table A2.10 in Annex 2).
- According to the Weibull analysis, lower thresholds would be needed for **11 out of the 60 air pollutants** (Table 3.3) in order to achieve the target 90% capture rate.
- Further comparison with the NRW inventory and/or the Spanish PRTR was made for an additional five pollutants (i.e. ethylene oxide, hexachlorobenzene, pentachlorobenzene, pentachlorophenol and trichlorobenzenes). Where the Weibull analysis was not possible, the potential for lower thresholds is highlighted. Further evaluation of these thresholds may be required.
- Due to a lack of data, no estimates of capture rate were possible using the Weibull analysis for the remaining 14 of the 60 air pollutants. For these pollutants, no suggestions for revisions to thresholds are provided.

3.3.2.2 Releases to Water

- **Current thresholds are sufficient to achieve a 90% capture rate for 35 of the 71 water pollutants** (see Table A2.11 in Annex 2).
- Lower thresholds would be needed **for 14 out of 71 water pollutants** in order to meet a 90% capture rate (Table 3.4). For eight of these pollutants, the thresholds would only need lowering by a small margin as the current capture rate is over 80%.
- Due to a lack of data, the Weibull analysis was unable to estimate thresholds for 17 pollutants. For these pollutants, no suggestions for revisions of the thresholds

are provided. Using data from the Spanish PRTR, it is estimated that 14 of these pollutants should have lower thresholds to achieve a 90% capture rate, indicating that further evaluation of these thresholds may be required.

- For an additional five pollutants (mercury and compounds, dieldrin, endrin, isodrin and nonylphenol ethoxylates) capture rates were estimated at slightly below 90% using the Weibull extrapolation. However, due to uncertainty inherent in the statistical analysis the modelled thresholds were slightly higher than the current ones. For these pollutants, no suggestions for revisions to thresholds are provided. See Table A2.13 for results of the Weibull analysis for all pollutants.

3.3.2.3 Releases to Land

- In the reported E-PRTR data on releases to land from 2016, sufficient data (more than 10 release reports) were only available to conduct the analysis for a single pollutant – nickel and compounds. In order to capture 90% of releases, the reporting threshold would need to be lowered from 20 kg/year to 0.3 kg/year. This lowering threshold would require an estimated 432 additional facilities to report releases. However, confidence for this finding is low since no corroborating data were available from the Spanish PRTR or NRW inventories.

3.3.3 Benefit and burden of removing pollutant reporting thresholds

The concept of removing all E-PRTR thresholds was assessed to provide some guidance on the added benefit and burden.

In many cases, the removal of all thresholds would provide more complete, accurate and transparent inventories of industrial releases. However, there would be significant additional burden placed on reporting facilities and competent authorities to provide data for smaller facilities and smaller, less significant releases.

The analysis of additional burden used 2016 data from the Spanish PRTR and NRW inventory, both of which have no release thresholds and hence all facilities emitting pollutants must report releases[13]. The analysis assessed the proportions of facilities in the Spanish PRTR and NRW inventory reporting releases above and below the existing E-PRTR reporting thresholds.

An estimate was undertaken of the number of facilities, across all reporting countries, that would need to start reporting if E-PRTR thresholds were to be removed. This analysis applied the proportions extrapolated from the number of facilities reporting above-threshold releases in the Spanish PRTR and NRW inventory reporting.

For example, if the NRW inventory indicates that 10% of facilities report above-threshold releases of a pollutant, and 50 facilities reported this pollutant to the E-PRTR in 2016, then it is assumed that these 50 facilities represent 10% of the total releasing that pollutant across Europe. The total number in this example would be 500 facilities, with 450 currently reporting at below-threshold level, and therefore potentially needing to begin reporting if thresholds are removed.

[13] The Weibull extrapolation technique using E-PRTR data is not appropriate for this specific purpose, as it is not possible to estimate the total number of facilities emitting a pollutant with this technique (see Annex A2.4.2.2 for an explanation).

The analysis estimated the impacts of removing thresholds. Two approaches crudely reflect the possible extremes of different assumptions on the burden of data gathering and reporting situations (in terms of number of facilities affected).

- **The individual pollutant approach** assumes that there is an equal amount of additional burden per extra pollutant reported. This is an extreme assumption as in many cases measurements/calculations are already made (and just not reported) or can be compiled for multiple pollutants at a time.
- **The all-or-nothing** approach assumes that if a facility is already measuring and reporting at least one pollutant (and therefore already preparing E-PRTR reports) the burden of additional pollutant reporting is minimal. The major burden would be imposed to the additional facilities that would now have to report, when previously all their releases were below the threshold. This was assessed separately for each release medium, as well as regarding overall releases per pollutant (i.e. independently of the release medium). This approach is relevant if the main burden is the administrative reporting process, so reporting releases of one pollutant would be almost as burdensome as reporting releases of 20 pollutants.

3.3.3.1 Results of the individual pollutant approach

In general, the additional burden from removing reporting thresholds would be high, when analysed at the pollutant-by-pollutant level, for both releases to air and to water. The key assumption in this approach is that there is an equal amount of additional burden per each additional pollutant reported.

For 46 air pollutants and 59 water pollutants, at least three-quarters of facilities currently release at below-threshold levels in the NRW inventory and/or Spanish PRTR.

When estimating the additional facilities across all countries that would need to begin reporting a given pollutant to the E-PRTR in a no threshold scenario, the result varies considerably for each pollutant. **For releases to air, between 66 and 36,926 additional facilities** would have to report (for 1,1,2,2-tetrachloroethane and nitrous oxide respectively). **For releases to water, the estimates varied between an additional 25 facilities** for chlorpyrifos **and 23,450 facilities** for mercury and compounds.

On average, across all pollutants and considering extrapolations from both the NRW inventory and Spanish PRTR, **the number of facilities reporting would rise from 456 per pollutant with current thresholds** (based on 2016 E-PRTR data) **to 7,797 per pollutant with no thresholds for releases to air, and from 235 to 2,723 per pollutant for releases to water.**

Full details on the findings for each pollutant are provided in Annex A2.4.3.3, Table A2.14 and Table A2.15.

For most air pollutants, results from the NRW inventory and Spanish PRTR were consistent. One exception to this is ammonia (NH_3), where 79% of facilities report below-threshold releases in the NRW inventory, but only 30% do so in the Spanish PRTR.

For water pollutants, the NRW inventory contained relatively few pollutant reports and, where data were available, the proportion of facilities reporting at below-threshold levels was sometimes much lower than for the Spanish PRTR. This was

the case for copper and compounds, nickel and compounds, total organic carbon (TOC), total nitrogen, and zinc and compounds.

This assessment could not be made for releases to land as none are reported in the NRW inventory or Spanish PRTR.

3.3.3.2 Results of the all-or-nothing approach

This section summarises findings from an assessment of the percentage of facilities in the NRW inventory and Spanish PRTR which currently do not report releases above threshold for *any* pollutant from E-PRTR activities (and therefore would not submit any reports were thresholds applied). The key assumption behind this approach is that if a facility is already measuring and reporting at least one pollutant the burden of reporting for additional pollutants is minimal. In other words, the main burden lies in preparing the report, independently of the number of pollutants included.

The first column of Table 3.6 presents the percentage of facilities reporting under the NRW inventory and the Spanish PRTR with releases below current E-PRTR thresholds. The second column gives the number of facilities reporting releases in E-PRTR 2016, while the final column estimates the extrapolated total number of facilities that would report to E-PRTR in a no threshold scenario.

Table 3.6 Percentage of facilities with releases below current E-PRTR thresholds

Release medium	% of facilities reporting at below-threshold level for all pollutants	Number of facilities reporting releases in E-PRTR 2016	Extrapolated total facilities reporting in the E-PRTR
NRW Inventory			
To Air	80%	12,393	62,341
To Water	29%	3,449	4,849
To Air and Water	75%	14,799	58,157
Spanish PRTR			
To Air	48%	12,393	23,960
To Water	65%	3,449	9,971
To Air and Water	45%	14,799	26,925

Note that the numbers in the 'Air' and 'Water' rows do not have to add up to the combined totals, as there are many facilities which release both air and water pollutants.

Overall, 75% of facilities in the NRW inventory currently report all releases to air and water at below threshold levels, versus 45% of facilities in the Spanish PRTR. Extrapolated to all of Europe, **eliminating reporting thresholds completely** would result in a **substantial increase in numbers of facilities** required to report releases. **While in 2016 14,799 facilities reported releases, this figure should increase to between 26,925 and 58,157 facilities if thresholds were removed.**

The difference between the results from the Spanish PRTR and the NRW inventory may highlight the different types of activity and the different size distribution of facilities in the two inventories. It is not possible to determine whether this analysis

represents the full range of variation which would occur across all European countries.

3.3.3.3 Comparison

The additional burden of removing pollutant release thresholds, in terms of number of facilities having to begin reporting, is larger when assuming there is additional burden per additional **individual pollutant** reported compared to an **'all-or-nothing'** assumption. This reflects the fact that a facility is much less likely to be releasing *all* pollutants at below threshold levels than it is for any given individual pollutant.

The true additional burden would probably fall somewhere between these two extremes. It may be more complicated, if the time and effort required to measure or estimate releases varies considerably amongst pollutants.

It is difficult to weigh-up the additional benefit (in terms of the improvement in capture-rate of pollutant release reporting) of removing thresholds with the additional burden. The balance of cost and benefit is likely to differ across pollutants, so it may be appropriate to prioritise threshold removal for those pollutants where additional data would be especially beneficial.

4 Review of E-PRTR Guidance on Release Quantification

Article 14(1) of the E-PRTR Regulation required the European Commission to draw up a Guidance document to support E-PRTR implementation. This document, published in May 2006, covers practical matters such as who should report, what information is required and how data should be submitted. The Guidance aims at ensuring transparency, completeness, consistency, comparability and accuracy of data reported in the E-PRTR by Member States.

A recent Staff Working Document[14] from the European Commission's Regulatory Fitness and Performance Programme (REFIT) evaluation of the E-PRTR Regulation concluded that an update to the Guidance document would help to improve interpretation of the Regulation by Member State competent authorities and facility operators. While a full revision of the Guidance is not feasible, updates to specific components of the Guidance would be considered valuable.

There are three **method classes** (measurement, "M"; calculation, "C"; or estimation, "E") used to categorise reported data. The type of release quantification method used (method class) can have a significant impact on the quality of values reported to the E-PRTR. Measurement and Calculation are usually more accurate than estimation.

Variations in the methods used can also impact the quality of the time series of data in the E-PRTR and comparability between facilities. Although the E-PRTR Regulation does not include definitions for "M"/"C"/"E", Section 1.1.11 of the Guidance document for the implementation of the E-PRTR defines the method classes and when each should be used:

> Class M: Release data are based on measurements **("M")**. Additional calculations are needed to convert the results of measurements into annual release data. For these calculations the results of flow determinations are needed. "M" should also be used when the annual releases are determined based on the results of short term and spot measurements. "M" is used when the releases of a facility are derived from direct monitoring results for specific processes at the facility, based on actual continuous or discontinuous measurements of pollutant concentrations for a given release route.
>
> Class C: Release data are based on calculations **("C")**. "C" is used when the releases are based on calculations using activity data (fuel used, production rate, etc.) and emission factors or mass balances. In some cases more complicated calculation methods can be applied, using variables like temperature, global radiance etc.
>
> Class E: Release data are based on non-standardised estimations **("E")**. "E" is used when the releases are determined by best assumptions or expert guesses that are not based on publicly available references or in case of absence of recognised emission estimation methodologies or good practice guidelines.

In the case of method classes M and C, the operator should also report the specific **methodology** used to quantify the release.

Article 9(1) of the E-PRTR Regulation also states that the operator of a facility is responsible for the quality of the reported data. The existing Guidance document

[14] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1513176768325&uri=SWD:2017:710:FIN

provides information on quantification methods and quality assurance (QA) procedures; however, this information is quite limited (especially for C and E methodologies) and outdated (in the case of M techniques). Consistent application and reporting of method classes and methodologies provides transparency and ensures the comparability and credibility of the data.

4.1 Objectives

The objective for the review of E-PRTR guidance on release quantification was the development of proposals **to the E-PRTR guidance to help improve the quality of reported E-PRTR data**. Specific objectives included:

- **Improving understanding of which quantification methods are used** to estimate releases reported to the E-PRTR, how these have changed over time and whether the methods, data sources and assumptions used are transparent;
- **Assessment of the quality of reported information** using the different quantification methods;
- **Identification of other relevant guidance on release quantification** produced by Member States and industry trade associations that may complement and/or improve the E-PRTR Guidance document;
- Future revision of the E-PRTR Guidance document **to consider improvement proposals and suggestions on release quantification**.

4.2 Key findings

Analysis of the E-PRTR Guidance document and E-PRTR data resulted in the following key findings:

- Measurement or Calculation method classes dominate the reporting of releases to air and water:
  - In 2016, 42% of reported pollutants **used measurement methods to quantify releases**;
  - 49% of reported pollutants for 2016 **used calculation methods.** This has risen slightly since the equivalent figure of 45% in 2007.
  - There is a **noticeable migration from Measurement** (reducing by 5%) to **Calculation** (increasing by 4%) over the 2007 – 2016 period;
  - **around 10%** of annual reports use release **Estimation** techniques (the least accurate method class).
- The **most commonly reported pollutants** (such as SO_2, NO_X, CH_4) have seen **little change in the method class used** between 2007 and 2016 i.e. the approaches to reporting releases are seemingly stable.
- For **less commonly reported pollutants** (such as hexachlorobenzene, tetrachloromethane and anthracene), which are reported by a relatively small number of facilities, there is **significant fluctuation in the method classes used**. Over the time-series, a wide variety of trends occur including a high variability in reported method classes from one year to the next.

- **More than 50% of Measurement and Calculation reports are not transparent.** They have an insufficient methodology description (e.g. 'No info' or 'Other measurement/calculation methodologies'[15] are reported).
- **Incompatible combinations of method class and methodology are used**, e.g. selecting "mass balance methodology" for a release determined using Measurement (NB mass balance is only applicable to Calculation methods).
- There are different approaches to handling measurements below the limits of detection or quantification.
- There is a lack of guidance on which **sources of diffuse or non-channelled releases** should be reported.
- Releases can be over-estimated due to the **presence of pollutants in process inputs** (e.g. cooling water abstracted from a river).
- **The same values** for **accidental releases and total releases are reported** in some cases, a situation expected to be unlikely for annual totals of releases.

Improvements to the E-PRTR Guidance document and reporting tools is recommended regarding the following:

- **Criteria for the selection of M/C/E and methodology description**, including advice on where more than one methodology description is applicable;
- **Reporting measurements below the limits of detection** or quantification, drawing on national, regional and sectoral guidance;
- **Identifying which sources of diffuse or non-channelled emissions** should be considered;
- If pollutants are present in process inputs **allow background pollutant loads to be subtracted**;
- **Requirements for data validation by competent authorities**, including consistency checks of method class and methodology and detailed checks of methodology descriptions;
- **Updating EEA and national PRTR reporting tools** to prevent the selection of incompatible combinations of method class and methodology, and to require a description of the 'other measurement/calculation methodology' used;
- **A reliability indicator** that assesses and ranks the credibility of reported releases.

4.3 Discussion

Work for this part of the report involved assessing the method class (i.e. measurement, calculation or estimation) and methodologies used to quantify releases given in each release report in the E-PRTR between 2007 and 2016. The analysis looked at changes in the relative use of method classes along with situations where data quality could potentially be compromised, such as reports with incompatible combinations of method class and methodology or with no specified methodology. The analysis also looked at instructions, advice and other reference

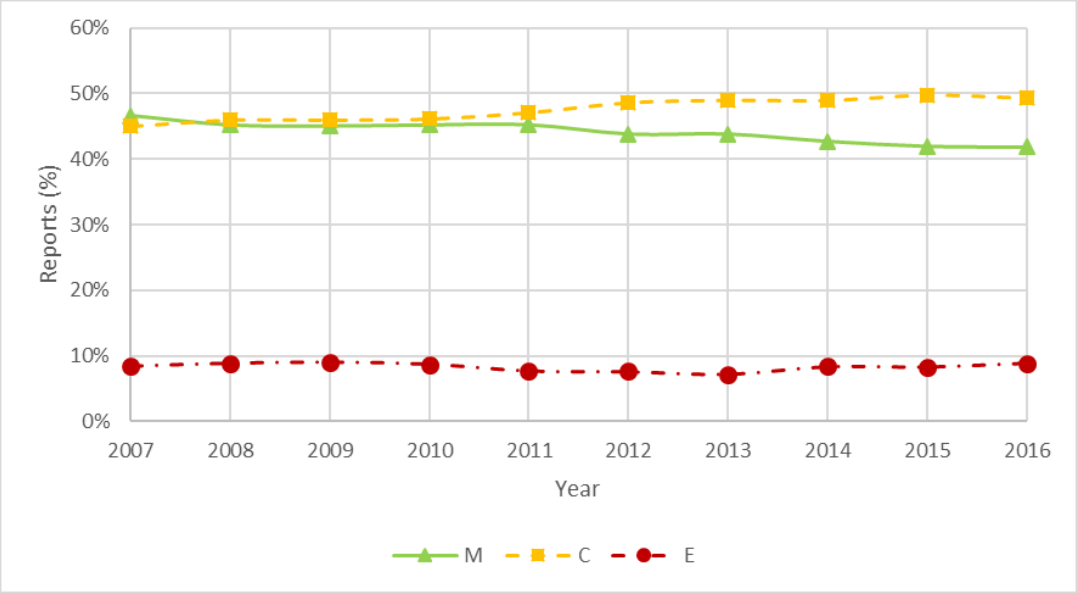
[15] With no further description of the methodology used.

material in guidance documents published by national and regional authorities. Results of a consultation with industry trade associations on release quantification guidance for E-PRTR reporting were summarised. Finally, the team developed possible improvement proposals for reporting tools and on release quantification, for possible inclusion in any future revision of the E-PRTR Guidance document.

4.3.1 Analysis of the use of measurement, calculation and estimation methods in the E-PRTR

It is important to understand the use and change in use of method classes. The chosen method class for quantifying releases (i.e. M, C or E) can affect the absolute value reported by operators and hence whether the reporting thresholds are exceeded. Figure 4.1 shows the evolution of quantification method class reported for all releases to air and water during the period 2007-2016. In general, there is an increase in C and E at the expense of M over this time period. Annex A3.1.1 provides full details of the analysis.

Figure 4.1 Evolution of quantification method classes for releases to air and water



The individual pollutant analysis shows a wide variety of trends. The analysis identifies two main groups of pollutants.

There is a group of pollutants with no significant changes over time in quantification method classes. Methane (Figure 4.2), SO_2, NO_X, chlorides and total nitrogen tend to be the stable over time, reported using well-established methods and reported by many facilities. Other pollutants exhibit very erratic method changes over time in quantification method classes, as in the example of trichloroethylene (Figure 4.3). This pattern usually relates to pollutants reported by a low number of facilities. Changes in the quantification method class used by a few facilities produces large variations in the overall pattern.

Figure 4.2 Method classes for quantifying methane releases to air[16]

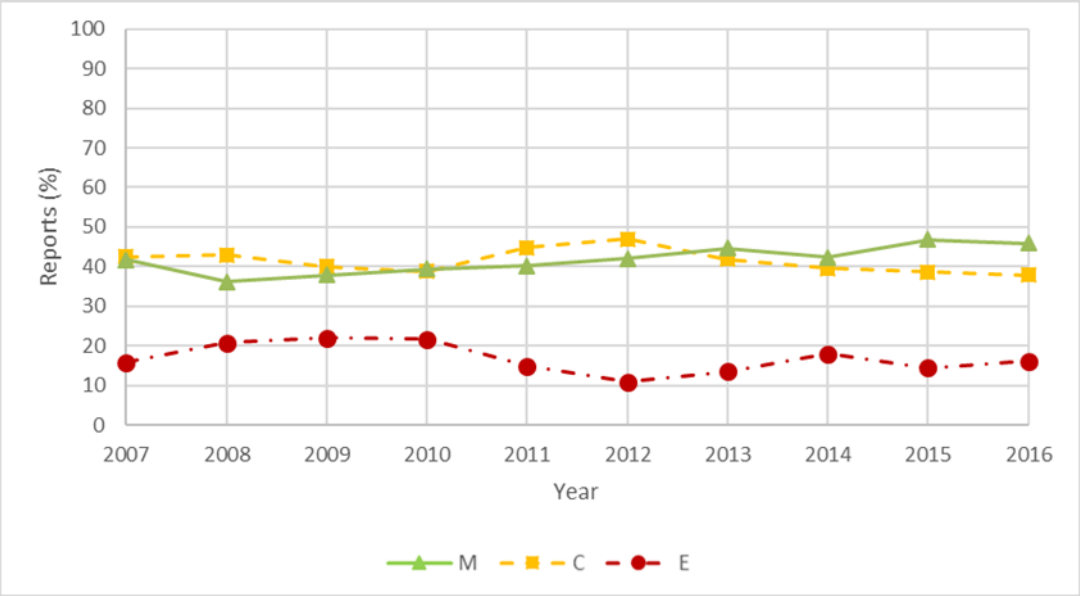
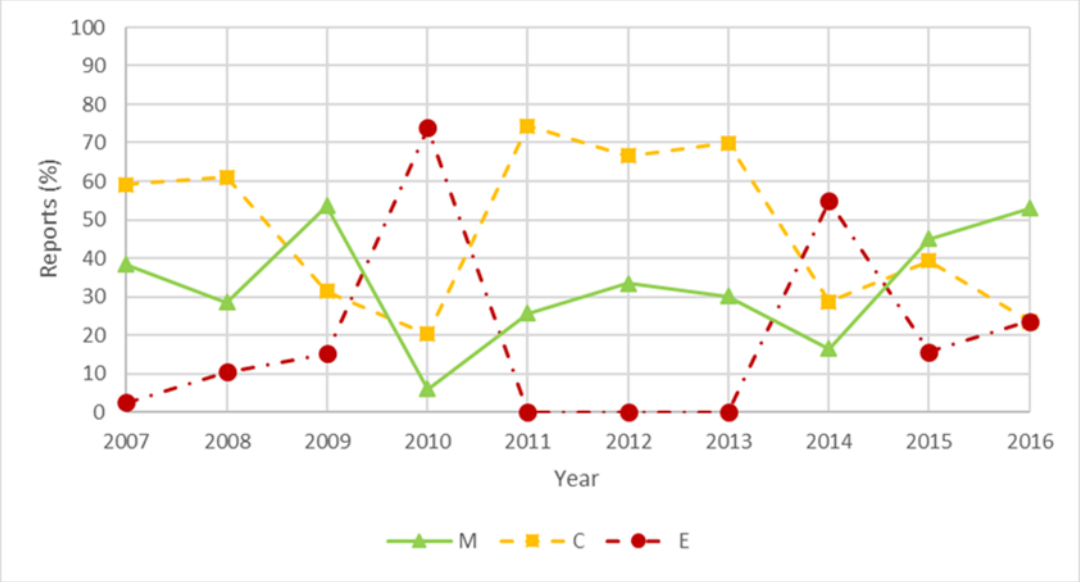


Figure 4.3 Evolution of quantification method classes used for releases to air of trichloroethylene from sectors that represent 80% of total releases.



4.3.2 Analysis of the methodologies used in measurements, calculations and estimations

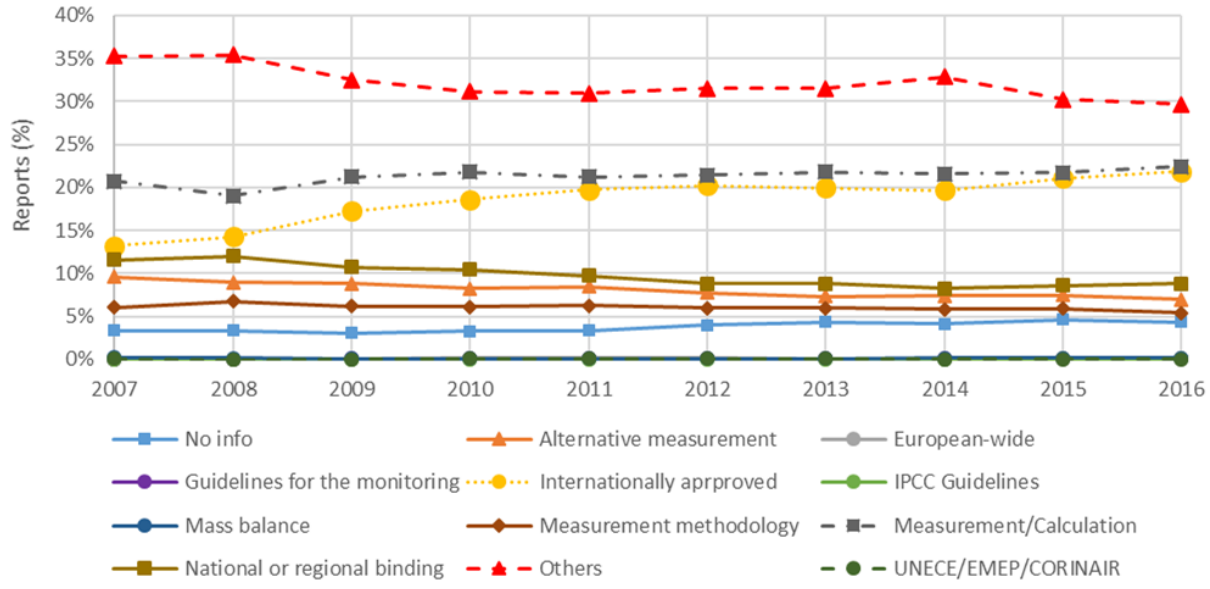
As stated in the E-PRTR Guidance document, providing information about the method classes and methodology used to determine release or off-site transfer amounts ensures the credibility of the data. In contrast, the lack of such information may compromise data quality.

[16] From France, Germany, Italy, Poland, Portugal, Spain and the United Kingdom (together representing 80% of total emissions).

An aim of this review was to analyse the range of the reported methodology descriptions. This analysis aimed to show how the use of different quantification methodologies has evolved. Reported data that are based on M or C must include details of the methodology used, according to the current E-PRTR Guidance document.

The prevalence of the methodologies used for reported releases is shown in Figure 4.4 with more information presented in Table 4.1. The frequency of use of the option '*Other measurement/calculation methodology*' and the absence of any descriptive information – defined in this report as '*No info*'[17] – were the focus of this analysis**,** since the level of certainty associated with the releases reported using these methodologies is unknown.

Figure 4.4 Evolution of methodologies used in measurements (number of reports)



[17] That is, without any methodology description in the E-PRTR data base.

Table 4.1 Distribution of methodologies used in 2016 (*'No info' and 'Other' are highlighted in yellow*)

	REPORTING YEAR: 2016					
	M (MEASURED)		C (CALCULATED)		E (ESTIMATED)	
	Number of reports	%	Number of reports	%	Number of reports	%
No info	687	4%	15	0%	1532	46%
Alternative measurement methodology in accordance with existing CEN/ISO measurement standards	1097	7%	22	0%	46	1%
European-wide sector specific calculation method	23	0%	1338	7%	7	0%
Guidelines for the monitoring and reporting of greenhouse gas emissions under the Emission Trading Scheme.	7	0%	980	5%	0	0%
Internationally approved measurement standard	3446	22%	525	3%	127	4%
IPCC Guidelines	10	0%	271	1%	19	1%
Mass balance method which is accepted by the competent authority	26	0%	853	5%	9	0%
Measurement methodology for the performance of which is demonstrated by means of certified reference materials and accepted by competent authority.	854	5%	2	0%	2	0%
Measurement/Calculation Methodology already prescribed by the competent authority in a licence or an operating permit for that facility	3532	22%	2039	11%	58	2%
National or regional binding measurement/calculation methodology prescribed by legal act for the pollutant and facility concerned.	1391	9%	633	3%	85	3%
Other measurement/calculation methodology	4678	30%	10827	58%	1450	43%
UNECE/EMEP EMEP/CORINAIR Emission Inventory Guidebook	4	0%	1053	6%	2	0%
TOTAL REPORTS	15755	100%	18558	100%	3337	100%

The main conclusions derived from analysis of reported methodologies (presented in full in Annex A3.1) are:

- The same methodology descriptions are sometimes used, regardless of whether the quantification method class is M, C or E. This contravenes the instructions in the current Guidance document. If Member State reporting tools present the available appropriate methodology descriptions, once M, C or E has been selected, this issue could be addressed.
- The current situation leads to incompatible combinations, such as the use of methodologies designed for measurements in the description for calculated (or even estimated) data. A more explicit definition of each methodology, in addition to unambiguously linking each methodology to M, C or E would address this situation.

For more than 50% of all release reports, an insufficient methodology description ('No info' or 'Other measurement/calculation methodology') is provided. Section 4.3.3 provides further details.

4.3.3 Number of reports using the methodologies 'Other' or 'No info' for each country

The percentage of data classified as 'No info' or 'Other measurement/calculation methodologies' is significant in most countries for both measured and calculated data, leading to a high level of uncertainty in data quality. Annex A3.1 provides full analysis of the data reported as 'No info' and 'Other measurement/calculation methodology'. The main conclusions of that analysis are:

- Approximately 35% of release reports, categorised as method class "**measurement**", were labelled as using 'Other measurement/calculation methodology', and a further 5% of release reports do not include any additional information ('No info') about the methodology. This is an issue that affects most Member States, with 22 countries reporting at least 10% of their measured release reports with insufficient information about the methodologies used.
- 'Other measurement/calculation methodology' was used for labelling the methodology for about 60% of release reports applying the "**calculated**" method class. On a country-by country basis, 14 of 32 countries report over half of their total data using 'Other measurement/calculation methodology'. There are very few calculated release reports with the methodology reported as 'No info'.
- For **estimated** data, approximately 90% of release reports have an insufficient methodology description (i.e. 'No info' or 'Other measurement/calculation methodology'). In recent years the number of reports with 'No info' for the methodology has increased significantly (from 28% of all reports in 2007 to 43% of all reports in 2016), while information coded as 'Other measurement/calculation methodology' has decreased by a similar amount. Completion of the methodology description is mandatory for M and C, but optional for E.

4.3.4 Analysis of incompatible combinations of method class and methodology

Incompatible combinations are cases where the method class and the methodology reported are different from the foreseen combinations set out in the E-PRTR Guidance document – see Table 4.2. For instance, as a mass balance methodology is a calculation method class, if a report states the method class as measurement (M) and that a mass balance methodology was used, there is inconsistency.

Incompatible method class and methodology combinations represent a source of uncertainty that contribute to poor data quality.

Table 4.2 Compatible quantification method classes and methodologies

Measurement methodologies
Internationally approved measurement standard
Measurement methodology already prescribed by the competent authority in a licence or an operating permit for that facility
National or regional binding measurement methodology prescribed by legal act for the pollutant and facility concerned
Alternative Measurement Method in accordance with existing CEN/ISO measurement standards
Measurement methodology the performance of which is demonstrated by means of certified reference materials and accepted by competent authority
Other measurement methodology
Calculation methodologies
Internationally approved calculation method
Calculation methodology already prescribed by the competent authority in a licence or an operating permit for that facility
National or regional binding calculation methodology prescribed by legal act for the pollutant and facility concerned
Mass balance method which is accepted by the competent authority
European-wide sector specific calculation method
Other calculation methodology

Incompatible combinations are not significant at the European level (<0.5% for measured data; <3% for calculated data), but this is indicative of some non-compliance with the reporting guidelines and a potential source of uncertainty. Two countries (Greece and Italy) represent a large share (nearly 50%) of the incompatible combinations for measurements, while the United Kingdom accounts for 66% of the total incompatible combination reports for calculations. Consultation with these countries could further clarify these issues.

Annex A3.2 provides the full results of this analysis. The main conclusions are:

- For measured data, most of the reports with incompatible combinations are in the following sectors: energy, mineral industry, and production and processing of metals.
- For calculated data, the distribution by sectors of incompatible combinations is concentrated in waste and wastewater management, energy, and intensive livestock production and aquaculture.

Given these conclusions, competent authorities could improve data validation through the following suggestions:

- Incompatible combinations of method classes and methodologies are avoidable if, once an operator has selected M or C, Member State reporting tools present only the available appropriate methodologies for selection.
- Member States that do not have incompatible combinations are consulted to see whether their reporting tools already have such restrictions in place.
- If an operator enters 'Other measurement/calculation methodology' in their report, the reporting tool should require them to fill a text field describing this methodology. This would allow competent authorities to assess whether an appropriate methodology was used. It will also help compile information for including further methodology codes in the future.
- Reporting tools should not allow reporting facilities to leave the 'Method class Name' field empty.

4.3.5 Guidance developed by national authorities and others

Guidance documentation generated by six Member States helped identify the potential existence of useful instructions, guidance or advice related to E-PRTR reporting. The analysis considered documentation from Sweden, Portugal, Spain, Ireland, France and the UK (Scotland), as well as other existing references such as those published by the OECD. In some countries (or regions), sector specific guidelines have been developed (e.g. guidance for glass manufacture and cement production in Spain, and for waste water in Germany).

The main findings of the review of this guidance are summarised below.

'Emissions based on values below reporting limit – a study on how low emission values are reported in Sweden'[18]

The aim of the study was to obtain an overview of how Swedish operators report releases based on values below the limit of quantification for the analytical methods used.

There are no clear guidelines on how to calculate the releases in cases when the analytical value is below the limit of quantification (the reporting limit) for the analysis. This may result in large differences in the reported values depending on which method operators use. The report proposed alternatives for handling these values and the effects of treating them in different ways (see Annex A3.3.1).

Portuguese 'Metodologia Nacional PRTR'[19]

The document has many aspects in common with the E-PRTR Guidance document. Both documents define what air and water releases are, which pollutants must be reported, which facilities have to report, and the method classes and classifications are described.

[18] Emissions based on values below reporting limit – a study on how low emission values are reported in Sweden (SMED Report No 9, 2018), http://urn.kb.se/resolve?urn=urn:nbn:se:naturvardsverket:diva-8263

[19] http://apambiente.pt/_zdata/Instrumentos/PRTR/2015_Metodologia Nacional PRTR_.pdf

An additional manual[20] helps Portuguese operators complete the PRTR reporting form and understand how to treat values below the limits of detection and quantification. Annex A3.3.2 provides a summary of these methods.

Spain has no national guidance but regions have published recommendations (as memoranda for operators) or instructions (for staff responsible for validation)[21]

Several regions in Spain have produced guidance for operators explaining what to report and how. Review of these materials showed that there are contradictory approaches to the treatment of values below the limit of detection in the different regions – see Annex A3.3.3.

Multiple Spanish regions provide guidance for specific sectors (beer industry, open-pit mining and quarrying, glass manufacturing, thermal power plants and other combustion plants, amongst others)[22]. In general, these guides provide information on releases associated with the production processes, pollutants, release calculation methodologies and emission factors (for air pollutants).

Irish 'EPA Guidance Note: Annual Environmental Report Annex on AER / PRTR Reporting'[23]

This document defines all three existing reporting method classes (M, C, E) and the methodologies available for each method class, including additional calculation methods approved by the Irish Environmental Protection Agency (EPA).

The EPA reporting tool includes a field called 'Designation or Description', where operators must provide a brief description of the methodology used. In cases where E is reported as the method class this cell should be left blank, but a short description of the methodology used must be entered as a footnote in the full Annual Environmental Report (AER). The Irish guide establishes how to treat measurement values below the limits of detection or quantification – see Annex A3.3.4.

Ireland has also developed additional sectoral guides with tools for the calculation or estimation of the most relevant pollutants in different sectors (e.g. intensive agriculture, waste water treatment, quarrying, combustion plants and landfills).

French 'GEREP Guide'[24]

This guide is valid for reporting to the E-PRTR and the French national emission register. It defines all three reporting method classes (M, C, E) and the methodologies available to each method class. It also includes a fourth method class (ILQ), for cases

20 https://apoiosiliamb.apambiente.pt/sites/default/files/documentos/Manual%20de%20Instru%C3%A7%C3%B5es%20PRTR%2BLCP_0.pdf

21 For example: http://www.comunidad.madrid/sites/default/files/doc/medio-ambiente/carta_inicio_prtr_datos_2018_13062679.pdf, http://www.agroambient.gva.es/es/web/calidad-ambiental/documentos-de-interes

22 Other sectoral guidance documents have been developed for certain activities (glass containers, farms, galvanisation, pulp / paper, refineries) at the national level: http://www.prtr-es.es/documentos/metodos-medicion-calculo

23 http://www.epa.ie/pubs/advice/aerprtr

24 https://www.declarationpollution.developpement-durable.gouv.fr/gerep/afficherGuideAidePopup.do?methode=lecture

when measured data are below the limit of quantification. The relevant parts of this document are summarised in Annex A3.3.5.

France has produced additional sectoral guides (e.g. waste treatment, cement, steel production, farms, etc.) that include calculation tools or emission factors for the most relevant pollutants in each sector.

Scotland has not developed a specific guide for E-PRTR reporting, but there are guides for reporting to the Scottish Pollutant Release Inventory (SPRI).

The analysed documents are 'General Operator Guidance' and 'Operator Guidance on Release Estimation Techniques'[25]. The first document gives a general method on how to determine releases from sites and the second document provides information on release estimation techniques (RETs) to assist operators in preparing submissions to the SPRI. Annex A3.3.6 summarises these two documents.

Germany has developed a guide called 'Calculation methods for waste water mass emissions'[26]

This document discusses the necessary equipment for taking and analysing samples, defines specific sampling methods for 42 substances and gives emission factors for each of the considered pollutants.

Regarding the limits of detection, if the number of measurements above the limit of detection (LoD) is higher or equal to 10%, the results below the LoD are assigned a value of 50% of the LoD. Otherwise, the values below the LoD are assigned a value of zero.

The Organisation for Economic Co-operation and Development (OECD) has developed multiple guidance documents[27] to help with the implementation of a PRTR

These documents assist with designing PRTRs and the harmonisation of PRTRs in different countries. They also pay special attention to data quality, developing a compendium of techniques used to estimate releases from various sources (point sources, diffuse sources, off-site transfers, and releases from products).

No relevant information is provided on the use of measured values below the limit of quantification (LoQ). However, these documents list available quantification techniques (e.g. direct monitoring, mass balance, chemical-specific emission factors, engineering calculations and engineering judgement) and provide links to the documentation related to these techniques in existing PRTR systems.

4.3.6 Guidance developed by trade associations

Some industry trade associations have developed instructions and advice for their members regarding E-PRTR reporting. A sample of 27 trade associations, covering different industrial sectors, were asked whether they have produced any guidance or asked for any feedback on how release quantification for E-PRTR reporting could be improved. Two thirds of the trade associations contacted responded – Annex A3.3

[25] https://sepa.org.uk/environment/environmental-data/spri/operator-guidance

[26] https://wiki.prtr.bund.de/images/6/65/Einheitliche_Berechnungsmethode_Frachtermittlung_im_Abwasser.pdf

[27] http://www.oecd.org/env/ehs/pollutant-release-transfer-register/publicationsintheseriesonpollutantreleaseandtransferregisters.htm

summarises the responses and documents received. Most of the responding trade associations have not developed sectoral-specific guidance for E-PRTR reporting.

Specific documentation has been produced for E-PRTR reporting in two sectors: power generation[28] and oil refining[29]. These sectors have a high polluting potential which is likely to be a driver for developing effective documentation to standardise reporting procedures and quantification of releases. Guidance includes:

- Emission factors for the most significant pollutants
- Necessary data for quantification
- Consideration about measurements below the limit of detection
- Pollutants to be continuously monitored.

The guidance developed by these associations are an exception. For other industrial sectors, no evidence of this type of guidance exists.

Responses from industry trade associations covered three main points:

- **A desire for consistent measurement and reporting between Member States**. Different measuring and reporting approaches hamper the usefulness of the E-PRTR as a pan-European tool.
- **General instructions that standardise reporting** would be a welcome improvement in the current reporting system in order to make the published data more accurate and reliable.
- **The E-PRTR is an additional administrative burden and changes that increase this burden would be unwelcome**. The need for extensive environmental information, especially continuous emission monitoring (CEM) systems was of concern. The cost of monitoring for facilities versus the utility of reported data should be evaluated.

4.3.7 Improvement proposals

The improvement proposals suggested below are based on the analysis of E-PRTR data and on the review of relevant guidance. These proposals are categorised within the following sections:

- Reporting tool improvements
- Guidance document improvements
- Other proposals.

In some cases, the following proposals may be complementary, with more than one of them addressing the same issue but from a different perspective.

[28] Eurelectric (trade association for the power generation sector) prepared sectoral guidance in 2008. It is worth highlighting the guidance to calculate plant specific emission factors for certain pollutants, based on measurements.

[29] Concawe (trade association for the oil refining sector) plays the most active role in this area, producing the first guidance documentation in 2007 and updates in 2009, 2015 and 2017.

4.3.7.1 Reporting tool improvements

Updating the EEA and national PRTR reporting tools may be the most cost-effective option to deal with following issues:

- **Issue**: Incompatible combinations of method class and methodologies.
  Proposal: Implementation of a corresponding specific drop-down menu for the selection of the methodology used (prescribed by licence or permit – PER, National or regional binding – NRB, etc.) for each method class (M/C/E). This proposal may consider methodologies included in the E-PRTR Guidance document or any other methodologies identified in the future.

- **Issue**: Insufficient information about methodology used for the quantification of releases.
  Proposal: Implementation of completeness checks, including restrictions so that:
  - If an operator enters 'Other measurement/calculation methodology' in their report, reporting tools should have a mandatory text field to describe the methodology used;
  - Reporting tools should not allow operators to leave the 'Method class Name' field empty.

Note that the E-PRTR Regulation states that a methodology description shall be provided for data based on measurement or calculation. The methodology description field may therefore be left empty only for estimations. Some countries, such as Spain, already make it mandatory to provide the methodology and a description of the accredited laboratory or alternative standards used.

- **Issue**: Pollutants not reported that are included in indicative pollutant lists.
  Proposal: Where an operator does not report a pollutant that is typically or frequently reported for that activity (see Section 5), include a new field in the reporting tool for the operator to explain why that pollutant is not being reported (to ensure that the lack of report of releases of that pollutant is appropriate). Reasons could include:
  - Releases do not exceed the reporting threshold;
  - Releases were not quantified;
  - The pollutant is not released from the installation and this has been properly demonstrated to the competent authority; etc.

- **Issue**: Reporting of normal releases as accidental releases.
  Proposal: In order to avoid reporting releases from normal operations as accidental releases, two safeguards could be implemented in reporting tools: an explanatory text field for a description of the accident (which may only be available to the competent authority), and a warning message in case accidental releases are the same as total releases.

The above-mentioned proposals would be very cost-effective, with low costs falling on public authorities/agencies and mostly concentrated in the initial implementation of updated reporting tools.

4.3.7.2 Guidance document improvements

Proposed revisions to the E-PRTR Guidance document have been developed to address the following issues:

- Reporting measurements below the limits of detection or quantification;
- Updating the criteria for the selection of method class (M/C/E) and methodology description;
- Assigning M/C/E in facilities with several release sources;
- Collecting further information about the methodology used for the quantification of releases;
- Requirements for data validation by competent authorities addressing:
  - Assessment of minimum requirements for consistency checks;
  - Conducting detailed checks of a proportion of reporting facilities focusing on the credibility of values reported and improvements in methodology descriptions;
- Further sector specific and facility level monitoring and reporting (data collection) guidance to competent authorities;
- Reporting accidental release correctly and reviewing the causes of such releases;
- Establishing criteria for the quantification of non-channelled emissions;
- Avoiding over-estimating releases due to the presence of pollutants in process inputs.

Specific suggested text for the Guidance document to address these issues has been drafted. Annex A3.5 presents these text proposals in full.

These proposals have low to medium costs, falling primarily on public authorities and agencies. The additional burden to operators would be mostly concentrated in the initial implementation of the improvements.

4.3.7.3 Other Proposals

Alignment with EMAS Regulation

The Eco-Management and Audit Scheme (EMAS) is an EU management tool designed to help registered organisations enhance their environmental performance and credibility. Some European directives and regulations include better regulation/regulatory relief provisions in favour of EMAS-registered organisations. For example, the IED establishes that the frequency of environmental inspections shall consider the participation of the facility in the scheme.

E-PRTR reports for EMAS-registered facilities may be considered as more reliable since EMAS-registered organisations publish an Environmental Declaration, validated by an accredited verifier. Competent authorities could use EMAS registration and quantification procedures to support E-PRTR reporting, under the scope of an audited eco-management system and the presence of these audits as a data quality indicator. This could help competent authorities prioritise data validation efforts, for instance, by focusing primarily on non-EMAS registered facilities. EMAS registration could also be a criterion for potential data quality reliability indicators (see Data reliability indicator below).

Data reliability indicator

Comparison of release reports between facilities, sectors and countries requires an understanding of the quality of the method class and methodologies used to quantify

releases. Establishing a system that assesses and ranks the credibility of reported releases would help prioritise, review and improve processes. Such an approach would be a similar concept to qualitative data rating schemes for emission factors in the EMEP/EEA Air Pollutant Emission Inventory Guidebook[30] or other guidance documents for the quantification of air releases such as the IPCC National Guidance for Greenhouse Gas Inventories[31] or the U.S. EPA AP-42 Compilation of Air Emissions Factors[32].

The data reliability analysis considered three different approaches:

- Quantitative quality index
- Semi-quantitative quality index (matrix-based)
- Improved method class and methodology system.

Common aspects in the three approaches are:

- Data reported as E will have the minimum quality score;
- M will usually have a higher quality score than C (e.g. M with low frequency sampling would be of lower quality than C, while calculations based on mass balance such as CO_2 in the EU Emissions Trading System (ETS) would be of higher quality than M);
- The quality score should consider when the reported data is a sum of amounts quantified by different method classes M, C and/or E (e.g. in the case of releases of the same pollutant from several sources);
- Where M is used, the frequency of sampling and analytical determination should be considered.

A quantitative quality index would be very complex and increase the burden for both operators and competent authorities. Further development of a semi-quantitative quality index or an improved method class and methodology system depends on the level of ambition, by countries and competent authorities, for the implementation of a reliability indicator.

A semi-quantitative quality index is conceptually like the quantitative approach but is based on matrices containing scores for the most common combinations of methods and parameters involved in release quantification. It would require the definition of scoring matrices and detailed guidance, as well as modification of reporting tools to include new data fields (which may include the quality index or quality index plus inputs to matrices). Compared to the quantitative approach, it is similar in complexity for system development, but would be simpler to implement by operators.

A reliability indicator based on an improved method class and methodology system is the least costly option and could consider:

- Current information provided by the methodology description
- Proposed improvements for the methodology description

[30] https://www.eea.europa.eu/themes/air/emep-eea-air-pollutant-emission-inventory-guidebook/emep

[31] https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/

[32] https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors

- Representativeness of sampling and measurements
- The possibility of releases reported from more than one release source using different method classes and methodologies.

The last two issues could use bonus/malus indexes[33] supplementing the codes used for the methodology description (e.g. ISO $^{++}$, ISO^{+}, ISO, ISO^{-} and ISO^{--}). A code (A-E or 1-5, as in emission inventories) may also be used to represent the quality.

The reporting tool, the operator or the competent authority could assign the quality indicator.

[33] The term bonus-malus (Latin for good-bad) is used for a business arrangement which alternately reward (bonus) or penalise (malus).

5 Review of Indicative Pollutant Lists

5.1 Objectives

Where the applicable reporting threshold is exceeded, Article 5(1) of the E-PRTR Regulation places an obligation on operators to report annually to their competent authority on releases of any pollutant in Annex II.

To assist operators and competent authorities identify which pollutants might be relevant to particular activities, Appendices 4 and 5 of the existing E-PRTR Guidance indicate activity-specific sub-lists of expected air and water pollutants. The lists were a guide to those first reporting to the E-PRTR and were broadly drawn to include all pollutants that could potentially be released from activities.

However, these lists do not reflect actual E-PRTR reporting since 2007. In addition, the current "present or not present" system, where a pollutant is present or absent, does not reflect the strength of the relationship between the pollutant and the activity. The current lists therefore confer equal importance to key pollutants and those that may be, in practice, seldom reported for an activity.

Member States have expressed support for reviewing and updating of the current lists since they remain a valuable tool for operators and competent authorities to identify the most important pollutants that could be released by an activity.

The review had two aims:

- First, to provide suggested **updates to the indicative activity-specific sub-lists of pollutants** for releases to air and water. An assessment of current and historical E-PRTR reporting and expert evaluation of other studies identified additional expected pollutants (not identified in current or historical E-PRTR reporting) from certain sources.
- Second, to explore different routes of **displaying the linkages between activities and pollutants**, moving away from the limited "present or not present" approach within the existing Guidance document to a strength-based approach that allows the most important pollutants released from a particular activity to be identified and prioritised for reporting by operators and reviewed by competent authorities.

5.2 Key findings

Using existing E-PRTR data complemented with information on BAT-AELs, new indicative pollutant lists for releases to air and water were developed.

- The updated lists (Table 5.1 and Table 5.2) provide a guide to the current pattern of releases **based on the percentage of facilities consistently reporting a pollutant for a particular main activity across multiple countries and years**. The strength of the pollutant-activity combination is shown using shades of blue. 'Typical' reporting means more than 50% of facilities with that activity and 'frequent' reporting means less than 50% of facilities. 'Infrequent' reporting describes reporting below the five years/five country threshold and 'rare' reporting is where only one or two instances have ever been reported.

- **There is an overall reduction in the number of pollutant-activity combinations** compared to the simple present/absent approach in the current Guidance.
- **For the potential new pollutants, indicative lists were developed.** Section 3 identifies these lists using information from a range of sources on potential new activities and pollutants. These are presented in Table 5.3 and Table 5.4.

At the E-PRTR Expert Group Workshop on 20 June 2019, Member States expressed support for the new indicative pollutant lists, noting that they are a very useful way to quality check whether reports are complete. Spain noted that they are particularly important where a facility has more than one activity.

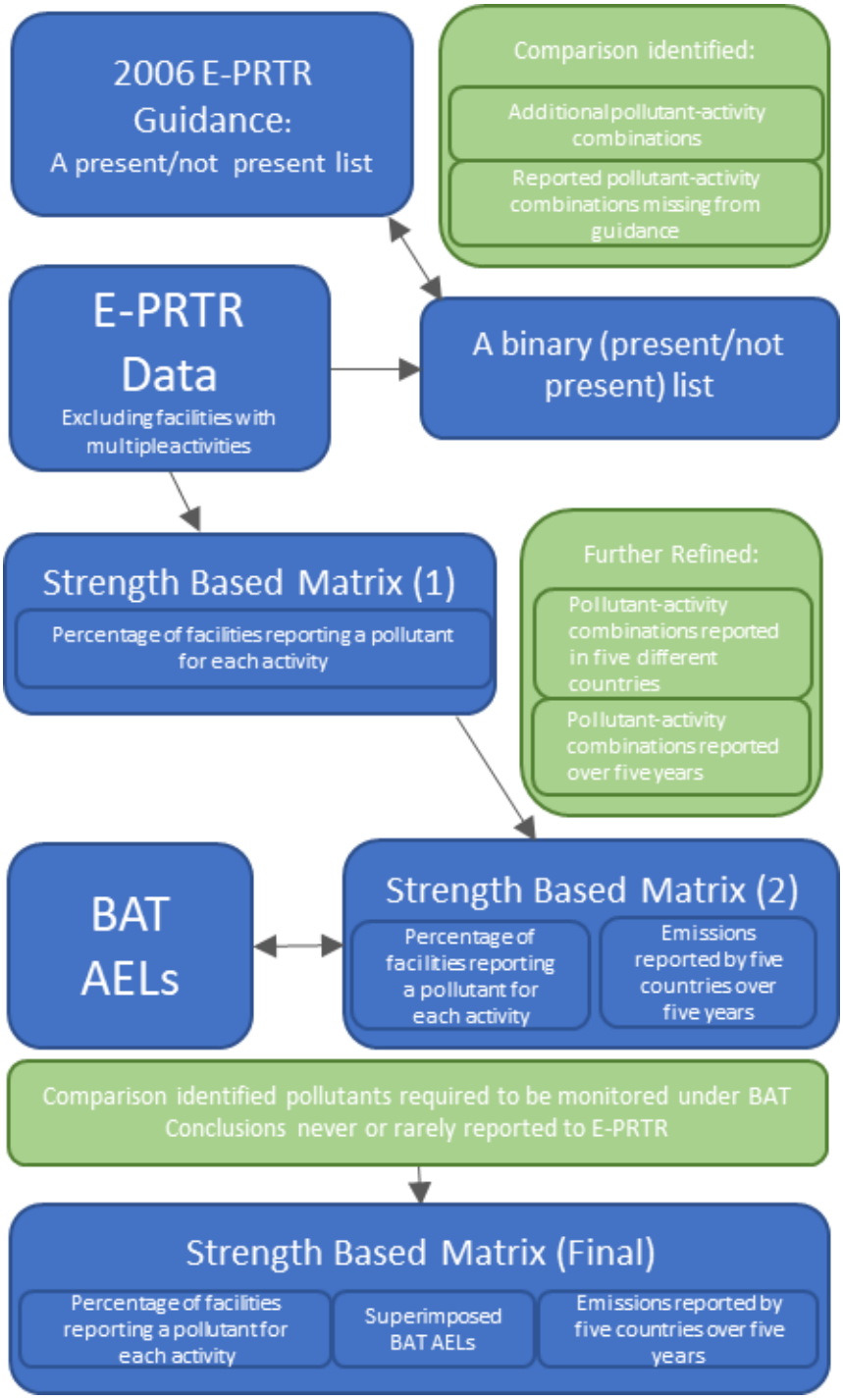
5.3 Discussion

Work for this part of the project involved three key steps:

- **Step 1** – A "present or not present" comparative analysis providing a present/absent comparison of the current indicative pollutant lists with observed reporting since 2007;
- **Step 2** – The development of strength-based matrices based on frequency of reporting of pollutants for specific activities;
- **Step 3** – A comparison against BREFs to identify any other pollutants of relevance for sectors.

The process to produce the new indicative pollutant lists is outlined in Figure 5.1.

Figure 5.1 Summary diagram of process to develop indicative pollutant lists



The following sections provide details of the steps included.

5.3.3 Step 1: "Present or not present" comparative analysis

Initially, binary (i.e. present or not present) indicative pollutant lists for releases to air and water based on all previous E-PRTR reporting from 2007 to 2016 were prepared. These only included reporting from facilities with a single activity. The lists were

compared to the "present or not present" lists in the current E-PRTR Guidance document.

While there is significant overlap between the pollutant-activity combinations reported to the E-PRTR and the current Guidance document, there are also pollutant-activity combinations present in the indicative pollutant lists in the current Guidance document that are not reported to the E-PRTR. These are likely to represent situations where a pollutant is released from either a relatively uncommon process or is released in very in low quantities, i.e. below the current reporting thresholds.

5.3.4 Step 2: Strength-based comparative analysis

A strength-based comparative analysis built on the earlier work of the European Topic Centre in preparation for integrated E-PRTR and LCP reporting[34]. The "present or not present" system in the current E-PRTR Guidance document does not reflect the strength of the relationship between the pollutant and the activity. The lists therefore imply equal importance to key pollutants and those that may be, in practice, seldom reported for an activity.

The strength-based matrices developed by the European Topic Centre were based on the numbers of facilities reporting releases of the relevant pollutants. However, the strength of different pollutant-activity combinations are skewed when using the count of facilities alone. For example, the total number of facilities reporting with the main activity of 7.(a) (intensive rearing of poultry and pigs) was large (6,351 in 2016), while the number of facilities reporting with the activity 1.(c) (thermal power stations and other combustion installations) was much smaller (1,083 in 2016). In this case, the large number of reports of ammonia releases from 7.(a) (intensive rearing of poultry and pigs) from farms would show a stronger case for reporting than nitrogen oxides from 1.(c) (thermal power stations and other combustion installations).

Therefore, to derive a useful strength matrix, the count of release reports for each pollutant from an activity was normalised by the total number of facilities reporting for that activity for each year, to indicate the strength of the pollutant-activity combination for each activity.

The E-PRTR data was filtered to only show the pollutant-activity combinations reported by at least five countries for at least five years. This ensured only those pollutant-activity combinations consistently reported are shown, further improving the relevance of the strength matrices.

The strength of the pollutant-activity combination (Table 5.1 and Table 5.2), is shown using shades of blue, with 'typical' reporting being more than 50% of facilities with that activity and 'frequent' reporting being less than 50% of facilities. 'Infrequent' reporting describes reporting below the five years/five country threshold and 'rare' reporting are where only one or two instances have ever been reported.

5.3.5 Step 3: Comparison against BREFs

BREFs for different sectors were then consulted to identify pollutants that have AELs or are required to be monitored according to BAT conclusions. These combinations are shown as black dots on Table 5.1 and Table 5.2. For both releases to air and

[34] https://cdrtest.eionet.europa.eu/help/eprtr_lcp/Guidance/E-PRTR-LCP%20Manual%20for%20reporters_v1.1.pdf

water, about 15% of the pollutant-activity combinations, covered under BAT conclusions, have never been reported to the E-PRTR. This may be as a result of the reporting thresholds.

Section 3 of this report covers additional pollutants that could be included in the E-PRTR Annex II list of pollutants. Preliminary indicative pollutant lists for releases to air and water of these potential new pollutants were developed and are presented in Table 5.3 and Table 5.4. These lists are simple “present or not present” lists, since release totals and the number of facilities that would be reporting these pollutants are not yet known in detail.

The pollutant-activity combinations were determined based on the following sources:

- BAT-AELs for specific sectors;
- Pollutant-sector combinations in international PRTRs;
- Inferred from status as a WFD priority substance;
- Inferred from the nature of the pollutant.

Table 5.1 Indicative pollutant-activity table for releases to air

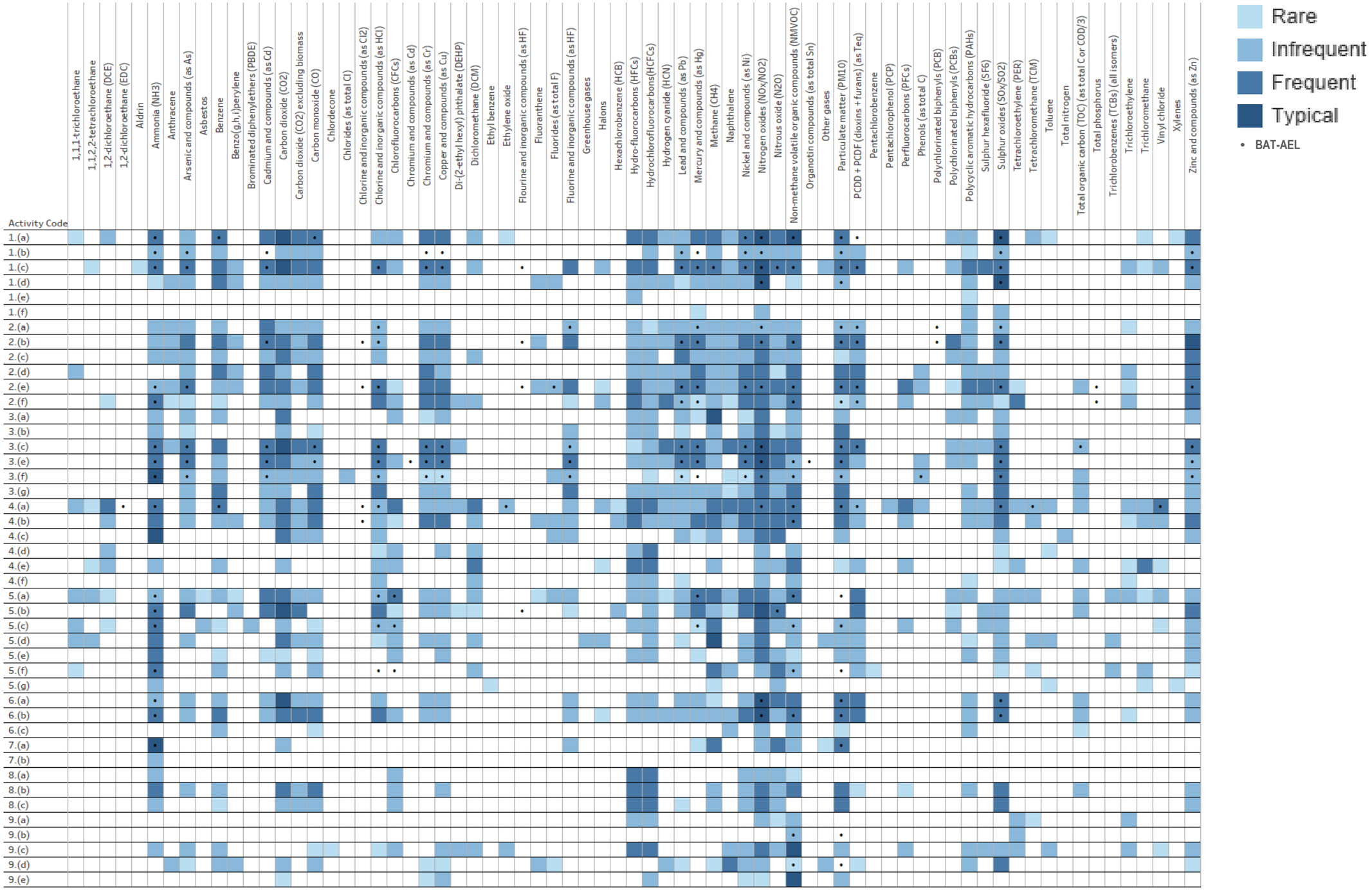


Table 5.2 Indicative pollutant-activity table for releases to water

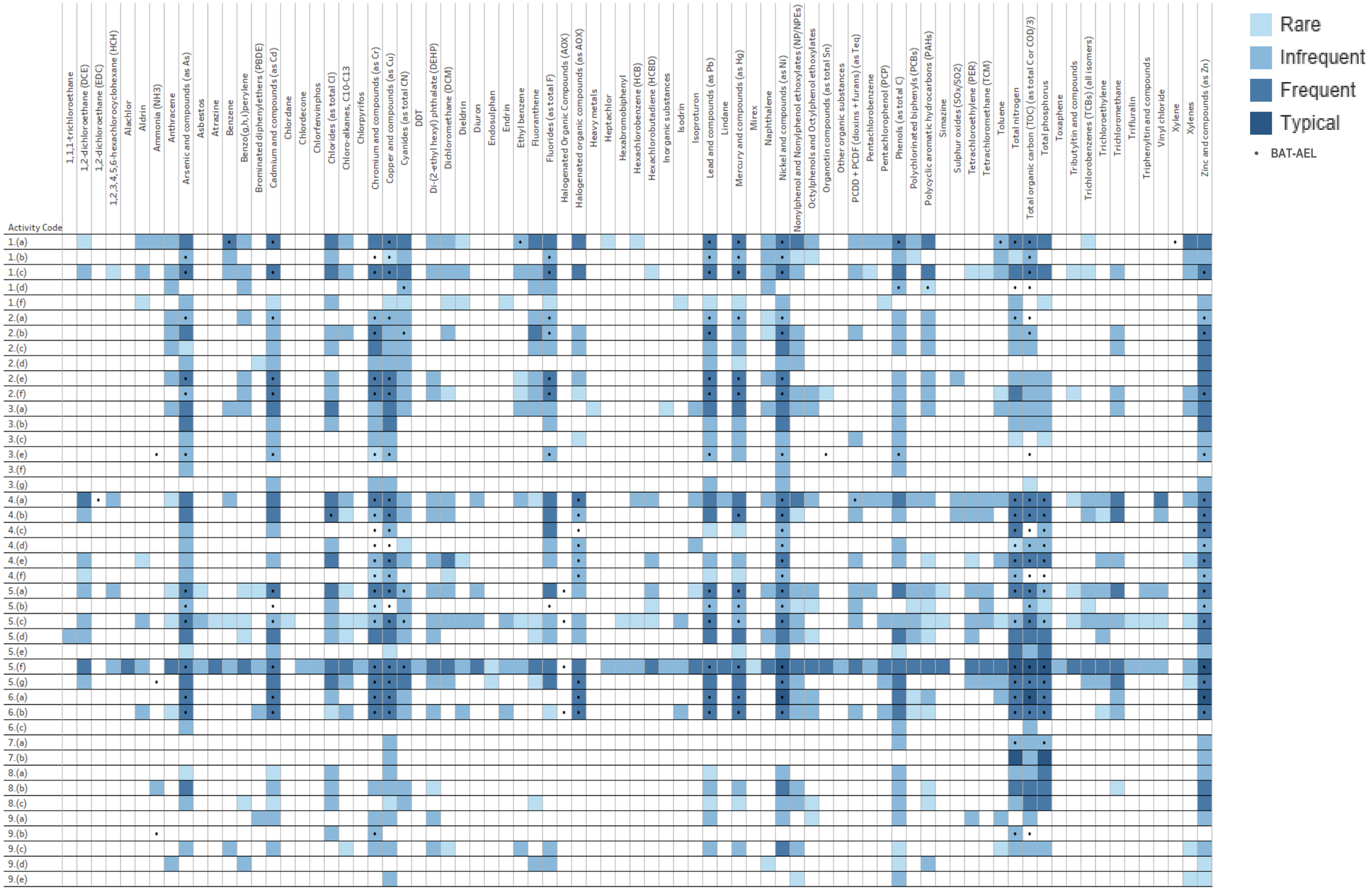


Table 5.3 Pollutant-activity indicator table for pollutants for potential future inclusion in the E-PRTR, releases to air

Activity	Acetaldehyde	Aclonifen	Acrolein	Acrylamide	Acrylic acid and its water-soluble salts	Acrylonitrile	Antimony and compounds (as Sb)	Beryllium and compounds (as Be)	Bifenox	Black carbon (BC)	Carbon disulphide	Chromium (VI) compounds (as Cr)	Cobalt and compounds (as Co)	Cybutryne	Cypermethrin	Dichlorvos	Dicofol	Formaldehyde (formalin)	Hexabromocyclododecane (HBCDD)	Hydrogen sulphide	Manganese and compounds (as Mn)	n-Hexane	PM2.5	Polychlorinated naphthalenes	Quinoxyfen	Selenium and compounds (as Se)	Short-chain chlorinated paraffins (SCCPs)	Terbutryn	Thallium and compounds (as Tl)	Tin and tin compounds (as Sn)	Total suspended particles (TSP)	Vanadium and compounds (as V)
1(a) - Oil and gas refineries	×						×				×	×	×					×			×	×				×						
1(c) - Combustion	×		×			×	×	×		×	×	×	×					×			×	×	×			×			×		×	×
1(d) - Coke ovens	×						×				×	×	×					×		×	×	×				×						
2(a) - Metal ore roasting or sintering	×						×				×	×	×					×			×	×				×						
2(b) - Production of pig iron or steel	×						×				×	×	×					×			×	×	×			×						
2(c) - Processing ferrous metals	×						×				×	×	×					×			×	×				×						
2(d) - Ferrous metals foundries	×						×				×	×	×					×			×	×				×						
2(e) - Production and/or smelting of non-ferrous metals	×						×	×			×	×	×					×			×	×				×						
2(f) - Surface treatment of metals and plastic materials	×						×				×	×	×					×			×	×				×						
3(a) - Underground mining and related operations	×		×				×				×	×	×					×			×	×				×						
3(b) - Opencast mining and quarrying	×		×				×				×	×	×					×			×	×				×						
3(c) - Production of cement and lime	×					×	×	×			×	×	×					×			×	×				×			×			×
3(e) - Manufacture of glass	×					×	×	×			×	×	×					×			×	×				×				×		×
3(f) - Melting mineral substances	×					×	×				×	×	×					×		×	×	×				×				×		×
3(g) - Manufacture of ceramic products	×					×	×	×			×	×	×					×			×	×				×						
4(a) - Production of organic chemicals	×		×	×	×	×	×				×	×	×					×	×		×	×		×		×	×					
4(b) - Production of inorganic chemicals	×		×	×		×	×				×	×	×					×			×	×				×						
4(c) - Production of fertilisers	×		×	×		×	×				×	×	×					×			×	×				×						
4(d) - Production of plant health products and biocides	×	×	×	×		×	×		×		×	×	×	×	×	×	×	×			×	×			×	×		×				
4(e) - Production of pharmaceutical products	×											×						×			×	×				×						
5(a) - Recovery and disposal of hazardous waste	×	×	×	×		×	×	×	×	×	×	×	×		×			×			×	×				×					×	
5(b) - Non-hazardous waste incineration	×		×	×		×	×	×		×	×	×	×					×			×	×	×			×			×		×	×
5(c) - Recovery and disposal of non-hazardous waste	×		×	×		×	×				×	×	×					×			×	×				×						
5(d) - Landfills	×		×	×		×	×				×	×	×					×			×	×				×						
5(f) - Urban waste-water treatment plants	×		×	×			×					×	×					×			×	×				×			×	×		×
5(g) - Independently operated industrial waste-water treatment plants							×					×	×					×			×					×			×	×		×
6(a) - Production of pulp	×		×	×			×				×	×	×					×			×	×				×						
6(b) - Production of paper and board and other primary wood products	×		×	×			×				×	×	×					×			×	×				×						
6(c) - Preservation of wood and wood products																		×														
7(a) - Intensive rearing of poultry and pigs	×											×						×			×					×						
8(a) - Slaughterhouses	×											×						×			×					×						
8(b) - Treatment and processing for food and beverage products	×		×				×					×	×					×			×	×				×						
8(c) - Treatment and processing of milk	×		×				×					×	×					×			×	×				×						
9(a) - Pre-treatment or dyeing of fibres or textiles	×						×					×	×					×			×	×					×						
9(b) - Tanning of hides and skins																						×					×					
9(c) - Surface treatment of substances, objects or products using organic solvents					×																						×					

Table 5.4 Pollutant-activity indicator table for pollutants for potential future inclusion in the E-PRTR, releases to water.

Activity	Acetaldehyde	Aclonifen	Acrolein	Acrylamide	Acrylonitrile	Antimony and compounds (as Sb)	Beryllium and compounds (as Be)	Bifenox	Carbon disulphide	Chromium (VI) compounds (as Cr)	Cobalt and compounds (as Co)	Cybutryne	Cypermethrin	Dichlorvos	Dicofol	Formaldehyde (formalin)	Hexabromocyclododecane (HBCDD)	Manganese and compounds (as Mn)	n-Hexane	PFHxS, its salts and related compounds	PFOA, its salts and related compounds	PFOS, salts and PFOS-F	Polychlorinated naphthalenes	Quinoxyfen	Selenium and compounds (as Se)	Short-chain chlorinated paraffins (SCCPs)	Sulphates	Terbutryn	Thallium and compounds (as Tl)	Tin and tin compounds (as Sn)	Total suspended solids (TSS)	Vanadium and compounds (as V)
1(a) - Oil and gas refineries	×					×			×	×	×					×		×	×					×						×		
1(b) - Gasification and liquefaction																										×				×		
1(c) - Combustion						×	×			×	×							×	×					×		×				×		
1(d) - Coke ovens	×					×			×	×	×					×		×	×					×								
2(a) - Metal ore roasting or sintering						×			×	×	×							×	×					×								
2(b) - Production of pig iron or steel						×			×	×	×							×	×					×								
2(c) - Processing ferrous metals						×			×	×	×							×	×					×								
2(d) - Ferrous metals foundries						×			×	×	×							×	×					×								
2(e) - Production and/or smelting of non-ferrous metals						×	×		×	×	×							×	×					×								
2(f) - Surface treatment of metals and plastic materials						×			×	×	×							×	×			×		×								
3(a) - Underground mining and related operations	×		×			×			×	×	×					×		×	×					×								
3(b) - Opencast mining and quarrying	×		×			×			×	×	×					×		×	×					×								
3(c) - Production of cement and lime						×	×			×						×		×						×								
3(e) - Manufacture of glass						×	×			×						×		×						×		×				×		
3(f) - Melting mineral substances						×				×						×		×						×								
3(g) - Manufacture of ceramic products						×	×			×						×		×						×								
4(a) - Production of organic chemicals	×		×	×	×	×			×	×	×					×	×	×	×				×	×	×	×					×	
4(b) - Production of inorganic chemicals	×		×	×	×	×			×	×	×					×		×	×					×							×	
4(c) - Production of fertilisers	×		×	×	×	×			×	×	×					×		×	×					×							×	
4(d) - Production of plant health products and biocides	×	×	×	×	×	×		×	×	×	×	×	×	×	×	×		×	×				×	×		×					×	
4(e) - Production of pharmaceutical products	×																														×	
4(f) - Production of explosives																															×	
5(a) - Recovery and disposal of hazardous waste		×				×	×	×		×	×		×			×		×	×					×							×	
5(b) - Non-hazardous waste incineration						×	×			×	×					×		×	×					×		×		×			×	×
5(c) - Recovery and disposal of non-hazardous waste						×				×	×					×		×	×					×							×	
5(d) - Landfills						×				×	×					×		×	×					×								
5(f) - Urban waste-water treatment plants		×				×	×	×		×	×	×	×	×	×	×	×	×	×	×	×	×		×	×	×		×	×	×	×	×
5(g) - Independently operated industrial waste-water treatment plants		×				×	×	×		×	×	×	×	×	×	×	×	×		×	×	×		×	×	×		×	×	×	×	×
6(a) - Production of pulp	×								×	×	×					×		×	×						×						×	
6(b) - Production of paper and board and other primary wood products	×		×						×	×	×					×		×	×						×							
6(c) - Preservation of wood and wood products																															×	
8(b) - Treatment and processing for food and beverage products	×		×													×		×	×													
8(c) - Treatment and processing of milk	×		×													×		×	×													
9(a) - Pre-treatment or dyeing of fibres or textiles						×				×						×				×					×							
9(b) - Tanning of hides and skins																		×							×							
9(c) - Surface treatment of substances, objects or products using organic solvents																				×	×				×							

6 Conclusions

A review of aspects of E-PRTR implementation assessed its effectiveness as the primary European-wide point source inventory of pollutant releases from industrial activities. The E-PRTR provides key information to evaluate the progress of relevant European environmental legislation. It is important that the activities and pollutants covered by the E-PRTR align with such legislation, particularly the IED.

Reporting to the E-PRTR relies on accurate release quantification by reporters. This study included a review of the method classes and specific methodologies currently used by reporters. This has identified where improvements to the E-PRTR Guidance could encourage and support more consistent and accurate release quantification.

Findings and suggestions from this work can inform European Commission considerations of the E-PRTR Regulation and Guidance, as well as the currently ongoing evaluation of the IED.

This report focuses on four aspects of the E-PRTR:

1. The activities covered;
2. The pollutants covered and their reporting thresholds;
3. Guidance on release quantification;
4. The lists of indicative pollutants expected for different activities.

Conclusions from each of these aspects are as follows:

1. E-PRTR activities

The study found that new activities could be included in the E-PRTR and that some capacity thresholds could be revised (as summarised in Section 2.2). These additions and revisions would improve the usefulness of E-PRTR in analyses of reductions of industrial releases in Europe.

- **Activities that could be added** to the E-PRTR include magnesium oxide production, CO_2 storage, metal working, and battery manufacturing. These additions would support tracking of progress with the IED, enable comparisons with international PRTRs and cover industrial activities of emerging environmental importance.
- Air releases from **intensive cattle rearing** appear significant but the reporting threshold to capture 90% of releases would impose a reporting obligation on a large number of new facilities. Consideration could be given to some form of top-down reporting.
- **Capacity thresholds need adjusting** to ensure the E-PRTR captures a significant level of releases for a small number of existing activities including waste water treatment and combustion plants.
- **Pollutant reporting thresholds may need to be lowered** if capacity thresholds are lowered to include a wider pool of smaller facilities, to ensure these facilities report their releases.

2. E-PRTR pollutants

Section 3.2 presents suggestions related to the list of pollutants included in the E-PRTR.

- **38 additional pollutants have been suggested for addition** to Annex I of the E-PRTR Regulation as a result of the analysis of the IED, media-specific EU legislation on waste and air, water, soil and waste pollution, and international conventions, as well as MS and international PRTRs (see Table 3.1). The addition of these pollutants would help the EU and Member States to track progress in addressing key media-based legislation including the National Emissions Ceilings Directive (NECD; 2016/2284/EU) and WFD.
- **Other pollutants of concern may emerge in the future,** most notably through the WFD watch-list process where pollutants may be identified as new priority substances. To assist future assessments of the scope of the E-PRTR pollutant list, tracking this process is encouraged**.**
- **Retain 24 existing pollutants in the E-PRTR pollutant list despite their prohibition.** Because their usage has been banned and releases have been reported in low quantities in recent years, these existing pollutants could be removed from the E-PRTR pollutant list. However, their retention ensures an historical data time-series and enables comparison with non-EU countries. Furthermore, there would be a limited reduction in reporting burden in removing these pollutants from Annex II. Careful review, by competent authorities of the few reports of releases of these pollutants could be encouraged.
- **For pollutants for which the E-PRTR is capturing less than 90% of all industrial releases, reporting thresholds should be lowered**. There are 11 air pollutants and 14 water pollutants with lower than 90% capture of all industrial releases. A lower reporting threshold, or these pollutants, would ensure an improved capture rate. Due to insufficient data, there was limited analysis for other pollutants and for releases to land, so future studies should consider whether reporting thresholds for these pollutants need to be revised.
- **Reporting thresholds should be retained.** Their complete removal was judged to have a significant additional burden that was not justified by the associated expected improvement in the completeness of the E-PRTR.

3. Release quantification guidance

Updates to guidance on the methods to be used by operators to quantify the releases and transfers from industrial facilities would improve E-PRTR implementation and the quality of reported data.

- **Measurement and calculation method classes each accounted for 40-50% of all reports** between 2007 and 2016. There has been a slight increase in calculations and estimations at the expense of measurements across this period.
- **Insufficient methodology descriptions or incompatible combinations compromise data quality**. Implementing data entry restrictions in reporting tools and improved data validation by competent authorities would address these issues.
- **Data quality improvements through revisions to the E-PRTR Guidance** to cover selection of the method class and methodology, including where more than one methodology classification is applicable and where measurements are below the limits of detection or quantification, are suggested.

4. Indicative pollutants lists

While the legal obligation is on the operator to report all E-PRTR Annex II pollutants above the reporting thresholds, the lists of expected pollutants to air and water by activity in the E-PRTR Guidance are of assistance to operators and competent

authorities when preparing and reviewing facility reports. **A new strength-based approach** considering the percentage of facilities reporting a pollutant for a main activity was developed. Compared to the previous simple “present or not present” lists (pollutant expected or not), the new lists are based on observed reports and will allow **prioritisation of efforts to report and review the most important pollutants** released from different activities. The new lists include:

- Pollutant-activity combinations reported consistently across many countries and years
- Pollutants for which BAT-AELs have been set for certain sectors
- Expected source activities for suggested new pollutants.

ANNEXES

Annex 1 Activities

A1.1 E-PRTR activities list supporting the IED

A1.1.1 Sectors not covered by the E-PRTR but covered by the IED

Table A1.1 summarises the assessment of sectors covered by Annex I of the IED but not covered by the E-PRTR Annex I activity list.

Table A1.1 Sectors covered by the IED but not covered by E-PRTR Annex I activity list

IED activity	Activity listed in IED Annex I	Evaluation summary
3.1. (c)	Mineral industry - Production of cement, lime and magnesium oxide: production of magnesium oxide in kilns with a production capacity exceeding 50 tonnes per day	Production of magnesium oxide is not covered by E-PRTR Annex I but is by the IED. The sector is characterised by about 14 plants with releases similar to cement and lime plants. This activity is suggested for inclusion in the E-PRTR.
5.5.	Waste management - Temporary storage of hazardous waste not covered under point 5.4 pending any of the activities listed in points 5.1, 5.2, 5.4 and 5.6 with a total capacity exceeding 50 tonnes, excluding temporary storage, pending collection, on the site where the waste is generated	Temporary storage activities are not covered by E-PRTR Annex I but a specific list of such activities is covered by IED. The activity is expected to produce relatively low releases, mainly of dust. It is therefore not suggested for inclusion in the E-PRTR.
6.9	Capture of CO_2 streams from installations covered by this Directive for the purposes of geological storage pursuant to Directive 2009/31/EC	CO_2 capture is not covered by E-PRTR Annex I but is by the IED. This activity is suggested for inclusion to ensure reporting of CO_2 releases from these installations.

A1.1.1.2 Assessment of IED activity 3.1 (c) magnesium oxide production

The IED covers the production of magnesium oxide in kilns with a production capacity exceeding 50 tonnes per day (IED Annex I activity 3.1(c)). The assessment of inclusion of magnesium oxide production in the E-PRTR was based on information in the BAT reference document for production of cement, lime and magnesium oxide (BREF CLM 2013[35]). This document lists 14 plants in the EU25 (2006 data), producing about 2.4 million t/year of magnesium oxide (2003 data). All of these plants exceed the capacity threshold of 50 tonnes per day.

The waste gas volume of each plant varies between 4,000-12,000 m^3/t (BREF CLM 2013). Assuming a mean waste gas volume of 8,000 m^3/t and releases at the upper BAT-AEL (dust max. 35 mg/Nm^3, NO_X max. 1,500 mg/Nm^3, CO max. 1,000 mg/Nm^3 and SO_X max. 400 mg/Nm^3), estimated total annual releases of the magnesium oxide sector are about 670 t/year dust, 29,000 t/year NO_X, 19,000 t/year CO and 7,700 t/year SO_X (see Table A1.2).

Compared to releases reported in the E-PRTR for 2017 from other activities in the mineral sector, the assumed releases from magnesium oxide production would add 44%, 17%, and 22% to the total releases of PM_{10}, NO_x and SO_x, respectively, from cement and lime manufacturing, provided that all magnesium oxide plants report releases above the reporting thresholds and do not perform better than the upper BAT-AEL.

Based on this assessment, it is suggested that the sub-sector of magnesium oxide production be included in Annex I of the E-PRTR Annex I. The administrative burden would be relatively low as only a few facilities are affected and E-PRTR reporting is expected to be limited to PM_{10}, NO_X, CO and SO_X. The BAT conclusions for magnesium oxide production do not require monitoring of additional air or water pollutants (BREF CLM 2013).

[35] https://eippcb.jrc.ec.europa.eu/reference/BREF/CLM_30042013_DEF.pdf

Table A1.2 Calculation of total releases of magnesium oxide production and comparison with cement and lime E-PRTR releases (2017)

Pollutant	Assumed mean specific waste gas volume (m^3/t)	Max. emissions[1] (mg/Nm^3)	Assumed annual production (t/year)	Max. releases[2] (t/year)	Share of E-PRTR 2017 cement and lime releases (%)
PM_{10}	8,000	35	2,400,000	672	44
NO_X	8,000	1,500	2,400,000	28,800	17
CO	8,000	1,000	2,400,000	19,200	11
SO_X	8,000	400	2,400,000	7,680	22

[1] Assuming emission levels at upper BAT-AELs.
[2] Assuming that releases of each of the 14 plants are above the current reporting thresholds for PM_{10}, NO_X, CO and SO_X.

A1.1.1.3 Assessment of IED activities 5.4 and 5.5 Temporary storage

Annex I of the IED covers, under activity 5.4, "*Landfills, as defined in Article 2(g) of Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste, receiving more than 10 tonnes of waste per day or with a total capacity exceeding 25 000 tonnes, excluding landfills of inert waste"*. According to the definition in Article 2(g) of that directive, this also covers permanent sites for the temporary storage of waste.

Annex I of the IED also covers, under activity 5.5, "*Temporary storage of hazardous waste not covered under point 5.4 pending any of the activities listed in points 5.1, 5.2, 5.4 and 5.6 with a total capacity exceeding 50 tonnes, excluding temporary storage, pending collection, on the site where the waste is generated"*. Under the IPPCD, the European Commission published a BAT reference document on emissions from storage (BREF EFS 2006[36]). BAT conclusions under the IED have not been published.

Temporary storage sites often do not consist of enclosed areas with capture of releases to air. Therefore, there is generally no periodic monitoring of stack emissions that could be used for E-PRTR reporting. Diffuse air emissions can be estimated by emission factors[37] or measured with photometers, but a European standard on measurement of diffuse emissions of dust is not available. However, total releases are not expected to exceed the reporting threshold for particulate matter (50,000 kg/year). Releases to water mainly consist of total suspended solids (TSS); this pollutant is currently not covered by the E-PRTR reporting requirements.

Based on this assessment, activities 5.4 and 5.5 of the IED Annex I activity list are not suggested for inclusion in the E-PRTR activity list.

A1.1.1.4 Assessment of IED activity 6.9 Capture of CO_2 streams

The IED Annex I activity list includes 6.9 'Capture of CO_2 streams from installations covered by this Directive for the purposes of geological storage pursuant to Directive

[36] https://eippcb.jrc.ec.europa.eu/reference/BREF/esb_bref_0706.pdf

[37] See for example VDI Guideline 3790 Part 3 (2010): 'Environmental meteorology - Emission of gases, odours and dusts from diffuse sources - Storage, transhipment and transportation of bulk materials'.

2009/31/EC'. At present, there are fewer than 10 pilot plants in Europe for carbon capture and storage. It is expected that the number of such installations will grow, in particular for sectors where alternative (renewable) fuels or electricity cannot be used. This is the case for example in cement production where a high share of CO_2 releases results from the calcination of limestone.

Releases from installations for capture of CO_2 streams depend strongly on the type of technology used for CO_2 capture. Expected releases are mainly releases to air such as non-methane volatile organic compounds (NMVOC), methanol or N-methyl-2-pyrrolidon (from Rectisol/Purisol scrubbers) as well as NH_3 (from ammonia scrubbers), but it cannot be ruled out that the prevalent technology in future may involve releases of different pollutants. Additionally, CO_2 releases are expected as the installations achieve only partial storage.

Activity 6.9 is suggested for inclusion in the E-PRTR to achieve coherence with the IED and to track releases from this activity. Based on recent pilot projects, the additional reporting requirement is initially expected to be fewer than 10 facilities, if any.

A1.1.2 Sectors covered by E-PRTR but with different capacity thresholds in the IED

Table A1.3 shows sectors covered by both the E-PRTR and IED, but with differing capacity thresholds. The main differences are highlighted in bold, and the last column summarises the differences.

A1.1.2.1 Assessment of differences in thresholds

For wood-based panel production (IED activity 6.1(c), E-PRTR activity 6.(b)), the capacity values of the E-PRTR and IED are expressed in different units. Based on information in the BAT reference document for production of wood-based panels (BREF WBP 2016[38]), the density of most wood-based panel products is between 500 and 800 kg/m^3. Assuming this typical density, the IED threshold of 600 m^3/day equates to a production capacity of 480-600 t/day, which is far higher than the capacity threshold of 20 t/day for this activity in Annex I of the E-PRTR. In 2009, more than half of the installations were not covered by IED capacity thresholds (BREF WBP 2016). On this basis, the E-PRTR threshold could be adapted to the IED threshold for consistency. However, to obtain a consistent time series of releases, it is suggested to retain the lower E-PRTR threshold which covers the majority of facilities in the sector. This would better enable the impact of implementation of best available techniques to be seen in E-PRTR data, as such techniques are often implemented in plants with capacity below the IED threshold.

For the production of food products from vegetable raw materials, IED activity 6.4(a)(ii) has the same capacity threshold (300 t/day) as E-PRTR activity 8.(b).(ii) but does not cover installations with a capacity of 300 to <600 t/day if they do not operate for more than 90 consecutive days in any year. The E-PRTR threshold could be changed to the IED wording. However, in order to retain a consistent time series of releases, it is suggested that the current E-PRTR threshold and definition be maintained, and that the reporting from a broader range of installations in the sector than under the IED definition be continued.

For the preservation of wood and wood products (IED activity 6.10, E-PRTR activity 6.(c)), the E-PRTR threshold is lower than in IED (50 m^3/day vs. 75 m^3/day). The E-

[38] https://eippcb.jrc.ec.europa.eu/reference/BREF/WBP_bref_2016published.pdf

PRTR also covers installations for wood preservation exclusively treating against sapstain, while these are excluded from the IED. In order to obtain a consistent time series of releases, it is suggested that the current E-PRTR threshold be maintained. As for wood-based panel production, this would better enable the impact of implementation of best available techniques to be seen in E-PRTR data, as such techniques are often implemented in plants with capacities below the IED threshold. No information is available on the number of installations treating exclusively against sapstain; it is suggested that those facilities be kept in the scope of the E-PRTR to obtain a complete picture of the sector.

Table A1.3 Sectors covered by E-PRTR but with different thresholds than in the IED (main differences highlighted in bold)

E-PRTR activity	Activity listed in E-PRTR Annex I	IED activity	Activity listed in IED Annex I	Evaluation
6.(b)	Paper and wood production and processing - industrial plants for the production of paper and board and other **primary wood products** (**such as chipboard, fibreboard and plywood**) with a production capacity of **20 tonnes per day**	6.1(a)	6.1.(a): Production in industrial installations of paper or cardboard with a production capacity exceeding 20 tonnes per day. 6.1.(b): Production in industrial installations of one or more of the following **wood-based panels**: **oriented strand board, particleboard or fibreboard** with a production capacity exceeding **600 m^3 per day**.	Threshold for paper or cardboard is identical. For primary wood products, the E-PRTR and IED have thresholds in different units. For a product density between 500-800 kg/m^3, the IED threshold is equal to a capacity of about 300-480 t/day, while the E-PRTR threshold is 20 t/day.
8.(b)(ii)	Animal and vegetable products from the food and beverage sector – treatment and processing intended for the production of food and beverage products from vegetable raw materials with a finished product production capacity of 300 tonnes per day **(average value on a quarterly basis)**	6.4(b)(ii)	Treatment and processing, other than exclusively packaging, of the following raw materials, whether previously processed or unprocessed, intended for the production of food or feed from: only vegetable raw materials with a finished product production capacity greater than 300 tonnes per day **or 600 tonnes per day where the installation operates for a period of no more than 90 consecutive days in any year**	Identical definitions (except semantical difference) but different thresholds. The E-PRTR additionally covers installations with a capacity between 300-600 t/day if operated no more than 90 consecutive days, which are not included in the IED.
6.(c)	Paper and wood production and processing - industrial plants for the preservation of wood and wood products with chemicals with a production capacity of **50 m^3 per day**	6.10	Preservation of wood and wood products with chemicals with a production capacity exceeding **75 m^3 per day other than exclusively treating against sapstain**.	Identical scope definition but different thresholds. The E-PRTR additionally covers smaller installations for wood preservation with a capacity of 50 to <75 m^3 per day, not covered by IED. Exclusion of installations treating against sapstain is mentioned in the IED but not in the E-PRTR.

A1.1.3 Sectors covered by the E-PRTR but not with the same sub-categories as in the IED

Table A1.4 shows where Annex I of the IED specifies different sub-sectors than Annex I of the E-PRTR. Differences are highlighted in bold.

Table A1.4 Sectors covered by the E-PRTR but not separated in the same sub-sectors as in the IED (main differences highlighted in bold)

# E-PRTR	Activity listed in E-PRTR	# IED	Activity listed in IED Annex I	Evaluation	Change of E-PRTR
1.(b)	Energy sector - Installations for gasification and liquefaction	1.4	Energy industries - Gasification or liquefaction of **a) coal** **b) other fuels in installations with a total rated thermal input of 20 MW or more**.	Identical but two sub-categories specified in IED	Separation of sub-categories is suggested to better reflect releases of IED subcategories.
3.(c).(i) and (iii)	Mineral industry - Installations for the production of i) cement clinker **in rotary kilns** iii) cement clinker or lime in **other furnaces**, with a production capacity of i) 500, iii) 50 tonnes per day.	3.1(b)	Mineral industry - Production of cement, lime and magnesium oxide: production of cement clinker **in rotary kilns** with a production capacity exceeding 500 tonnes per day **or in other kilns** with a production capacity exceeding 50 tonnes per day	E-PRTR only covers cement production in rotary kilns in 3.(c).(i) and mixes cement production in other furnaces with lime production in 3.(c).(iii), whereas IED refers to cement production in rotary kilns and other kilns in one category	Alignment with the IED activity definition is suggested to be able to separately sum-up releases of the cement and lime subsectors
3.(c). (ii) and (iii)	Mineral industry - Installations for the production of ii) lime **in rotary kilns** iii) cement clinker or lime in **other furnaces**, with a production capacity of 50 tonnes per day.	3.1(b)	Mineral industry - Production of cement, lime and magnesium oxide: production of lime **in kilns** with a production capacity exceeding 50 tonnes per day	E-PRTR only covers lime production in rotary kilns in 3.(c).(ii) and mixes lime production in other furnaces with cement production in 3.(c).(iii), whereas IED refers to lime production in 'kilns' in general in one category	Alignment with the IED activity definition is suggested to be able to separately sum-up releases of the cement and lime subsectors
5.(a)	Waste and wastewater management - installations for the recovery or disposal of hazardous waste receiving 10 tonnes per day	5.1 + 5.2(b) + 5.6	Waste management - 5.1.: Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving one or more of the following activities: **(a) biological treatment;** **(b) physico-chemical treatment;** **(c) blending or mixing prior to submission to any of the other activities listed in points 5.1 and 5.2;**	The IED covers specific sub-sectors, whereas the E-PRTR is general	Alignment with the IED activity definition is suggested to clarify that disposal covers landfill, incineration and co-incineration, and to sum-up releases of IED subsectors 5.1, 5.2 b)

# E-PRTR	Activity listed in E-PRTR	# IED	Activity listed in IED Annex I	Evaluation	Change of E-PRTR
			(d) repackaging prior to submission to any of the other activities listed in points 5.1 and 5.2; **(e) solvent reclamation/regeneration;** **(f) recycling/reclamation of inorganic materials other than metals or metal compounds;** **(g) regeneration of acids or bases;** **(h) recovery of components used for pollution abatement;** **(i) recovery of components from catalysts;** **(j) oil re-refining or other reuses of oil;** **(k) surface impoundment.** **5.2. (b) Disposal or recovery of waste in waste incineration plants or in waste co-incineration plants: for hazardous waste with a capacity exceeding 10 tonnes per day.** **5.6.: Underground storage of hazardous waste with a total capacity exceeding 50 tonnes**		and 5.6 separately.

A1.1.3.2 Assessment of differences in definitions

The E-PRTR could be improved by using sub-category definitions identical to those in Annex I of the IED. The specification and separation of sub-sectors in the E-PRTR would allow separate assessment of releases from these sub-sectors.

Separate assessment is particularly useful for those sectors where sector-specific BAT conclusions have been published. Differences between the IED Annex I list of activities and the E-PRTR Annex I list are that:

- The activity gasification and liquefaction has two types of fuel categories in the IED, namely coal and or other fuels, whereas no fuel categories are specified in the E-PRTR;
- Cement and lime production have product-related categories in the IED whereas Annex I of the E-PRTR divides by processes, mixing cement and lime production in different categories;
- Hazardous waste management has a detailed sub-activity list in the IED whereas the E-PRTR has just one category for this activity.

For the hazardous waste management sector, Annex I of the E-PRTR defines a single activity while Annex I of the IED splits the sector into three main categories. For each of these categories, specific best available techniques have been defined: BAT conclusions for waste disposal and recovery (BREF WT 2018[39]) and for waste incineration (BREF WI 2019[40]), and legislative requirements for underground storage of hazardous waste (Landfill Directive; 1999/31/EC).

On this basis, it is suggested to align the E-PRTR definitions for these three activities with the activity definitions of IED Annex I.

A1.1.4 Sectors covered by E-PRTR and IED but with different activity definitions

The following Table A1.5 summarises the assessment of sectors covered by the E-PRTR and IED but with ambiguity in activity definitions.

Table A1.5 Sectors covered by the IED and E-PRTR Annex I activity lists but with ambiguity in activity definitions

IED activity	Activity listed in IED Annex I	Evaluation of corresponding E-PRTR activity definitions
5.3(a)	Waste management - Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day involving one or more of the following activities, and excluding activities covered by Council Directive 91/271/EEC of 21 May 1991 concerning urban waste water treatment: (i) biological treatment; (ii) physico-chemical treatment; (iii) pre-treatment of waste for incineration or co-incineration; (iv) treatment of slags and ashes;	The E-PRTR covers disposal of non-hazardous waste with a capacity exceeding 50 t/day (Annex I activity 5.(c)) but does not explicitly cover involved waste management activities as listed in IED Annex I. Waste treatment activities listed in the IED are expected to have releases to air and water below the reporting thresholds. To achieve common understanding of inclusion of waste management activities on non-hazardous waste disposal sites, it is suggested to add in the E-PRTR Annex I

[39] https://eippcb.jrc.ec.europa.eu/reference/BREF/WT/JRC113018_WTbref.pdf

[40] https://eippcb.jrc.ec.europa.eu/reference/BREF/WI/JRC118637_WI_Bref_2019_published.pdf

IED activity	Activity listed in IED Annex I	Evaluation of corresponding E-PRTR activity definitions
	(v) treatment in shredders of metal waste, including waste electrical and electronic equipment and end-of-life vehicles and their components.	activity 5.(c) the same wording as used in the IED Annex I activity list.
5.3(b)	Waste management - Recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day involving one or more of the following activities, and excluding activities covered by Directive 91/271/EEC: (i) biological treatment; (ii) physico-chemical treatment; (iii) pre-treatment of waste for incineration or co-incineration; iv) treatment of slags and ashes; (v) treatment in shredders of metal waste, including waste electrical and electronic equipment and end-of-life vehicles and their components. When the only waste treatment activity carried out is anaerobic digestion, the capacity threshold for this activity shall be 100 tonnes per day.	Non-hazardous waste recovery or mix of recovery and disposal is covered by IED but not covered by E-PRTR. Most activities are expected to have releases below the reporting thresholds. Exemptions are anaerobic digestion or anaerobic and aerobic digestion, generally combined with biogas combustion. About 120-150 centralised facilities are expected to exceed the capacity threshold, as are a few large on-farm installations. To achieve consistency with the IED and to cover relevant related releases, it is suggested that the same wording used for the IED Annex I activity list be included in Annex I of the E-PRTR.

A1.1.4.2 Assessment of IED activities 5.3(a) disposal of non-hazardous waste

The IED covers in Annex I activity 5.3(a) the disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day involving one or more of the following activities (excluding activities concerning urban wastewater treatment):

1. biological treatment;
2. physico-chemical treatment;
3. pre-treatment of waste for incineration or co-incineration;
4. treatment of slags and ashes;
5. treatment in shredders of metal waste, including waste electrical and electronic equipment and end-of-life vehicles and their components.

To make clear that waste treatment activities are covered where the wording of E-PRTR Annex I activity 5.(c) only refers to ‘disposal’ of non-hazardous waste, and to be fully consistent with the IED Annex I activity list, it is suggested that the title and detailed list of activity types in IED Annex I activity 5.3 be adopted in E-PRTR Annex I activity 5.(c). No additional activities are expected to fall under the E-PRTR through the change in wording. However, by clarifying that the waste treatment involved is included in reporting requirements, related releases may increase if they have not been included in the reporting so far.

A1.1.4.3 Assessment of IED activity 5.3(b) recovery of non-hazardous waste or a mix of recovery and disposal

Additionally, the IED covers in Annex I activity 5.3(b) the recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day (when the only waste treatment activity carried out is anaerobic digestion, the capacity

threshold for this activity shall be 100 tonnes per day) involving one or more of the following activities (excluding activities concerning urban waste water treatment):

1. biological treatment;
2. pre-treatment of waste for incineration or co-incineration;
3. treatment of slags and ashes;
4. treatment in shredders of metal waste, including waste electrical and electronic equipment and end-of-life vehicles and their components.

There is ambiguity in the wording of the corresponding definition in E-PRTR Annex I: Activity 5.(c) reads 'Installations for the disposal of non-hazardous waste with a capacity of more than 50 tonnes per day' (without a list of sub-categories), while the sub-categories in the IED refers to waste treatment and not to disposal. Under activity 5.3(a) and (b) of the IED (disposal or recovery of non-hazardous waste), 1,137 installations were reported in the EU27 (BREF WT 2018[41]). Data on the share of activities permitted under 5.3(b) are not available.

The BREF for Waste Treatment (BREF WT 2018) shows that non-hazardous waste treatment activities usually do not exceed the E-PRTR reporting thresholds for the typical pollutants of the sector such as particulate matter (50,000 kg/year), NH_3 (10,000 kg/year), SO_X (150,000 kg/year), NO_X, NMVOC or methane (each 100,000 kg/year)[42]. Only very large activities operate with waste gas volumes of about 100,000 Nm^3/h. If these activities operate all year long (which is often not the case), a dust level of about 60 mg/Nm^3 would be needed to exceed the E-PRTR reporting threshold as well as a NMVOC level of 115 mg/Nm^3; such high emission levels are typically not achieved and would not represent BAT.

An exception is the activity 'anaerobic digestion' (alone or in combination with aerobic digestion and combined with biogas combustion): According to the Waste Framework Directive, this activity is classified as 'R3' (waste recovery). For this activity, release concentrations of methane, SO_2, NH_3 and NO_X were reported which, if combined with high-volume flows and long operation times, would exceed E-PRTR reporting thresholds. About 2,500 installations exist in the European Union carrying out digestion, with only a few large centralised installations (about 120-150) and 95% being on-farm installations. On-farm installations generally have capacities below 50 tonnes per day (BREF WT 2018).

To achieve consistency with the IED, the E-PRTR activity list could be extended by including the same wording as used in 5.3(b) of the IED Annex I activity list: 'Recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day' (100 tonnes per day when the only waste recovery activity is digestion), and by listing the same sub-categories.

If the current reporting thresholds are not changed, a small share of recovery installations have reporting requirements under the E-PRTR due to their releases to air. It is assumed that mainly centralised installations carrying out digestion (including biogas combustion) and a few very large on-farm digestion plants have to report.

Table A1.6 presents an indicative calculation of the impact on release reporting if the current ambiguity of the definition were changed to explicitly include 'biological treatment'. It is assumed that about 200 large digestion plants would report to the E-PRTR. The last column shows the share of expected annual releases in comparison to releases reported

[41] https://eippcb.jrc.ec.europa.eu/reference/BREF/WT/JRC113018_WTbref.pdf

[42] See for example Table 3.1 on dust air flow of shredders and Table 4.20 on emissions to air from anaerobic digestion in BREF WT 2018.

in 2017 from waste and wastewater management activities (under activity 5 of E-PRTR Annex I).

Table A1.6 Calculation of worst-case total releases from biogas combustion of 200 large digestion plants

Pollutant	Max. waste gas volume[1] (m^3/h)	Max. emissions[1] (mg/Nm^3)	Annual releases of one plant (t/year)	Annual releases of 200 plants[2] (t/year)	Share of E-PRTR 2017 waste/waste water (%)
SO_X	50,000	436	191	38,200	1,360
NO_X	50,000	822	360	72,000	109
CH_4	50,000	681	298	59,600	6.9

[1] Maximum waste gas volume assumed for 8760 hours/year; maximum emissions as reported for biogas combustion in BREF WT 2018 (Table 4.20).
[2] Assumption of 120-150 centralised installations and 50-80 large on-farm installations (BREF WT 2018).

A1.2 E-PRTR activities list supporting medium-specific EU legislation on air, water and waste

A1.2.1 Air-related legislation

A1.2.1.1 Air Quality Directive

The European Union's Air Quality Directive (2008/50/EC) does not refer to specific activities but requires air quality standards to be set for SO_X, NO_X, particulate matter (PM_{10}/$PM_{2.5}$), lead, benzene and carbon monoxide. These substances are all covered by the E-PRTR with the exception of $PM_{2.5}$.

A1.2.1.2 Medium Combustion Plant Directive

The Medium Combustion Plant Directive (MCPD; 2015/2193/EU) covers a large number of combustion plants with capacity thresholds between 1 MW and <50 MW. As the Annex I activity list of the E-PRTR covers only installations with a capacity of 50 MW and higher, none of the activities of the MCPD are covered.

For an assessment of inclusion of medium combustion plants see Annex A1.3 and Annex A1.6.

A1.2.2 Surface water-related legislation

A1.2.2.1 Urban Waste Water Treatment Directive

The European Union's Urban Waste Water Treatment Directive (UWWTD: 91/271/EEC) covers activities with a capacity from 2,000 population equivalents (p.e.) while the activity list in Annex I of the E-PRTR only covers installations above 100,000 p.e. Reporting of urban waste water treatment activities with a capacity between 2,000 and 100,000 p.e. is missing in the E-PRTR. An assessment of appropriate capacity thresholds is made in Annex A1.6.

A recent study by the European Environment Agency[43] found that there would be benefits from streamlining the reporting on UWWTP under the E-PRTR and the UWWTD. This would require yearly reporting and obligatory reporting of releases instead of voluntary reporting each second year under UWWTD. Obligatory reporting elements of UWWTD, like capacity design and operative description, could be added under the E-PRTR.

A1.2.2.2 Water Framework Directive

The European Union's Water Framework Directive (2000/60/EC) does not address specific activities but regulates the management of water bodies in general. Industrial facilities influencing water body quality can generate releases directly (provided they carry out their own treatment activities) or indirectly (via urban waste water treatment installations). Directly releasing facilities are covered by the E-PRTR if they include activities covered by Annex I of the E-PRTR Regulation; direct releases from non-E-PRTR activities are not covered. Releases from UWWTP are covered by the E-PRTR if these facilities exceed a capacity of 100,000 p.e. See Annex A1.6 for an assessment of lower capacity thresholds for UWWTP in the E-PRTR and Annexes A1.1, A1.3, A1.4 and A1.5 for an assessment of including non-E-PRTR activities in North Rhine-Westphalia, a region of Germany.

A1.2.2.3 Priority Substances Directive

The European Union's Priority Substances Directive (2013/93/EU) does not address specific activities but sets environmental quality targets for certain substances in water bodies. For an assessment of coverage of such substances by the E-PRTR, see Section 3.

A1.2.2.4 Nitrates Directive

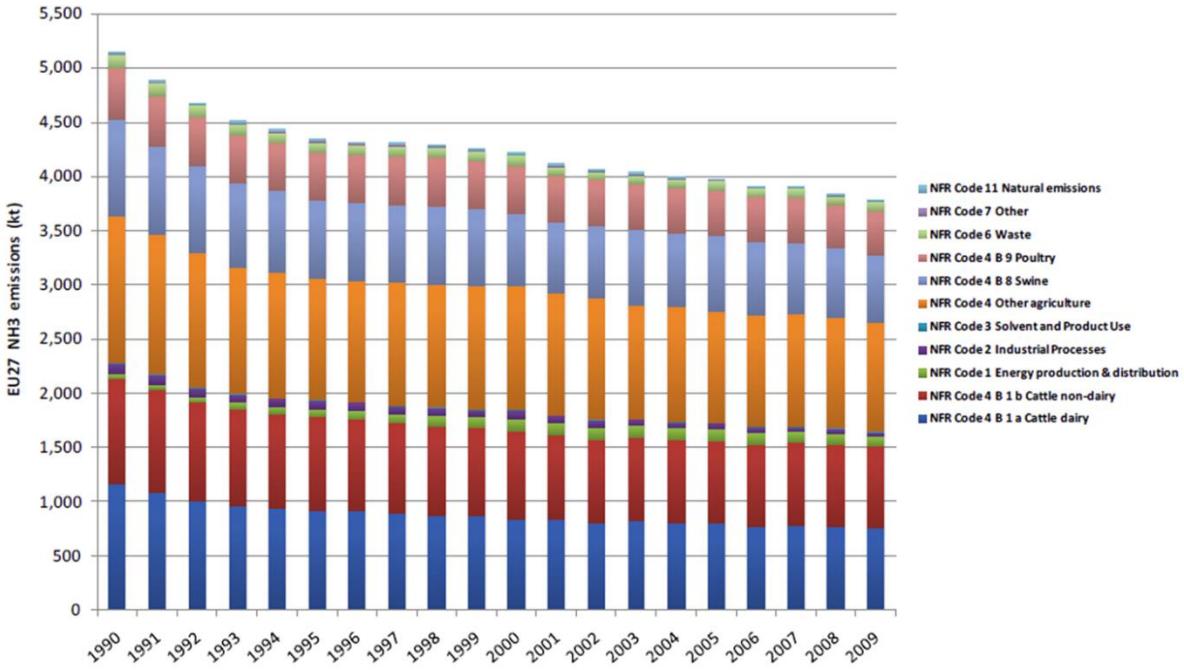
The European Union's Nitrates Directive (1991/676/EEC) addresses nitrogen releases from agricultural activities. Agricultural activities are partly covered by the activity list in Annex I of the E-PRTR: activity 7.(a) covers intensive rearing of poultry or pigs if exceeding specific thresholds for poultry (40,000 places[44]), pigs (2,000 places over 30 kg) and sows (750 places). Intensive rearing of cattle is not covered, nor is small-scale farming.

Calculations based on emission factors show that the rearing of dairy and non-dairy cattle (Nomenclature for Reporting (NFR) code 4B1) contribute a very high share, about 40%, to total ammonia releases in the EU27 (about 1,500,000 tonnes). In contrast, poultry and pigs (swine) (NFR codes 4B8 and 4B9) emit about 27% (about 1,000,000 tonnes; see Figure A1.1). In addition to ammonia releases, cattle rearing also contributes significantly to methane and N_2O releases in Europe (see Figure A1.2 and Figure A1.3; cattle-specific N_2O release data are not available).

[43] Industrial waste water treatment – pressures on Europe's environment, EEA Report, No 23/2018, European Environment Agency, ISSN 1977-8449, 2019. doi:10.2800/496223.

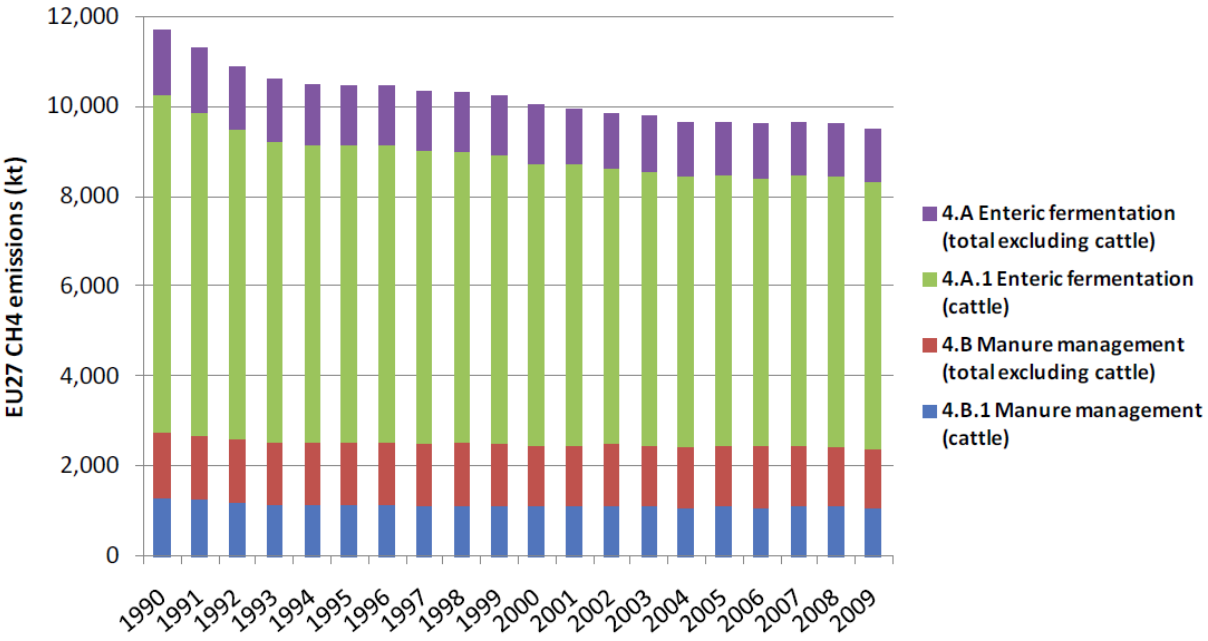
[44] The term 'places' refers to the average number of animals alive at any one time over the course of a year, as the number can vary seasonally and for poultry several generations can occur during one year.

Figure A1.1 Sector-specific NH_3 releases in the EU27 (2012)



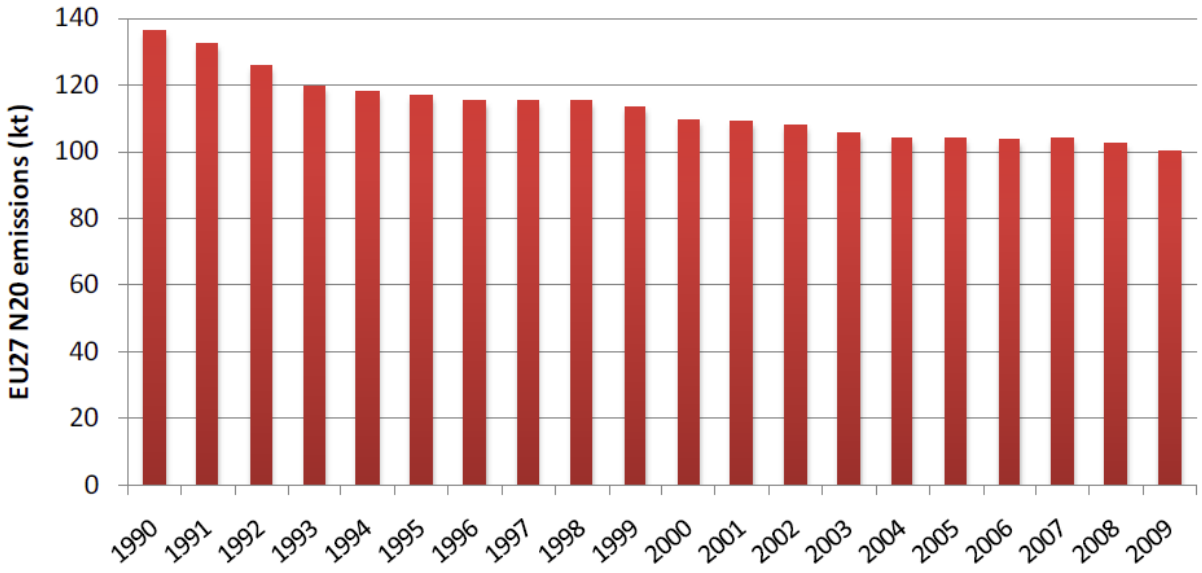
Source: CLRTAP, cited in AMEC report on intensive rearing of cattle (2012)

Figure A1.2 Sector-specific CH_4 releases from enteric fermentation in the EU27



Source: UNFCCC, cited in AMEC report on intensive rearing of cattle (2012)

Figure A1.3 Total N_2O releases from manure management in the EU27



Source: UNFCCC, cited in AMEC report on intensive rearing of cattle (2012)

Intensive rearing of cattle is not covered by the IED, so there is no BREF for the sector. This decreases the need for inclusion of the sector in the E-PRTR since an important use of the E-PRTR is the assessment releases for sectors where BAT conclusions have been published.

Annex A1.6 includes the assessment of potentially appropriate capacity thresholds for cattle rearing.

A1.2.3 Waste / Ground water and soil-related legislation

A1.2.3.1 Extractive Industries Directive

The European Union's Extractive Industries Directive (2006/21/EC) aims at good management of extractive industry waste. Related disposal activities and landfill sites are covered by activities 5.(a), 5.(c) and 5.(d) in the E-PRTR Annex I activity list.

A1.2.3.2 Waste Framework Directive

The European Union's Waste Framework Directive (2008/98/EC) refers to waste management including disposal and recovery activities. While the disposal of hazardous and non-hazardous waste is covered by the Annex I activity list of E-PRTR, the recovery of non-hazardous waste (e.g. composting and digestion) and temporary storage are not covered. As these activities are subject to the IED Annex I activity list, Annex A1.1 assesses their inclusion in the E-PRTR Annex I activity list.

A1.2.3.3 Landfill Directive

The European Union's Landfill Directive (1999/13/EC) refers to permitting and operation of waste disposal sites which are covered by activity 5.(d) in the E-PRTR Annex I activity list. In addition, the German national emission inventory includes a separate category for

flaring waste disposal gas, characterised as a 'non-E-PRTR activity'. To ensure comprehensive reporting of releases from landfill sites, it is suggested that the 'flaring of disposal gas' be explicitly included in the E-PRTR Annex I activity list where disposal and landfill is addressed. See Annex A1.3 for assessment of non-E-PRTR activities in the German emissions reporting system.

A1.2.4 Chemicals legislation

A1.2.4.1 REACH Regulation

The European Union's REACH Regulation (EC 1907/2006) does not refer to specific activities but aims at the regulation of harmful chemicals, with a particular focus on substances of high and very high concern. For an assessment of substances covered by the E-PRTR, see Section 3.

A1.2.4.2 Stockholm Convention - POPs Regulation

The European Union's POPs Regulation (EU 757/2010) does not refer to specific activities but aims at the regulation of persistent organic pollutants. For an assessment of substances covered by the E-PRTR, see Section 3.

A1.2.4.3 Mercury Convention - Mercury Regulation

The United Nations Minamata Convention aims at a phase-out of mercury use and a reduction of mercury emissions as far as technically possible, in combination with safe storage of mercury-containing waste. The Minamata Regulation (EU 852/2017) implements the requirements, in combination with the Industrial Emissions Directive (2010/75/EU). Mercury is already listed in Annex II of the E-PRTR. Activities with the highest mercury potential for mercury releases are covered by the IED and BAT conclusions and by the E-PRTR, in particular primary and secondary non-ferrous metal industries, primary and secondary iron and steel production, coking, cement production, coal combustion and waste incineration. Other sectors, also contributing to mercury releases to a smaller extent, are also covered by the IED and BAT conclusions[45], such as ceramics and glass manufacturing industries, pulp and paper industry, and biomass combustion.

A sector not covered by the IED and E-PRTR but with potential high mercury releases is the gypsum manufacturing industry. Since mercury emissions may rise in the next decades due to increased mercury emissions reduction by scrubbers at coal power plants leading to increased mercury content in the gypsum produced by the scrubbers, the inclusion of the activity is assessed in Annex A1.5.

A1.3 Member States supplementing the E-PRTR list of activities with additional activities

A1.3.1 Spanish PRTR

Spain has put into practice requirements beyond those established by the E-PRTR. Spanish national regulations include additional activities and pollutants with the basic purpose of improving the standardisation with other regulations. Additionally, a key

[45] Note that until 2019 not all of the BAT conclusions mentioned above have addressed mercury emissions.

objective is to increase the level of information that the facilities have to report, in order to have as much knowledge as possible of industrial operations in relation to their polluting capacity.

For reporting to the Spanish PRTR there is an obligation to report all release quantities for every pollutant, regardless of whether or not the established pollutant thresholds are reached. This avoids underestimation of releases from distributed smaller sources where the E-PRTR pollutant thresholds are not reached.

The Spanish PRTR has one list of activities which covers all IED and E-PRTR activities, as well as some Spanish-specific activities. In fact, the official name of the register is the Spanish Register of Emissions and Pollutant Sources. Figure A1.4 shows the structure of the Spanish PRTR and example correspondence of activity codes for the E-PRTR, IPPC Spain and the IED.

Review of public PRTRs at the national level for all EU member states shows that Spain is the only country that has incorporated additional activities into its PRTR. These additional activities are:

- Cement grinding with a production capacity exceeding 500 tonnes per day (note that cement production facilities usually include clinker production and cement grinding, so that cement grinding should be reported to the Spanish PRTR as a part of the facility; the additional Spanish activity refers to installations where clinker is not produced and cement is manufactured from purchased clinker). Air pollutants reported are CO, PM_{10}, CO_2, NO_X, SO_2, chlorine, nickel and benzene, but none of these accounts for more than 1% of total releases reported to the Spanish PRTR (ranging from 0.04% to 0.71%). Total organic carbon (TOC) is the only water pollutant reported, accounting for only 0.01% of total releases reported to the Spanish PRTR.
- Magnesium oxide production in kilns with a production capacity of 500 tonnes per day. Air pollutants reported are CO, CO_2, PM_{10}, NO_X and SO_2, but none of these account for more than 2% of total releases reported to the Spanish PRTR (ranging from 0.1% to 1.75%). Total nitrogen and chemical oxygen demand (COD) are the only water pollutants reported, with a negligible contribution (less than 0.0001%) to total releases reported to the Spanish PRTR.
- Recovery, or a mix of recovery and disposal, of non-hazardous waste with a treatment capacity of 75 tonnes per day, involving one or more of the following activities:
  - **Biological treatment**. Air pollutants reported are chlorine, CH_4 and NH_3, accounting for 1.12%, 0.75% and 0.28%, respectively, of total releases reported to the Spanish PRTR. Total nitrogen is the only water pollutant reported, accounting for only 0.1% of total releases reported to the Spanish PRTR.
  - **Pre-treatment for incineration or co-incineration**. Air pollutants reported are NH_3, CO_2, PM_{10}, SO_2 and NO_X, accounting for only 0.03%, 0.01%, 0.003, 0.0003 and 0.0002%, respectively, of total releases reported to the Spanish PRTR. No releases to water are reported.
  - **Pre-treatment for incineration or co-incineration**. Air pollutants reported are NH_3, CO_2, PM_{10}, SO_2 and NO_X, accounting for only 0.03%, 0.01%, 0.003, 0.0003 and 0.0002%, respectively, of total releases reported to the Spanish PRTR. No releases to water are reported.
  - **Treatment of slags and ashes**. Two installations under the scope of the Spanish PRTR but no releases are reported.
  - **Treatment in shredders of metal waste, including waste electrical and electronic equipment and end-of-life vehicles and their components**. CO is the only air pollutant reported, accounting for only 0.03% of total releases reported to the Spanish PRTR. Water pollutants reported are total nitrogen, total

phosphorus and COD, accounting for only 0.003%, 0.001% and 0.001%, respectively, of total releases reported to PRTR.

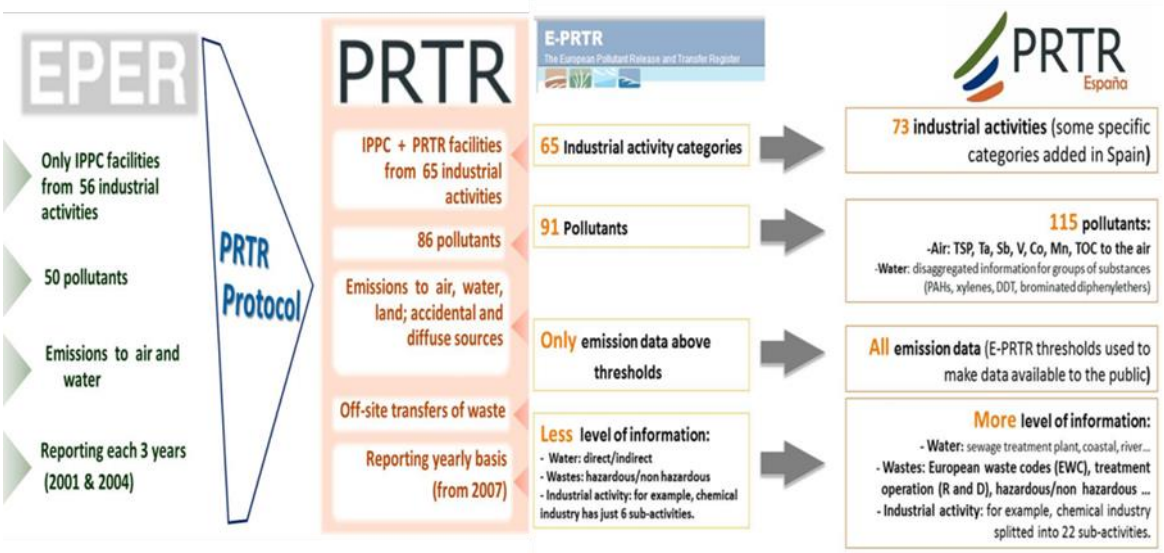
- **Temporary storage of hazardous waste not covered under point 5.d[46] as long as the waste is waiting for the application of any of the activities listed in points 5.a[47], 5.b[48], 5.d or 5.j[49] with a total capacity exceeding 50 tonnes, excluding temporary storage, if is going to be collected, on the site where the waste is generated**. Mercury is the only air pollutant reported, accounting for 0.12% of total releases reported to the Spanish PRTR. Polycyclic aromatic hydrocarbons (PAHs) is the only water pollutant reported, accounting for 0.36% of total releases reported to the Spanish PRTR.
- **Underground storage for hazardous waste with a storage capacity exceeding 50 tonnes**. Included for standardisation with the IPPCD although there are no such installations in Spain.
- **Installations for the production and treatment of cellulose with a production capacity exceeding 500 tonnes per day**. Air pollutants reported are NMVOC, PM_{10}, CO, SO_2, CO_2 and NO_X, accounting for 0.033%, 0.022%, 0.008%, 0.008%, 0.007% and 0.005%, respectively, of total releases reported to the Spanish PRTR. TOC and adsorbable organically bound halogens (AOX) are the only water pollutants reported, accounting for 0.73% and 0.35%, respectively, of total releases reported to the Spanish PRTR.
- **Capture of CO_2 coming from installations for geological storage**. Included for standardisation with the IPPCD although there are no such installations in Spain.

It is worth noting that the Spanish PRTR includes additional activities primarily to align the Spanish PRTR with other EU laws, rather than due to particular significance of these additional activities for releases from the Spanish industrial sector.

Figure A1.4 summarises the evolution of the scope in terms of the reporting needs of pollutants. This figure shows that the original framework established by the EPER is smaller in scope than the requirements currently included in the E-PRTR, which in turn is exceeded by the scope of activities, pollutants, reporting obligations and additional information required to be reported by facility operators to the Spanish PRTR.

[46] Landfills of all types of waste that receive more than 10 tonnes per day or have a total capacity of more than 25,000 tonnes excluding landfills of inert waste.
[47] Facilities for the recovery or disposal of hazardous waste, with a capacity of more than 10 tonnes.
[48] Facilities for the recovery or elimination of waste in incineration or co-incineration plants.
[49] Underground storage of hazardous waste, with a total capacity exceeding 50 tonnes.

Figure A1.4 Structure of the Spanish PRTR and links with the EPER and the E-PRTR



A1.3.2 North Rhine-Westphalia inventory

Compared with Annex I of the E-PRTR, Germany requires emissions reporting every fourth year for additional sectors and for an extended list of pollutants. The requirement is based on the 11th Ordinance ('11. BImSchV') to the Clean Air Act ('Bundes-Immissions-schutzgesetz'), referring to the activity list in the 4th Ordinance to the Clean Air Act ('4. BImSchV'). Reported emissions are not published but are subject to public access to information requests. Although a common web-based data collection system is used, data are divided into regional data sets, held by each of the 16 federal states of Germany. Table A1.7 shows examples of activities covered by the German regulation in addition to those of Annex I of the E-PRTR.

Table A1.7 Non-E-PRTR activity examples of German emission reporting (every 4th year)

E-PRTR Annex I activities with different thresholds	Examples of non-E-PRTR activities
■ Medium combustion plants and engines with a thermal input ≥1 MW and <50 MW ■ Gasification or liquefaction of shales below 20 MW ■ Cement production with capacity below 500 t/day (kilns and other types) ■ Lime and magnesium oxide calcination below 50 t per day ■ Glass manufacturing between ≥100 kg/day and <20 t/day ■ Ceramics manufacturing between >4 m^3 and <75 t/day ■ Steel processing <2.5 t/hour ■ Non-ferrous metal production of lead and cadmium between ≥0.5 t/day and <4 t/day ■ Foundries between >2 t/day and <20 t/day ■ Printing (e.g. heatset web offset printing between >25 kg/hour and <150 kg/hour or between >15 t/year and <200 t/year) ■ Treatment of waste with <10 kg/day hazardous or <3 kg/hour non-hazardous waste	■ Briquette production from lignite and coal ■ Distillation or processing of tar and tar products ■ Production of mixtures of tar or bitumen with minerals ■ Crushing, drying, grinding or classifying of natural or artificial stones ■ Calcining bauxite, gypsum, diatomaceous earth, quartzite calcination ■ Ship manufacturing or repair ■ Sand blasting surface treatment of steel and cast if >300 m^3/hour ■ Metal powder manufacturing ■ Medicinal products manufacturing ■ Lubricant refineries and paraffin production ■ Distillation of volatile organic solvents >1 t/hour ■ Manufacturing of paints, varnishes or printing inks ■ Plastics processing (PU, PVC foils) ■ Wood pellet production ■ Thermal recovery of dust from steel production ■ Thermal recovery of metals or metal compounds

E-PRTR Annex I activities with different thresholds	Examples of non-E-PRTR activities
■ Treatment of contaminated soil between >1 t/day and <10 t/day ■ Chemical treatment of waste <10 t/day	■ Storage tanks with >10,000 t for liquids with ignition temperature of 375.15 K ■ Installations for transfer of dusty goods ■ Installations for vessel cleaning (trains, lorries, ships, containers)

Reporting thresholds of the German Ordinance are very low for carcinogenic, mutagenic or reprotoxicant (CMR) substances (0.01 kg/hour or 0.25 kg/year) and low for other pollutants (10, 50 or 100 kg/year), depending on their toxicity.

The PRTR data of Germany cover:

- E-PRTR facilities with releases above the E-PRTR reporting threshold;
- E-PRTR facilities with releases below the E-PRTR reporting threshold;
- Non-E-PRTR facilities with releases above and below the E-PRTR reporting threshold.

For this project, 36,867 records of releases to air in 2016 were analysed, originating from (agro-)industrial installations of North Rhine-Westphalia (NRW). The NRW emission inventory covers about 6,500 installations, including about 2,400 IED installations, equivalent to a fifth of all IED installations in Germany. Most of the 4,100 non-IED installations carry out non-E-PRTR activities. This large variety of activities makes the NRW inventory a blueprint for Europe's industry.

Table A1.8 shows the sum of reported NECD pollutants of the NRW emission inventory compared with the German E-PRTR data and total E-PRTR reporting. For NO_X, SO_2, NMVOC and PM_{10}, the NRW data base covers between 35 and 45% of PRTR data of Germany and between 2.8 and 6.9% of the total releases reported to the E-PRTR. For NH_3, the share is lower, with 14% of Germany's PRTR data and 1.1% of all E-PRTR data.

Table A1.8 E-PRTR releases of NO_X, SO_2, NMVOC, NH_3 and PM_{10} above reporting thresholds in Germany and Europe, compared to NRW emission reporting

Pollutant	Releases of NRW inventory facilities above E-PRTR thresholds compared with German PRTR data 2016	Releases of NRW inventory facilities above E-PRTR thresholds compared with all E-PRTR data 2016
NO_X	41%	6.9%
SO_2	35%	2.8%
NMVOC	54%	5.1%
NH_3	14%	1.1%
PM_{10}	38%	4.1%

The subsequent sections assess the five major NECD pollutants regarding the share of releases contributed by releases from E-PRTR activities that are above E-PRTR reporting thresholds, when compared to total data. For the assessment of the share of releases, three situations are evaluated:

- Comparison within the scope of E-PRTR activities: Share of releases above the reporting threshold compared to the E-PRTR total.
- Comparison of E-PRTR activities with NRW total (E-PRTR and non-E-PRTR activities) if E-PRTR reporting thresholds are applied.
- Comparison of E-PRTR activities with NRW total (E-PRTR and non-E-PRTR activities) if no E-PRTR reporting thresholds are applied.

Additionally, the number of reporting facilities is shown and also the share of releases originating from non-E-PRTR facilities.

A1.3.2.2 NO_X releases in the NRW data set

NO_X releases in NRW total 150,630 tonnes in 2016, reported by 2,922 facilities. Table A1.9 shows the shares of E-PRTR and non-E-PRTR facilities within the NRW data set. It also shows E-PRTR and non-E-PRTR facilities emitting above the E-PRTR reporting threshold of 100 t/year of NO_X.

Table A1.9 Share of NO_X releases from E-PRTR and non-E-PRTR facilities compared with total NRW PRTR NO_X releases

NO_X 2016	NRW data total	NRW data E-PRTR facilities	NRW data non-E-PRTR facilities	NRW data E-PRTR >100 t	NRW data non-E-PRTR >100 t
Number of facilities	2,922	1,108	1,814	173	7
Amount (t)	150,630	135,400	15,230	125,331	1,220
Share of total	100%	89%	11%	83%	0.8%
Share of E-PRTR facilities	-	100%	-	93%	-

Restricting the analysis to E-PRTR facilities, applying a NO_X reporting threshold of 100 t/year captures more than 90% of NO_X releases from E-PRTR facilities (93%). Publicly reported E-PRTR releases (i.e. those above the E-PRTR reporting threshold) represent 83% of total releases reported in NRW.

If the German reporting threshold of 100 kg/year was applied to E-PRTR facilities, the releases would cover 89% of the total NO_X releases reported in NRW; the remaining 11% originates from non-E-PRTR activities. If the capture of 90% of the total NO_X releases from industrial activities as reported in NRW is to be fulfilled, additional sectors would need to be included in E-PRTR reporting.

Seven non-E-PRTR facilities exceed the current E-PRTR reporting threshold of 100 t/year of NO_X, with a share of 0.8% of total NOx releases in the NRW inventory:

- One combustion plant with a capacity of 1 to <50 MW, incinerating varnished or coated wood or wood panels (252 t NO_X);
- One facility for rolling of light metals with a capacity >0.5 t/year (246 t NO_X);
- Two combustion plants with a capacity of 1 to <50 MW, incinerating gaseous or liquid fuels other than light fuel oil (227 t NO_X);
- One combustion plant with a capacity of 20 to <50 MW incinerating light fuel oil, methanol, ethanol, untreated vegetable oils or vegetable oil methyl esters, untreated natural gas, liquid gas, gases from public gas supply or hydrogen (240 t NO_X);
- One stationary motor or turbine with a capacity of 1 to <50 MW using gaseous or liquid fuels (136 t NO_X);
- One facility for mineral processing (producing bauxite, dolomite, gypsum, diatomaceous earth, magnesite, quartzite or lime) (120 t NO_X).

The assessment of largest non-E-PRTR activities contributing to NO_X releases in the NRW data set shows that the following activities could be considered for inclusion in the Annex I activity list of the E-PRTR due to their high releases:

- Medium combustion plants (1 to <50 MW capacity);
- Rolling of light metals (0.5 t/year);
- Specific mineral processing industries (producing bauxite, dolomite, gypsum, diatomaceous earth, magnesite, quartzite or lime).

However, apart from medium combustion plants (1 to <50 MW capacity), there are no significant releases of more than two pollutants from these activities and therefore they are not proposed for inclusion.

A1.3.2.3 SO_2 releases in the NRW data set

SO_2 releases in NRW total 80,655 tonnes in 2016, reported by 2,318 facilities. Table A1.10 shows the shares of E-PRTR facilities within the data set, non-E-PRTR facilities, as well as the E-PRTR facilities and non-E-PRTR facilities reporting above the threshold of 150 t/year of SO_2.

Table A1.10 Share of SO_2 releases from E-PRTR and non-E-PRTR facilities compared with total NRW PRTR SO_2 releases

SO_2 2016	NRW data total	NRW data E-PRTR facilities	NRW data non-E-PRTR facilities	NRW data E-PRTR >150 t	NRW data non-E-PRTR >150 t
Number of facilities	2318	898	1,420	92	0
Amount (t)	80,655	78,726	1,929	72,912	0
Share of total NRW data	100%	98%	2%	90%	0%
Share of NRW E-PRTR facilities	-	100%	-	93%	-

Restricting the analysis to E-PRTR facilities, applying a SO_2 reporting threshold of 150 t/year captures 98% of releases from E-PRTR facilities. Publicly reported E-PRTR releases (those exceeding the reporting threshold) represent 90% of total SO_2 releases reported in NRW.

Within the non-E-PRTR activities, no facility exceeds the current E-PRTR threshold of 150 t SO_2. Non-E-PRTR facilities emitting more than 50 t SO_2 each are:

- One combustion plant with a capacity of 1 to <50 MW, incinerating gaseous or liquid fuels other than light fuel oil (96 t SO_2);
- One stationary engine or turbine with a capacity of 1 to <50 MW using gaseous or liquid fuels (78 t SO_2);
- Two flares at waste disposal sites (124 t SO_2);
- One facility for expended clay production (70 t SO_2);
- One facility for mineral processing (producing bauxite, dolomite, gypsum, diatomaceous earth, magnesite, quartzite or lime; 70 t SO_2).

The assessment of largest non-E-PRTR activities contributing to SO_2 releases in the NRW data set shows that the following activities could be considered for inclusion in the activity list of the E-PRTR (if also emitting significant amounts of other pollutants) due to their high SO_2 releases (although below the current reporting threshold):

- Medium combustion plants (1 to <50 MW capacity);
- Specific mineral processing industries (producing bauxite, dolomite, gypsum, diatomaceous earth, magnesite, quartzite or lime).

However, since there are there are no significant releases of more than two pollutants from mineral processing, only medium combustion plants are proposed for inclusion in the E-PRTR.

The NRW data set indicates that significant SO_2 releases occur from flares at waste disposal sites, so the definition for the E-PRTR activity 5.(d) (landfills) could be modified to explicitly include this process.

A1.3.2.4 NMVOC releases in the NRW data set

NMVOC releases in NRW total 30,827 t in 2016, reported by 3,162 facilities. Table A1.11 shows the shares of E-PRTR facilities within the data set, non-E-PRTR facilities, as well as the E-PRTR facilities and non-E-PRTR facilities reporting above the threshold of 100 t/year of NMVOC.

Table A1.11 Share of NMVOC releases from E-PRTR and non-E-PRTR facilities compared with total NRW PRTR NMVOC releases

NMVOC 2016	NRW data total	NRW data E-PRTR facilities	NRW data non-E-PRTR facilities	NRW data E-PRTR >100 t	NRW data non-E-PRTR >100 t
Number of facilities	3,162	1,233	1,929	14	0
Amount (t)	30,827	26,759	4,068	22,377	0
Share of total NRW data	100%	87%	13%	73%	0%
Share of NRW E-PRTR facilities	-	100%	-	84%	-

Restricting the analysis to E-PRTR facilities, applying a NMVOC reporting threshold of 100 t/year captures less than 90% of releases from E-PRTR facilities (84%). Publicly reported E-PRTR releases represent 73% of total NMVOC releases reported in NRW. If the German NMVOC threshold of 100 kg/year was applied to current E-PRTR facilities, the releases would capture 87% of the total NMVOC releases reported in NRW.

Within the non-E-PRTR activities, no facility exceeds the current E-PRTR threshold of 100 t NMVOC. Non-E-PRTR facilities emitting more than 50 t NMVOC each are:

- 10 facilities for surface coating with a capacity of <150 kg/hour or <200 t/year organic solvents (664 t NMVOC);
- Two facilities producing paint and varnishes with a capacity of >50 t/day organic solvents (160 t NMVOC);
- One combustion plant with a capacity of 1 to <50 MW, incinerating gaseous or liquid fuels other than light fuel oil (75 t NMVOC);
- One facility for textile finishing with a capacity <500 m^2/hour textiles (74 t NMVOC);
- One facility for polyurethane shaped products with a capacity of ≥200 kg/hour polyurethane raw material consumption (62 t NMVOC);
- One facility for coating and impregnation of resins with a capacity of ≥25 kg/hour (52 t NMVOC);
- One facility for storage of crude oil, petrochemical or chemical products with a capacity ≥25,000 t (58 t NMVOC).

The assessment of largest non-E-PRTR activities contributing to NMVOC releases in the NRW data set shows that several activities listed above could be considered for inclusion in the activity list of the E-PRTR due to their high releases (although below the current reporting threshold). However, apart from medium combustion plants (1 to <50 MW capacity), there are no significant releases of other pollutants from these activities and therefore they are not proposed for inclusion in the E-PRTR.

A1.3.2.5 NH_3 releases in the NRW data set

NH_3 releases in NRW total 4,573 t in 2016, reported by 683 facilities. The following Table A1.12 shows the shares of E-PRTR facilities within the data set, non-E-PRTR facilities, as well as the E-PRTR facilities and non-E-PRTR facilities reporting above the threshold of 10 t/year of NH_3.

Table A1.12 Share of NH_3 releases from E-PRTR and non-E-PRTR facilities compared with total NRW PRTR NH_3 releases

NH_3 2016	NRW data total	NRW data E-PRTR facilities	NRW data non-E_PRTR facilities	NRW data E-PRTR >10 t	NRW data non-E-PRTR >10 t
Number of facilities	682	622	60	2	0
Amount (t)	4,563	4,397	166	2,360	0
Share of total NRW data	100%	96%	4%	52%	0%
Share of NRW E-PRTR facilities	-	100%	-	54%	-

Restricting the analysis to E-PRTR facilities, applying a NO_X reporting threshold of 10 t/year captures much less than 90% of NH_3 releases from E-PRTR facilities (54%). Publicly reported E-PRTR releases represent 52% of total NH_3 releases reported in NRW. If the German threshold of 100 kg/year for NH_3 was applied to current E-PRTR facilities, the releases would capture 96% of the total NH_3 releases reported in NRW.

Within the non-E-PRTR activities, four facilities exceed the current E-PRTR threshold of 10 t/year of NH_3. Non-E-PRTR facilities emitting 10 t and more of NH_3 each are:

- Two facilities for coating and impregnation of resins with a capacity of $\geq$25 kg/hour (104 t NH_3);
- Two facilities producing amino-based synthetic resins with a capacity of $\geq$10 kg/hour (39 t NH_3).

The assessment of largest non-E-PRTR activities contributing to NH_3 releases in the NRW data set shows that the coating or impregnation of resins as well as the production of amino-based synthetic resins could be considered for inclusion in the activity list of the E-PRTR due to their high releases. However, there are no significant releases of other pollutants from these activities and therefore they are not proposed for inclusion in the E-PRTR.

A1.3.2.6 PM_{10} releases in the NRW data set

PM_{10} releases in NRW total 8,255 t in 2016, reported by 3,885 facilities. Table A1.13 shows the shares of E-PRTR facilities within the data set, non-E-PRTR facilities, as well as the E-PRTR facilities and non-E-PRTR facilities reporting above the threshold of 50 t/year of PM_{10}.

Table A1.13 Share of PM_{10} releases from E-PRTR and non-E-PRTR facilities compared with total NRW PRTR PM_{10} releases

PM_{10} 2016	NRW data total	NRW data E-PRTR facilities	NRW data non-E-PRTR facilities	NRW data E-PRTR >50 t	NRW data non-E-PRTR >50 t
Number of facilities	3,885	1,757	2,207	21	0
Amount (t)	8,255	6,384	1,870	3,580	0
Share of total NRW data	100%	77%	23%	43%	0%
Share of NRW E-PRTR facilities	-	100%	-	56%	-

Restricting the analysis to E-PRTR facilities, applying a PM_{10} reporting threshold of 50 t/year captures much less than 90% of releases from E-PRTR facilities (56%). Publicly reported releases represent 43% of total PM_{10} releases reported in NRW. If no threshold was applied to current E-PRTR facilities, the releases would capture 77% of the total PM_{10} releases reported in NRW. Within the non-E-PRTR activities, no facility exceeds the current E-PRTR threshold of 50 t/year of PM_{10}. There are no non-E-PRTR facilities emitting more than 10 t/year of PM_{10}. The biggest non-E-PRTR facility emitting PM_{10} is:

- One facility for distillation and processing of tar or tar products (5 t PM_{10}).

The assessment of largest non-E-PRTR activities contributing to PM_{10} releases in the NRW data set shows that the distillation and processing of tar or tar products could be considered for inclusion in the activity list of the E-PRTR due to their high releases. However, there are no significant releases of other pollutants from this activity and therefore it is not proposed for inclusion in the E-PRTR.

A1.3.2.7 Methane releases in the NRW data set

Methane releases in NRW total 6,286 t in 2016, reported by 1852 facilities. Table A1.14 shows the shares of E-PRTR facilities within the data set, non-E-PRTR facilities, as well as the E-PRTR facilities and non-E-PRTR facilities reporting above the threshold of 100 t/year of methane.

Table A1.14 Share of CH_4 releases from E-PRTR and non-E-PRTR facilities compared with total NRW PRTR CH_4 releases

CH_4 2016	NRW data total	NRW data E-PRTR facilities	NRW data non-E-PRTR facilities	NRW data E-PRTR >100 t	NRW data non-E-PRTR >100 t
Number of facilities	1,852	938	914	0	0

CH_4 2016	NRW data total	NRW data E-PRTR facilities	NRW data non-E-PRTR facilities	NRW data E-PRTR >100 t	NRW data non-E-PRTR >100 t
Amount (t)	6,286	3,867	2224	0	0
Share of total NRW data	100%	62%	38%	0%	0%
Share of NRW E-PRTR facilities	-	100%	-	0%	-

Restricting the analysis to E-PRTR facilities, the public E-PRTR reporting applying a PM_{10} reporting threshold of 100 t/year captures no releases from E-PRTR facilities (0%), hence publicly reported releases represent 0% of total methane releases reported in NRW. If the German methane threshold of 100 kg/year was applied to current E-PRTR facilities, the releases would capture 62% of the total methane releases reported in NRW.

Within the non-E-PRTR activities, no facility exceeds the current E-PRTR threshold of 100 t/year methane. Non-E-PRTR facilities emitting 50 t and more of methane each are:

- Two stationary motors or turbines with a capacity of 1 to <50 MW using gaseous or liquid fuels (148 t CH_4);
- Two stationary motors and turbines with 1 to <20 MW (168 t).

The assessment of largest non-E-PRTR activities contributing to methane releases in the NRW data (although below the current E-PRTR reporting threshold) shows that a reduction of the current capacity threshold for combustion plants could be considered to include medium combustion plants (1 to <50 MW capacity) in the E-PRTR.

A1.3.2.8 Pollutants in the NRW data base with a high share of releases from non-E-PRTR activities

Releases of pollutants reported in 2016 in NRW were analysed regarding releases originating from non-E-PRTR activities.

The analysis in Table A1.15 below shows that for NMVOC and the greenhouse gases CH_4 and N_2O a high share of releases (14-38%) was reported from non-E-PRTR activities. Furthermore, some CMR substances such as nickel, benzene, trichloromethane, perchloroethylene, dichloromethane and dichloroethane have a relatively high share (6.2-22%). The CMR substance DEHP was reported from only one facility carrying out a non-E-PRTR activity. For PM_{10} and NO_X, releases originating from non-E-PRTR activities have shares of 28% and 12%, respectively, of the total releases reported in NRW.

Besides medium combustion plants, no activity with high releases of multiple pollutants was identified.

Table A1.15 Share of releases arising from non-E-PRTR facilities, compared with total NRW inventory releases of each pollutant

Pollutant	All activities in NRW (kg/year)	Non-E-PRTR activities (kg/year)	Share	Number of non-E-PRTR facilities	Comment
DEHP	403	403	100%	1	Vulcanisation of rubber <25 t/hour
CH_4	6,285,771	2,418,336	38%	958	Mainly combustion plants, textile finishing
PM_{10}	6,839,437	1,927,546	28%	2,207	Several activities
N_2O	1,304,697	148,221	11%	899	Several activities
Ni	3,118	676	22%	300	Mainly non-ferrous metal smelters/metal coating below E-PRTR threshold
Cr	3,045	486	16%	284	Mainly transfer of dusty goods
NMVOC	30,826,992	4,216,090	14%	1,978	Several activities
Trichloro-methane	107	14	13%	1	Common waste gas treatment
NO_X	136,180,861	16,444,558	12%	1,858	Several activities
Benzene	78,032	9,425	12%	289	Several activities
Perchloro-ethylene	173	18	10%	4	Mainly distillation of organic solvents
NH_3	4,572,867	294,377	6.4%	85	Several activities
Dichloro-methane	3,568	229	6.4%	5	Several activities
1,2 Dichlo-roethane	3,081	235	6.2%	1	Common waste gas treatment
As	940	39	4.2%	254	Several activities
Zn	41,042	1,681	4.1%	246	Several activities
PAH	131	4.9	3.7%	239	Several activities
SO_2	80,655,209	2,727,045	3.4%	1,455	Mainly combustion plants
HCl	2,266,628	55,479	2.4%	439	Several activities
PCDD/F	0.006624	0.000146	2.2%	260	Mainly combustion plants
Cu	5,093	102	2.0%	281	Several activities
CO	390,951,634	7,530,605	1.9%	1,770	Several activities
HF	390,182	5,635	1.4%	442	Several activities
Cd	620	4.8	0.8%	252	Several activities
Pb	29,870	191	0.6%	278	Several activities
Hg	2,438	5.8	0.2%	177	Several activities

A1.3.2.9 Methane

Analysis of methane releases from non-E-PRTR activities shows that the majority (94%) of releases from non-E-PRTR activities originate from combustion plants, including the sub-categories:

- Liquid fuel motors and turbines with 1 to <20 MW capacity;
- Gaseous fuel motors and turbines with 1 to <20 MW;
- Stationary motors and turbines with 1 to <50 MW;
- Medium combustion plants for solid and liquid fuels except light fuel oil with 20 to <50 MW;
- Combustion plants for other gaseous fuels with 10 to <50 MW;
- Combustion plants for other fuels with 0.1 to <50 MW.

Other contributions of methane releases from non-E-PRTR activities originate from:

- Combustion of waste oil or disposal site gases (2.5%);
- Textile finishing (1.6%);
- Flaring of waste disposal site gas (0.7%);
- Combustion of coated wood and wood-based panels (0.6%).

None of the non-E-PRTR activities reported releases above the current threshold of 100 t/year. 48 facilities reported releases above 10 t/year, comprising mainly motors and turbines. 284 facilities reported releases above 1 t/year, mainly motors and turbines but also combustion of gaseous, solid and liquid fuels (1 to <50 MW) and textile finishing plants.

Considering all reported NRW releases, currently no facility exceeds the 100 t/year threshold of CH_4. Reducing the threshold to 10 t/year would include 120 facilities under the E-PRTR scope (mainly large combustion plants >50 MW and intensive rearing of pigs).

A1.3.2.10 Nitrous oxide (N_2O)

The analysis of N_2O releases from non-E-PRTR activities shows that the majority of releases from non-E-PRTR activities originate from combustion plants, including the sub-categories:

- Liquid fuel motors and turbines with 1 to <20 MW;
- Gaseous fuel motors and turbines with 1 to <20 MW;
- Stationary motors and turbines with 1 to <50 MW;
- Medium combustion plants for solid and liquid fuels except light fuel oil with 20 to <50 MW;
- Combustion plants for other gaseous fuels with 10 to <50 MW;
- Combustion plants for other fuels with 0.1 to <50 MW.

The remaining contributions from non-E-PRTR activities originate from:

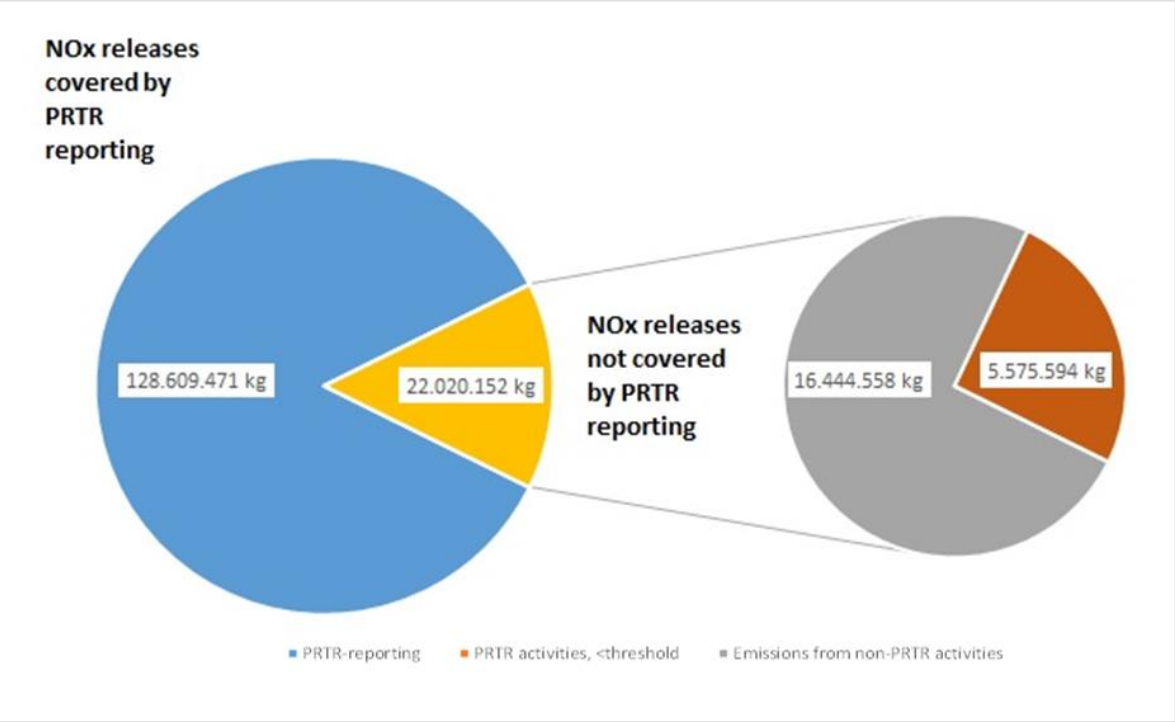
- Combustion of waste oil or disposal site gases (2.5%);
- Textile finishing (1.6%);
- Flaring of disposal site gas (0.7%);
- Combustion of coated wood and wood-based panels (0.6%).

A1.3.2.11 Nitrogen oxides (NO_X)

With regard to NO_X releases, analysis of the NRW inventory indicates that of the 15% of total NO_X releases is not covered by E-PRTR reporting, with the major share of these releases originating from non-E-PRTR activities. Within the non-E-PRTR activities, only

very few facilities exceed the current reporting threshold. The inclusion of medium combustion plants would not lead to capture of 90% of NOx industrial releases in NRW unless the pollutant reporting for NOx was also reduced.

Figure A1.5 NO_X releases in E-PRTR reporting and shares of non-reported NO_X releases from E-PRTR and non-E-PRTR activities in NRW (2016)



A1.3.2.12 Conclusions

The assessment of the NRW data base shows that medium combustion plants contribute a significant share of releases of greenhouse gases (CH_4 and N_2O) as well as ambient air quality pollutants (PM_{10} and NO_X). Therefore, the inclusion of this sector with appropriate capacity thresholds is assessed in Annex A1.6.

Besides medium combustion plants, additional activities have been identified as having releases of certain air pollutants such as NO_X and SO_2 above the current reporting threshold:

- Rolling of light metals (0.5 t/year);
- Specific mineral processing industries (producing bauxite, dolomite, gypsum, diatomaceous earth, magnesite, quartzite or lime).

However, apart from medium combustion plants, no other activities have significant releases of more than two pollutants.

Flares from waste disposal sites could be included in the E-PRTR activity list as they can generate high releases of SO_2 (above the current threshold of 100 t/year) as well as of methane and N_2O. Since reporting of releases from landfills is already covered by 5.(d) in Annex I of the E-PRTR, explicit inclusion of waste disposal site flares would ensure complete reporting of releases and cover significant releases of SO_2 and greenhouse gases (CH_4, N_2O).

A1.4 Harmonisation potential of the E-PRTR list of activities with international PRTRs

With an increased focus on sustainability as a global priority, international analyses are turning to PRTRs as a key source of current and time series data on the environmental releases of pollutants. Robust global analyses seek to aggregate and compare data from PRTRs around the world. The primary challenge with such analyses is that each PRTR was designed to meet its country- or region-specific needs, with less attention given to the comparability of the data among different PRTRs. Consequently, PRTRs have differing reporting requirements, including which activities are covered. These differences confound global analyses based on the valuable environmental release information in PRTRs.

Recognising this comparability issue, OECD developed a document which presents a harmonised list of PRTR reporting sectors[50]. The OECD 'short list' of harmonised sectors includes 154 sectors that are covered in the reporting requirements of four or more of the following mature PRTRs: Australia, Canada, Japan, the United States, and the E-PRTR. Approximately half of the 'short list' sectors are covered by all five PRTRs. For those sectors covered by only four PRTRs, the E-PRTR is consistently the one PRTR that does not fully cover these sectors. Including these activities in the E-PRTR would improve the EU's contribution to, and benefits from, global analyses.

Although Annex I of the E-PRTR Regulation specifies the industrial **activities** covered by the E-PRTR, other PRTRs typically establish which facilities must report based on a **sector** designation. Sector designations can be readily translated from each country's sector identification system to the International Standard Industrial Classification of All Economic Activities (ISIC)[51]. This correspondence is not straightforward for E-PRTR Annex I activities. In some cases, an Annex I activity clearly corresponds to a specific sector. In other cases, an Annex I activity spans many different sectors. For example, surface finishing activities (i.e. E-PRTR activities 2.(f) and 9.(c)) are carried out in facilities in numerous sectors. Given that other PRTRs use a sector approach, this analysis identified which sectors (rather than activities) are not currently covered by the E-PRTR.

A1.4.1 Method

This section describes the approach used to develop a list of sectors, as defined by ISIC or Statistical Classification of Economic Activities in the European Community (NACE) codes, that could be added to the E-PRTR to improve the global comparability of E-PRTR data with PRTRs.

A1.4.1.1 Identify sectors covered by other PRTRs but not included in the E-PRTR.

As mentioned above, for each ISIC class, the OECD document indicates if the sector is fully, partly, or not at all covered by the PRTRs of Australia, Canada, Japan, the United States, and the E-PRTR. Those sectors that are not fully covered by the E-PRTR, but are fully or partially covered by all four other PRTRs, were identified to include in a list of sectors that could be added to the E-PRTR to improve global harmonisation.

[50] http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=env/jm/mono(2013)5&doclanguage=en

[51] https://stat.unido.org/content/learning-center/international-standard-industrial-classification-of-all-economic-activities-%2528isic%2529

While the OECD short list of harmonised sectors served as the starting point for this analysis, some modifications were made:

- The project team reviewed the sectors listed on the OECD short list as 'partially' covered by the E-PRTR. The review determined if the portion of the sector not currently covered in the E-PRTR was significant. If it was not significant and the sector was largely already covered by the activities listed in E-PRTR Annex I, the sector was not considered further.
- Sectors that were only partially covered by most other PRTRs (two or more) and were partially covered by the E-PRTR were not considered further as the current E-PRTR coverage was comparable to that of other PRTRs.

A1.4.1.2 Identify the sectors with significant reporting in other PRTRs.

From the list of sectors covered by the other four PRTRs, but not fully covered by the E-PRTR, the next step was to remove the sectors with few facilities and/or low reported environmental releases. In these cases, adding the sectors to the E-PRTR would contribute little benefit to global harmonisation.

Characterising the sectors with significant reporting in other PRTRs was based on the number of facilities and magnitude of releases in each sector for the four PRTRs (Australia, Canada, Japan and the U.S.) as follows:

- The OECD PRTR reporting sectors document assigned a score for each ISIC class in each PRTR based on a) the average releases (and transfers or waste management quantities, where applicable) per facility and b) the number of facilities reporting. A score of 3 indicates high reporting, a score of 2 indicates moderate reporting, and a score of 1 indicates low reporting.
- The scores were summed across the four PRTRs (Australia, Canada, Japan and the U.S.) for each ISIC class, resulting in a combined score from 0 to 12 for each ISIC class.
  - For example, for ISIC 2731 Manufacture of fibre optic cables, the OECD document assigned a score of 3 for the Canadian PRTR (i.e. high reporting based on releases and facilities reporting), and assigned a score of 2 (moderate reporting) to each of the other PRTRs (i.e. for Australia, Japan and the U.S.). Summing the scores for the four PRTRs resulted in a combined reporting score of 9 (i.e. 3+2+2+2).
  - This combined reporting score indicated the prevalence of information reported for the ISIC class across the four PRTRs, where the ISIC classes with the most facilities and releases reported received the highest scores.
- ISIC classes with scores lower than 9 were removed from the analysis, as these classes do not have consistently robust reporting across PRTRs and were considered lower priority candidates for harmonisation.
- For each ISIC division (comprised of ISIC classes), the highest reporting score for any class in that division was retained, as it represented the maximum benefit from including the ISIC division in the E-PRTR.

Table A1.16 shows the sectors with combined reporting scores greater than or equal to 9, presented by their ISIC division (which is the same as the NACE division). The third column lists the combined reporting score for the division based on reporting to other PRTRs.

Table A1.16 Sectors that could be added to the E-PRTR to improve global harmonisation

ISIC/NACE division code	ISIC division name	PRTR combined reporting score[1]	Value added, million Euro[2]
25	Manufacture of fabricated metal products, except machinery and equipment	12	105,403
29	Manufacture of motor vehicles, trailers and semi-trailers	10	211,252
28	Manufacture of machinery and equipment n.e.c.	10	169,752[3,4]
30	Manufacture of other transport equipment	10	57,620[5]
27	Manufacture of electrical equipment	9	93,315
26	Manufacture of computer, electronic and optical products	9	90,393[3]

[1] Based on Global Pollutant Release and Transfer Register Proposal for a Harmonised List of Reporting Sectors, OECD, 27/2/2013.
[2] Value added at factor cost (2016), in Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E), Eurostat. Accessed 14/1/2019.
[3] Value added data for one included class is from 2014.
[4] Value added data for one included class is from 2011.
[5] Value added data for one included class is from 2015.

A1.4.1.3 Provide context on the size of the candidate ISIC classes in E-PRTR countries.

E-PRTR countries' value added data are shown in the last column of Table A1.16 to provide additional context characterising the size of the sectors that could be added to the E-PRTR to improve global harmonisation. To focus primarily on the sectors that are most prevalent in the E-PRTR countries, ISIC divisions with 'value added' less than 50 billion Euro were removed from the analysis. The 'value added' in Table A1.16 is for the ISIC classes within the ISIC divisions listed and does not represent the value added for the entire ISIC division. Data for 'value added at factor cost – million Euro' were retrieved from Eurostat for 2016 except as noted in the table footnotes. Value added data were retrieved for the EU-28, Iceland, Norway, and Switzerland. Value added data on the ISIC classes for the two other countries participating in the E-PRTR, Serbia and Liechtenstein, were not available from Eurostat and are not included in Table A1.16. Data for Iceland, Norway, and Switzerland were not available for many sectors. Given that the EU contributed over 90% of the GDP of E-PRTR countries in 2016, EU data can be expected to represent a large enough portion of the economic activity of E-PRTR countries to be sufficient for this screening-level analysis. Economic data reported by NACE code were matched to the corresponding ISIC class according to the NACE REV. 2 - ISIC REV. 4 correspondence table published by Eurostat. If more than one NACE code corresponded to an ISIC class, value added was summed for all included NACE codes. Results were summarised at the NACE division level by taking the sum of the value added by all candidate ISIC classes within the division, as this best represents the economic contribution of the activities suggested for E-PRTR inclusion within the division.

A1.4.1.4 Assess the extent to which these sectors are already covered by the E-PRTR.

Because E-PRTR reporting requirements are determined by the activities within a facility, rather than its NACE code, some facilities in Table A1.17 are already included in the E-PRTR. These facilities primarily report 2.(f) and 9.(c) activities, which cover surface treatment of metals and plastic materials using an electrolytic or chemical process, and surface treatment of products using organic solvents, respectively. Table A1.17 provides the number of facilities that reported to the E-PRTR from each of the sectors in Table A1.16.

Table A1.17 Coverage of selected sectors in the E-PRTR

ISIC/NACE Division code	ISIC Division name	Count of facilities in E-PRTR, 2016
25	Manufacture of fabricated metal products, except machinery and equipment	158
26	Manufacture of computer, electronic and optical products	11
27	Manufacture of electrical equipment	13
28	Manufacture of machinery and equipment n.e.c.	8
29	Manufacture of motor vehicles, trailers and semi-trailers	109
30	Manufacture of other transport equipment	25

To assess if the activities already reported cover a significant portion of the releases from the sector, reporting and release rates in the E-PRTR for each ISIC Division identified in Table A1.16 were compared to reporting and release rates for the same ISIC Divisions in the U.S. TRI, with the results shown in Table A1.18. TRI reporting covers each of these sectors in whole, rather than covering specific activities as is the case for the E-PRTR. Given the differences in covered activities, pollutants, and thresholds between the E-PRTR and the TRI, this analysis is only intended for screening-level comparisons. To make this comparison more robust, the analysis was restricted as follows.

1. **Pollutant** restriction. Only pollutants that are reportable in both the E-PRTR and the TRI were included in Table A1.18. This restriction means that some of the largest pollutant releases reported by these sectors are excluded, such as NMVOCs in the E-PRTR and nitrate compounds in the TRI.
2. **Media** restriction. Only air and water releases were included in Table A1.18. This restriction was added because all types of land disposal are included in the TRI whereas only land treatment and deep well injection are in the E-PRTR.
3. **Sector** restriction. The denominators for the calculations of the percentages in Table A1.17 were limited to only manufacturing sectors (ISIC 10-33) to exclude sectors that are not represented in both the E-PRTR and the TRI.

Table A1.18 Comparison of E-PRTR and U.S. TRI reporting and release rates by manufacturing ('mfg') sector

	E-PRTR, 2016				U.S. TRI, 2016			
ISIC/ NACE Division code	Facilities reporting	% of all mfg facilities reporting	Releases (kg)	% of all mfg releases reported	Facilities reporting	% of all mfg facilities reporting	Releases (kg)	% of all mfg releases reported
25	113	6.4%	290,623	0.61%	2,333	16%	1,814,047	2.4%
26	2	0.1%	841	<0.01%	683	4.8%	146,550	0.2%

	E-PRTR, 2016				U.S. TRI, 2016			
27	9	0.5%	3,348	<0.01%	465	3.2%	442,636	0.6%
28	1	0.1%	268	<0.01%	1,034	7.2%	375,483	0.5%
29	28	1.6%	33,791	0.07%	548	3.8%	1,692,322	2.2%
30	7	0.4%	15,164	0.03%	341	2.4%	1,206,337	1.6%

The data shown in this table were restricted for comparability as follows: only pollutants that are reportable in both the E-PRTR and TRI are included; only air and water releases are included; and the percentage columns only include manufacturing facilities (ISIC 10-33).

For all of the identified sectors that could be more comprehensively covered by the E-PRTR to improve global harmonisation, the E-PRTR has lower release reporting rates (based on both percentage of manufacturing facilities and percentage of releases) compared to the TRI. This difference is expected since the TRI covers all activities for the sector and the E-PRTR only covers the activities listed in Annex I. Based on this comparison, additional release reporting would be expected if these sectors were fully covered in the E-PRTR. Further research on the size of these sectors in the E-PRTR countries would be required to estimate the number of facilities that would report and their expected releases.

A1.4.1.5 Suggestions to improve global harmonisation

This screening-level analysis indicates that sectoral additions to the E-PRTR could improve global harmonisation as follows:

- **ISIC 26, 27, 28 and 30**. The E-PRTR includes few facilities in these sectors. Together, these four ISIC divisions account for 2% of manufacturing facilities in the E-PRTR while they account for 18% of manufacturing facilities reporting to the TRI. Value-added data in Table A1.16 indicate these sectors are at least of moderate size in the EU. The low number of facilities reporting in these sectors suggests that they are not well-covered by existing E-PRTR activities. Releases for these sectors in the E-PRTR account for less than 0.05% of manufacturing releases while they account for 3% of manufacturing releases in the TRI. Further investigation of the TRI releases from these sectors indicate that quantities of metals and metal compounds released are significant, especially in ISIC 27, Manufacture of electrical equipment. For this sector in TRI, metals and metal compounds accounted for 73% of the 443,000 kg of releases shown for the sector in Table A1.18.
- **ISIC 29, Manufacture of motor vehicles, trailers and semi-trailers**. This sector has more than 100 facilities already included in the E-PRTR (see Table A1.17), although the count drops considerably to 28 when energy-production-related pollutants such as carbon dioxide and nitrogen oxides are excluded. Restricting the comparison between programs to TRI-covered pollutants indicates that releases associated with activities unrelated to fuel combustion are not well-covered in the E-PRTR data.
- **ISIC 25, Manufacture of fabricated metal products**. ISIC 25 appears to be relatively well-covered in the E-PRTR as demonstrated by the 158 facilities reporting and releases of TRI-covered chemicals of 291,000 kg or 0.6% of manufacturing releases. The 0.6% contribution to all manufacturing releases is within an order of magnitude of the TRI contribution from this sector (2.4%), therefore, adding this sector to the E-PRTR may not significantly improve global harmonisation of E-PRTR data.

An alternative approach to improving global harmonisation of E-PRTR data could be to include a metal-working activity in Annex I.

- **Metal-working activities**. While some activities are covered in Annex I for ISIC 25, 26, 27, 28, 29, and 30, metal-working activities across these sectors are not included. One potential approach to improving global harmonisation could be to include a metal-working activity in Annex I. Such an addition would better align the E-PRTR activities with other PRTRs' covered sectors. From a risk-screening perspective, releases of metals and metal compounds typically drive toxicity scores for both human health and ecotoxicity. The addition of a metal-working activity to Annex I would be expected to result in meaningful additional data for global PRTR harmonisation, particularly from a risk-screening perspective. At this time further investigation of the specific processes at U.S. facilities in these sectors that are generating releases of metals to air and water, and of potential capacity and release thresholds, is suggested

A1.5 Horizon scanning regarding activities with increasing environmental interest in the future

Four industrial activities were identified with increasing emissions potential in the future. Based on the significance of their releases, three of these activities could be considered for future inclusion in the E-PRTR Annex I activity list:

- Regarding **small co-incineration plants** with a capacity of <50 MW (typically of just below 50 MW):
  - Decentralised energy provision is a trend in industries and for local heat;
  - Current trend is for coal and biomass (depending on prices), with future potential for increasing gas;
  - Some projects plan to operate with both conventional and biomass fuels;
  - **If the E-PRTR is extended to include combustion plants 20 to 50 MW as proposed, many of these co-incineration plants would be covered**.
- For industries with mercury releases not covered by BAT conclusions:
  - Gypsum manufacturing from scrubber sludge generated by coal combustion plants. This may increase in future years due to mercury-specific reduction techniques used in coal combustion plants. However, this will be in parallel with a trend of less gypsum sludge from coal combustion due to closing plants;
  - Legislation would be needed first to require mercury monitoring of gypsum production plants; otherwise reporting of releases could only be based on emission factors (which is not beneficial for evaluating varying sector releases and trends).

  For these reasons, inclusion of **gypsum manufacturing is not proposed**.
- Industrial scale **3-D printing** could be a sector with increasing emissions potential, depending on the number of facilities and their size. 3-D printing techniques are associated with releases of particulate matter ($PM_{2.5}$) and NMVOC. However, releases depend on abatement techniques (e.g. those used for particulate matter) and are expected to be relatively low. Nonetheless, **industrial-scale 3-D printing could be considered for inclusion**.
- As the uptake of electric vehicles increases, **battery production** in Europe is expected to increase. Production sites may have the risk of generating releases of heavy metals, lithium and acids to water and land. As it is expected to be the sector with largest emissions potential in the future, **battery production should therefore be considered for inclusion** in the activity list of the E-PRTR at this time.

A1.6 Appropriate capacity thresholds for additional activities

A1.6.1 Cattle rearing

On behalf of the European Commission, a study was undertaken in 2012 to assess a potential threshold for inclusion of intensive cattle rearing in the IED[52]. The study found that livestock units (LSU) would be the most appropriate unit to set capacity thresholds, although not ideal because it does not distinguish between intensive and extensive farming. It found that some Member States already use different LSU thresholds for permitting of cattle rearing, using for example 30, 100, 200, 300 and 500 as thresholds.

Table A1.19 shows the effect of setting thresholds of 50, 100, 200 and 600 LSU based on data from the 2012 study. It shows the number of holdings covered and the number of cattle head (separated by dairy and non-dairy). The share of related releases equals the share of total cattle head; total cattle in the EU is estimated at about 90 million head.

Table A1.19 Cattle rearing holdings and cattle covered when considering different Livestock Unit (LSU) thresholds for inclusion in the E-PRTR

LSU threshold	Number of dairy holdings (share of total)	Number of dairy cattle head [share of total]	Number of other holdings (share of total)	Number of other cattle head (share of total)	Number of all cattle head (share of total)
50	289,000 (12%)	18 million (72%)	195,000 (23%)	51 million (79%)	69 million (77%)
100	153,000 (6%)	13 million (53%)	94,000 (1%)	39 million (60%)	52 million (58%)
200	49,000 (2%)	7 million (28%)	32,000 (4%)	22 million (34%)	29 million (32%)
600	5,000 (0.2%)	2 million (7%)	3,000 (0.4%)	6 million (8%)	8 million (9%)

The table shows that setting a threshold of 50 LSU would include about 69 million LSU and 77% of the sector's NH_3 releases, requiring reporting from 2.7 million holdings. Setting a threshold of 100 LSU would cover about 52 million LSU and 58% of NH_3 releases, requiring reporting from 247,000 holdings. Setting a threshold of 200 LSU would cover about 29 million LSU and 32% of NH_3 releases, requiring reporting from 81,000 holdings. Setting a threshold of 600 LSU would cover about 8 million LSU and about 9% of NH_3 releases.

In 2017, E-PRTR reporting was submitted from 34,720 facilities. To capture a significant share of NH_3 releases from cattle rearing (58%), a capacity threshold of 100 LSU would have to be set without restrictions of reporting thresholds. The total number of E-PRTR reporting facilities would increase by a factor of eight (711% more facilities). The following figure visualises the increase of reporting facilities.

[52] https://circabc.europa.eu/sd/a/a2c0b5e1-959b-43bd-b792-5ebbcbc1969b/30310%20Final%20Report%20(Cattle)%20Main.pdf

Figure A1.6 Increase of reporting facilities when requiring E-PRTR reporting from cattle rearing holdings with more than 100 livestock units

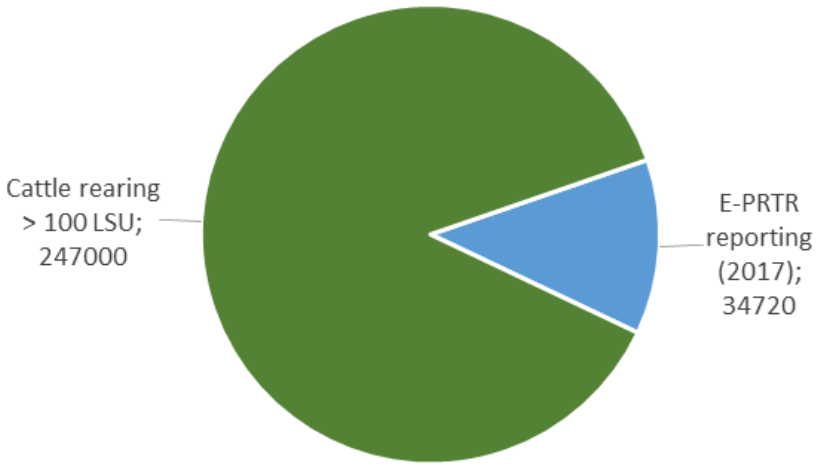


Figure A1.6 shows that the administrative burden of including cattle rearing with a capacity threshold of 100 LSU in E-PRTR would be high. The reporting would capture 58% of NH_3 releases, but only if reporting thresholds would be decreased from 10,000 kg/year to 1,000 kg/year for NH_3 and from 100,000 kg/year to 10,000 kg/year for methane [53].

Applying current methane and ammonia reporting thresholds, about 600 LSU are needed for a facility to be subject to reporting. This would capture only about 7% of NH_3 sector releases and 8,000 holdings. Compared to 2017 E-PRTR reporting, the number of reporting facilities would increase by 23%; however, capture of 90% of sector releases of NH_3 would be missed by a large margin.

Based on this assessment, cattle rearing is not suggested for E-PRTR direct reporting for the following reasons.

1) Capturing half of total NH_3 releases from cattle rearing would imply an administrative burden for about a quarter of a million holdings. The holdings concerned would not use measurements but emission factors for reporting. The resulting releases would be the same as emissions reporting under the Convention on Long-Range Transboundary Air Pollution (CLRTAP) and the United Nations Framework Convention on Climate Change (UNFCCC), which is also based on emission factors.
2) The added value of reporting of cattle rearing with emission factors from large individual holdings compared with reporting of national totals would highly depend on using adequate emission factors by individual operators. This would need clear guidance and correct consideration by the operators and competent authorities concerned. Reporting quality may be limited by lack of time.
3) Neighbourhood populations (important users of E-PRTR data) are typically more concerned by daily odour emissions from cattle rearing holdings than they are interested in annual releases of ammonia, methane and N_2O of previous years.
4) Although the Nitrates Directive sets a framework for nitrogen releases from farming, there are no European-wide BAT requirements for cattle rearing. Therefore, there is

[53] Based on 143-343 kg/(LSU*a) CH_4 and 15 kg/(LSU*a) NH_3 for intensive cattle rearing holdings in 'GV- Schlüssel und Emissionsfaktoren Tierhaltung' (2008) Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie.

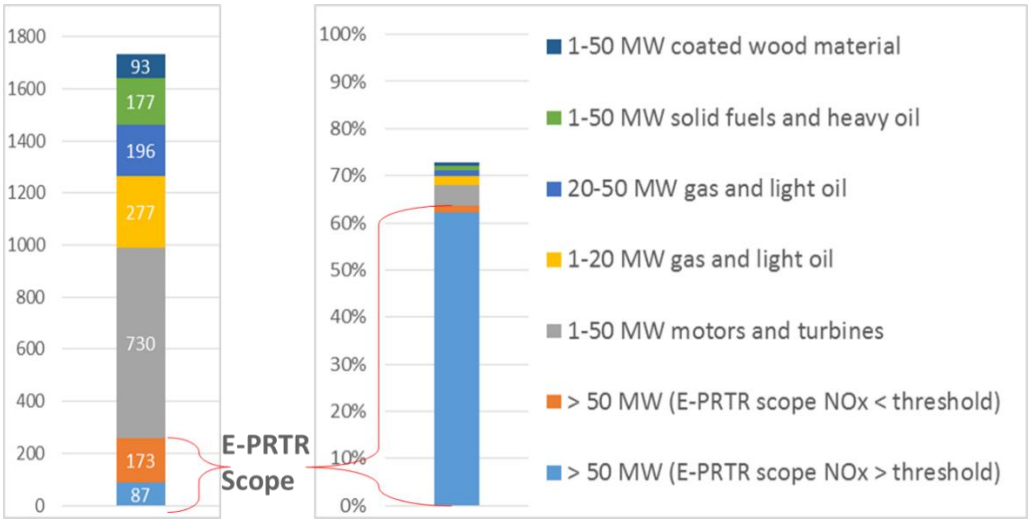
not the same need for the Commission to assess BAT-related reduction in releases from cattle rearing as there is from other sectors which are covered by the IED.

5) Once sector-specific BAT requirements are published (under the IED or in the context of international conventions), national inquiries on their implementation can lead to similar results with less administrative burden than individual reporting.

A1.6.2 Medium Combustion Plants

In the NRW inventory, 83% of total NO_X releases originate from releases exceeding the reporting threshold. Large combustion plants with a capacity of 50 MW or more produce 62% of total NO_X releases (87 facilities). Another 1.5% of total NO_X releases originate from large combustion plants with a capacity of 50 MW or more, but with releases below the reporting threshold (173 facilities). A further 9.2% of NO_X releases originate from facilities not covered by the E-PRTR (1,473 facilities).

Figure A1.7 Number of combustion plants by category (left) and related share of total NO_X releases (right) in NRW (2016)



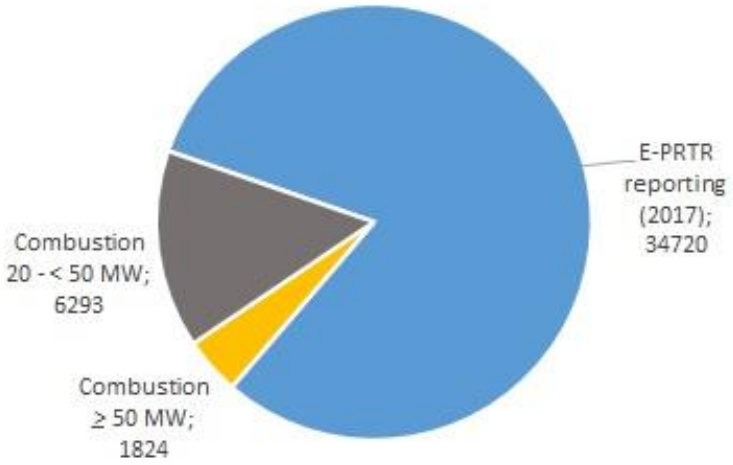
If all facilities covered by the Medium Combustion Plant Directive were included in the E-PRTR activity list, the number of combustion facilities covered by E-PRTR increases from 260 (87 above, 173 below, the reporting threshold) to 1,733 facilities (+667%). Inclusion of these 1,473 additional combustion plant facilities would capture a further 9.2% of total NO_X releases in the E-PRTR, if pollutant reporting thresholds are set to zero, but would increase the number of reporting facilities significantly.

An assessment of combustion plants restricted to a capacity of 20 to <50 MW is difficult to implement with the NRW inventory, because only gas and light oil combustion plants are separated in categories of 1 to <20 MW and 20 to <50 MW. The share of plants from 20 to <50 MW compared to the total of 1 to <50 MW is 41%. This share is used to estimate the number of medium combustion plants within the other fuel categories like solid fuels, heavy oil and coated wood (including motors and turbines). The resulting number of facilities is 602 out of a total of 1,473.

To extrapolate to the number of additional facilities, European-wide, beyond those currently reporting NO_X releases from facilities with a capacity of 50 MW or more in the 2017 E-PRTR, the additional number of facilities in NRW (602) is related to facilities above the reporting threshold (87) in NRW. This means that the number of such facilities in the E-PRTR would increase by a factor of 6.9. Additionally, combustion plants with 50 MW capacity and more but not exceeding the reporting threshold would also be included in reporting if the NO_X reporting threshold was set to zero. This means that the number of reporting facilities in NRW would increase by 173, a factor of two if compared with the 87 facilities in NRW above the threshold).

In the 2017 E-PRTR, 912 combustion plants with a capacity of 50 MW or more across Europe reported NO_X releases. Applying the factor of two, 1,824 additional facilities with a capacity above 50 MW would be covered by E-PRTR reporting; applying the factor of 6.9, 6,293 additional facilities with a capacity of 20 to <50 MW would fall under E-PRTR reporting. Figure A1.8 shows the assumed additional number of facilities in Europe that would have to report to the E-PRTR.

Figure A1.8 Increase in number of reporting facilities when requiring E-PRTR reporting from combustion plants with 20 to <50 MW capacity, and including reporting from combustion plants with ≥50 MW capacity but currently below the NOx reporting threshold



The inclusion of these facilities would increase the share of NO_X releases captured by the E-PRTR from 83% by 1.5 percentage points (facilities >50 MW) and 9.2 percentage points (facilities 20 to <50 MW).

A1.7 Revised capacity threshold for urban waste water treatment plants

North Rhine-Westphalia (NRW) release data for 2016 was used to assess an appropriate change of the capacity threshold for urban waste water treatment plants (UWWTP). NRW is a federal state of Germany, assumed to show a typical European distribution of small, medium and large urban waste water treatment plants due to its mix of densely and more sparsely populated areas.

UWWTP are not covered by the IED as they cannot be considered as typical 'industrial installations'. However, these facilities not only treat waste water from households and commercial activities, but also from a large number of industrial activities that do not release pollutants directly into water bodies. While a key aim of the E-PRTR is to capture a large share of industrial releases, typical pollutants like chemical oxygen demand

(COD), nitrogen and phosphate from UWWTP originate from households and commercial sites to a large extent. This problem could be addressed in part by requiring the recipient UWWTP of waste water transfers to be reported in the E-PRTR. Due to the current lack of alternative data sources, releases from UWWTP in the E-PRTR are assumed to include a large contribution to releases from households and commercial activities in addition to those from industrial activities. When extending the reporting requirements of E-PRTR to a larger number of UWWTP, it is necessary to be aware of this change of the focus of the E-PRTR. However, a high share of typical industrial water releases like AOX and heavy metals can only be captured in the E-PRTR reporting if a high number of UWWTP are included.

Table A1.20 shows an assessment of eleven major waste water pollutants. In the second column, releases of UWWTP ≥100,000 population equivalents (p.e.) exceeding the reporting thresholds of Annex II of the E-PRTR are compared with all releases from UWWTP ≥100,000 p.e in the NRW inventory. This column shows the level of releases captured for the existing scope of E-PRTR UWWTP. In the third column, releases originating from the NRW inventory for UWWTP ≥100,000 p.e. without applying reporting thresholds are compared with all releases from the NRW inventory for UWWTP ≥2,000 p.e. This column shows the significant contribution of releases from smaller UWWTP that are not currently be captured by the E-PRTR due to its activity thresholds. In the last column, releases from the NRW inventory for UWWTP ≥100,000 p.e. exceeding the reporting thresholds of Annex II of the E-PRTR are compared with all releases from UWWTP ≥2,000 p.e. This column highlights a significant share of releases that could be attributed to releases from UWWTP between 100,000 and 2,000 p.e. and highlights a significant likelihood that the E=PRTR could be missing a large percentage of releases from UIWWTP.

It can be observed that a share of more than 90% of releases from UUWTP is only achieved for nitrogen, TOC, nickel, copper and zinc releases within the current scope of the E-PRTR. If the scope is extended to the scope of the UWWTD (≥2,000 p.e.), the share does not reach 90% for any pollutant, even when Annex II reporting thresholds are ignored.

Table A1.20 Analyses of 90% criterion for urban wastewater treatment plants ≥100,000 p.e. based on release data from NRW (share above 90% marked in green)

Pollutant	Share from UWWTP ≥100,000 p.e. above reporting thresholds compared with all releases from UWWTP ≥100,000 p.e.	Share from all UWWTP ≥100,000 p.e. without reporting thresholds compared with all releases from UWWTP ≥2,000 p.e.	Share from UWWTP ≥100,000 p.e. above reporting thresholds compared with all releases from UWWTP ≥2,000 p.e.
P	76%	51%	39%
N	91%	62%	56%
AOX	70%	76%	53%
TOC	98%	66%	65%
Pb	42%	62%	26%
Cd	39%	66%	26%
Hg	48%	64%	31%
Ni	99%	67%	66%

Pollutant	Share from UWWTP ≥100,000 p.e. above reporting thresholds compared with all releases from UWWTP ≥100,000 p.e.	Share from all UWWTP ≥100,000 p.e. without reporting thresholds compared with all releases from UWWTP ≥2,000 p.e.	Share from UWWTP ≥100,000 p.e. above reporting thresholds compared with all releases from UWWTP ≥2,000 p.e.
Cu	94%	66%	62%
Zn	99%	61%	60%
Cr	69%	67%	46%

Reduction of the capacity threshold to >15,000 p.e. is considered in Table A1.21. If the capacity threshold is reduced to that level and the Annex II reporting thresholds are kept, reported releases represent a smaller share of total releases of UWWTP >15,000 p.e. compared with reporting under the current capacity threshold of >100,000 p.e. (This can be seen by comparing the first column in Table A1.21 with the first column in Table A1.20.)

The last column shows the share of reported releases if the capacity threshold is lowered to 15,000 p.e. and Annex II reporting thresholds are kept when compared with the total releases of all UWWTP with a capacity ≥2,000 p.e.; 90% capture is not achieved for any pollutant. The middle column in Table A1.21 shows that to achieve 90% capture of releases from UWWTP for all assessed pollutants, the capacity threshold would need to be lowered to ≥15,000 p.e. and pollutant reporting thresholds removed or at least lowered.

Table A1.21 Analyses of 90% criterion for urban wastewater treatment plants ≥15,000 p.e. based on release data from NRW (share above 90% marked in green)

Pollutant	Share from UWTP ≥15,000 p.e. with reporting thresholds compared with all releases from UWWTP ≥15,000 p.e.	Share from all UWTP ≥15,000 p.e. without reporting thresholds compared with all releases from UWWTP ≥2,000 p.e.	Share from UWTP ≥15,000 p.e. with reporting thresholds compared with all releases from UWWTP ≥2,000 p.e.
P	48%	90%	44%
N	60%	94%	64%
AOX	55%	98%	53%
TOC	68%	96%	71%
Pb	28%	94%	26%
Cd	27%	96%	26%
Hg	34%	92%	31%
Ni	68%	96%	84%
Cu	65%	96%	74%
Zn	63%	96%	87%
Cr	48%	95%	46%

If the capacity threshold is lowered to 15,000 p.e. and pollutant reporting thresholds are set to zero, the number of reporting facilities in North Rhine-Westphalia increases from 68 to 332 facilities (a factor of 4.9; 390% more reporting facilities). If the capacity threshold is

lowered to 2,000 p.e., the number of reporting facilities in North Rhine-Westphalia increases from 68 to 530 (a factor of 7.8; 680% more reporting facilities).

Based on 1,277 urban waste water treatment plants reporting in the 2017 E-PRTR and not changing pollutant reporting thresholds, about 5,000 additional facilities would fall under the E-PRTR if the capacity threshold were to be lowered to 15,000 p.e. If the E-PRTR capacity threshold was aligned with the UWWTD at 2,000 p.e., about 8,700 additional facilities would be covered by the E-PRTR.

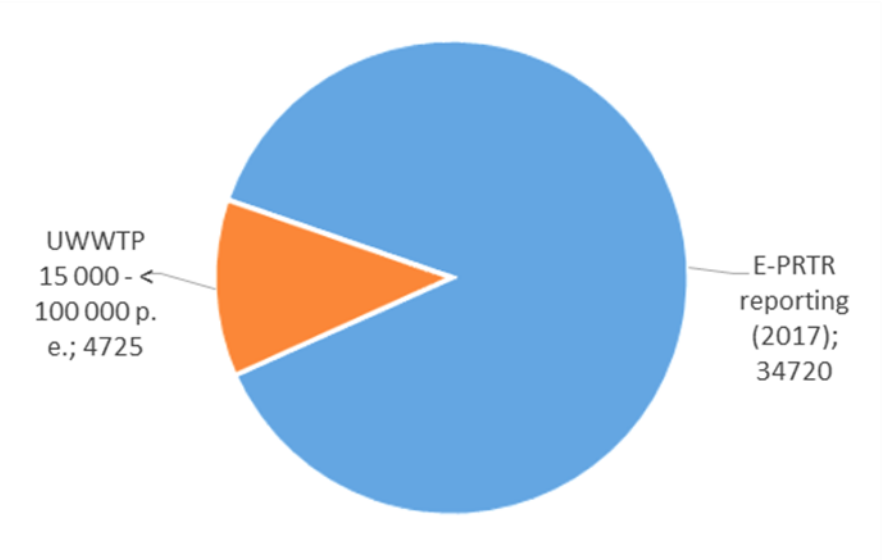
Table A1.22 list new pollutant reporting thresholds which would achieve 90% capture of releases for all pollutants from this sector if the capacity threshold is reduced to 15,000 p.e. If these reporting thresholds are applied, the number of reporting facilities in North Rhine-Westphalia increases from 68 to 318 facilities (a factor of 4.7; 370% more reporting facilities).

Table A1.22 Analyses of 90% criterion for urban wastewater treatment plants ≥15,000 p.e. with reduced reporting thresholds, based on release data from NRW (share above 90% marked in green)

Pollutant	Annex II reporting thresholds (kg/year)	New reporting thresholds (kg/year)	Lowering factor between Annex II reporting threshold and new reporting threshold	Share with new reporting thresholds compared with all releases from UWWTP ≥15,000 p.e.	Share without reporting thresholds compared with all releases from UWWTP ≥2,000 p.e.	Share with new reporting thresholds compared with all releases from UWWTP ≥2,000 p.e.
P	5,000	200	27	100%	90%	90%
N	50,000	12,280	4.1	95%	94%	90%
AOX	1,000	80	13	92%	98%	90%
TOC	50,000	17,540	2.9	94%	96%	90%
Pb	20	0.4	50	96%	94%	90%
Cd	5	0.12	42	94%	96%	90%
Hg	1	0.005	200	97%	92%	90%
Ni	20	11	1.8	94%	96%	90%
Cu	50	13	3.9	94%	96%	90%
Zn	100	71	1.4	94%	96%	90%
Cr	50	4.1	12	94%	95%	90%

Extrapolating from the assessment above to data from the 1,277 UWWTP reporting in the 2017 E-PRTR, about 4,700 additional facilities would fall under the E-PRTR reporting to achieve the 90% criterion for all pollutants. Figure A1.9 below visualises this potential increase in reporting facilities compared with all reporting facilities in the 2017 E-PRTR.

Figure A1.9 Increase in total reporting facilities when requiring E-PRTR reporting from urban waste water treatment plants ≥15,000 population equivalents and with revised reporting thresholds



Annex 2 Pollutants and thresholds

A2.1 Introduction

Annex II of the E-PRTR Regulation includes seven pollutant groups:

- chlorinated organic substances
- greenhouse gases
- heavy metals
- inorganic substances
- other gases
- other organic substances
- pesticides.

comprising a total of 91 substances or groups of substances. It is important to note that the list of substances that should be reported to the E-PRTR is not a comprehensive list of all possible pollutants released to air, water and land. Rather, it is intended to include pollutants that are of most environmental concern, thus informing the public of pressures on the environment. Also, as the E-PRTR is the most comprehensive European-wide point source inventory of industrial releases, alignment, where possible, with other European environmental legislation will provide policy makers and other stakeholders with key data to assess the progress of such legislation.

The current list of pollutants in Annex II of the E-PRTR Regulation largely reflects the pollutant lists in Annex III of the Integrated Pollution Prevention and Control Directive (IPPCD) and the subsequent Annex II of the Industrial Emissions Directive (IED), as well as the list of substances included in the UNECE PRTR Protocol. It also reflects the 2006 scientific understanding of the main environmental issues and pollutants of most concern associated with E-PRTR Annex I activities. Whilst most of these pollutants continue to be of interest, new pollutants and environmental issues have risen in prominence in the intervening years. Hence, there is a need for the E-PRTR list of pollutants to be reviewed to ensure that it is up-to-date and fit for purpose.

This section presents an analysis of the current list of substances in Annex II of the E-PRTR Regulation. It also identifies other substances that could be included for future reporting.

The analysis has been conducted on the basis of reviewing:

- The current Annex II list of the E-PRTR regulation and reported release quantities for each pollutant from 2007-2016;
- The IED list of polluting substances and pollutants for which BAT conclusions have set AELs for certain industrial sectors;
- Other EU environmental legislation on air, waste and water;
- Additional pollutants of specific EU MS national interest;
- Pollutant lists from existing international obligations;
- Suggestions on harmonising pollutant lists across international PRTRs;
- Substances of concern identified in the scientific literature and recent environmental policy reviews, strategies and action plans.

When assessing substances for potential inclusion, consideration was given to current and future usage (i.e. in relation to their regulatory status, such as whether

they have been recently banned), as well as to emerging substances of concern (i.e. horizon scanning) where current data are limited.

A2.2 Substances for possible addition to the E-PRTR pollutant list

According to the latest statistics compiled under the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation, there are over 22,000 chemical substances manufactured or imported in quantities above 1 tonne per annum in the EU. Over 20% of these substances are manufactured or imported in quantities above 1,000 tonnes per annum[54]. In addition, there are hundreds of active substances used in plant protection products and biocidal products. A ranking of all these substances in terms of their environmental significance is not possible, even by using two simple proxies like toxicity and quantities (manufactured/imported/released) and ignoring other parameters such as route of exposure. The REACH Regulation is generating this information for many chemicals, but many other emerging pollutants (e.g. active substances used in pharmaceutical, plant protection and biocidal products) are outside the scope of the REACH Regulation; for these substances no information is available in terms of quantities manufactured or imported. For chemicals within the scope of REACH, the combination of the information available from the registered substances database (quantities manufactured or imported in the EU by tonnage bands and use descriptors such as Environmental Release Categories) and the Classification and Labelling Inventory is possible. Although the information is not yet complete or entirely accurate (in particular with regard to use descriptors), as the registration dossiers are updated in the near future, this combination will allow the identification of those chemical substances for which releases to the environment are to be expected.

Therefore, to identify substances that are not listed in the E-PRTR Annex II and which raise concerns due to their properties, EU medium-specific legislation has been analysed, along with pollutant lists used in MS and international PRTRs. In addition, the scientific literature has been screened for papers discussing substances found in water, soil and air and which have been suggested to pose a significant threat to human health and the environment due to their properties.

A2.2.1 Substances relevant to the Industrial Emissions Directive

A2.2.1.1 IED Annex II list of polluting substances

The Industrial Emissions Directive (IED) (2010/75/EU) is the European legislative instrument laying down rules to prevent and control emissions generated by industrial activities. Article 14 of the IED establishes the conditions for the granting of a permit to installations. In particular, permits have to include 'emission limit values for polluting substances listed in Annex II, and for other polluting substances, which are likely to be emitted from the installation concerned in significant quantities'. Therefore, Annex II presents an indicative list of substances (or rather groups of substances) to be monitored which needs to be customised depending on the nature of the relevant installation. For most of the groups of substances listed in

[54] Own elaboration of data from REACH registered substances database.

Annex II of the IED, the E-PRTR already requires reporting of one or more substances.

The list in Annex II of the IED distinguishes between air and water pollutants and is compared with Annex of the E-PRTR Regulation in Table A2.1. A blank entry in the E-PRTR column indicates that the IED pollutant is not specifically listed in the E-PRTR; these cases are discussed after Table A2.1.

Table A2.1 Comparison between Annex II of the IED and Annex II of the E-PRTR Regulation

IED Annex II	E-PRTR Annex II
AIR	
1. Sulphur dioxide and other sulphur compounds	Sulphur oxides (SO_X/SO_2)
2. Oxides of nitrogen and other nitrogen compounds	Nitrogen dioxides (NO_X/NO_2)
3. Carbon monoxide	Carbon monoxide (CO)
4. Volatile organic compounds	Non-methane volatile organic compounds (NMVOC)
5. Metals and their compounds	Cadmium and compounds (as Cd) Chromium and compounds (as Cr) Copper and compounds (as Cu) Lead and compounds (as Pb) Mercury and compounds (as Hg) Nickel and compounds (as Ni) Zinc and compounds (as Zn)
6. Dust including fine particulate matter	Particulate matter (PM_{10})
7. Asbestos (suspended particulates, fibres)	Asbestos
8. Chlorine and compounds	Chlorine and inorganic compounds (as HCl)
9. Fluorine and compounds	Fluorine and inorganic compounds (as HF)
10. Arsenic and compounds	Arsenic and compounds (as As)
11. Cyanides	Cyanides (as total CN)
12. Substances and mixtures which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction via the air	
13. Polychlorinated dibenzodioxins and polychlorinated dibenzofurans	PCDD + PCDF (dioxins + furans) (as Teq)
WATER	
1. Organohalogen compounds and substances which may form such compounds in the aquatic environment	Halogenated organic compounds (as AOX)
2. Organophosphorus compounds	Chlorpyrifos
3. Organotin compounds	Organotin compounds (as total Sn) Tributyltin and compounds Triphenyltin and compounds

IED Annex II	E-PRTR Annex II
4. Substances and mixtures which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction in or via the aquatic environment	
5. Persistent hydrocarbons and persistent and bioaccumulable organic toxic substances	
6. Cyanides	Cyanides (as total CN)
7. Metals and their compounds	Arsenic and compounds (as As) Cadmium and compounds (as Cd) Chromium and compounds (as Cr) Copper and compounds (as Cu) Lead and compounds (as Pb) Mercury and compounds (as Hg) Nickel and compounds (as Ni) Zinc and compounds (as Zn)
8. Arsenic and compounds	Arsenic and compounds (as As)
9. Biocides and plant protection products	Alachlor Aldrin Atrazine Chlordane Chlordecone Chlorfenvinphos Chlorpyrifos DDT Diuron Endosulphan Endrin Heptachlor 1,2,3,4,5,6-hexachlorocyclohexane (HCH) Isodrin Lindane Mirex Simazine Toxaphene Isoproturon Tributyltin and compounds Triphenyltin and compounds Trifluralin
10. Materials in suspension	
11. Substances which contribute to eutrophication (in particular, nitrates and phosphates)	Total phosphorus Total nitrogen
12. Substances which have an unfavourable influence on the oxygen balance (and can be measured using parameters such as biochemical oxygen demand – BOD, chemical oxygen demand – COD, etc.)	Total organic carbon
13. Substances listed in Annex X to Directive 2000/60/EC	

Entries in IED Annex II refer to groups of substances or substance categories which are broadly defined. This is to enable regulators to address specific circumstances at specific installations. For instance, entry no. 12 for air pollutants and entry no. 4 for water pollutants refer to substances and mixtures which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction, respectively, via air or in and via the aquatic environment. No further details are provided on how to identify proven carcinogenic, mutagenic or reprotoxicant (CMR) substances and mixtures, or whether these are substances, or mixtures containing such substances, that meet the harmonised classifications and labelling carc/muta/repr 1A and 1B according to the Classification, Labelling and Packaging (CLP) Regulation.

As of late 2018 there were 1,188 substances with a harmonised classification for C 1A/1B or M 1A/1B or R 1A/1B. Many of these substances are intermediate products generated within closed systems. Others, such as pesticides, are more widely used in open systems but are already included in Annex II of the E-PRTR or included in lists related to other legislation such as the WFD and the Stockholm Convention. These other lists are considered below in Annex 0 and Annex A2.2.3, respectively.

Entry no. 5 for water pollutants refers to persistent hydrocarbons and persistent and bioaccumulable organic toxic substances. However, it does not provide a definition for persistency, bioaccumulabity and toxicity or references to other pieces of legislation with these definitions – for instance, the REACH Regulation sets criteria for the identification of very persistent and very bioaccumulative (vPvB) substances and of persistent, bioaccumulative and toxic (PBT) substances, while the CLP Regulation sets criteria for hazard classification and labelling.

Entry no. 13 for water pollutants refers to the list of substances in the Water Framework Directive, which has been most recently updated by Directive 2013/39/EU. This list is examined in more detail in Annex A2.2.2.1 below.

For all IED substance categories, the E-PRTR lists specific substances or groups of substances. However, in two instances, the IED Annex II includes categories which may be considered for inclusion in the E-PRTR. These are:

- Entry no. 6 for air: Dust including fine particulate matter;
- Entry no. 10 for water: Materials in suspension (or total suspended solids).

The E-PRTR Annex II currently lists PM_{10}. However, the IED also refers to ‘fine particulate matter’, that is $PM_{2.5}$, which is also included in the NECD. Thus, this specific substance is suggested for inclusion in the E-PRTR.

Materials in suspension (or total suspended solids, TSS) is a parameter normally used as a water quality indicator. TSS is suggested for inclusion in the E-PRTR.

A2.2.1.2 Pollutants with AELs set by BAT conclusions

A key aspect of the IED is the application of Best Available Techniques (BAT) that are determined for different industrial sectors as part of the process co-ordinated by the European IPPC Bureau at the EU Joint Research Centre in Seville. This process results in BAT Reference Documents (BREFs) and the BAT conclusions contained therein are adopted by the European Commission as Implementing Decisions. Associated emission levels (AELs) have been set in BAT conclusions for particular industry sectors. Substances with AELs that are not required to be reported under the E-PRTR are listed in Table A2.2.

Table A2.2 Substances not in Annex II of the E-PRTR but for which AELs have been set in BAT conclusions

Sector	Released to air	Released to water
Chemical Waste Water Treatment (CWW)		Total suspended solids (TSS)
Coking (IS)	H_2S	Sulphate, thiocyanate
Glass Industry (GLS)	Co, Mn, Sb, Se, Sn, Tl, V, H_2S, formaldehyde, Amines	
Non-ferrous metals (NFM)	H_2SO_4, H_2S, Tl, Sb	
Production of chlor-alkali (CAK)		Free chlorine, chlorate, sulphate
Pulp & Paper (PP)	Total reduced sulphur (TRS)	Total suspended solids (TSS), EDTA, DTPA
Refineries (REF)	Sb, V	Total suspended solids (TSS), V, hydrocarbon oil index (HOI), ethyl benzene
Sintering (IS)		Total suspended solids (TSS)
Steel (IS)		Suspended solids (TSS), Fe
Tanneries (TAN)		Sulphides, total suspended solids (TSS)
Waste Incineration (WI)	Tl, Co, Mn, Sb	
Wood-based products (WBP)	Formaldehyde	Total suspended solids (TSS)

Some of the pollutants identified in Table A2.2 are only associated with one particular BAT sector and then in some cases, only with a particular process within that sector. Since defining specific pollutant lists for different BAT sectors (i.e. for different E-PRTR activities) would be onerous and burdensome, it is suggested that only pollutants where AELs have been set for at least two BAT sectors be included in Annex of II of the E-PRTR Regulation. For air, pollutants would be formaldehyde, hydrogen sulphide, antimony, cobalt, manganese, thallium and vanadium; for water, the pollutants would be TSS and sulphates.

A2.2.2 Substances relevant to the Water Framework Directive

An important piece of European legislation is the Water Framework Directive (WFD; 2000/60/EC). One of its objectives is to achieve good ecological status of all EU water bodies. The ecological status is defined as ‘high’, ‘good’ or ‘moderate’ on the basis of the assessment of a set of elements among which there is a concentration of specific synthetic and non-synthetic pollutants. These are identified by the European Commission according to the strategies to limit releases of individual pollutants or groups of pollutants to water set by Article 16 of the WFD. The selected pollutants and groups of pollutants (defined as priority substances) are listed in Annex X of the WFD. They are substances that present a significant risk to or via the aquatic environment and for which a set of measures has been established to ensure the progressive reduction of discharges, emissions and

losses[55]. Importantly, for a subset of pollutants defined as priority hazardous substances, measures aim at the cessation or phasing-out of discharges, emissions and losses within 20 years of the first adoption of control measures. Priority hazardous substances are identified on the basis of their PBT properties or equivalent level of concern.

In addition to the lists of priority substances and priority hazardous substances, the WFD maintains a surface water 'watch list' of potential water pollutants that should be carefully monitored by the EU Member States to determine the risk they pose to the aquatic environment and whether environmental quality standards (EQS) should be set for them.

A2.2.2.1 WFD priority substances list

To achieve good ecological and chemical status, the concentrations of priority substances must be below EQS set by the 'daughter directives' of the WFD. In 2001, a first list of 33 priority substances was adopted (Decision 2455/2001) and in 2008 the EQS for those substances were established (Annex II of the EQS Directive 2008/105/EC). The list of priority substances is reviewed by the Commission every six years (Article 16(4); although originally the review was to be performed every four years). A first review was carried out in 2012 by the European Commission (with the assistance of a wide range of stakeholders) and concluded that:

- New information was available on the characteristics and the risks associated with some of the priority substances and some new substances;
- Because of their intrinsic PBT properties, widespread use and common potential for long-range transport, some priority hazardous substances were still found in the aquatic environment, mostly in sediment and/or biota, at concentrations above the EQS, therefore entailing widespread failures of the objective of good chemical status;
- Although Article 8 of the WFD requires Member States to establish monitoring programmes of the quantitative, ecological and chemical status of surface and groundwaters[56], the availability of monitoring data was not sufficient for the assessment of exposure and thus for the prioritisation of new priority substances in future reviews.

Following the first review, the European Commission published Directive 2013/39/EU, a 'daughter directive' of the WFD, regarding priority substances in the field of water policy. This directive introduced EQS for 12 new substances and revised and/or recategorised the EQS for nine priority substances as priority hazardous substances. The current list of priority and priority hazardous substances is presented in Table A2.3 along with a comparison with the list of pollutants contained in Annex II of the E-PRTR Regulation.

[55] Article 10 ensures that any measures established by the WFD on the combined approach for point and diffuse sources take into account any other measures established by other relevant European legislation.

[56] Technical specifications and standardised methods for the sampling, analysis and monitoring are laid down in Article 21.

Table A2.3 Priority substances according to Annex I of Directive 2013/39/EU

CAS number	EC number	Substance	Priority hazardous substance	E-PRTR
15972-60-8	240-110-8	Alachlor		✓
120-12-7	204-371-1	Anthracene	✓	✓
1912-24-9	217-617-8	Atrazine		✓
71-43-2	200-753-7	Benzene		✓
N/A	N/A	Brominated diphenylethers (Tetra, penta, hexa and heptabromo dipheyl ethers)	✓	✓
7440-43-9	231-152-8	Cadmium and compounds	✓	✓
85535-84-8	287-476-5	Chloroalkanes, C10-13 iv	✓	✓
470-90-6	207-432-0	Chlorfenvinphos		✓
2921-88-2	220-864-4	Chlorpyrifos (Chlorpyrifos-ethyl)		✓
107-06-2	203-458-1	1,2-Dichloroethane		✓
75-09-2	200-838-9	Dichloromethane		✓
117-81-7	204-211-0	Di(2-ethylhexyl)phthalate (DEHP)	✓	✓
330-54-1	206-354-4	Diuron		✓
115-29-7	204-079-4	Endosulfan	✓	✓
206-44-0	205-912-4	Fluoranthene vi		✓
118-74-1	204-273-9	Hexachlorobenzene	✓	✓
87-68-3	201-765-5	Hexachlorobutadiene	✓	✓
608-73-1	210-158-9	Hexachlorocyclohexane	✓	✓
34123-59-6	251-835-4	Isoproturon		✓
7439-92-1	231-100-4	Lead and compounds		✓
7439-97-6	231-106-7	Mercury and compounds	✓	✓
91-20-3	202-049-5	Naphthalene		✓
7440-02-0	231-111-4	Nickel and compounds		✓
25154-52-3 **104-40-5**	246-672-0 203-199-4	Nonylphenols (4-nonylphenol)	✓ ✓	✓
1806-26-4 **140-66-9**	217-302-5 N/A	Octylphenols (4-(1,1',3,3'-tetramethylbutyl)-phenol)		✓
608-93-5	210-172-5	Pentachlorobenzene	✓	✓
87-86-5	201-778-6	Pentachlorophenol		✓
N/A **50-32-8**	N/A 200-028-5	Polyaromatic hydrocarbons (benzo(a)pyrene)	✓ ✓	✓
122-34-9	204-535-2	Simazine		✓
N/A (36643-28-4)	N/A	Tributyltin compounds (tributyltin-cation)	✓	✓

CAS number	EC number	Substance	Priority hazardous substance	E-PRTR
12002-48-1	234-413-4	Trichlorobenzenes		✓
67-66-3	200-663-8	Trichloromethane (chloroform)		✓
1582-09-8	216-428-8	Trifluralin	✓	✓
115-32-2	204-082-0	Dicofol	✓	
1763-23-1	217-179-8	Perfluoroctane sulfonic acid and its derivatives	✓	✓
124495-18-7	N/A	Quinoxyfen	✓	
N/A	N/A	Dioxins and dioxin like compounds	✓	✓
74070-46-5	277-704-1	Aclonifen		
42576-02-3	255-894-7	Bifenox		
28159-98-0	248-872-3	Cybutryne		
52315-07-8	257-842-9	Cypermethrin		
62-73-7	200-547-7	Dichlorvos		
N/A	N/A	Hexabromocyclododecane (HBCDD)	✓	
76-44-8/ 1024-57-3	200-962-3/ 213-831-0	Heptachlor and heptachlor epoxide	✓	✓
886-50-0	212-950-5	Terbutryn		
Substances which are not in the priority substance list but for which Environmental Quality Standards exist under Directive 2008/105/EC				
56-23-5	-	Carbon-tetrachloride (tetrachloromethane)		✓
50-29-3	-	DDT total[1] para-para-DDT		✓
309-00-2 **60-57-1** **72-20-8** **465-73-6**	-	Cyclodiene pesticides Aldrin Dieldrin Endrin Isodrin		 ✓ ✓ ✓ ✓
127-18-4	-	Tetrachloro-ethylene		✓
79-01-6	-	Trichloro-ethylene		✓

Source: European Commission, Annex I of Directive 2013/39/EU, available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:226:0001:0017:EN:PDF European Commission, Annex II of Directive 2008/105/EC, available at: http://ec.europa.eu/environment/water/water-framework/priority_substances.htm

[1] DDT total comprises the sum of the isomers 1,1,1-trichloro-2,2 bis (p-chlorophenyl) ethane (CAS number 50-29-3; EU number 200-024-3); 1,1,1-trichloro-2 (o-chlorophenyl)-2-(p-chlorophenyl) ethane (CAS number 789-02-6; EU Number 212-332-5); 1,1-dichloro-2,2 bis (p-chlorophenyl) ethylene (CAS number 72-55-9; EU Number 200-784-6); and 1,1-dichloro-2,2 bis (p-chlorophenyl) ethane (CAS number 72-54-8; EU Number 200-783-0).

From this first comparison, it is clear that the majority of both priority substances and priority hazardous substances are already covered by Annex II of the E-PRTR. Indeed, many of the pesticides in the above list that are monitored under the E-

PRTR have been included in the Stockholm Convention over the last 15 years, and their authorisation and use have become severely restricted.

From Table A2.3 it is also possible to identify some priority substances that are not currently monitored under the E-PRTR. These are substances used as plant protection products (aclonifen, bifenox, cypermethrin, dicofol, quinoxyfen), biocides (cybutryne, dichlorvos, terbutryn) and industrial chemicals (the flame retardant hexabromocyclododecane - HBCDD).

While aclonifen[57], bifenox[58] and cypermethrin[59] are still approved as active substances in plant protection products in many EU Member States, quinoxyfen, dicofol, cybutryne, dichlorvos, terbutryn and HBCDD are subject to bans and restrictions:

- The approval for quinoxyfen has not been renewed with effect from 2019;
- Dicofol is not approved in the EU and has been proposed for listing under the Stockholm Convention;
- Cybutrine, dichlorvos and terbutryn are not approved as active substances in biocidal products;

Thus, releases of these pollutants from facilities subject to the E-PRTR can be expected to be limited in future years.

HBCDD was used in paints and as a flame retardant in expanded and extruded polystyrene. It is included in Annex XIV of the REACH Regulation with a sunset date of August 2015. After this date, any use must be previously authorised. It is also included in Part A (Elimination) of the Stockholm Convention since 2013. However, it has been used in high quantities and it is expected to be released from paints and expanded and extruded polystyrene and other treated articles at the end of their life cycle.

While in many cases there are likely to be limited future releases of the outstanding WFD priority substances, they are all suggested for inclusion in Annex II of the E-PRTR Regulation in order to increase coherence between the legal instruments.

A2.2.2.2 WFD Watch Lists

Prior to the publication of Directive 2013/39/EU, there was much discussion on the inclusion of certain pharmaceutical substances (diclofenac, EE2 - birth control oestrogen and E2 - oestrogen steroid hormone) in the list of priority substances. Finally, it was decided to include these in a watch list for further monitoring, a mechanism designed to allow targeted EU-wide monitoring of substances of possible concern to support the prioritisation process in future reviews of the priority substance list. The first watch list had to contain no more than 10 substances/groups of substances, but it can increase by one at each update of the list, up to 14 entries. Table A2.4 lists the substances included in the first watch list

[57] Approved as active substance in plant protection products in AT, BE, BG, CY, CZ, DE, EE, EL, ES, FI, FR, HR, IE, IT, LT, LU, LV, NL, PT, SE, SI, SK.

[58] Approved as active substance in plant protection products in AT, BE, BG, CZ, DE, EE, ES, FI, FR, HU, IT, LT, LV, NL, PL, RO, SE, SK, UK.

[59] Approved as active substance in plant protection products in AT, BE, BG, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SI, SK, UK.

(seven individual substances and three groups of substances[60] for a total of 17 substances).

Table A2.4 Substances in the first WFD watch list

Substance	CAS number	Substance type
17-Beta-estradiol (E2)	50-28-2	Oestrogen steroid hormone
Estrone (E1)	53-16-7	Hormone
17-Alpha-ethinylestradiol (EE2)	57-63-6	Birth control oestrogen
Diclofenac	15307-86-5	Nonsteroidal anti-inflammatory drug
2,6-Di-tert-butyl-4-methylphenol	128-37-0	Antioxidant used in cosmetics, food, pharmaceuticals and a range of other products
2-Ethylhexyl 4-methoxycinnamate	5466-77-3	Sunscreen ingredient / UV filter
Erythromycin	114-07-8	Macrolide antibiotic
Clarithromycin	81103-11-9	Macrolide antibiotic
Azithromycin	83905-01-5	Macrolide antibiotic
Methiocarb	2032-65-7	Carbamate insecticide and herbicide
Oxadiazon	19666-30-9	Herbicide
Triallate	2303-17-5	Herbicide
Imidacloprid	105827-78-9 / 138261-41-3[61]	Neonicotinoid insecticide
Thiacloprid	111988-49-9	Neonicotinoid insecticide
Thiamethoxam	153719-23-4	Neonicotinoid insecticide
Clothianidin	210880-92-5	Neonicotinoid insecticide
Acetamiprid	135410-20-7 /160430-64-8	Neonicotinoid insecticide

The first update of the WFD watch list was adopted by the European Commission in 2018, following the recommendations of a Joint Research Centre (JRC) study on the availability and quality of data for the substances in the first watch list and the potential candidates for inclusion[62]. It is important to note that the substances to be included in, or removed from, the watch list are selected according to the availability of sufficient high-quality monitoring data to proceed with risk assessments. On this basis, five substances have been removed (diclofenac, oxadiazon, triallate, 2-ethylhexyl-4-methoxycinnamate and 2,6-di-tert-butyl-4-methylphenol) and three new substances have been added to the second watch list, with 13 substances

[60] Natural hormones, macrolide antibiotics and neonicotinoid insecticides.

[61] Note: it is not uncommon for substances to have multiple CAS numbers. This is because the same molecule can have different isomers (bonding patterns and atomic organisation) and different CAS numbers are given to different isomers.

[62] Loos, R. et al (2018): Review of the 1st Watch List under the Water Framework Directive and recommendations for the 2 Watch List. EUR 29173 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79- 81839-4, doi:10.2760/614367, JRC111198.

suggested for inclusion for the third watch list. These substances are listed in Table A2.5.

Table A2.5 Substances in the second WFD watch list and substances suggested for inclusion in the third WFD watch list

Substance	CAS number	Substance type and hazard properties
Metaflumizone*	139968-49-3	Insecticide with vP, vB and T properties
Amoxicillin*	26787-78-0	Antibiotic substance
Ciprofloxacin*	85721-33-1	Antibiotic substance with T properties
Chromium (VI)**	18540-29-9	Industrial substance with P, T, M and R properties
Etofenprox**	80844-07-1	Pyrethroid insecticide
Dimoxystrobin**	149961-52-4	Fungicide with vP, B and T properties
Proquinazid**	189278-12-4	Fungicide with vP, B and T properties
Venlafaxine**	93413-69-5	Antidepressant drug with P and T properties
Free Cyanide**	57-12-5	Cyanides are used extensively in industry and are also emitted from car exhaust fumes. T properties.
Permethrin**	52645-53-1	Pyrethroid insecticide with P and T properties
Esfenvalerate**	66230-04-4	Pyrethroid insecticide
Pyridaben**	96489-71-3	Acaricide and insecticide with PBT properties
Fenpyroximate**	134098-61-6	Acaricide with PBT properties
Diflubenzuron**	35367-38-5	Insecticide with T properties
Deltamethrin**	52918-63-5	Pyrethroid insecticide with B and ED properties
Bifenthrin**	82657-04-3	Pyrethroid insecticide with PBT and ED properties

Notes:
*2nd watch list
**suggested for inclusion in the 3rd watch list
P: Persistent; B: Bioaccumulative; vP: Very Persistent; vB: Very Bioaccumulative; T: Toxic; C: Carcinogenic; M: Mutagenic; R: Reprotoxicant; ED: Endocrine disruptor

Apart from chromium (VI) and free cyanide, none of the substances included or suggested for inclusion in the first, second and third watch lists are currently monitored under the E-PRTR. It is important to note that, while some of these pollutants may be released by activities listed in Annex I of the E-PRTR (e.g. activity 4.(d), chemical installations for the production on an industrial scale of basic plant health products and of biocides; and activity 4.(e), installations using a chemical or biological process for the production on an industrial scale of basic pharmaceutical products), most are captured and released by activities listed under waste and wastewater management, in particular by urban waste-water treatment plants (activity 5.(f)) and by independently operated industrial waste-water treatment plants which serve one or more activities of Annex I of the E-PRTR Regulation (activity 5.(g)). Indeed, waste-water treatment plants are likely to capture and, when not able to completely treat the compounds, release a wide range of different chemicals that are not inherent of the activity itself.

The substances included or suggested for inclusion in the first, second and third watch lists are mostly hormones, antibiotics and insecticides. Beyond the objective of gathering more data, these groups of substances have been prioritised because of the concerns generated by their effects in the environment:

- Hormones: exposure to oestrogens via the environment have been linked to breast cancer in women and prostate cancer in men. Oestrogens have been linked to sexual dimorphism in fish and have toxic effects to the reproductive development in animals and plants[63].
- Antibiotics: a recent JRC report[64] notes that the inclusion of the antibiotics is consistent with the European One Health Action Plan against Antimicrobial Resistance (AMR).
- There is growing evidence of a worldwide decline of insects, with the widespread use of pesticides and synthetic fertilisers as a leading driving force[65]. Neonicotinoid insecticides are of particular concern.

While the substances included in the WFD watch lists are not suggested for inclusion, they are useful as horizon scanning tools, because among these substances there may be future priority substances or priority hazardous substances that should be considered for inclusion in the E-PRTR at a later date.

A2.2.3 Substances listed in the Stockholm Convention

The use of pesticides at industrial scales have raised concerns about the effects on the environment and have caused the call for better regulation[66]. Pesticides are regulated in the European Union by the Regulation (EC) No 1107/2009 concerning the placing of plant protection products on the market. According to this regulation, active substances need to be approved before being placed on the EU market. There are currently around 484 active substances approved for use in plant protection products[67].

Some pesticides are also regulated by Regulation (EC) No 850/2004 on persistent organic pollutants, which implemented the Stockholm Convention. The Stockholm Convention entered into force in May 2004 with the aim of protecting human health and the environment from chemicals that remain intact in the environment for a long period, so-called persistent organic pollutants or POPs. There are currently 30 chemicals or classes of chemicals regulated by the Treaty. Table A2.6 lists the substances regulated by the Stockholm Convention and compares the list to the E-PRTR Annex II.

Table A2.6 Comparison of substances listed in the Stockholm Convention and the E-PRTR

Stockholm Convention	Substance	E-PRTR
	Aldrin	✓

[63] See, for example, Adeel, M. et al. (2017): Environmental impact of estrogens on human, animal and plant life: A critical review. Environment International, Volume 99, Pages 107-119.

[64] Loos, R. et al (2018): Review of the 1st Watch List under the Water Framework Directive and recommendations for the 2 Watch List. EUR 29173 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79- 81839-4, doi:10.2760/614367, JRC111198.

[65] See, for example, Sánchez-Bayo, F., and Wyckhuys, K. (2019): Worldwide decline of the entomofauna: A review of its drivers. Biological Conservation, Volume 232, Pages 8-27.

[66] Milner, A.M., Boyd, I.L. (2017): Toward pesticidovigilance. Science, Vol. 357, Issue 6357, pp. 1232-1234.

[67] http://ec.europa.eu/food/plant/pesticides/eu-pesticides-atabase/public/?event=homepage&language=EN

Stockholm Convention	Substance	E-PRTR
Annex A (Elimination)	Chlordane	✓
	Chlordecone	✓
	Decabromodiphenyl ether (commercial mixture, c-decaBDE)	✓[1]
Annex A (Elimination)	Dieldrin	✓
	Endrin	✓
	Heptachlor	✓
	Hexabromobiphenyl	✓
	Hexabromocyclododecane (HBCDD)	
	hexabromodiphenyl ether and heptabromodiphenyl ether	✓[1]
	alpha-hexachlorocyclohexane	✓
	beta-hexachlorocyclohexane	✓
	Lindane / gamma-hexachlorocyclohexane	✓
	Mirex	✓
	Pentachlorophenol and its salts and esters	✓
	Short-chain chlorinated paraffins (SCCPs)	
	Technical endosulfan and its related isomers	✓
	Tetrabromodiphenyl ether and pentabromodiphenyl ether	✓[1]
	Toxaphene	✓
Annex A (Elimination) and Annex C (unintentional production)	Hexachlorobenzene (HCB)	✓
	Hexachlorobutadiene	✓
	Pentachlorobenzene	✓
	Polychlorinated biphenyls (PCBs)	✓
	Polychlorinated naphthalenes	
Annex B (Restriction)	DDT / 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane	✓
	Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F)	
Annex C (unintentional production)	Polychlorinated dioxins and furans (as TEF)	✓

Stockholm Convention	Substance	E-PRTR
Proposed	Dicofol	
	Perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds	
	Perfluorohexane sulfonic acid (PFHxS), its salts and PFHxS-related compounds	

[1] Total mass of the following brominated diphenylethers: penta-BDE, octa-BDE and deca-BDE

Most of the pesticides listed in the Stockholm Convention and which are reported to the E-PRTR have been banned or severely restricted, with releases decreasing by four orders of magnitude in the period 2007-2016. Of the substances in the Stockholm Convention that are not currently reported to the E-PRTR, polychlorinated naphthalenes and short-chain chlorinated paraffins are included in Annex A (Elimination) of the Stockholm Convention whereas dicofol is not approved in the EU and has been proposed for inclusion in the Stockholm Convention. As such, releases of these pollutants from E-PRTR facilities would be expected to be low. Nevertheless, in order to ensure coherence and consistency between international agreements and European legislation, these compounds, as well as perfluorinated compounds, are suggested for inclusion in the E-PRTR.

A2.2.4 Additional substances reported to Member State PRTRs

In addition to a review of the range of EU legislation, the project team has reviewed national PRTRs from EU countries to identify any nationally important substances that are reported independently of the scope of the E-PRTR. This review has highlighted that the countries incorporating additional pollutants in their national PRTRs are:

- France
- Spain
- Sweden
- United Kingdom.

In addition to this analysis, the emissions inventory compiled by the Environment Agency of North Rhine-Westphalia, Germany (NRW inventory hereafter) has also been analysed for additional pollutants that are independent of the scope of the E-PRTR. A summary list of these substances is provided in Table A2.7.

Table A2.7 Substances additional to those in E-PRTR Annex II that are reported by national and sub-national PRTRs

Pollutant	NRW inventory	Spain	Sweden	UK	France
Acrylamide	✓				
Acrylonitrile	✓				
Ammonium-N (Nh4-N)			✓		
Antimony and compounds (as Sb)		✓			
Beryllium and compounds	✓			✓	
Butadiene (1,3-Butadiene)				✓	
Carbon dioxide from biofuels			✓		
Carbon dioxide from carbon fuels			✓		
Chlorinated hydrocarbons	✓				
Cobalt and compounds (as Co)	✓	✓			
Dibromoethane			✓		
Dried sewage sludge			✓		
Formaldehyde (formalin)	✓				
Hydrogen chloride				✓	
Hydrogen fluoride				✓	
Hydrogen sulphide (H_2S)					✓
Hydrogen sulphide and inorganic odour-intensive sulphide (as H_2S)	✓				
Iron oxides	✓				
Magnesium and magnesium compounds (as Mg)	✓				
Manganese and compounds (Mn)	✓	✓		✓	
Mercaptans and organic sulphides	✓				
Nitric acid	✓				

Pollutant	NRW inventory	Spain	Sweden	UK	France
o,p'-DDT		✓			
p,p'-DD		✓			
p,p'-DDD		✓			
p,p'-DDE		✓			
Phosphate-P (PO4-P)			✓		
Phosphoric acid	✓				
PM2.5	✓			✓	
Selenium and compounds (as Se)	✓			✓	
Silicon and silicon compounds	✓				
Sulfuric acid	✓				
Sulphates					✓
Total sulphur			✓		
Thallium and compounds (as Tl)	✓	✓			
Tin and tin compounds (as Sn)	✓			✓	
Total suspended particulate (TSP)		✓	✓	✓	
Vanadium (V)	✓	✓		✓	

Some of the pollutants in Table A2.7 have already been suggested for addition to the E-PRTR list of pollutants based on other lists and sources. These pollutants are:

- acrylamide
- acrylonitrile
- antimony and compounds (as Sb)
- cobalt and compounds (as Co)
- formaldehyde
- hydrogen sulphide
- manganese and compounds (Mn)
- $PM_{2.5}$
- selenium and compounds (as Se)
- sulphates
- thallium and compounds (Tl)
- tin and compounds (as Sn)
- total suspended particulate (TSP)
- vanadium and compounds (as V).

Otherwise, the pollutants in Table A2.7 only appear in one PRTR with the exception of beryllium and compounds. This particular pollutant is therefore also suggested for addition to the E-PRTR list of pollutants.

A2.2.5 Alignment with international PRTR pollutant lists

In 2014, OECD published a harmonised list of pollutants[68] that aggregated and cross-referenced the pollutants reported in Pollutant Release and Transfer Registers (PRTRs) in five countries plus the Kiev Protocol. The purpose of this document was to improve the comparability of PRTR data on a global scale. The 'Short Chemical List' in the OECD list includes the 126 most toxic or environmentally relevant pollutants in industry that were commonly subject to reporting under PRTR programmes. Of these 'short list' pollutants, 30 are not included or are included only as part of a group in the E-PRTR but are reported by at least three of the other major PRTRs (i.e. Australia, Canada, Japan, and the United States). Of these 30 pollutants, 28 are included on all four of the other major PRTRs. All five of the PRTRs were further investigated to determine if pollutants had been added since the OECD document was published. While pollutants have been added, none were added that met the criterion of inclusion in three or more PRTRs other than the E-PRTR.

Considering the 30 pollutants for inclusion in the E-PRTR would be a significant step for the alignment of international PRTRs and could have multiple benefits including:

- ***Improving global harmonisation of data and analyses.*** As new PRTRs are designed or existing PRTRs are modified to incorporate the OECD harmonised list of pollutants into their own list of reportable pollutants, the comparability of PRTR data globally will continue to increase. This increased standardisation will create a greater opportunity for the E-PRTR countries to contribute to and benefit from future global analyses.

68 http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=env/jm/mono(2014)32&doclanguage=en

- ***Streamlining the pollutant evaluation process***. Methods for evaluating pollutants for PRTR inclusion vary among countries; however, several major PRTRs have already concluded that the additional pollutants warrant listing thus indicating they have met varying criteria.

To provide context on the potential value of including these pollutants in the E-PRTR, toxicity scores were calculated for each pollutant as follows.

- Releases of each chemical to air and to water were compiled from the PRTRs of Australia, Canada, Japan, and the U.S. using 2016 data.
- For each chemical, four Characterisation Factors (CFs) were compiled from the USEtox model[69] – CFs for air/health, water/health, air/ecotoxicity, and water/ecotoxicity. The health CFs used were the total CFs for cancer and non-cancer.
- For each chemical in each PRTR, the mass released was multiplied by the corresponding CF to produce four toxicity scores – for air/health, water/health, air/ecotoxicity and water/ecotoxicity.
- Averaging the scores for the four PRTRs produced four average toxicity scores per chemical – for air/health, water/health, air/ecotoxicity and water/ecotoxicity.

Table A2.8 lists the 30 pollutants identified. The 14 pollutants with relatively high rankings based on their toxicity scores are shown first in the table. The remaining pollutants either ranked lower in toxicity scores, or there was insufficient information to rank them. (It should be noted that one of these other pollutants, styrene, has been reported to the Czech PRTR since 2004.) The 14 high priority pollutants are suggested for inclusion in Annex II of the E-PRTR Regulation and these have been included in Table 3.1.

Table A2.8 Pollutants covered by most major international PRTRs but not currently reported to the E-PRTR

Priority	Pollutant Name	Relative toxicity score	Notes
High	Chromium(VI) compounds (as Cr)[70]	High health and ecotoxicity scores for air & water	High Characterisation Factors (CFs) for health and ecotoxicity; reported to the E-PRTR as part of the Cr and Cr Compounds group
High	Antimony and compounds (as Sb)	High health and ecotoxicity scores for air & water	High CFs for health and ecotoxicity
High	Acrolein	High health and ecotoxicity scores for air & water	High CFs for health and ecotoxicity
High	Cobalt and compounds (as Co)	High ecotoxicity scores for air & water	No USEtox CFs available for health; high release quantities
High	Manganese and compounds (as Mn)	High ecotoxicity scores for air & water	No USEtox CFs available for health; high release quantities

[69] https://www.usetox.org/

[70] Hexavalent chromium was considered as a potential addition because it is much more toxic than non-hexavalent chromium and is reported separately for three other PRTRs. Hexavalent chromium is currently included within a chromium & chromium compounds group in the E-PRTR.

Priority	Pollutant Name	Relative toxicity score	Notes
High	Carbon disulphide	High health toxicity scores for air & water	
High	Formaldehyde	High health toxicity scores for air & water	High air and water release quantities
High	Acrylonitrile	High health toxicity scores for air & water	High release quantities
High	Acrylamide	High health toxicity score for air	High CFs for health
High	n-Hexane	High health toxicity score for air	High release quantities
High	Acrylic acid and its water-soluble salts	High health toxicity score for air	
High	Acetaldehyde	High health toxicity score for water	High air and water release quantities
High	Selenium and compounds (as Se)	High ecotoxicity scores for water	High release quantities
High	2-Ethoxyethanol / ethylene glycol monoethyl ether	High health toxicity score for water	High release quantities
Medium	Methylenebis(phenylisocyanate) (MDI)	No USEtox CFs available for health or ecotoxicity	
Medium	2-Ethoxyethanol acetate / 2-ethoxyethyl acetate	No USEtox CFs available for health	No releases reported in Australia, Canada or U.S.; only reported in Japan
Medium	2-Methoxyethanol acetate / 2-methoxyethyl acetate	No USEtox CFs available for health	No releases reported in Australia, Canada or U.S.; only reported in Japan
Medium	4,4'-Methylene-bis(2-chloroaniline) (MOCA) / 3,3'-dichloro-4,4'-diaminodiphenylmethane	No USEtox CFs available for ecotoxicity; high CFs for health	
Medium	Decabromodiphenyl ether	No USEtox CFs available for ecotoxicity; high CF for health	Reported to the E-PRTR as part of brominated diphenyl ethers group
Medium	1,3-Butadiene	No USEtox CFs available for ecotoxicity; high CF for health	
Medium	1,1,2-Trichloroethane	High USEtox CFs for health	
Medium	Aniline	High USEtox CF for health	No releases reported in Australia, or Canada; only reported in Japan and U.S.
Medium	Biphenyl (1,1-biphenyl)		

Priority	Pollutant Name	Relative toxicity score	Notes
Medium	Dibutyl phthalate		
Medium	Methoxyethanol / ethylene glycol monomethyl ether		No releases reported in Australia, Canada or Japan; only reported in U.S.
Medium	Methyl methacrylate		High release quantities
Medium	Styrene		High release quantities; has been reported to Czech PRTR since 2004
Medium	Acetonitrile	High USEtox CFs for health	
Medium	Cumene (1-methylethylbenzene)		
Medium	Phenol		High release quantities; reported to the E-PRTR as part of phenols group

A2.2.6 Other pollutants of concern

This section considers a screening of the scientific literature and other relevant European strategies and action plans to identify additional substances for potential future inclusion in Annex II of the E-PRTR Regulation. It is suggested that the status of these substances be tracked, particularly through the WFD watch list process for when they may become designated as priority substances or priority hazardous substances.

A2.2.6.1 Pesticides

The pesticides included in the E-PRTR pollutant list were of environmental significance in the 1990s. Subsequently, other pesticides have raised concerns over their ecological effects, for example, the neonicotinoid active substances. In 2015, neonicotinoids and fipronil accounted for around one third of the world insecticide market, with the 2010 production of imidacloprid estimated at around 20,000 tonnes[71].

Neonicotinoids have been associated with declines in the populations of pollinators and the most used have already been restricted in the EU: imidacloprid and thiamethoxam have been approved as insecticides (and only as insecticides) in permanent greenhouses or for the treatment of seeds intended to be used only in permanent greenhouses; clothianidin and nitenpyram have not been approved; while acetamiprid and thiacloprid have been approved in most Member States. Their inclusion in the E-PRTR would allow authorities to verify the effectiveness of the implemented restrictions and for the public to access information on a category of pesticides raises concerns[72]. The increasing evidence of their adverse effects on

[71] Simon-Delso et al. (2015): Systemic insecticides (neonicotinoids and fipronil): trends, uses, mode of action and metabolites, Environ Sci Pollut Res 22:5–34.

[72] It should be noted that for the E-PRTR to catch such variations in the short-medium term, release quantities should be reported only on the basis of sampling and analysis and not by calculation methodologies.

pollinators and non-target organisms has led to the development of alternatives, such as sulfoxaflor. However, recent studies have found that this insecticide also has direct and indirect effects on pollinators; halving the population of bumblebees and harming their reproductive health[73]. Sulfoxaflor was approved in the EU in 2015 and the reappraisal of the risk assessment is scheduled for 2025. It is therefore suggested that sulfoximine-based insecticides be monitored for potential future inclusion in the E-PRTR.

Another emerging pesticide is phorate[74] which has been added to Annex III of the Rotterdam Convention, making it subject to the Prior Informed Consent Procedure, through which countries can decide on future imports of chemicals.

A2.2.6.2 Emerging pollutants and the NORMAN Network

Beyond EU legislation, there are international initiatives such as the NORMAN Network[75]. This is a network of reference laboratories, research centres and related organisations for the monitoring of emerging environmental substances. It started its operation with funding from the European Commission's 6th Framework Programme. The NORMAN Network defines 'emerging substances' as 'substances that have been detected in the environment, but which are currently not included in routine monitoring programmes at EU level and whose fate, behaviour and (eco)toxicological effects are not well understood. 'Emerging pollutants' can be defined as pollutants that are currently not included in routine monitoring programmes at the European level and which may be candidates for future regulation, depending on research on their (eco)toxicity, potential health effects and public perception and on monitoring data regarding their occurrence in the various environmental compartments.'

The network maintains a list of emerging substances, examples of which are surfactants, flame retardants, pharmaceuticals and personal care products, gasoline additives and their degradation products, biocides, polar pesticides and their degradation products and various proven or suspected endocrine disrupting compounds (EDCs).

A2.2.6.3 Pharmaceuticals

The presence of pharmaceuticals and personal care products (PPCPs) in the aquatic environment may pose potential threats to the ecosystem and human health. Active pharmaceutical ingredients (APIs) can affect wildlife at concentrations at and below those found in the aquatic environment. For example, diclofenac, an over-the-counter non-steroidal anti-inflammatory drug used to treat pain and inflammatory diseases in both humans and animals is found in concentrations higher than the limit defined for the WFD watch list (100 nanograms per litre) in over

[73] Siviter et al. (2018): Sulfoxaflor exposure reduces bumblebee reproductive success, Nature volume 561, pages 109-112.

[74] https://www.unenvironment.org/news-and-stories/press-release/governments-agree-landmark-decisions-protect-people-and-planet

[75] https://www.norman-network.net

10,000 kilometres of rivers around the globe[76]. Veterinary diclofenac has been found responsible for the near extinction of vultures in the Indian subcontinent[77].

There are knowledge gaps regarding the presence of many APIs in the environment and their potential to bioaccumulate. Of highest concern is the potential contribution of antibiotics in the environment to develop and maintain antimicrobial resistance (AMR). There are also uncertainties on the possible effects of inadvertent chronic exposure to a low level of APIs via the environment (e.g. drinking water). Finally, most UWWTP are not able to fully remove APIs and, in addition, manure from treated animals is spread on land.

In 2012, there were around 5,000 active pharmaceutical substances on the EU market[78], many of which entered the market before the Environmental Risk Assessment guidelines came into force (for human medicinal products in 2006 and for veterinary products in 2007).

The German Environment Agency performed a comprehensive literature review of publications and articles on the occurrence of pharmaceuticals in the environment[79] and found that around 631 different pharmaceuticals have been measured above the limits of detection of the analytical methods employed, of which 17 substances have been found in all five UN regions (Africa group; Asia-Pacific group; Eastern Europe group; group of Latin American and Caribbean States; Western Europe and others group, including North America, Australia, and New Zealand).

A total of nine APIs are included or have been suggested for inclusion in the WFD/EQS watch list[80]. One of the objectives of the European Commission's strategic approach to pharmaceuticals in the environment[81] is to fill in the knowledge gaps on the magnitude of the problem. A supporting study to the Commission's strategic approach to pharmaceuticals in the environment was published in 2018[82]. The authors reviewed a number of studies on a range of topics such as:

- Contribution of manufacturing activities and UWWTPs to environmental contamination;
- Data on consumption of pharmaceuticals with a high-risk profile;
- Occurrence of pharmaceuticals in drinking water and marine areas;
- Occurrence, fate and ecotoxicity of metabolites and transformation products;
- Impacts of chronic exposure on non-standard endpoints in laboratory conditions and with predictive models;
- Adverse effects related to pharmaceuticals in the environment;
- Development of AMR in the microbial population in potentially contaminating sources (manure and waste waters).

[76] https://phys.org/news/2018-04-rivers-worldwide-threatened-pharma.html

[77] https://www.nature.com/news/cattle-drug-threatens-thousands-of-vultures-1.19839

[78] Küster A, Adler N. 2014 Pharmaceuticals in the environment: scientific evidence of risks and its regulation. Phil. Trans. R. Soc. B 369: 20130587. http://dx.doi.org/10.1098/rstb.2013.0587.

[79] https://www.umweltbundesamt.de/en/database-pharmaceuticals-in-the-environment-0

[80] See Tables A2.4 and A2.5.

[81] https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-2210630_en

[82] Lockwood, S., et al. (2018): Options for a strategic approach to pharmaceuticals in the environment. Task 1 Report.

The authors concluded that data, including monitoring data, remain scattered across individual studies, non-standardised, incomplete and not readily available to the public and policymakers. The WFD watch lists should contribute to reducing uncertainty and may result in some of the APIs being ultimately included as priority substances or priority hazardous substances in the WFD list, at which point APIs should be considered for inclusion in the E-PRTR.

A2.3 Assessment of existing E-PRTR pollutants

This section presents the methodology and the results of the assessment of the current Annex II list of the E-PRTR regulation. The objective was to identify those pollutants that, despite being severely restricted or banned for many years, are still reported to the register in certain quantities, highlighting the necessity of checking the reporting accuracy of follow-up actions when such releases and transfers occur.

The full data set of version 14 of the E-PRTR was downloaded from the EEA's website[83]. Pivot tables were used to calculate, for each pollutant, the:

- Aggregated quantities released to water, air and land by reporting year;
- Number of reporting facilities by reporting year;
- Average value of the annual aggregated quantities;
- Number of outliers exceeding the upper bound[84].

Outliers were screened to identify likely reporting errors, by further examining the reporting facility, type of activity and reporting trends per facility, which may explain values significantly higher than the median and average reported values. All outliers deemed to be reporting errors were recorded and excluded from the analysis.

The analysis identifies those pollutants for which reported quantities and number of reporting facilities have decreased over time and are zero or approaching zero in most years in the 2007-2016 period, especially 2012-2016. Many of the substances and groups of substances in the register have been banned or severely restricted and their reported releases have reduced accordingly. For each pollutant, the relevant legislation and its entry into force has been identified (e.g. the POPs Regulation, the Water Framework Directive, the REACH Regulation).

For completeness, the same exercise was repeated with waste transfer data, but the results remained unchanged.

Table A2.9 lists pollutants that have been reported in the last three reporting years in aggregated quantities below 100 kg per year. Releases of these particular pollutants predominantly come from UWWTP, installations for the recovery or disposal of hazardous waste, and chemical installations for the production on an industrial scale of basic organic chemicals.

[83] https://www.eea.europa.eu/data-and-maps/data/member-states-reporting-art-7-under-the-european-pollutant-release-and-transfer-register-e-prtr-regulation-21

[84] Where an outlier is a data point that is more than 1.5 interquartile ranges above the third quartile.

Table A2.9 E-PRTR substances reported in the last three reporting years in aggregated quantities below 100 kg per year

Pollutant	2014		2015		2016		Total quantity since 2007 (kg)	Total number of releases since 2007
	Quantity (kg)	# Releases	Quantity (kg)	# Releases	Quantity (kg)	# Releases		
Mirex	-	-	-	-	-	-	56.40	2
Chlorfenvinphos	-	-	-	-	-	-	91.77	9
Chlordecone	99.25	4	-	-	-	-	234.59	13
Hexabromobiphenyl	0.46	3	-	-	0.68	2	84.43	23
Endosulphan		-	1.07	1	1.15	1	106.21	16
Brominated diphenylethers (PBDE)	2.2	1	2.8	3	1.26	2	426.62	77
Toxaphene	4.06	2	4.3	2	2.45	1	71.27	12
DDT	7.41	3	1.07	1	9.47	2	262.01	21
Heptachlor	-	-	-	-	-	-	179.57	12
Simazine	226.8	7	13.63	5	11.57	3	871.69	76
Trifluralin	4.06	2	4.3	2	2.45	1	95.85	13
Triphenyltin and compounds	7.41	3	1.07	1	9.47	2	408.82	31
Chlordane	10	1	5.07	2	10.57	3	71.32	4
Atrazine	16.48	5	12.9	4	16.41	4	796.67	71
Alachlor	10	2	11.71	3	19.47	3	128.00	23
Lindane	13.33	4	11.48	3	22.56	6	746.92	60
Isodrin	35.56	5	20.47	6	45.1	9	687.73	89
Endrin	30.56	4	15.47	5	45.47	9	569.94	74
Isoproturon	97.13	20	84.55	18	48.37	16	1,454,047	316

Pollutant	2014		2015		2016		Total quantity since 2007 (kg)	Total number of releases since 2007
	Quantity (kg)	# Releases	Quantity (kg)	# Releases	Quantity (kg)	# Releases		
1,2,3,4,5,6-hexachlorocyclohexane (HCH)	21.55	4	39.79	5	49.6	7	1,716.77	65
Aldrin	40.42	7	29.15	8	54.81	13	1,306.13	93
Dieldrin	40.42	7	30.15	8	57.41	12	1,356.99	105
Hexachlorobenzene (HCB)	84.6	6	59.73	4	97.12	5	1,170.76	66
Pentachlorobenzene	86.17	5	78.87	4	97.87	5	4,905.55	63

The categories 'heavy metals', 'other organic substances' and 'inorganic substances' are generic entries that have been used by some reporting facilities. Occasionally, these facilities have used them without specifying the relevant pollutant and therefore no analysis was possible. Dioxins and furans are reported in low quantities (ranging from 1 to 1.5 kg for the total annual amount in the E-PRTR) but, due to their very high toxicity, have not been suggested for removal, and their future reporting should continue. Chlorpyrifos is also reported in low quantities, but it is still approved as an active substance in plant protection products in the EU[85].

Most of the pollutants that are highlighted are pesticides. Pesticides are regulated in the European Union by Regulation (EC) No 1107/2009 concerning the placing of plant protection products (PPP) on the market. Most of the pesticides listed in the E-PRTR Annex II are also regulated by Regulation (EC) No 850/2004 on persistent organic pollutants (POPs), which implemented the Stockholm Convention. The Stockholm Convention entered into force on May 2004 with the aim of protecting human health and the environment from chemicals that remain intact in the environment for a long period. More precisely, POPs have four main characteristics:

- Long-term persistence;
- Distribution across wide boundaries;
- Bioaccumulation through the food web;
- Toxicity to both humans and wildlife.

Any party to the Convention may propose substances or groups of substances for inclusion in Annex A, B or C of the Convention.

For the substances and groups of substances included in Annex A (Elimination), parties to the Convention must take steps to eliminate their production and use. For substances and groups of substances listed in Annex B (restriction), parties to the Convention must take steps to restrict their production and use. Annex C (unintentional production) lists those substances and groups of substances which are unintentionally produced, for which parties to the Convention must take steps to reduce their unintentional releases.

Twenty-two pesticides are included in the E-PRTR substance list, and only two (chlorpyrifos and diuron[86]) are still approved as active substances in plant protection products in some Member States. Ten pesticides are included in the Stockholm Convention/POPs Regulation and the other ten have not received an approval according to the PPP Regulation. Nineteen pesticides are therefore banned or severely restricted and have also been reported in low quantities:

1. Mirex: included in the Stockholm Convention – Annex A since 2004;
2. Chlorfenvinphos: not approved as PPP active substance since 2002;
3. Chlordecone: included in the Stockholm Convention – Annex A since 2012;
4. Endosulfan: included in the Stockholm Convention – Annex A since 2012 and not approved in the EU since 2005;
5. Toxaphene: included in the Stockholm Convention – Annex A since 2004;
6. DDT: included in the Stockholm Convention – Annex B since 2004;
7. Heptachlor: included in the Stockholm Convention – Annex A since 2004;
8. Simazine: not approved as PPP active substance since 2004;[87]
9. Trifluralin: not approved as PPP active substance since 2010;

[85] Authorised in: AT, BE, BG, CY, CZ, EE, EL, ES, FR, HR, HU, IT, LU, MT, NL, PL, PT, RO, SK, UK.

[86] Authorised in: AT, CZ, EL, ES, IE, IT, SI, SK.

[87] It should be noted that in 2014 simazine was reported in aggregated quantities totalling 226.8 kg, of which 212 kg from one water treatment operator.

10. Triphenyltin and compounds: fentin acetate and fentin hydroxide have not been authorised as PPP active substances in the EU since 2002;
11. Chlordane: included in the Stockholm Convention – Annex A since 2004;
12. Atrazine: not approved as PPP active substance since 2004;
13. Alachlor: not approved as PPP active substance since 2006;
14. Lindane: included in the Stockholm Convention – Annex A since 2009;
15. Isodrin: obsolete and not approved as PPP active substance;
16. Endrin: included in the Stockholm Convention – Annex A since 2004;
17. Isoproturon: reported in high quantities until 2012. Not approved as PPP active substance since 2016;
18. Aldrin: included in the Stockholm Convention – Annex A since 2004;
19. Dieldrin: included in the Stockholm Convention – Annex A since 2004.

Reported releases of the twentieth restricted pesticide, tributyltin and compounds, were over 500 kg in 2016[88]. Therefore, removal of this pollutant from Annex II of the E-PRTR Regulation was not considered further.

In addition, another five substances have been reported in low quantities in the period 2014-2016. These are:

- Hexachlorobenzene (HCB);
- Pentachlorobenzene;
- Hexabromobiphenyl;
- Polybrominated diphenylethers (PBDE);
- 1,2,3,4,5,6-hexachlorocyclohexane (HCH).

Hexachlorobenzene was used as a fungicide. It is included in Annex A (Elimination) of the Stockholm Convention since 2004, and it is not approved as an active substance in plant protection products in the EU. However, it is also a by-product of the manufacture of certain industrial chemicals and exists as an impurity in several pesticide formulations[89].

Pentachlorobenzene was used as a fungicide, flame retardant and intermediate in the production of quintozene, an active substance in plant protection products that is not approved in the EU since 1979. It is included in the Stockholm Convention since 2009. Production of pentachlorobenzene ceased some decades ago, but it can be produced unintentionally during combustion, thermal and industrial processes. It is also present as an impurity in products such as solvents or pesticides.

Hexabromobiphenyl belongs to the group of polybrominated biphenyls (PBBs), which were used as flame retardants, mainly in the 1970s. PBBs have been restricted in the European Union since 1984[90]. This group of chemicals is highly persistent in the environment, highly bio-accumulative, and has a strong possibility for long-range environmental transport. Hexabromobiphenyl is classified as a possible human carcinogen, it has other chronic toxic effects and is included in Annex A (Elimination) of the Stockholm Convention since 2009. According to

[88] Bis(tributyltin) oxide was used as a fungicide but has not been approved since 2002. Tributyltin (TBT) and compounds and triphenyltin (TPT) and compounds are part of the organostannic chemical group. Organostannic compounds have been used as anti-foulant agents (active substances in biocidal products) for the treatment of ship hulls. This use has been restricted in 1989 with Council Directive 89/677/EEC. Additional restrictions on the use of TBT and TPT apply since 2010: articles containing these compounds cannot be placed on the market.

[89] http://www.pops.int/TheConvention/ThePOPs/AllPOPs/tabid/2509/Default.aspx

[90] By Directive 83/264/EEC, now entry no. 8 of Annex XVII of the REACH Regulation: shall not be used in textile articles, such as garments, undergarments and linen, intended to come into contact with the skin.

available information, hexabromobiphenyl is no longer produced or used in most countries[91].

PBDE congeners including tetraBDE, pentaBDE, hexaBDE, heptaBDE, octaBDE, nonaBDE and decaBDE have been used as flame retardants since the 1970s and are very persistent, very bio-accumulative, and toxic. They have been progressively restricted, starting from the lower congeners (considered more toxic) to the higher congeners, which through debromination can degrade to the lower congeners. They are listed in Annex A of the Stockholm Convention.

Isomers of hexachlorocyclohexane (alpha- and beta-) were used as insecticides and can be produced as by-products in the manufacture of lindane (gamma hexachlorocyclohexane), an insecticide itself. They were added to the Stockholm Convention in 2009.

This analysis identified 24 substances that are reported in limited quantities and for which future releases can be expected to be very low because of regulatory restrictions. However, to ensure coherence with international conventions as well as to enable global comparisons with other countries where many of these substances may not yet be banned, it is not suggested to remove these substances from Annex II of the E-PRTR Regulation. Furthermore, since these substances are expected to be released from only a few activities the overall reduction in the regulatory burden would be small compared to the benefits of retaining them. Nevertheless, competent authorities could be encouraged to carefully review reports of release of these substances, to verify the reported amounts, and to take any appropriate follow-up actions.

A2.4 Threshold analysis: Detailed methodology and results

A2.4.1 Background

This section describes the methodology and detailed results relating to the following two issues:

1. For each pollutant, establish what thresholds would now capture 90% of total releases from E-PRTR facilities. This should be analysed for air, water and land releases, since the threshold may differ for each medium.
2. The additional benefit, and administrative burden, that would arise from removing E-PRTR release thresholds – either on a wholescale basis or for specific pollutants.

Estimating the proportion of all industrial releases captured by the E-PRTR is inherently difficult, because by definition, most data on releases below the reporting thresholds are not reported. We therefore do not know the true quantity of releases below reporting thresholds, so we cannot give a precise answer.

In this analysis, two different data sources and approaches are taken to answering these questions.

3. Use of local industrial emissions data sets from North Rhine-Westphalia (NRW)[92] in Germany (Emissionserklärungen 2016 nach 11. BImSchV, and the 2016 NRW

[91] http://www.pops.int/TheConvention/ThePOPs/AllPOPs/tabid/2509/Default.aspx

[92] Provided with permission by the Landesamt für Natur, Umwelt und Verbraucherschutz (LANUV), Nordrhein-Westfalen.

Waste Water Database; hereafter referred to as the NRW inventory) and the Spanish PRTR[93], in which all releases are reported from all facilities undertaking E-PRTR activities, including releases below the reporting threshold. This allows direct calculation of the thresholds that would be required to capture 90% of releases of each pollutant in these areas, and the number of facilities reporting releases below the release thresholds. Extrapolating from these local data sets to the rest of Europe provides one approach to addressing the questions.

4. Using above-threshold pollutant release data from the E-PRTR to extrapolate expected below-threshold releases, using an indirect statistical approach which assumes a smooth distribution of release sizes from facilities (the Weibull extrapolation – see Section A2.4.2.2 below).

Both approaches have strengths and weaknesses. Local data may not be representative of the rest of Europe but extrapolating from such data makes no assumptions about the size distribution of releases below thresholds. Conversely, the E-PRTR covers the whole of Europe, but the assumption that release sizes vary smoothly may not always be appropriate. Combining the results from both approaches will highlight those pollutants for which there is agreement that current thresholds are sufficient or require adjustment, and those pollutants for which there is uncertainty that may require additional research work.

A2.4.2 Methodology

A2.4.2.1 Use of below-threshold reporting from NRW inventory and the Spanish PRTR

Data from the NRW inventory and the Spanish PRTR were supplied for releases to air and water in 2016, at the facility level. These data sets included reported releases below the E-PRTR release thresholds, and therefore allow a direct calculation of:

a) The percentage of releases above and below the E-PRTR release thresholds;

b) The thresholds that would be required to capture 90% of all releases;

c) The additional burden of removing release thresholds completely (were reporting thresholds currently applied).

It is important to note that no data on releases to land were available from either the NRW inventory or the Spanish PRTR.

Data preparation

Both data sets also contained reported releases from facilities undertaking activities not included in the E-PRTR regulation. These facilities and their associated releases were removed from the data sets before carrying out calculations.

For the NRW inventory, an extra aggregation step was necessary before conducting the analysis, because the release data are reported and supplied at the level of installations within facilities. It would be incorrect to analyse the E-PRTR reporting thresholds at this level of aggregation, because the thresholds apply to the facility level. The activity type is also defined at the level of installations within facilities, so an individual facility can produce some releases from E-PRTR and some from non-E-PRTR releases.

[93] Provided with permission by the Ministerio para la Transición Ecológica.

Therefore, before undertaking the analysis, releases were first summed across all installations undertaking E-PRTR activities within a facility. Inspection of data reported to the E-PRTR from facilities present in the NRW inventory confirmed that this approach matches that used for E-PRTR reporting.

Calculations

In order to assess the percentage of releases in the NRW inventory and the Spanish PRTR captured by the current E-PRTR release thresholds (were they to be applied), releases above and below the threshold were simply summed across all facilities and activities for each pollutant and release medium separately, then a percentage calculated.

In order to assess the release threshold required to achieve 90% capture rate for a given pollutant and release medium, facilities were first sorted in order of release size from largest to smallest, and the cumulative sum of releases calculated. The required release threshold to achieve 90% capture rate was then found by taking the reported release quantity of the first facility for which the cumulative sum of releases is greater than or equal to 90%. Counting the number of facilities reporting releases between this reported release quantity and the E-PRTR threshold then gave an estimate of the additional burden resulting from lowering the reporting threshold to the required value.

The estimate of the additional burden of removing thresholds altogether was found by calculating the proportion of facilities reporting above and below E-PRTR thresholds in the NRW inventory and the Spanish PRTR data. These proportions were then used to extrapolate from the number of facilities reporting above-threshold releases in the E-PRTR in 2016, in order to estimate the number of facilities across all reporting countries that would need to start reporting if E-PRTR thresholds were removed. For example, if the NRW inventory indicates that 10% of facilities report above-threshold releases of a pollutant, and 50 facilities reported this pollutant to the E-PRTR in 2016, then it is assumed that these 50 facilities represent 10% of the total releasing that pollutant across Europe. The total number in this example would be 500 facilities, with 450 reporting at below-threshold level and therefore needing to begin reporting.

A2.4.2.2 Weibull extrapolation

The approach taken in two previous reviews of EPER[94] and E-PRTR[95] thresholds was to use an indirect statistical method to estimate the quantity of releases below reporting thresholds. The method assumes that, for a given pollutant, the frequency of pollutant releases of different sizes across all facilities should form a smooth statistical distribution. The presence of reporting thresholds truncates the distribution at the threshold level, but by parameterising an appropriate distribution function using the data on releases above the threshold, the unobserved part of the distribution below the reporting threshold (and thus the total quantity of releases) can be extrapolated.

This approach will work well if the fitted distribution function provides a good approximation to observed pollutant releases, as well as to pollutant releases below the reporting thresholds.

[94] https://www.irz.cz/dokumenty/eper/eper_review_2004_version_16-5-2007.pdf

[95] http://ec.europa.eu/environment/industry/stationary/eper/pdf/Final%20report_20120605.pdf

In the two previous reviews of reporting thresholds cited above, the 3-parameter cumulative Weibull distribution was used, due to several advantageous features:

i. It can mimic almost any distribution function, so it can adapt to different distributions for different pollutants;
ii. It can be fitted to any monotonically increasing data set, such as a sorted list of cumulative pollutant releases by facility;
iii. The total unreported releases from facilities is estimated analytically, so it is not computationally intensive.

Data preparation

In order to fit the 3-parameter Weibull cumulative distribution function, for a given year, release medium and pollutant (and any other grouping variables used) the releases from individual facilities are sorted from largest to smallest, and the cumulative sum of releases is calculated. This produces an observed cumulative distribution curve as the number of facilities rises, for all releases above the reporting threshold in the E-PRTR database (or other data source being analysed).

Fitting the 3-parameter cumulative Weibull distribution

The 3-parameter Weibull cumulative distribution function is given by Equation A2.1:

Equation A2.1

$$y = a(1 - e^{-bx^c})$$

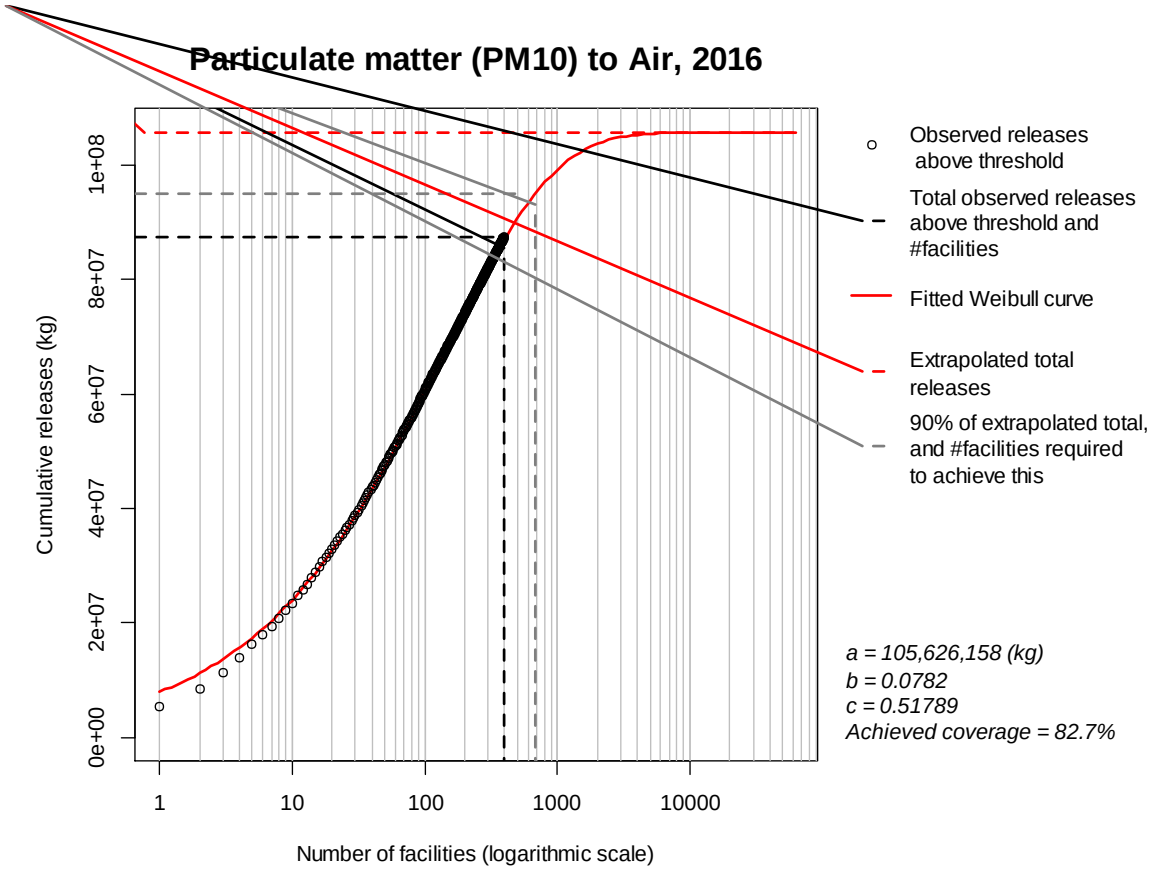
Where x is the number of facilities, y is the cumulative releases from the x largest facilities, and a, b and c are parameters affecting the scale and shape of the distribution function.

The 3-parameter Weibull distribution function was fitted to the observed cumulative release data using non-linear least-squares regression, implemented by the 'nls' function in the statistical software R version 3.5.0[96].

The most important parameter for this analysis is a, as this represents the estimate of the asymptotic total releases as x goes to infinity (dashed red line in Figure A2.1). The value of a is used as the estimate of total releases from all industrial facilities undertaking E-PRTR activities, including releases below the threshold (and therefore not reported). The percentage capture rate of releases achieved by the E-PRTR can then be calculated by comparing the value of a (dashed red line) with the total of releases reported to the E-PRTR (dashed horizontal black line in Figure A2.1).

[96] R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. Website: https://www.R-project.org/

Figure A2.1 Observed cumulative releases of particulate matter (PM_{10}) in 2016 from the E-PRTR database, and the extrapolation to below-threshold releases using the fitted 3-parameter Weibull function



Predicting the release threshold required to achieve 90% capture rate

For pollutants where the estimated capture rate of the E-PRTR release thresholds is less than 90% (such as particulate matter in 2016 – see figure above), the fitted Weibull function was also used to predict how low the threshold would have to be, and how many additional facilities would have to report, in order to achieve a capture rate of at least 90%.

This is found by rearranging the fitted Weibull function as follows:

Equation A2.2

$$x_{90\%} = ceiling\left(\left(\frac{\ln\left(\frac{1}{1-0.9}\right)}{b}\right)^{\frac{1}{c}}\right)$$

Where $x_{90\%}$ is the number of facilities required to achieve a capture rate of at least 90%.

The corresponding release threshold to achieve a capture rate of at least 90%, $threshold_{90\%}$, is then given by the predicted quantity of pollutant released by the last facility required to reach 90% capture rate, by substituting $x_{90\%}$ and $x_{90\%}$ - 1 into Equation A2.2:

Equation A2.3

$$threshold_{90\%} = a(1 - e^{-bx_{90\%}{}^{c}}) - a(1 - e^{-b(x_{90\%}-1)^{c}})$$

Estimating the additional burden of removing release thresholds

Using the Weibull extrapolation method, it is not possible to estimate the additional number of facilities which would have to report releases if release thresholds were removed entirely. This is due to the asymptotic nature of the function, whereby 100% coverage of releases is only achieved as the number of facilities tends to infinity.

Therefore, the additional burden of removing thresholds, on a pollutant-by-pollutant basis, was assessed using only data from the NRW inventory and Spanish PRTR. For pollutants not reported in the NRW inventory and Spanish PRTR, no estimate of additional burden was made.

Scope and application to the E-PRTR database

The analysis described above was applied to the master E-PRTR database, to which access was provided by the European Environment Agency (EEA). Weibull curves were first fitted to all of the pollutant release data for each pollutant and release medium, for the years 2007-2016. Release data from the EU-28 countries as well as Iceland, Norway, Serbia and Switzerland were analysed.

Although 2007-2016 data were analysed, for simplicity and clarity the results for 2016 were the main focus of analysis. To ensure the results were as robust as possible for 2016, some data-cleaning was implemented to remove outliers. Cases where the parameter b was greater than 1.5 following initial fitting of Weibull curves were investigated, as this signifies that the largest pollutant release makes up more than around 75% of all releases. Release quantities from affected facilities in 2016 were compared to those in other years to assess plausibility of the 2016 data. Release quantities which appeared to be errors on closer inspection were either corrected (in the case of obvious unit errors) or removed.

The results from the analysis are presented below, for pollutants where at least 10 releases were reported. While sufficient observations were available to implement the Weibull analysis for most pollutant releases to air and water, for a significant minority of pollutants (see results below) the data were either too few, or too irregular for the fitting algorithm, resulting in an error. No estimates of release threshold suitability are available for these pollutants.

Very few releases to land were reported in the E-PRTR. As such, the Weibull approach only yielded an estimate based on 10 or more facility reports for one pollutant – nickel and compounds (Ni) – in 2016.

The analysis did not include transfers of pollutants in wastewater in the analysis of pollutant releases. This was to ensure there was no double-counting of releases first transferred from a facility to a wastewater treatment plant, then released from that plant into the environment.

A2.4.2.3 Validation of the Weibull analysis using data from the NRW inventory and Spanish PRTR

A key potential weakness of the Weibull approach is the assumption that pollutant releases across all facilities form a smooth statistical distribution, and that releases below the thresholds continue to follow this distribution. In the previous two reviews

of reporting thresholds this was an untested assumption. In reality, constraints on the sizes of businesses and types of installation could result in discontinuities and plateaus in release quantities.

The results of the analysis of the sufficiency of the current release thresholds using the Spanish PRTR and the NRW inventory were used to provide an estimate of the confidence in the results of applying the Weibull analysis to E-PRTR data. For each pollutant and release medium, the estimate of the percentage of all releases accounted for by above-threshold releases from the Weibull analysis of E-PRTR data was compared with the directly calculated values from the Spanish PRTR and NRW data sets. On the basis of this comparison, the Weibull results were categorised into three levels of confidence.

- High confidence: The estimate of releases captured from the Weibull result is within 20 percentage points of the results from the NRW inventory and Spanish PRTR and is on the same side of the target 90% capture rate.
- Medium confidence: either
  - there is no data available to validate the Weibull results in the NRW inventory and Spanish PRTR, or
  - the Weibull estimate is more than 20 percentage points away from the result of either the analysis of the NRW inventory or the Spanish PRTR and is on the other side of the target 90% capture rate to that estimate.
- Low confidence: The Weibull estimate is more than 20 percentage points away from, and on the other side of the target 90% capture rate from the results of analysis of both the NRW inventory and the Spanish PRTR.

Where no estimate was available from the Weibull analysis of E-PRTR data, indications of threshold sufficiency were taken from the analysis of the NRW inventory and Spanish PRTR only.

A2.4.3 Detailed results tables

The key findings and textual summary of results is provided in the main report (Sections 3.2 and 3.3.2). This annex provides detailed results tables on which the summarised results are based.

There are a number of considerations and caveats to bear in mind when interpreting the results.

- Cases where no pollutant releases were recorded, or where the Weibull analysis could not be applied due to insufficient data, are indicated by a '-'.
- Reported values of 0% are 'real' zeros – i.e. all facilities report releases at below-threshold level. This occurs in the NRW and Spanish PRTR data due to the small number of facilities reporting releases of some pollutants.
- The fitted Weibull distribution curves can never fit the observed data perfectly. In some cases, this imperfect fit produces counterintuitive results such as the following:
  - Capture rate estimates greater than 100% in the Weibull analysis. In these cases, the asymptote of the fitted line falls below the level of the total above-threshold cumulative releases in the data. This mainly affects pollutants emitted from relatively few facilities. In the main report, these values have been capped at 100%, but are left uncapped in this annex.
  - For some water pollutants (mercury and compounds, dieldrin, endrin, isodrin and nonylphenol and nonylphenol ethoxylates), the estimate of capture rate is below 90%, but the predicted required threshold for obtaining 90% is actually higher than the current one (Table A2.13). This can occur when the minimum

reported release size is considerably larger than the reporting threshold, or when there is a jump in reported release sizes close to the threshold, causing the curve to fit poorly in this part of the distribution. In the main report (Section 3.2), the water pollutants affected by this are not included among those suggested for a reduction in reporting threshold. However, they are retained in the detailed results tables below.

A2.4.3.1 Capture rate of current reporting thresholds, as a percentage of total (estimated) releases from industry

For the 60 air pollutants and 71 water pollutants within the scope of E-PRTR reporting, Table A2.10 and Table A2.11 below show the observed capture-rate of current E-PRTR release thresholds based on the Weibull analysis of above-threshold releases in the E-PRTR, as well as observed above and below-threshold data in the Spanish PRTR and NRW inventory. Where no estimate is available from the Weibull analysis of E-PRTR data but is provided by the Spanish PRTR and/or NRW inventory, this is also noted in the table as 'likely above' or 'likely below' 90% capture rate.

Table A2.10 and Table A2.11 are colour-coded according to whether the Weibull analysis estimates that above or below 90% of releases from E-PRTR activities are covered by current reporting thresholds, and to reflect the degree of support in the estimate provided by comparison with the NRW inventory and Spanish PRTR (as described in Annex A2.4.2.3 above). The colour coding scheme is shown below.

Figure A2.2 Confidence categories for the results of the Weibull analysis

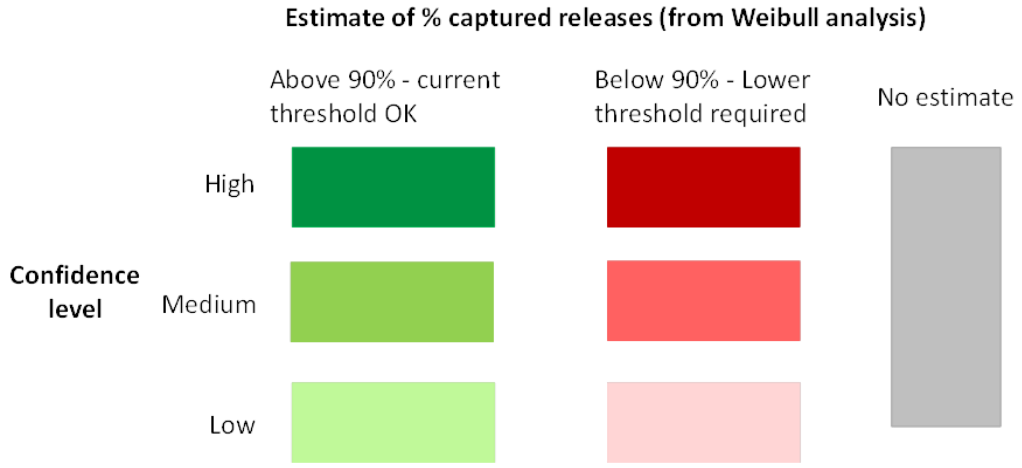


Table A2.10 Comparison of results from the Weibull analysis of releases to air, and confidence level from comparison with the NRW inventory and the Spanish PRTR, in terms of the capture rate of total releases with current thresholds.

Pollutant	Observed capture rate of PRTR thresholds in local inventories		Estimated capture rate in E-PRTR, using Weibull extrapolation	Confidence in Weibull estimate
	NRW inventory	Spanish PRTR		
1,2-dichloroethane (DCE)	-	99.6%	100.7%	Above: High confidence
Chlorofluorocarbons (CFCs)	-	99.6%	95.9%	Above: High confidence
Dichloromethane (DCM)	97.7%	98.7%	100.8%	Above: High confidence
Hydrochlorofluorocarbons (HCFCs)	-	100.0%	100.7%	Above: High confidence
Hydro-fluorocarbons (HFCs)	-	93.0%	93.0%	Above: High confidence
Nitrogen oxides (NO_X/NO_2)	95.6%	92.2%	90.7%	Above: High confidence
Perfluorocarbons (PFCs)	-	100.0%	94.2%	Above: High confidence
Polychlorinated biphenyls (PCBs)	-	97.4%	98.9%	Above: High confidence
Sulphur oxides (SO_X/SO_2)	96.6%	93.2%	93.0%	Above: High confidence
Trichloromethane	-	96.9%	94.4%	Above: High confidence
Zinc and compounds (as Zn)	98.0%	92.0%	96.0%	Above: High confidence
Carbon dioxide (CO_2)	97.9%	86.8%	91.7%	Above: Medium confidence
Carbon monoxide (CO)	97.2%	86.4%	100.7%	Above: Medium confidence
Halons	-	-	100.4%	Above: Medium confidence
Lead and compounds (as Pb)	96.1%	58.1%	96.7%	Above: Medium confidence
Mercury and compounds (as Hg)	93.7%	86.3%	92.0%	Above: Medium confidence

Pollutant	Observed capture rate of PRTR thresholds in local inventories		Estimated capture rate in E-PRTR, using Weibull extrapolation	Confidence in Weibull estimate
	NRW inventory	Spanish PRTR		
Nickel and compounds (as Ni)	65.0%	95.0%	97.0%	Above: Medium confidence
PCDD + PCDF (dioxins + furans) (as Teq)	88.0%	93.5%	100.9%	Above: Medium confidence
1,1,1-trichloroethane	-	0.0%	100.3%	Above: Low confidence
Benzene	81.4%	79.8%	90.7%	Above: Low confidence
Chlorine and inorganic compounds (as HCl)	86.0%	69.4%	95.0%	Above: Low confidence
Hydrogen cyanide (HCN)	29.6%	22.4%	101.5%	Above: Low confidence
Methane (CH_4)	0.0%	67.7%	91.3%	Above: Low confidence
Naphthalene	74.8%	73.8%	92.8%	Above: Low confidence
Nitrous oxide (N_2O)	71.8%	69.7%	93.9%	Above: Low confidence
Polycyclic aromatic hydrocarbons (PAHs)	0.0%	84.8%	99.2%	Above: Low confidence
Sulphur hexafluoride (SF6)	-	0.0%	99.7%	Above: Low confidence
Tetrachloroethylene (PER)	-	0.0%	95.7%	Above: Low confidence
Tetrachloromethane (TCM)	0.0%	88.6%	100.5%	Above: Low confidence
Trichloroethylene	-	80.8%	98.5%	Above: Low confidence
Arsenic and compounds (as As)	73.4%	72.6%	86.6%	Below: High confidence
Copper and compounds (as Cu)	80.4%	71.9%	83.0%	Below: High confidence
Fluorine and inorganic compounds (as HF)	87.5%	74.8%	89.1%	Below: High confidence

Pollutant	Observed capture rate of PRTR thresholds in local inventories		Estimated capture rate in E-PRTR, using Weibull extrapolation	Confidence in Weibull estimate
	NRW inventory	Spanish PRTR		
Non-methane volatile organic compounds (NMVOC)	87.2%	88.7%	81.8%	Below: High confidence
Ammonia (NH_3)	55.5%	94.0%	43.3%	Below: Medium confidence
Cadmium and compounds (as Cd)	86.5%	64.6%	89.3%	Below: Medium confidence
Particulate matter (PM_{10})	67.2%	51.2%	81.7%	Below: Medium confidence
1,1,2,2-tetrachloroethane	-	100.0%	32.9%	Below: Low confidence
Chromium and compounds (as Cr)	52.3%	69.2%	89.6%	Below: Low confidence
Di-(2-ethyl hexyl) phthalate (DEHP)	-	0.0%	68.6%	Below: Low confidence
Vinyl chloride	-	99.4%	76.0%	Below: Low confidence
1,2,3,4,5,6-hexachlorocyclohexane (HCH)	-	-	-	No estimate
Aldrin	-	-	-	No estimate
Anthracene	-	93.4%	-	No estimate – likely above
Asbestos	-	-	-	No estimate
Chlordane	-	-	-	No estimate
Chlordecone	-	-	-	No estimate
DDT	-	-	-	No estimate
Dieldrin	-	-	-	No estimate
Endrin	-	-	-	No estimate

Pollutant	Observed capture rate of PRTR thresholds in local inventories		Estimated capture rate in E-PRTR, using Weibull extrapolation	Confidence in Weibull estimate
	NRW inventory	Spanish PRTR		
Ethylene oxide	-	0.0%	-	No estimate – likely below
Heptachlor	-	-	-	No estimate
Hexabromobiphenyl	-	-	-	No estimate
Hexachlorobenzene (HCB)	-	0.0%	-	No estimate – likely below
Lindane	-	-	-	No estimate
Mirex	-	-	-	No estimate
Pentachlorobenzene	-	0.0%	-	No estimate – likely below
Pentachlorophenol (PCP)	-	0.0%	-	No estimate – likely below
Toxaphene	-	-	-	No estimate
Trichlorobenzenes (TCBs) (all isomers)	-	0.0%	-	No estimate – likely below

Table A2.11 Comparison of results from the Weibull analysis of releases to water, and confidence level from comparison with the NRW inventory and Spanish PRTR, in terms of the capture rate of total releases with current thresholds.

Pollutant	Observed capture rate of PRTR thresholds in local inventories		Estimated capture rate in E-PRTR, using Weibull extrapolation	Confidence in Weibull estimate
	NRW inventory	Spanish PRTR		
1,2-dichloroethane (DCE)	-	95.1%	100.5%	Above: High confidence
Arsenic and compounds (as As)	-	93.6%	93.6%	Above: High confidence
Di-(2-ethyl hexyl) phthalate (DEHP)	-	99.9%	94.2%	Above: High confidence
Nickel and compounds (as Ni)	98.8%	95.2%	92.6%	Above: High confidence
Octylphenols and Octylphenol ethoxylates	-	95.3%	100.0%	Above: High confidence
PCDD + PCDF (dioxins + furans) (as Teq)	-	97.7%	98.5%	Above: High confidence
Phenols (as total C)	99.6%	99.4%	100.7%	Above: High confidence
Polychlorinated biphenyls (PCBs)	-	92.3%	100.8%	Above: High confidence
Polycyclic aromatic hydrocarbons (PAHs)	-	94.6%	100.9%	Above: High confidence
Toluene	97.3%	-	99.2%	Above: High confidence
Tributyltin and compounds	-	98.9%	100.5%	Above: High confidence
Trichlorobenzenes (TCBs) (all isomers)	-	96.8%	100.6%	Above: High confidence
Vinyl chloride	-	97.3%	101.2%	Above: High confidence
Xylenes	94.3%	-	98.8%	Above: High confidence
Benzene	-	-	99.3%	Above: Medium confidence
Ethyl benzene	-	-	95.0%	Above: Medium confidence

Pollutant	Observed capture rate of PRTR thresholds in local inventories		Estimated capture rate in E-PRTR, using Weibull extrapolation	Confidence in Weibull estimate
	NRW inventory	Spanish PRTR		
Halogenated organic compounds (as AOX)	70.0%	92.0%	100.8%	Above: Medium confidence
Atrazine	-	0.0%	99.4%	Above: Low confidence
Benzo(g,h,i)perylene	-	0.0%	97.2%	Above: Low confidence
Cadmium and compounds (as Cd)	39.3%	84.9%	90.3%	Above: Low confidence
Chlorides (as total Cl)	-	89.1%	100.2%	Above: Low confidence
Chloro-alkanes, C10-C13	-	74.3%	93.0%	Above: Low confidence
Chromium and compounds (as Cr)	68.5%	81.5%	93.8%	Above: Low confidence
Cyanides (as total CN)	-	85.7%	101.4%	Above: Low confidence
Dichloromethane (DCM)	-	85.5%	100.7%	Above: Low confidence
Fluoranthene	-	64.0%	98.5%	Above: Low confidence
Fluorides (as total F)	-	87.0%	92.8%	Above: Low confidence
Hexachlorobutadiene (HCBD)	-	0.0%	99.8%	Above: Low confidence
Lindane	-	72.3%	102.6%	Above: Low confidence
Naphthalene	-	0.0%	100.7%	Above: Low confidence
Pentachlorobenzene	-	0.0%	100.2%	Above: Low confidence
Pentachlorophenol (PCP)	-	49.1%	97.7%	Above: Low confidence
Tetrachloroethylene (PER)	-	85.6%	93.9%	Above: Low confidence
Tetrachloromethane (TCM)	-	88.0%	97.5%	Above: Low confidence

Pollutant	Observed capture rate of PRTR thresholds in local inventories		Estimated capture rate in E-PRTR, using Weibull extrapolation	Confidence in Weibull estimate
	NRW inventory	Spanish PRTR		
Trichloromethane	-	88.3%	94.1%	Above: Low confidence
Asbestos	-	-	78.4%	Below: Medium confidence
Lead and compounds (as Pb)	41.9%	86.7%	84.1%	Below: Medium confidence
Total phosphorus	76.1%	94.6%	80.7%	Below: Medium confidence
1,2,3,4,5,6-hexachlorocyclohexane (HCH)	-	93.2%	83.7%	Below: Low confidence
Aldrin	-	0.0%	85.0%	Below: Low confidence
Anthracene	-	0.0%	82.3%	Below: Low confidence
Chlorpyrifos	-	83.4%	51.2%	Below: Low confidence
Copper and compounds (as Cu)	93.7%	93.9%	89.2%	Below: Low confidence
Dieldrin	-	0.0%	81.6%	Below: Low confidence
Diuron	-	91.8%	29.8%	Below: Low confidence
Endrin	-	0.0%	88.3%	Below: Low confidence
Isodrin	-	0.0%	87.5%	Below: Low confidence
Isoproturon	-	85.6%	62.1%	Below: Low confidence
Mercury and compounds (as Hg)	48.4%	96.0%	89.4%	Below: Low confidence
Nonylphenol and nonylphenol ethoxylates (NP/NPEs)	-	98.1%	89.8%	Below: Low confidence
Total nitrogen	91.4%	96.0%	85.2%	Below: Low confidence

Pollutant	Observed capture rate of PRTR thresholds in local inventories		Estimated capture rate in E-PRTR, using Weibull extrapolation	Confidence in Weibull estimate
	NRW inventory	Spanish PRTR		
Total organic carbon (TOC) (as total C or COD/3)	97.8%	95.0%	82.2%	Below: Low confidence
Trichloroethylene	-	42.4%	84.0%	Below: Low confidence
Zinc and compounds (as Zn)	99.3%	94.2%	85.3%	Below: Low confidence
Alachlor	-	0.0%	-	No estimate – likely below
Brominated diphenylethers (PBDE)	-	0.0%	-	No estimate – likely below
Chlordane	-	0.0%	-	No estimate – likely below
Chlordecone	-	0.0%	-	No estimate – likely below
Chlorfenvinphos	-	0.0%	-	No estimate – likely below
DDT	-	0.0%	-	No estimate – likely below
Endosulphan	-	0.0%	-	No estimate – likely below
Ethylene oxide	-	-	-	No estimate
Heptachlor	-	0.0%	-	No estimate – likely below
Hexabromobiphenyl	-	-	-	No estimate
Hexachlorobenzene (HCB)	-	0.0%	-	No estimate – likely below
Mirex	-	0.0%	-	No estimate – likely below
Organotin compounds (as total Sn)	-	0.0%	-	No estimate – likely below
Simazine	-	0.0%	-	No estimate – likely below
Toxaphene	-	-	-	No estimate

Pollutant	Observed capture rate of PRTR thresholds in local inventories		Estimated capture rate in E-PRTR, using Weibull extrapolation	Confidence in Weibull estimate
	NRW inventory	Spanish PRTR		
Trifluralin	-	0.0%	-	No estimate – likely below
Triphenyltin and compounds	-	0.0%	-	No estimate – likely below

A2.4.3.2 Required release thresholds for achieving 90% capture rate and resulting additional burden

Table A2.12 and Table A2.13 extend the analysis of capture rates by pollutant, to also provide indications of the reporting threshold that would be required in order to achieve 90% capture rate of all industrial releases from E-PRTR activities. Associated with this is an additional number of facilities which do not currently have to report releases of a given pollutant but would have to do so with the required lower threshold. Where the current thresholds capture more than 90% of releases, the results are still presented for context, even though the required threshold is higher, and number of facilities required to report lower than under current thresholds. Where applicable, these results could potentially also be used to support arguments for *raising* reporting thresholds to reduce burden, although that question is outside of the scope of the current report.

Note that thresholds in the table are rounded to the nearest 2 decimal places for values less than 10. Where required thresholds are presented as 0.00 kg/year, this means a value of less than 0.005 kg/year. For example, the threshold for polychlorinated dibenzodioxin (PCDD) + polychlorinated dibenzofuran (PCDF) – dioxins + furans – released to air based on the Spanish PRTR data is displayed as 0.00, but this is actually 0.0001 kg/year (0.1g/year).

Table A2.12 Required reporting thresholds for releases to air and number of facilities required to report under current and required thresholds, as estimated from the analysis of below-threshold data in the NRW inventory and Spanish PRTR, and Weibull extrapolation of E-PRTR data.

Pollutant	Current release threshold (kg/year)	NRW inventory			Spanish PRTR			E-PRTR Weibull extrapolation		
		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:	
			Above current threshold	Above required threshold		Above current threshold	Above required threshold		Above current threshold	Above required threshold
1,1,1-trichloroethane	100	-	-	-	52	0	1	905	17	3
1,1,2,2-tetrachloroethane	50	-	-	-	57	1	1	1.31	6	271
1,2,3,4,5,6-hexachlorocyclohexane (HCH)	10	-	-	-	-	-	-	-	-	-
1,2-dichloroethane (DCE)	1,000	-	-	-	3,322	2	2	10,300	24	8
Aldrin	1	-	-	-	-	-	-	-	-	-
Ammonia (NH_3)	10,000	4,082	113	312	12,000	2,135	1,920	447	7,088	127,681
Anthracene	50	-	-	-	136	1	1	-	-	-
Arsenic and compounds (as As)	20	6.78	8	23	3.72	22	69	12	179	242
Asbestos	1	-	-	-	-	-	-	-	-	-
Benzene	1,000	581	20	28	609	25	46	1,200	261	243
Cadmium and compounds (as Cd)	10	6.52	9	13	2.79	29	102	7.06	190	210
Carbon dioxide (CO_2)	10,000,0000	457,888,291	121	57	72,682,000	165	213	131,000,000	2,135	1,862
Carbon monoxide (CO)	500,000	4,457,642	30	13	28,9000	60	88	1,790,000	509	163
Chlordane	1	-	-	-	-	-	-	-	-	-
Chlordecone	1	-	-	-	-	-	-	-	-	-

Pollutant	Current release threshold (kg/year)	NRW inventory			Spanish PRTR			E-PRTR Weibull extrapolation		
		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:	
			Above current threshold	Above required threshold		Above current threshold	Above required threshold		Above current threshold	Above required threshold
Chlorine and inorganic compounds (as HCl)	10,000	7,055	30	41	2,618	29	113	14,800	358	258
Chlorofluorocarbons (CFCs)	1	-	-	-	117	2	1	55	261	54
Chromium and compounds (as Cr)	100	8.50	8	45	22	16	70	57	141	159
Copper and compounds (as Cu)	100	42	9	17	19	16	61	38	158	279
DDT	1	-	-	-	-	-	-	-	-	-
Di-(2-ethyl hexyl) phthalate (DEHP)	10	-	-	-	0.99	0	15	4.26	7	38
Dichloromethane (DCM)	1,000	3,262	1	1	346,000	5	1	15,600	92	22
Dieldrin	1	-	-	-	-	-	-	-	-	-
Endrin	1	-	-	-	-	-	-	-	-	-
Ethylene oxide	1,000	-	-	-	88	0	1	-	-	-
Fluorine and inorganic compounds (as HF)	5,000	2,502	17	21	1,304	37	86	3,942	185	198
Halons	1	-	-	-	-	-	-	1,560	11	2
Heptachlor	1	-	-	-	-	-	-	-	-	-
Hexabromobiphenyl	0	-	-	-	-	-	-	-	-	-
Hexachlorobenzene (HCB)	10	-	-	-	1.00	0	4	-	-	-
Hydrochlorofluorocarbons (HCFCs)	1	-	-	-	6.00	2	2	1,970	310	9

Pollutant	Current release threshold (kg/year)	NRW inventory			Spanish PRTR			E-PRTR Weibull extrapolation		
		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:	
			Above current threshold	Above required threshold		Above current threshold	Above required threshold		Above current threshold	Above required threshold
Hydro-fluorocarbons (HFCs)	100	-	-	-	200	10	9	252	377	212
Hydrogen cyanide (HCN)	200	32	2	12	33	3	31	1,960	55	14
Lead and compounds (as Pb)	200	1,254	7	5	24	20	109	357	152	94
Lindane	1	-	-	-	-	-	-	-	-	-
Mercury and compounds (as Hg)	10	19	33	27	7.50	49	59	12	439	390
Methane (CH4)	100,000	5,500	0	272	28,652	175	1,355	131,000	1,553	1,335
Mirex	1	-	-	-	-	-	-	-	-	-
Naphthalene	100	93	5	7	38	9	19	142	79	64
Nickel and compounds (as Ni)	50	6.32	12	46	198	53	30	122	329	187
Nitrogen oxides (NO_X/NO_2)	100,000	259,854	121	75	143,580	242	196	110,000	2,427	2,290
Nitrous oxide (N_2O)	10,000	519	19	125	977	57	351	15,500	600	449
Non-methane volatile organic compounds (NMVOC)	100,000	66,683	18	28	74,095	81	90	49,590	810	1,374
Particulate matter (PM_{10})	50,000	5,668	17	108	6,303	35	242	17,309	395	725
PCDD + PCDF (dioxins + furans) (as Teq)	0	0.00	10	12	0.00	26	17	0.01	174	20
Pentachlorobenzene	1	-	-	-	0.04	0	1	-	-	-
Pentachlorophenol (PCP)	10	-	-	-	0.04	0	1	-	-	-
Perfluorocarbons (PFCs)	100	-	-	-	2,200	2	2	2,200	39	24

Pollutant	Current release threshold (kg/year)	NRW inventory			Spanish PRTR			E-PRTR Weibull extrapolation		
		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:	
			Above current threshold	Above required threshold		Above current threshold	Above required threshold		Above current threshold	Above required threshold
Polychlorinated biphenyls (PCBs)	0	-	-	-	8.58	1	1	2.10	39	11
Polycyclic aromatic hydrocarbons (PAHs)	50	1.90	0	11	32	13	22	250	70	26
Sulphur hexafluoride (SF_6)	50	-	-	-	3.96	0	3	144	23	13
Sulphur oxides (SO_X/SO_2)	150,000	390,647	65	45	272,555	90	65	272,000	1,014	746
Tetrachloroethylene (PER)	2,000	-	-	-	188	0	8	4,890	12	9
Tetrachloromethane (TCM)	100	7.72	0	5	79	1	2	798	12	7
Toxaphene	1	-	-	-	-	-	-	-	-	-
Trichlorobenzenes (TCBs) (all isomers)	10	-	-	-	5.68	0	1	-	-	-
Trichloroethylene	2,000	-	-	-	113	1	3	4,610	6	4
Trichloromethane	500	-	-	-	16,956	1	1	1,450	24	16
Vinyl chloride	1,000	-	-	-	3,166	3	3	1,289	35	75
Zinc and compounds (as Zn)	200	1,128	10	6	265	66	57	415	385	247

Table A2.13 Required reporting thresholds for releases to water and number of facilities required to report under current and required thresholds, as estimated from the analysis of below-threshold data in the NRW inventory and Spanish PRTR, and Weibull extrapolation of E-PRTR data.

Pollutant	Current release threshold (kg/year)	NRW inventory			Spanish PRTR			E-PRTR Weibull extrapolation		
		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:	
			Above current threshold	Above required threshold		Above current threshold	Above required threshold		Above current threshold	Above required threshold
1,2,3,4,5,6-hexachlorocyclohexane (HCH)	1	-	-	-	3.62	1	1	0.69	7	11
1,2-dichloroethane (DCE)	10	-	-	-	320	2	1	66	29	13
Alachlor	1	-	-	-	0.01	0	3	-	-	-
Aldrin	1	-	-	-	0.00	0	4	0.92	12	15
Anthracene	1	-	-	-	0.00	0	9	0.37	87	154
Arsenic and compounds (as As)	5	-	-	-	8.81	50	38	14	781	482
Asbestos	1	-	-	-	-	-	-	0.32	107	214
Atrazine	1	-	-	-	0.04	0	5	1.57	4	3
Benzene	200	-	-	-	-	-	-	10,100	102	35
Benzo(g,h,i)perylene	1	-	-	-	0.16	0	3	1.33	36	25
Brominated diphenylethers (PBDE)	1	-	-	-	0.11	0	3	-	-	-
Cadmium and compounds (as Cd)	5	0.49	4	37	3.15	18	27	5.15	307	300
Chlordane	1	-	-	-	0.09	0	2	-	-	-

Pollutant	Current release threshold (kg/year)	NRW inventory			Spanish PRTR			E-PRTR Weibull extrapolation		
		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:	
			Above current threshold	Above required threshold		Above current threshold	Above required threshold		Above current threshold	Above required threshold
Chlordecone	1	-	-	-	0.01	0	3	-	-	-
Chlorfenvinphos	1	-	-	-	0.05	0	3	-	-	-
Chlorides (as total Cl)	2,000,000	-	-	-	1,840,000	71	75	9,000,000	596	182
Chloro-alkanes, C10-C13	1	-	-	-	0.67	3	6	1.82	20	18
Chlorpyrifos	1	-	-	-	0.83	3	4	0.09	5	45
Chromium and compounds (as Cr)	50	17	14	38	20	32	49	67	361	287
Copper and compounds (as Cu)	50	56	46	39	77	60	47	48	942	992
Cyanides (as total CN)	50	-	-	-	31	19	26	275	174	59
DDT	1	-	-	-	0.03	0	3	-	-	-
Di-(2-ethyl hexyl) phthalate (DEHP)	1	-	-	-	16	54	17	11	399	215
Dichloromethane (DCM)	10	-	-	-	5.65	10	13	33	61	25
Dieldrin	1	-	-	-	0.00	0	4	1.00	12	16
Diuron	1	-	-	-	1.03	11	10	0.00	116	28,302
Endosulphan	1	-	-	-	0.02	0	3	-	-	-
Endrin	1	-	-	-	0.01	0	4	1.18	9	10

Pollutant	Current release threshold (kg/year)	NRW inventory			Spanish PRTR			E-PRTR Weibull extrapolation		
		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:	
			Above current threshold	Above required threshold		Above current threshold	Above required threshold		Above current threshold	Above required threshold
Ethyl benzene	200	-	-	-	-	-	-	650	56	37
Ethylene oxide	10	-	-	-	-	-	-	-	-	-
Fluoranthene	1	-	-	-	0.10	2	7	3.12	58	20
Fluorides (as total F)	2,000	-	-	-	1,610	52	62	3,120	506	383
Halogenated organic compounds (as AOX)	1,000	265	9	30	1,229	51	45	3,200	361	152
Heptachlor	1	-	-	-	0.01	0	3	-	-	-
Hexabromobiphenyl	0	-	-	-	-	-	-	-	-	-
Hexachlorobenzene (HCB)	1	-	-	-	0.01	0	8	-	-	-
Hexachlorobutadiene (HCBD)	1	-	-	-	0.02	0	6	41	7	3
Isodrin	1	-	-	-	0.01	0	2	1.21	9	10
Isoproturon	1	-	-	-	0.62	2	4	0.08	16	103
Lead and compounds (as Pb)	20	1.96	4	41	14	27	35	11	484	813
Lindane	1	-	-	-	0.32	4	9	1.30	6	4
Mercury and compounds (as Hg)	1	0.03	1	30	2.08	23	14	1.01	335	357
Mirex	1	-	-	-	0.01	0	3	-	-	-
Naphthalene	10	-	-	-	0.04	0	7	786	219	34

Pollutant	Current release threshold (kg/year)	NRW inventory			Spanish PRTR			E-PRTR Weibull extrapolation		
		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:	
			Above current threshold	Above required threshold		Above current threshold	Above required threshold		Above current threshold	Above required threshold
Nickel and compounds (as Ni)	20	51	61	39	42	75	47	33	1,155	925
Nonylphenol and Nonylphenol ethoxylates (NP/NPEs)	1	-	-	-	4.13	23	12	12	252	209
Octylphenols and Octylphenol ethoxylates	1	-	-	-	1.80	11	8	2.04	45	25
Organotin compounds (as total Sn)	50	-	-	-	2.28	0	7	-	-	-
PCDD + PCDF (dioxins + furans) (as Teq)	0	-	-	-	0.01	3	1	0.00	39	13
Pentachlorobenzene	1	-	-	-	0.05	0	3	15	5	3
Pentachlorophenol (PCP)	1	-	-	-	0.96	1	2	4.97	18	6
Phenols (as total C)	20	398	21	8	775	55	10	1,620	447	78
Polychlorinated biphenyls (PCBs)	0	-	-	-	0.31	2	2	63	18	2
Polycyclic aromatic hydrocarbons (PAHs)	5	-	-	-	9.44	6	4	19	62	22
Simazine	1	-	-	-	0.05	0	4	-	-	-
Tetrachloroethylene (PER)	10	-	-	-	4.14	6	8	15	32	24
Tetrachloromethane (TCM)	1	-	-	-	0.72	6	7	10	43	11
Toluene	200	1,162	9	5	-	-	-	9,330	95	33

Pollutant	Current release threshold (kg/year)	NRW inventory			Spanish PRTR			E-PRTR Weibull extrapolation		
		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:		Threshold required for 90% capture (kg/year)	# facilities emitting:	
			Above current threshold	Above required threshold		Above current threshold	Above required threshold		Above current threshold	Above required threshold
Total nitrogen	50,000	52,537	43	41	122,000	142	99	26,233	1,654	2,418
Total organic carbon (TOC) (as total C or COD/3)	50,000	73,801	62	44	88,033	125	96	41,381	1,995	3,080
Total phosphorus	5,000	3,101	20	40	7,906	156	119	2,042	1,627	3,193
Toxaphene	1	-	-	-	-	-	-	-	-	-
Tributyltin and compounds	1	-	-	-	171	1	1	171	4	2
Trichlorobenzenes (TCBs) (all isomers)	1	-	-	-	5.94	2	2	16	17	7
Trichloroethylene	10	-	-	-	0.95	1	9	4.99	21	39
Trichloromethane	10	-	-	-	8.24	14	16	25	90	60
Trifluralin	1	-	-	-	0.00	0	3	-	-	-
Triphenyltin and compounds	1	-	-	-	0.03	0	4	-	-	-
Vinyl chloride	10	-	-	-	71	2	2	57	14	7
Xylenes	200	518	5	5	-	-	-	2,620	81	37
Zinc and compounds (as Zn)	100	296	63	39	170	88	65	86	2,008	2,826

A2.4.3.3 Additional burden of removing release thresholds

This section provides tables of detailed estimates by pollutant of the additional administrative burden of removing release thresholds completely, such that all releases of any size would be reported. These are derived from analysis of the NRW inventory and Spanish PRTR, where release thresholds do not exist. These tables supplement the summary in Section 3.3.3 of the main report.

The share of facilities reporting releases of each pollutant above and below the E-PRTR thresholds was calculated in the NRW inventory and Spanish PRTR (2016 data). The additional burden from removing thresholds was then extrapolated, by assuming that these same proportions would also apply to the whole of Europe. The number of facilities reporting releases of each pollutant in the E-PRTR in 2016 (at above-threshold levels, by definition) was then scaled accordingly to given an estimate of the total number of facilities which would be required to report that pollutant to the E-PRTR if thresholds were removed.

Note that an estimate of additional burden could not be made where no facilities reported above-threshold releases for a pollutant in the E-PRTR in 2016, or where 100% of facilities in the NRW inventory or Spanish PRTR reported at below-threshold levels. In the latter case, this is because when 0% of facilities report above-threshold releases, the scaling factor to apply to E-PRTR facilities reporting above-threshold releases would be infinity, which is not a helpful estimate. These cases are reported as '-' in the tables below.

Table A2.14 Removing reporting thresholds: additional burden of reporting by pollutant – releases to air

Pollutant	% facilities reporting at below-threshold level in 2016		# Facilities reporting releases in E-PRTR 2016	Extrapolated total facilities reporting to the E-PRTR with no threshold	
	NRW inventory	Spanish PRTR		Lower estimate	Upper estimate
1,2-dichloroethane (DCE)	-	85%	24	156	-
Arsenic and compounds (as As)	94%	96%	179	3,155	5,102
Benzene	87%	91%	261	2,036	2,881
Carbon dioxide (CO_2)	77%	92%	2,135	9,210	27,729
Carbon monoxide (CO)	95%	97%	509	9,654	18,748
Chlorofluorocarbons (CFCs)	-	90%	261	2,610	-
Copper and compounds (as Cu)	95%	97%	158	3,458	6,034
Dichloromethane (DCM)	91%	89%	92	828	1,012
Fluorine and inorganic compounds (as HF)	91%	93%	185	2,166	2,470

Pollutant	% facilities reporting at below-threshold level in 2016		# Facilities reporting releases in E-PRTR 2016	Extrapolated total facilities reporting to the E-PRTR with no threshold	
	NRW inventory	Spanish PRTR		Lower estimate	Upper estimate
Hydrochlorofluorocarbons (HCFCs)	-	91%	310	3,565	-
Hydro-fluorocarbons (HFCs)	-	80%	377	1,923	-
Mercury and compounds (as Hg)	78%	92%	439	1,956	5,402
Naphthalene	58%	87%	79	190	606
Nitrogen oxides (NOx/NO2)	81%	90%	2,427	12,997	23,117
Non-methane volatile organic compounds (NMVOC)	97%	94%	810	13,080	28,845
PCDD + PCDF (dioxins + furans) (as Teq)	93%	93%	174	2,536	2,662
Perfluorocarbons (PFCs)	-	89%	39	351	-
Polychlorinated biphenyls (PCBs)	-	99%	39	3,237	-
Sulphur oxides (SO_x/SO_2)	87%	95%	1,014	8,081	19,987
Trichloroethylene	-	99%	6	414	-
Trichloromethane	-	96%	24	600	-
Zinc and compounds (as Zn)	88%	89%	385	3,311	3,564
Ammonia (NH_3)	79%	30%	7,088	10,076	33,433
Cadmium and compounds (as Cd)	94%	95%	190	3,336	4,095
Chlorine and inorganic compounds (as HCl)	91%	95%	358	4,093	7,481
Halons	-	-	11	-	-
Lead and compounds (as Pb)	96%	97%	152	3,626	5,328
Nickel and compounds (as Ni)	95%	92%	329	4,277	6,882
Particulate matter (PM_{10})	99%	97%	395	15,676	26,790
Polycyclic aromatic hydrocarbons (PAHs)	100%	97%	70	2,348	-
Tetrachloromethane (TCM)	100%	94%	12	204	-

Pollutant	% facilities reporting at below-threshold level in 2016		# Facilities reporting releases in E-PRTR 2016	Extrapolated total facilities reporting to the E-PRTR with no threshold	
	NRW inventory	Spanish PRTR		Lower estimate	Upper estimate
1,1,1-trichloroethane	-	100%	17	-	-
1,1,2,2-tetrachloroethane	-	92%	6	72	-
Chromium and compounds (as Cr)	97%	98%	141	4,318	6,045
Di-(2-ethyl hexyl) phthalate (DEHP)	-	100%	7	-	-
Hydrogen cyanide (HCN)	94%	97%	55	990	1,668
Methane (CH_4)	100%	95%	1,553	33,341	-
Nitrous oxide (N_2O)	97%	98%	600	22,011	37,526
Sulphur hexafluoride (SF_6)	-	100%	23	-	-
Tetrachloroethylene (PER)	-	100%	12	-	-
Vinyl chloride	-	77%	35	152	-
1,2,3,4,5,6-hexachlorocyclohexane (HCH)	-	-	-	-	-
Aldrin	-	-	1	-	-
Anthracene	-	98%	7	392	-
Asbestos	-	-	2	-	-
Chlordane	-	-	-	-	-

Table A2.15 Removing reporting thresholds: additional burden of reporting by pollutant – releases to water

Pollutant	% facilities reporting at below-threshold level in 2016		# Facilities reporting releases in E-PRTR 2016	Extrapolated total facilities reporting to the E-PRTR with no threshold	
	NRW inventory	Spanish PRTR		Lower estimate	Upper estimate
1,2,3,4,5,6-hexachlorocyclohexane (HCH)	-	95%	7	154	-
1,2-dichloroethane (DCE)	-	97%	29	855	-
Arsenic and compounds (as As)	-	80%	781	3,905	-
Chlorides (as total Cl)	-	84%	596	3,761	-
Chloro-alkanes, C10-C13	-	85%	20	133	-
Copper and compounds (as Cu)	35%	82%	942	1,454	5,322
Cyanides (as total CN)	-	88%	174	1,484	-
Di-(2-ethyl hexyl) phthalate (DEHP)	-	33%	399	599	-
Dichloromethane (DCM)	-	85%	61	397	-
Fluorides (as total F)	-	81%	506	2,608	-
Nickel and compounds (as Ni)	14%	78%	1,155	1,344	5,159
Nonylphenol and Nonylphenol ethoxylates (NP/NPEs)	-	61%	252	646	-
Octylphenols and Octylphenol ethoxylates	-	81%	45	237	-
PCDD + PCDF (dioxins + furans) (as Teq)	-	92%	39	481	-
Phenols (as total C)	45%	67%	447	809	1,341
Polychlorinated biphenyls (PCBs)	-	93%	18	261	-
Polycyclic aromatic hydrocarbons (PAHs)	-	95%	62	1,219	-
Tetrachloroethylene (PER)	-	88%	32	272	-
Tetrachloromethane (TCM)	-	87%	43	330	-
Toluene	72%	-	95	338	-
Total nitrogen	39%	78%	1,654	2,693	7,688
Total organic carbon (TOC) (as total C or COD/3)	13%	74%	1,995	2,285	7,661

Pollutant	% facilities reporting at below-threshold level in 2016		# Facilities reporting releases in E-PRTR 2016	Extrapolated total facilities reporting to the E-PRTR with no threshold	
	NRW inventory	Spanish PRTR		Lower estimate	Upper estimate
Total phosphorus	71%	76%	1,627	5,695	6,904
Tributyltin and compounds	-	98%	4	204	-
Trichlorobenzenes (TCBs) (all isomers)	-	89%	17	162	-
Trichloromethane	-	84%	90	546	-
Vinyl chloride	-	85%	14	91	-
Xylenes	74%	-	81	308	-
Zinc and compounds (as Zn)	11%	79%	2,008	2,263	9,515
Asbestos	-	-	107	-	-
Benzene	-	-	102	-	-
Cadmium and compounds (as Cd)	94%	93%	307	4,537	5,449
Chromium and compounds (as Cr)	80%	90%	361	1,831	3,644
Ethyl benzene	-	-	56	-	-
Halogenated organic compounds (as AOX)	84%	80%	361	1,826	2,326
Lead and compounds (as Pb)	94%	91%	484	5,306	8,591
Mercury and compounds (as Hg)	99%	89%	335	3,073	23,785
Aldrin	-	100%	12	-	-
Anthracene	-	100%	87	-	-
Atrazine	-	100%	4	-	-
Benzo(g,h,i)perylene	-	100%	36	-	-
Chlorpyrifos	-	83%	5	30	-
Dieldrin	-	100%	12	-	-
Diuron	-	78%	116	527	-
Endrin	-	100%	9	-	-
Fluoranthene	-	97%	58	2,291	-
Hexachlorobutadiene (HCBD)	-	100%	7	-	-
Isodrin	-	100%	9	-	-

Pollutant	% facilities reporting at below-threshold level in 2016		# Facilities reporting releases in E-PRTR 2016	Extrapolated total facilities reporting to the E-PRTR with no threshold	
	NRW inventory	Spanish PRTR		Lower estimate	Upper estimate
Isoproturon	-	95%	16	344	-
Lindane	-	92%	6	72	-
Naphthalene	-	100%	219	-	-
Pentachlorobenzene	-	100%	5	-	-
Pentachlorophenol (PCP)	-	95%	18	378	-
Trichloroethylene	-	98%	21	1,197	-
Alachlor	-	100%	3	-	-
Brominated diphenylethers (PBDE)	-	100%	2	-	-
Chlordane	-	100%	2	-	-
Chlordecone	-	100%	-	-	-
Chlorfenvinphos	-	100%	-	-	-
DDT	-	100%	2	-	-
Endosulphan	-	100%	1	-	-
Ethylene oxide	-	-	1	-	-
Heptachlor	-	100%	3	-	-
Hexabromobiphenyl	-	-	2	-	-
Hexachlorobenzene (HCB)	-	100%	3	-	-
Mirex	-	100%	-	-	-
Organotin compounds (as total Sn)	-	100%	1	-	-
Simazine	-	100%	3	-	-
Toxaphene	-	-	1	-	-
Trifluralin	-	100%	2	-	-
Triphenyltin and compounds	-	100%	3	-	-

Annex 3 Guidance

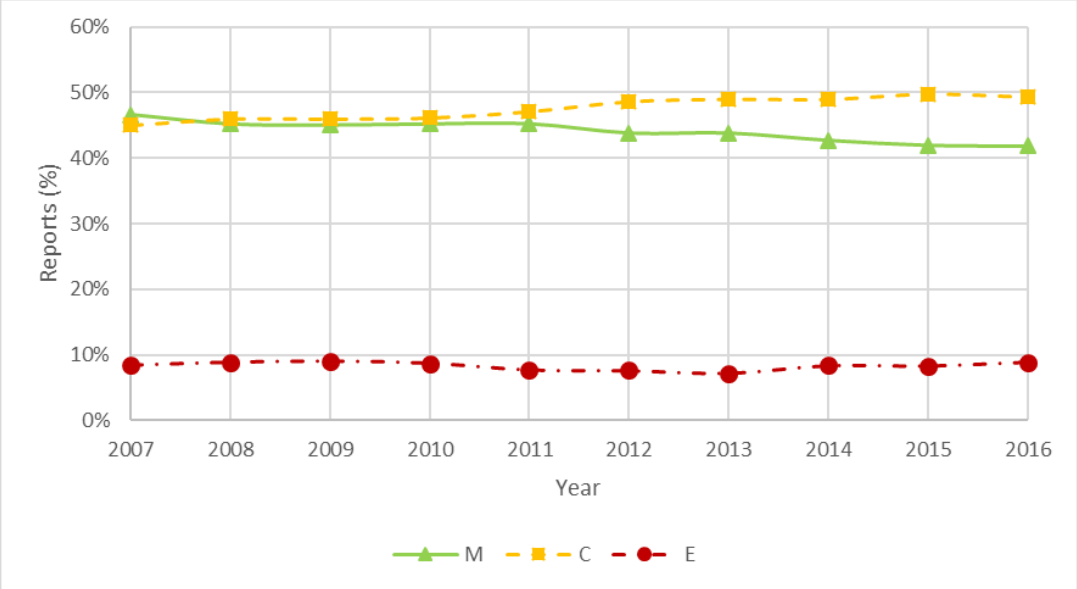
A3.1 Analysis of methodologies

A3.1.1 Assessment of measurement calculation and estimation methods usage

The analysis was done overall for each medium and individually for each pollutant to determine the reported quantification method classes as percentages of the total number of release reports by pollutant. For each pollutant, two analyses were carried out: (i) analysis broken down by sector and (ii) analysis by country. Each analysis uses only a sample of sectors and countries, made up of the largest emitters and capped at the point at which the sample accounts for at least 80% of total releases.

As the chosen method class for quantifying releases (M, C or E) can affect the absolute value reported by operators, and hence whether the reporting thresholds are exceeded, it is important to understand the use, and change in use, of these method classes. Figure A3.1 shows the evolution of quantification method class reported for all releases to air and water during the period 2007-2016.

Figure A3.1 Evolution of quantification method classes for releases to air and water



The individual pollutant analysis shows a wide variety of trends. Two main groups of pollutants can be identified:

- Pollutants with no significant changes over time in quantification method classes (as in the case of methane releases to air, shown in Figure A3.2 below). For 12 pollutants released to air and 19 pollutants released to water, the quantification method classes are primarily C and/or E. For 17 pollutants released to air and 36 pollutants released to water, quantification has usually been made through measurements. M is more often used for well-known air and water pollutants such as SO_2, NO_X, chlorides and total nitrogen.
- Other pollutants (22 released to air and 16 released to water) with very erratic changes over time in quantification method classes (as in the example of

trichloroethylene shown in Figure A3.3 below). This pattern usually relates to pollutants that are reported by a low number of facilities. Changes in the quantification method class used by a few facilities produces large variations in the overall pattern.

Figure A3.2 Evolution of quantification method classes used for releases to air of methane for countries (France, Germany, Italy, Poland, Portugal, Spain and the United Kingdom) that represent 80% of total releases.

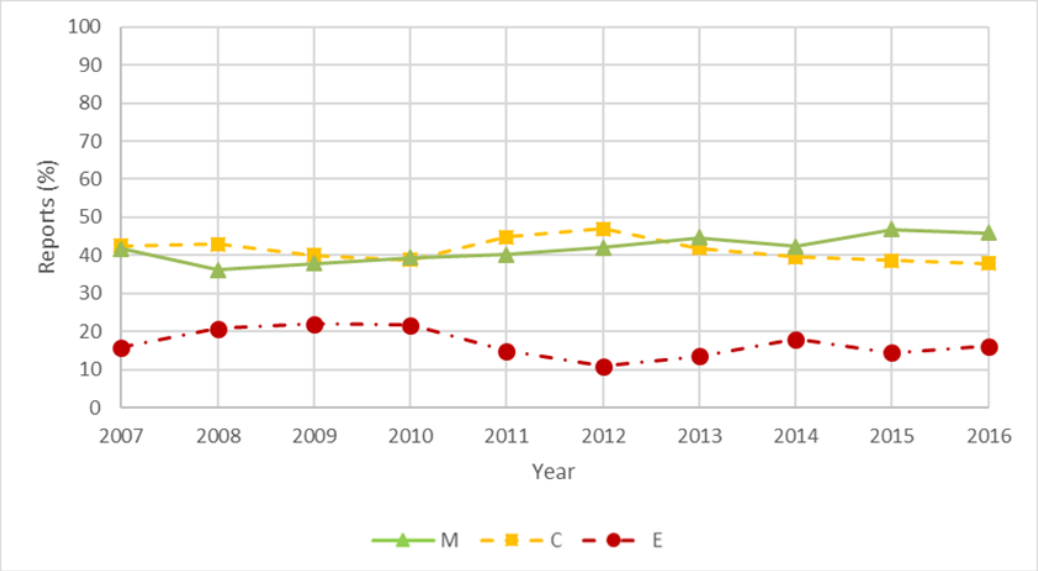
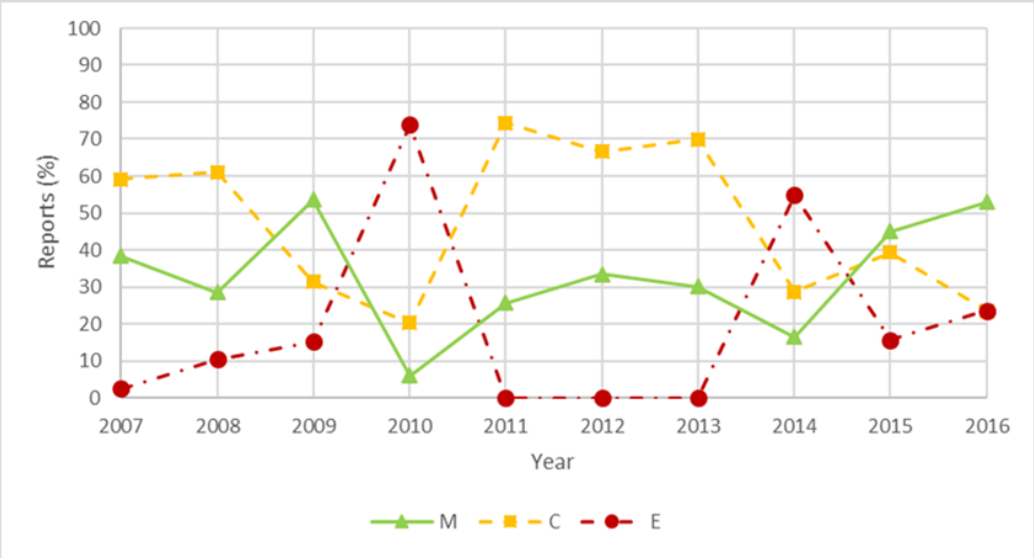


Figure A3.3 Evolution of quantification method classes used for releases to air of trichloroethylene from sectors that represent 80% of total releases.



A3.1.2 Quantification methodologies used

The following tables show, for each reporting year, the prevalence of different methodologies used for reported releases and their percentage contribution to total reports by method class. Proportions for 'No info' and 'Other measurement/calculation methodologies' are highlighted in yellow.

Table A3.1 Distribution of methodologies used in 2007

	REPORTING YEAR: 2007					
	M (MEASURED)		C (CALCULATED)		E (ESTIMATED)	
	Number of reports	%	Number of reports	%	Number of reports	%
No info	592	3%	9	0%	863	27%
Alternative measurement methodology in accordance with existing CEN/ISO measurement standards	1696	10%	23	0%	23	1%
European-wide sector specific calculation method	2	0%	706	4%	1	0%
Guidelines for the monitoring and reporting of greenhouse gas emissions under the Emission Trading Scheme.	4	0%	755	4%	0	0%
Internationally approved measurement standard	2339	13%	134	1%	136	4%
IPCC Guidelines	0	0%	205	1%	9	0%
Mass balance method which is accepted by the competent authority	37	0%	1370	8%	7	0%
Measurement methodology for the performance of which is demonstrated by means of certified reference materials and accepted by competent authority.	1068	6%	8	0%	2	0%
Measurement/Calculation Methodology already prescribed by the competent authority in a licence or an operating permit for that facility	3667	21%	1462	9%	129	4%
National or regional binding measurement/calculation methodology prescribed by legal act for the pollutant and facility concerned.	2049	12%	1136	7%	8	0%
Other measurement/calculation methodology	6243	35%	10262	60%	2025	63%
UNECE/EMEP EMEP/CORINAIR Emission Inventory Guidebook	11	0%	1043	6%	6	0%
TOTAL REPORTS	17708	100%	17113	100%	3209	100%

Table A3.2 Distribution of methodologies used in 2008

	REPORTING YEAR: 2008					
	M (MEASURED)		C (CALCULATED)		E (ESTIMATED)	
	Number of reports	%	Number of reports	%	Number of reports	%
No info	604	3%	11	0%	823	23%
Alternative measurement methodology in accordance with existing CEN/ISO measurement standards	1622	9%	22	0%	15	0%
European-wide sector specific calculation method	6	0%	682	4%	3	0%
Guidelines for the monitoring and reporting of greenhouse gas emissions under the Emission Trading Scheme.	3	0%	775	4%	0	0%
Internationally approved measurement standard	2579	14%	164	1%	126	4%
IPCC Guidelines	1	0%	233	1%	8	0%
Mass balance method which is accepted by the competent authority	25	0%	1495	8%	9	0%
Measurement methodology for the performance of which is demonstrated by means of certified reference materials and accepted by competent authority.	1225	7%	7	0%	0	0%
Measurement/Calculation Methodology already prescribed by the competent authority in a licence or an operating permit for that facility	3449	19%	1777	10%	67	2%
National or regional binding measurement/calculation methodology prescribed by legal act for the pollutant and facility concerned.	2177	12%	1041	6%	32	1%
Other measurement/calculation methodology	6414	35%	11120	60%	2475	70%
UNECE/EMEP EMEP/CORINAIR Emission Inventory Guidebook	3	0%	1097	6%	1	0%
TOTAL REPORTS	18108	100%	18424	100%	3559	100%

Table A3.3 Distribution of methodologies used in 2009

	REPORTING YEAR: 2009					
	M (MEASURED)		C (CALCULATED)		E (ESTIMATED)	
	Number of reports	%	Number of reports	%	Number of reports	%
No info	531	3%	22	0%	753	22%
Alternative measurement methodology in accordance with existing CEN/ISO measurement standards	1514	9%	18	0%	17	0%
European-wide sector specific calculation method	10	0%	1005	6%	0	0%
Guidelines for the monitoring and reporting of greenhouse gas emissions under the Emission Trading Scheme.	10	0%	777	4%	0	0%
Internationally approved measurement standard	2974	17%	127	1%	119	3%
IPCC Guidelines	1	0%	286	2%	3	0%
Mass balance method which is accepted by the competent authority	19	0%	1376	8%	9	0%
Measurement methodology for the performance of which is demonstrated by means of certified reference materials and accepted by competent authority.	1068	6%	3	0%	1	0%
Measurement/Calculation Methodology already prescribed by the competent authority in a licence or an operating permit for that facility	3655	21%	1969	11%	54	2%
National or regional binding measurement/calculation methodology prescribed by legal act for the pollutant and facility concerned.	1848	11%	965	5%	37	1%
Other measurement/calculation methodology	5602	33%	10016	57%	2462	71%
UNECE/EMEP EMEP/CORINAIR Emission Inventory Guidebook	3	0%	1037	6%	2	0%
TOTAL REPORTS	17235	100%	17601	100%	3457	100%

Table A3.4 Distribution of methodologies used in 2010

	REPORTING YEAR: 2010					
	M (MEASURED)		C (CALCULATED)		E (ESTIMATED)	
	Number of reports	%	Number of reports	%	Number of reports	%
No info	580	3%	10	0%	660	19%
Alternative measurement methodology in accordance with existing CEN/ISO measurement standards	1452	8%	28	0%	22	1%
European-wide sector specific calculation method	21	0%	821	5%	5	0%
Guidelines for the monitoring and reporting of greenhouse gas emissions under the Emission Trading Scheme.	10	0%	804	4%	0	0%
Internationally approved measurement standard	3272	19%	49	0%	132	4%
IPCC Guidelines	0	0%	193	1%	0	0%
Mass balance method which is accepted by the competent authority	18	0%	1339	7%	11	0%
Measurement methodology for the performance of which is demonstrated by means of certified reference materials and accepted by competent authority.	1076	6%	2	0%	1	0%
Measurement/Calculation Methodology already prescribed by the competent authority in a licence or an operating permit for that facility	3832	22%	2093	12%	70	2%
National or regional binding measurement/calculation methodology prescribed by legal act for the pollutant and facility concerned.	1838	10%	815	5%	68	2%
Other measurement/calculation methodology	5483	31%	10756	60%	2422	71%
UNECE/EMEP EMEP/CORINAIR Emission Inventory Guidebook	11	0%	1054	6%	5	0%
TOTAL REPORTS	17593	100%	17964	100%	3396	100%

Table A3.5 Distribution of methodologies used in 2011

	REPORTING YEAR: 2011					
	M (MEASURED)		C (CALCULATED)		E (ESTIMATED)	
	Number of reports	%	Number of reports	%	Number of reports	%
No info	573	3%	8	0%	925	31%
Alternative measurement methodology in accordance with existing CEN/ISO measurement standards	1463	8%	26	0%	36	1%
European-wide sector specific calculation method	21	0%	800	4%	4	0%
Guidelines for the monitoring and reporting of greenhouse gas emissions under the Emission Trading Scheme.	19	0%	892	5%	0	0%
Internationally approved measurement standard	3411	20%	443	2%	101	3%
IPCC Guidelines	0	0%	245	1%	1	0%
Mass balance method which is accepted by the competent authority	18	0%	1288	7%	6	0%
Measurement methodology for the performance of which is demonstrated by means of certified reference materials and accepted by competent authority.	1083	6%	1	0%	1	0%
Measurement/Calculation Methodology already prescribed by the competent authority in a licence or an operating permit for that facility	3664	21%	2000	11%	83	3%
National or regional binding measurement/calculation methodology prescribed by legal act for the pollutant and facility concerned.	1682	10%	770	4%	38	1%
Other measurement/calculation methodology	5344	31%	10502	58%	1761	60%
UNECE/EMEP EMEP/CORINAIR Emission Inventory Guidebook	10	0%	1032	6%	3	0%
TOTAL REPORTS	17288	100%	18007	100%	2959	100%

Table A3.6 Distribution of methodologies used in 2012

	REPORTING YEAR: 2012					
	M (MEASURED)		C (CALCULATED)		E (ESTIMATED)	
	Number of reports	%	Number of reports	%	Number of reports	%
No info	661	4%	15	0%	926	32%
Alternative measurement methodology in accordance with existing CEN/ISO measurement standards	1275	8%	28	0%	53	2%
European-wide sector specific calculation method	22	0%	1226	7%	6	0%
Guidelines for the monitoring and reporting of greenhouse gas emissions under the Emission Trading Scheme.	16	0%	881	5%	0	0%
Internationally approved measurement standard	3348	20%	434	2%	110	4%
IPCC Guidelines	0	0%	249	1%	0	0%
Mass balance method which is accepted by the competent authority	15	0%	1316	7%	2	0%
Measurement methodology for the performance of which is demonstrated by means of certified reference materials and accepted by competent authority.	986	6%	0	0%	0	0%
Measurement/Calculation Methodology already prescribed by the competent authority in a licence or an operating permit for that facility	3545	21%	2100	11%	83	3%
National or regional binding measurement/calculation methodology prescribed by legal act for the pollutant and facility concerned.	1456	9%	734	4%	63	2%
Other measurement/calculation methodology	5213	32%	10361	56%	1631	57%
UNECE/EMEP EMEP/CORINAIR Emission Inventory Guidebook	7	0%	1005	5%	1	0%
TOTAL REPORTS	16544	100%	18349	100%	2875	100%

Table A3.7 Distribution of methodologies used in 2013

	REPORTING YEAR: 2013					
	M (MEASURED)		C (CALCULATED)		E (ESTIMATED)	
	Number of reports	%	Number of reports	%	Number of reports	%
No info	723	4%	17	0%	792	29%
Alternative measurement methodology in accordance with existing CEN/ISO measurement standards	1217	7%	27	0%	7	0%
European-wide sector specific calculation method	18	0%	1118	6%	6	0%
Guidelines for the monitoring and reporting of greenhouse gas emissions under the Emission Trading Scheme.	9	0%	910	5%	0	0%
Internationally approved measurement standard	3322	20%	379	2%	113	4%
IPCC Guidelines	0	0%	233	1%	1	0%
Mass balance method which is accepted by the competent authority	14	0%	1322	7%	2	0%
Measurement methodology for the performance of which is demonstrated by means of certified reference materials and accepted by competent authority.	994	6%	2	0%	0	0%
Measurement/Calculation Methodology already prescribed by the competent authority in a licence or an operating permit for that facility	3621	22%	2223	12%	19	1%
National or regional binding measurement/calculation methodology prescribed by legal act for the pollutant and facility concerned.	1471	9%	760	4%	20	1%
Other measurement/calculation methodology	5248	32%	10604	57%	1788	65%
UNECE/EMEP EMEP/CORINAIR Emission Inventory Guidebook	8	0%	1005	5%	1	0%
TOTAL REPORTS	16645	100%	18600	100%	2749	100%

Table A3.8 Distribution of methodologies used in 2014

	REPORTING YEAR: 2014					
	M (MEASURED)		C (CALCULATED)		E (ESTIMATED)	
	Number of reports	%	Number of reports	%	Number of reports	%
No info	672	4%	15	0%	1326	41%
Alternative measurement methodology in accordance with existing CEN/ISO measurement standards	1214	7%	28	0%	22	1%
European-wide sector specific calculation method	15	0%	1215	6%	5	0%
Guidelines for the monitoring and reporting of greenhouse gas emissions under the Emission Trading Scheme.	8	0%	2296	12%	1	0%
Internationally approved measurement standard	3230	20%	94	0%	99	3%
IPCC Guidelines	0	0%	255	1%	0	0%
Mass balance method which is accepted by the competent authority	24	0%	963	5%	2	0%
Measurement methodology for the performance of which is demonstrated by means of certified reference materials and accepted by competent authority.	960	6%	2	0%	3	0%
Measurement/Calculation Methodology already prescribed by the competent authority in a licence or an operating permit for that facility	3538	22%	1398	7%	119	4%
National or regional binding measurement/calculation methodology prescribed by legal act for the pollutant and facility concerned.	1353	8%	712	4%	78	2%
Other measurement/calculation methodology	5400	33%	10764	57%	1555	48%
UNECE/EMEP EMEP/CORINAIR Emission Inventory Guidebook	6	0%	1070	6%	1	0%
TOTAL REPORTS	16420	100%	18812	100%	3211	100%

Table A3.9 Distribution of methodologies used in 2015

	REPORTING YEAR: 2015					
	M (MEASURED)		C (CALCULATED)		E (ESTIMATED)	
	Number of reports	%	Number of reports	%	Number of reports	%
No info	734	5%	18	0%	1449	46%
Alternative measurement methodology in accordance with existing CEN/ISO measurement standards	1194	7%	39	0%	27	1%
European-wide sector specific calculation method	21	0%	1263	7%	8	0%
Guidelines for the monitoring and reporting of greenhouse gas emissions under the Emission Trading Scheme.	8	0%	950	5%	0	0%
Internationally approved measurement standard	3375	21%	223	1%	110	3%
IPCC Guidelines	11	0%	363	2%	19	1%
Mass balance method which is accepted by the competent authority	24	0%	819	4%	4	0%
Measurement methodology for the performance of which is demonstrated by means of certified reference materials and accepted by competent authority.	942	6%	2	0%	1	0%
Measurement/Calculation Methodology already prescribed by the competent authority in a licence or an operating permit for that facility	3472	22%	2169	11%	55	2%
National or regional binding measurement/calculation methodology prescribed by legal act for the pollutant and facility concerned.	1372	9%	706	4%	106	3%
Other measurement/calculation methodology	4842	30%	11320	60%	1387	44%
UNECE/EMEP EMEP/CORINAIR Emission Inventory Guidebook	3	0%	1088	6%	1	0%
TOTAL REPORTS	15998	100%	18960	100%	3167	100%

Table A3.10 Distribution of methodologies used in 2016

	REPORTING YEAR: 2016					
	M (MEASURED)		C (CALCULATED)		E (ESTIMATED)	
	Number of reports	%	Number of reports	%	Number of reports	%
No info	687	4%	15	0%	1532	46%
Alternative measurement methodology in accordance with existing CEN/ISO measurement standards	1097	7%	22	0%	46	1%
European-wide sector specific calculation method	23	0%	1338	7%	7	0%
Guidelines for the monitoring and reporting of greenhouse gas emissions under the Emission Trading Scheme.	7	0%	980	5%	0	0%
Internationally approved measurement standard	3446	22%	525	3%	127	4%
IPCC Guidelines	10	0%	271	1%	19	1%
Mass balance method which is accepted by the competent authority	26	0%	853	5%	9	0%
Measurement methodology for the performance of which is demonstrated by means of certified reference materials and accepted by competent authority.	854	5%	2	0%	2	0%
Measurement/Calculation Methodology already prescribed by the competent authority in a licence or an operating permit for that facility	3532	22%	2039	11%	58	2%
National or regional binding measurement/calculation methodology prescribed by legal act for the pollutant and facility concerned.	1391	9%	633	3%	85	3%
Other measurement/calculation methodology	4678	30%	10827	58%	1450	43%
UNECE/EMEP EMEP/CORINAIR Emission Inventory Guidebook	4	0%	1053	6%	2	0%
TOTAL REPORTS	15755	100%	18558	100%	3337	100%

A3.1.3 Temporal evolution of the quantification methodologies used

Using the data shown in the previous tables, a temporal evolution of quantification methodologies was developed. In the graphs below, the relative share of each specific methodology is shown for measurements, calculations and estimations separately. (As in the previous section, the proportions correspond to the number of reports, not the mass reported).

Figure A3.4 Evolution of methodologies used in measurements (number of reports)

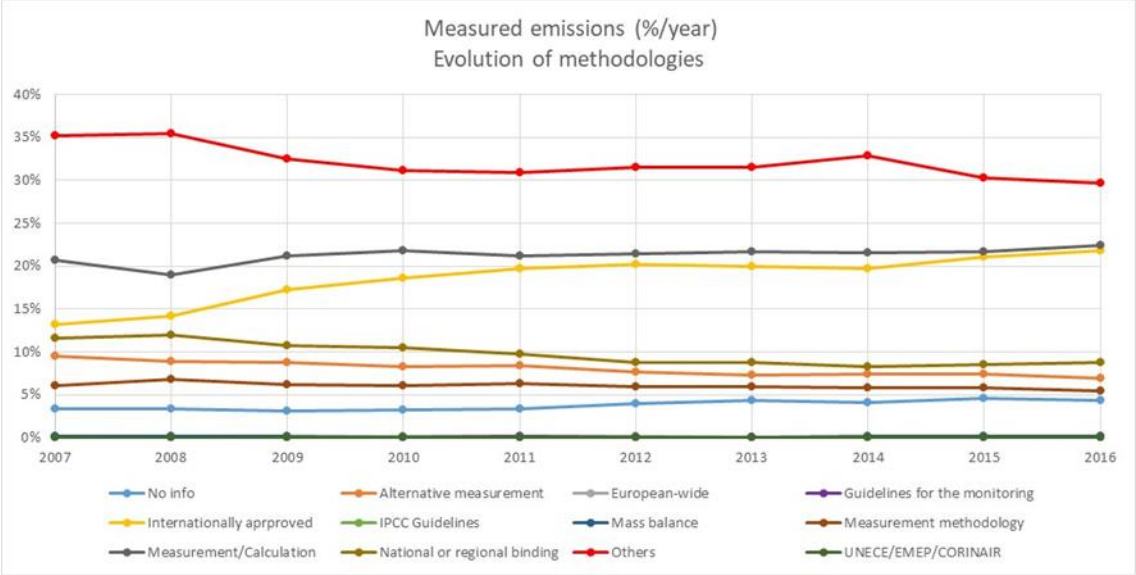


Figure A3.5 Evolution of methodologies used in calculations (number of reports)

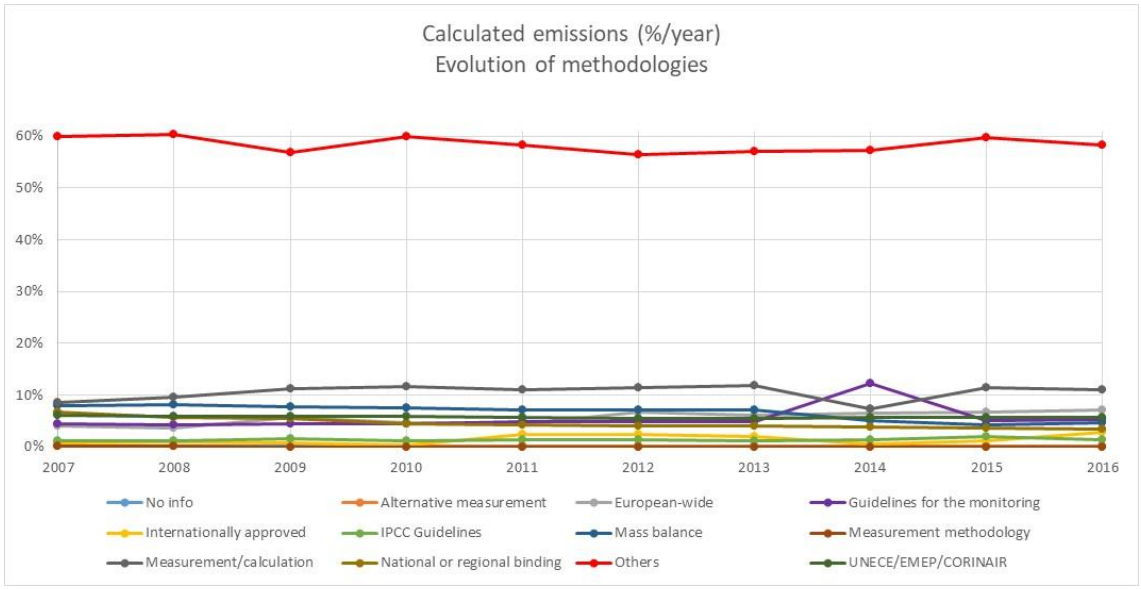
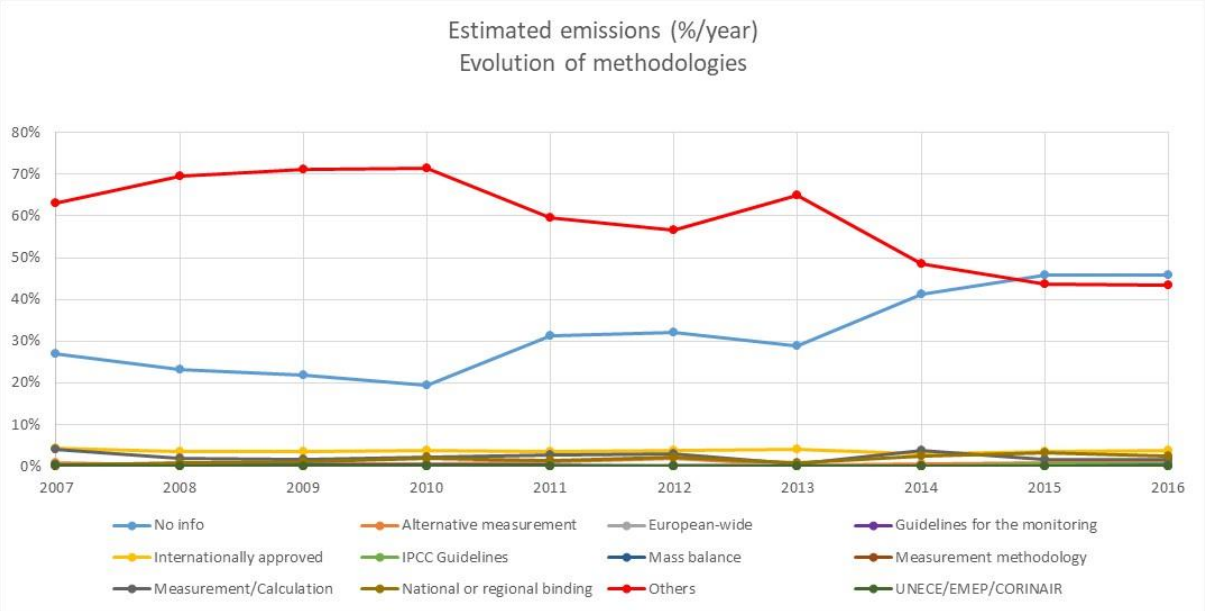


Figure A3.6 Evolution of methodologies used in estimations (number of reports)



A3.2 Quantification of incompatible combinations of method class and methodology

A3.2.1 Analysis by countries

The following tables show the percentage of total reports with incompatible combinations of 'method class' and 'methodology' for each E-PRTR country, ordered from highest to lowest. This analysis was done separately for both measurement and calculation method classes.

The study was carried out for the period 2007-2016, for releases to air and water. The results obtained refer to the percentage of the total number of incompatible combinations, not of the total of data reported for each country.

For *measured reports*, the following countries do not have any incompatible combinations: Austria, Belgium, Cyprus, Denmark, Finland, Iceland, Latvia, Luxembourg, Netherlands, Norway, Serbia, Spain, Switzerland (i.e. 0% in the following table).

Table A3.11 Distribution of reported incompatible methodologies for measurements

Country	% of records with incompatible methodology
Greece	24.4%
Italy	22.4%
Slovakia	12.8%
Bulgaria	12.3%
Portugal	9.8%
Ireland	3.7%
Hungary	2.7%
Sweden	2.3%

Country	% of records with incompatible methodology
France	2.1%
Poland	2.0%
Czech Republic	1.3%
Romania	0.9%
Lithuania	0.7%
Slovenia	0.7%
Estonia	0.5%
Croatia	0.4%
Germany	0.4%
Malta	0.4%
United Kingdom	0.4%

Two countries (Greece and Italy) represent the largest percentage of total incompatible combinations for measured reports. Whether the reporting systems of these and other countries allow such incompatible reports could be investigated.

For *calculated reports*, the following countries do not have incompatible combinations: Austria, Cyprus, Denmark, Finland, Latvia, Netherlands, Norway, Romania, Spain, Switzerland (i.e. 0% in the following table).

Table A3.12 Distribution of reported incompatible methodologies for calculations

Countries	% of records with incompatible methodology
United Kingdom	66%
Lithuania	6%
Hungary	5%
Bulgaria	5%
Italy	3.4%
Slovakia	2.6%
France	2.3%
Belgium	2.0%
Ireland	1.6%
Greece	1.2%
Portugal	1.2%
Poland	0.8%
Luxembourg	0.7%
Sweden	0.6%
Estonia	0.5%
Malta	0.4%
Germany	0.2%
Czech Republic	0.1%
Croatia	0.1%
Iceland	0.1%

Countries	% of records with incompatible methodology
Serbia	0.03%
Slovenia	0.03%

In this case, one country (the United Kingdom) represents the largest percentage for the incompatible combinations for calculated reports, being around 66% of total incompatible combinations reported. Whether the reporting systems of this country and other countries allow such incompatible reports could be investigated.

In the next section an analysis by sector is presented for the five countries which represent the highest percentage of incompatible combinations.

A3.2.2 Analysis by sectors

This section presents a detailed analysis of the countries accounting for the majority (cumulatively above 80%) of total incompatible combinations of method class and methodology, in order to identify the contribution of different sectors. This analysis was carried out separately for measured and calculated method classes.

A3.2.2.1 Measured methods

The five countries which represent the majority (cumulatively above 80%) of total incompatible combinations for measurements, rated from highest to lowest, are: Greece, Italy, Slovakia, Bulgaria and Portugal.

Table A3.13 Distribution by sector of reported incompatible methodologies for measurements: Greece

Sector	Description	% of incompatible reports
1	Energy sector	70.1%
3	Mineral industry	13.1%
2	Production and processing of metals	6.6%
4	Chemical industry	4.4%
5	Waste and waste water management	4.4%
8	Animal and vegetable products	1.5%
6	Paper and wood production and processing	0%
7	Intensive livestock production and aquaculture	0%
9	Other activities	0%

Table A3.14 Distribution by sector of reported incompatible methodologies for measurements: Italy

Sector	Description	% of incompatible reports
1	Energy sector	32.5%
3	Mineral industry	32.5%
4	Chemical industry	18.3%
9	Other activities	9.5%

Sector	Description	% of incompatible reports
8	Animal and vegetable products	3.2%
5	Waste and waste water management	1.6%
7	Intensive livestock production and aquaculture	1.6%
2	Production and processing of metals	0.8%
6	Paper and wood production and processing	0%

Table A3.15 Distribution by sector of reported incompatible methodologies for measurements: Slovakia

Sector	Description	% of incompatible reports
1	Energy sector	40.3%
3	Mineral industry	30.6%
2	Production and processing of metals	15.3%
4	Chemical industry	8.3%
6	Paper and wood production and processing	5.6%
5	Waste and waste water management	0%
7	Intensive livestock production and aquaculture	0%
8	Animal and vegetable products	0%
9	Other activities	0%

Table A3.16 Distribution by sector of reported incompatible methodologies for measurements: Bulgaria

Sector	Description	% of incompatible reports
4	Chemical industry	29.0%
3	Mineral industry	20.3%
1	Energy sector	18.8%
7	Intensive livestock production and aquaculture	14.5%
5	Waste and waste water management	11.6%
2	Production and processing of metals	4.4%
6	Paper and wood production and processing	1.5%
8	Animal and vegetable products	0%
9	Other activities	0%

Table A3.17 Distribution by sector of reported incompatible methodologies for measurements: Portugal

Sector	Description	% of incompatible reports
1	Energy sector	74.6%
6	Paper and wood production and processing	14.6%

Sector	Description	% of incompatible reports
2	Production and processing of metals	9.1%
9	Other activities	1.8%
3	Mineral industry	0%
4	Chemical industry	0%
5	Waste and waste water management	0%
7	Intensive livestock production and aquaculture	0%
8	Animal and vegetable products	0%

The sectors with the highest percentage of incompatible combinations of method class and methodology are 1, 3 and 4 (energy sector, mineral industry, chemical industry).

A3.2.2.2 Calculated methods

The five countries which represent the majority (cumulatively above 80%) of incompatible combinations for calculated methods, rated from highest to lowest, are: United Kingdom, Lithuania, Hungary, Bulgaria and Italy.

Table A3.18 Distribution by sector of reported incompatible methodologies for calculations: United Kingdom

Sector	Description	% of incompatible reports
5	Waste and waste water management	62.9%
1	Energy sector	20.0%
7	Intensive livestock production and aquaculture	6.6%
8	Animal and vegetable products	4.1%
2	Production and processing of metals	2.5%
4	Chemical industry	2.4%
3	Mineral industry	0.9%
6	Paper and wood production and processing	0.6%
9	Other activities	0.1%

Table A3.19 Distribution by sector of reported incompatible methodologies for calculations: Lithuania

Sector	Description	% of incompatible reports
7	Intensive livestock production and aquaculture	85.4%
1	Energy sector	8.5%
5	Waste and waste water management	5.5%
4	Chemical industry	0.6%
2	Production and processing of metals	0%
3	Mineral industry	0%

Sector	Description	% of incompatible reports
6	Paper and wood production and processing	0%
8	Animal and vegetable products	0%
9	Other activities	0%

Table A3.20 Distribution by sector of reported incompatible methodologies for calculations: Hungary

Sector	Description	% of incompatible reports
5	Waste and waste water management	54.0%
1	Energy sector	13.3%
4	Chemical industry	11.3%
2	Production and processing of metals	10.0%
3	Mineral industry	9.3%
8	Animal and vegetable products	2.0%
6	Paper and wood production and processing	0%
7	Intensive livestock production and aquaculture	0%
9	Other activities	0%

Table A3.21 Distribution by sector of reported incompatible methodologies for calculations: Bulgaria

Sector	Description	% of incompatible reports
5	Waste and waste water management	55.9%
7	Intensive livestock production and aquaculture	11.7%
1	Energy sector	11.0%
3	Mineral industry	11.0%
2	Production and processing of metals	6.9%
6	Paper and wood production and processing	3.5%
4	Chemical industry	0%
8	Animal and vegetable products	0%
9	Other activities	0%

Table A3.22 Distribution by sector of reported incompatible methodologies for calculations: Italy

Sector	Description	% of incompatible reports
5	Waste and waste water management	32.7%
6	Paper and wood production and processing	16.3%
4	Chemical industry	12.2%
3	Mineral industry	11.2%

Sector	Description	% of incompatible reports
1	Energy sector	9.2%
2	Production and processing of metals	9.2%
9	Other activities	7.1%
7	Intensive livestock production and aquaculture	2.0%
8	Animal and vegetable products	0%

In this case, the activities that contribute the most to the percentage of incompatible combinations are 5, 7 and 1 (waste and waste water management, intensive livestock production and aquaculture, energy sector).

A3.3 Review of guidance developed by national authorities

This section contains summaries of key information regarding release quantification in the national guidance documents reviewed for this project.

A3.3.1 Sweden – 'Emissions based on values below reporting limit – a study on how low emission values are reported in Sweden'[97]

The alternatives proposed in this report for handling release values below the limit of quantification are:

1. The limit of quantification is used as a numeric value for the release;
2. Half the limit of quantification is used as a numeric value;
3. The release is reported as '0' or '–' (where '–' means that the value is missing);
4. The release is reported as the average of the limit of detection (LoD) and the limit of quantification (LoQ);
5. When there are some measurements above the LoQ, then the estimated concentration is (100 - A) · LoQ/100, where A is the percentage of samples below LoQ.

The data used in this study corresponds to 2016 releases. Approximately 30% of all values in the studied dataset (both above and below the reporting limits) had a comment on the reported value, but only some of these comments describe how the releases were calculated. Due to the lack of information regarding the release calculations, a comprehensive picture of the problem cannot be provided.

Some of the effects of handling values below the reporting limit differently are:

- Large differences in the release values for the same pollutant and facility from year to year;
- Large differences in release values between facilities in the same sector indicating the data are not comparable;
- Facilities that choose to use half or the whole of the limit of quantification as a numeric value for releases could be identified as outliers in the EEA E-PRTR validation tool at a national or/and international level.

[97] Emissions based on values below reporting limit – a study on how low emission values are reported in Sweden (SMED Report No 9, 2018).

A3.3.2 Portugal – 'Manual de Instruções para operadores'[98]

This document has the following information about handling values below the limits of detection or quantification:

- In the case of releases to air, when the concentration of a pollutant is below the limit of quantification or limit of detection, the operator has to indicate the value of said limit. Then, if the concentration is below the limit of quantification, the reporting tool will automatically use a third of the limit of quantification as the concentration to calculate annual releases. If the concentration is below the limit of detection, the system will automatically treat the value as zero.
- In the case of releases to water, the operator has to manually enter the numerical value. If the pollutant's concentration is below the limit of quantification, the value used should be half of the limit of quantification, and if it is below the limit of detection, the entered value should be zero.

A3.3.3 Spain – Multiple regional[99] and sectoral guides

There are contradictory approaches to the treatment of values below the limit of detection in the different guidance documents reviewed. For example:

- In one region, the concentration of a pollutant is determined using half the value of the LoD.
- In another region, the following formula is used to calculate the concentration: (100 - A) x LoD/100, where A is the percentage of samples under the LoD.
- In a further region it is suggested that if measurements of a certain pollutant are below the LoD, releases of this pollutant should not be reported.

In a sectoral guide for the production of cement[100] the approach to values below the limit of detection is the same as in one of the regional guides explained above: for measurements below the LoD, the concentration used in the average is given by (100 - A) x LoD/100, where A is the percentage of samples under the LoD. If the average value used in each sample is below the LoD, the value assigned to the pollutant will be zero (0). If different measurements have different limits of detection (a typical situation if they are made by different laboratories), the above formula is used independently for all samples that have the same limit.

A3.3.4 Ireland – 'EPA Guidance Note: Annual Environmental Report Annex on AER / PRTR Reporting'[101]

This guide establishes how to treat measurement values below the limits of detection or quantification:

98 https://apoiosiliamb.apambiente.pt/sites/default/files/documentos/Manual%20de%20Instru%C3%A7%C3%B5es%20PRTR%2BLCP_0.pdf

99 http://www.comunidad.madrid/sites/default/files/doc/medio-ambiente/carta_inicio_prtr_datos_2018_13062679.pdf, http://www.agroambient.gva.es/documents/20549779/92789144/CIRCULAR+INFORMATIVA+DECLARACI%C3%93N+PRTR+2018/c581219f-8979-4b12-a511-d605b4b5ddf1, http://www.juntadeandalucia.es/medioambiente/portal_web/administracion_electronica/Tramites/Vigilancia_Prevencion/Modelos/EPRTR/Modelos/Guias_apoyo/Guia_apoyo_PRTR_%202013.pdf

100 http://www.prtr-es.es/Data/images/GuiaMetodosMedicionyFactoresEmisionJulio2017.pdf

101 http://www.epa.ie/pubs/advice/aerprtr

- Where the volume of an emission is very large, the concentrations of certain pollutants in the emission may fall below the LoD and/or LoQ at the emission point/s.
- The fact that a pollutant of relevance to the facility is not quantifiable at the final emission point does not permit a conclusion to be drawn that emitted quantities are insignificant. Equally, this fact does not mean that PRTR reporting threshold values are not exceeded or that the operator need not assess such releases.
- Conversely, the operator is obliged to assess the annual mass emission of the pollutant(s) by other means. Possible procedures which can be used to determine releases in such cases include measurement closer to the source (e.g. measurement in part-streams before these enter a central air abatement or waste-water treatment plant) and/or estimation of releases (e.g. on the basis of pollutant elimination rates or mass balance calculations).
- Where determination of the annual mass emission is not possible as a result of current arrangements at the facility, it is necessary for the operator to make an estimate of the potential pollutant load in the emission. For this purpose, and in the interests of balancing the need for reliable reporting against avoiding unnecessary additional cost, the EPA recommends that the following procedure be adopted:
  - Where measurement data indicates that a pollutant known to be relevant to the facility is consistently present in the emission at concentrations below the limit of analytical quantification available, the operator should use the reported value or, if this is unsuitable, a value equal to 50% of the LoD value, i.e. the concentration value representing the analytical limit of detection, as a first order approximation of the 'actual' concentration in their determination of the annual mass load. These values, and the calculated loads derived from them, should always be handled and reported as being based on analyses below the LoD/LoQ.
  - This information should then be used to estimate the annual mass load of the pollutant released by the facility.
  - Where the Estimated Annual Mass Load of the Pollutant falls below 10% of the PRTR Reporting Threshold for the Pollutant (in releases to Air or Water) as prescribed in Annex II of the PRTR Regulations, then, with the agreement of the EPA, it will not generally be necessary to adopt more sophisticated monitoring techniques for improving the accuracy of the estimate for future years. Instead, a similar estimate may be made for each reporting year, and this estimate should be reported.
  - If, however, in the present (or any subsequent) year, the Estimated Annual Mass Load exceeds 10% of the respective Reporting Threshold, the Agency will initially require a more detailed assessment of the actual release. The facility should consider carrying out a once-off or short-term speciated substance characterisation survey of their emissions to establish what the approximate quantities of the substances emitted annually is likely to be. This Characterisation Programme should be agreed with the installation EPA Licence Inspector before commencing operations and should be sufficient to provide good confidence in terms of the true emission for the characterisation period.
  - Depending on the outcome of the Characterisation Programme, the facility should agree with their EPA Licence Inspector how the emission should be quantified in future years. This might involve formal monitoring or a suitable calculation or modelling approach. In certain cases, additional abatement or

mitigation works might need to be implemented; this would be a matter for discussion with the EPA's Office of Climate, Licensing and Resource Use.
– Where the substance is predicted by the initial Characterisation Programme assessment to be emitted in a quantity greater than the relevant PRTR reporting threshold, formal monitoring of the emission should be initiated without delay with the prior agreement of the EPA.

A3.3.5 France – 'GEREP Guide'[102]

This document defines all three existing reporting methods (M, C, E) and the methodologies available to each method. Additionally, it includes a fourth reporting method, *inférieure à la limite de quantification* (ILQ), for cases in which the annual releases have been calculated based on a measured concentration value below the limit of quantification. No further details about this method are given in the document.

The guide establishes how measured data below the limit of quantification are to be treated for releases to water, but does not mention what to do for releases to air or in cases where releases are below the limit of detection:

- If the concentration of a pollutant is below the limit of quantification, the value used will be 50% of this value;
- If all measurements of a pollutant taken in a year are below the limit of quantification, releases of that pollutant can be considered zero.

A3.3.6 UK, Scotland – 'General Operator Guidance' and 'Operator Guidance on Release Estimation Techniques (RET)'[103]

The first document gives a general method on how to determine emissions being released from sites. The Scottish Pollutant Release Inventory (SPRI) reporting process for emissions follows six steps:

- Identify 'reporting unit' boundary: include pollutants and their routes through the industrial process and allocate where they may be finally released to the environment and those which are captured within products;
- Identification of sources releases: primarily from the process or waste management activities, but also from storage, handling and discharge/disposal activities;
- Link sources to media: air, land, water, wastewater and waste transferred from the facility;
- Identify relevant pollutants to sources within the site's boundary;
- Quantification of emissions: following the sector guidance on SPRI website or using the site's best available information;
- Complete the SPRI Operator Reporting Form.

This guidance also describes the sections the electronic reporting form is split into, with examples showing how to estimate and report releases.

[102] https://www.declarationpollution.developpement-durable.gouv.fr/gerep/afficherGuideAidePopup.do?methode=lecture

[103] https://www.sepa.org.uk/environment/environmental-data/spri/operator-guidance

The second document provides information on release estimation techniques (RET) to assist operators in preparing submissions to the SPRI. In general, there are five types of RET that may be used to evaluate emissions:

- Sampling or direct monitoring;
- Emission factors;
- Mass balance or other engineering calculations (such as fuel analysis);
- Indirect monitoring;
- Engineering judgement.

Each operator should choose the best RET which provides the most accurate emission data for their SPRI return. The guide gives detailed descriptions of each method, with examples on how to calculate releases.

Regarding limits of detection, where a substance may be released but at a release concentration that is below the LoD, the operator needs to report N/A (not applicable) unless an alternative RET, such as mass balance, produces an applicable result.

In cases where some analyses in a series do not detect a substance but others do, provided that no more than 5% of the readings show a positive value, and the values obtained are not more that 20% above the accepted LoD, the operator can treat them as if they were also reported as below the LoD. In any other case, they should use the values obtained and make the assumption that where the substance is reported as not detected it is present at 50% of the LoD.

A3.4 Trade association responses

Industry trade associations that were consulted on whether they have developed instructions and advice for their members regarding reporting to the E-PRTR are shown in Table A3.23.

Table A3.23 Trade associations consulted regarding E-PRTR reporting guidance

Activity Sector	Name of Association		Activity Sector	Name of Association
Power Generation	Eurelectric		Copper, Zinc, Lead	European Non-Ferrous Metals Association
	Euroheat & Power			
	European Biogas Association			European General Galvanizers Association
	The European Association for the Promotion of Cogeneration			The European Foundry Association
				European Copper Alliance
				European Lead Sheet Industrial Association
				International Zinc Association Europe
	Concawe			European Steel Association

Activity Sector	Name of Association		Activity Sector	Name of Association
Oil Refining	Fuels Europe		**Steel**	Association of European Ferro-Alloy Producers
Cement	European Cement Association		**Lime**	European Lime Association
Chemical	European Chemical Industry Council		**Glass**	AGC Glass
	Petrochemicals Europe			The European Container Glass Federation
Wastewater	European Water Association		**Ceramics**	European Ceramics Association
Waste Incineration	European Union for Responsible Incineration and Treatment of Special Waste		**Paper**	Confederation of European Paper Industries
	Hazardous Waste Europe			
	The Confederation of European Waste to Energy Plants			
	Municipal Waste Europe			

The main responses and concerns of these associations are presented below:

Power Generation (Eurelectric[104])

Eurelectric have developed two relevant documents:

- 'European Wide Sector Specific Calculation Method for Reporting to the European Pollutant Release and Transfer Register'. This document includes emission factors for the sector's most relevant pollutants, establishes the necessary data for the calculation of these emission factors, determines which pollutants should be measured continuously, and considers the case where emissions factors are derived from measurements below the limit of detection.
- 'Eurelectric Response to EC Public Consultation on the Evaluation of the European Pollutant Release and Transfer Register (E-PRTR) Regulation' which identified several issues needing harmonisation and/or guidance at the EU level including:
  - Reporting on the quality level of data (e.g. based on direct measurement, calculation or estimation, with different levels of accuracy).
  - Methodology to deal with releases below the limit of quantification (LoQ).
  - Clear deduction of the background load of the water intake for releases to water
  - A recommendation to use EU-wide sectorial emission factors when available, and preferably to use periodic measurements, in order to improve the consistency of the database.

[104] Euroheat & Power, European Biogas Association and the European Association for the Promotion of Cogeneration were also consulted.

– Clarification of the reporting required for intermediate transfers of waste.

Oil Refining (Concawe, Fuels Europe)

Apart from concern expressed over the misclassification of facilities into incorrect sectors (facilities that do not meet the definition of oil refinery but continue to be reported as refineries), the following documents were received:

- 'Air pollutant emission estimation methods for E-PRTR reporting by refineries'; contains emission factors and other advice regarding how refineries should report;
- 'Air emissions from the refining sector. Analysis of E-PRTR data 2007-2014' contains a review of data on releases to air submitted by national authorities for oil refineries, with detailed analyses for five substances: SO_X, NO_X, NMVOCs, benzene and CO_2.

Cement (European Cement Association, CEMBUREAU)

This association is concerned about serious inconsistencies found in the published data set as in many cases the reported figures do not match the industry's own figures, which should in principle be the source for E-PRTR. CEMBUREAU suggests, for example, the reporting of total releases and releases normalised to production to assess environmental performance more properly. CEMBUREAU welcomes an improvement in the E-PRTR reporting system which would help to make the E-PRTR data more accurate and reliable.

Steel (European Steel Association)

This association showed their interest in several items:

- List of pollutants applicable may be revised/discussed
- Identification of the methodologies for diffuse releases to air
- Monitoring requirements from specific sectoral BREF
- Releases below the limits of detection and quantification
- Clarity on the way the data are reported and alignment with IED requirements
- How to correct erroneous figures in the database
- Relevance of reporting absolute versus relative data.

Chemical (European Chemical Industry Council[105])

Their interests are not focused on the E-PRTR and only on national solvents inventories such as those submitted under the CLRTAP that assess total solvent releases from national anthropogenic activities.

Paper (Confederation of European Paper Industries)

This association has not developed any guidance. They showed general concern about the case of data below the limit of detection, citing that authorities enter the value into the E-PRTR as the lowest value of the BREF BAT-AEL range.

Waste Incineration (European Union for Responsible Incineration and Treatment of Special Waste, Hazardous Waste Europe, The Confederation of European Waste to Energy Plants, Municipal Waste Europe)

Highlighting their position that the sector is of little importance in the context of total pollutant releases, suggestions were made about:

[105] Petrochemicals Europe was also consulted.

- Limit of quantification
- Distance between the upper limit of QUAL2 measuring range and emission limit value
- Calculation of annual flows
- Other issues related to reporting to the E-PRTR but not related to release quantification.

Lime (European Lime Association)

E-PRTR issues are not on their agenda since they have not received requests for assistance from their members.

Copper, Zinc, Lead (Eurometaux: European Non-Ferrous Metals Association[106], European Copper Alliance)

Three documents were received from Eurometaux:

- 'Order of 31 January 2008 (revised on April 2019) regarding PRTR' (French legislation)[107]
- '*Guide methodologique d'aide à la declaration annuelle des emissions polluantes et des dechets a l'attention des exploitants*' (Methodological guidance for operators for the annual reporting of pollutant emissions and waste)[108]
- 'Copper emissions to water reported to the E-PRTR. Preliminary learnings'.

Additionally, specific comments on the implementation of E-PRTR were made:

- Need to enhance the harmonisation of criteria for E-PRTR reporting
- The recommendation of a holistic assessment made on different reporting practices in Member States, based on the available guidelines
- Existing difficulties for linking the E-PRTR regulation more strongly to the needs of the IED
- Importance of thresholds to prioritise pollution reduction activities
- Thresholds for releases of metals to water and application to dissolved forms of metals
- Subtraction of natural background loads.

Glass (AGC Glass, The European Container Glass Federation)

No specific instructions for reporting to the E-PRTR have been developed.

Ceramics (Cerame-Unie)

Cerame-Unie has not worked on E-PRTR related matters because it views this as a competence of the national authorities. Furthermore, since the threshold for reporting is high, only large plants are targeted by E-PRTR. Most ceramic plants do not meet the thresholds and are therefore not required to report to the E-PRTR.

[106] Other consulted associations were: Association of European Ferro-Alloy Producers (associated with Eurometaux), European Foundry Association (who claimed that no extension of the system is necessary because it already requires a lot of effort, in particular for SME companies) and European Copper Alliance (who provided their feedback as part of the consolidated information shared by Eurometaux, however, they provided a report on copper emissions to water as reported in the E-PRTR, and wanted to re-emphasize their call for consistent measurement and reporting between member states: different measuring and reporting approaches hamper the usefulness of E-PRTR as a pan-European tool).

[107] https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000018276495

[108] https://www.declarationpollution.developpement-durable.gouv.fr/download/GuideGeneral.pdf

A3.5 E-PRTR Guidance document improvements

The sections below provide a range of areas where improved guidance is likely to improve the quality of reported E-PRTR data.

A3.5.1 Guidance on measurements below the limits of detection or quantification

The E-PRTR Guidance document does not deal with cases when measured values are below the limit of detection (LoD) or limit of quantification (LoQ). This important and complex issue has been considered in several sectoral or regional guidance documents, but with different (even contradictory) approaches. Different assumptions on how to deal with measurements below the detection/quantification limit may lead to exceeding or falling below the reporting threshold. As such, this issue could have a significant impact on reported quantities. Implementation of common criteria to deal with these measurements is therefore strongly suggested in order to improve comparability of the data.

The following text may be added to Section 1.1.11.1 of the E-PRTR Guidance document:

> *"Unless otherwise stated under a specific permit or regulation, the following criteria shall be considered in case measurements are below the limit of detection (LoD) or limit of quantification (LoQ):*
>
> - *If measurement is between LoD and LoQ, then the average of the two values should be considered;*
> - *If measurement is based on an analytical method included in the BREF on Monitoring of Emissions to Air and Water from IED Installations (or another standardised method with equal or lower LoD/LoQ), then LoD/2 should be considered in case measurement is below LoD;*
> - *If measurement is based on an analytical method different than those mentioned above, then LoD should be considered in case measurement is below LoD."*

The rationale of this proposal is to encourage the development of analytical methods with minimum requirements on LoD/LoQ, as well as providing harmonisation on this important issue. The above-mentioned criteria may be complemented with specific requirements in corresponding permits about the limits of detection and quantification of analytical methods used in measurements for certain pollutants.

A3.5.2 Provide more detailed criteria for the selection of M/C/E

The current criteria (shown below) could be updated in order to improve assignment of M/C/E in facilities with several release activities. For example, based on these current criteria, a pollutant release quantified by 34% M, 33% C and 33% E will lead to assignment of M as the reported method. The E-PRTR Guidance currently says:

> Where the total release of a pollutant at a facility is determined by more than one determination method (e.g. M and C), the determination method with the highest amount of release is chosen for reporting. Example: The release of an air pollutant at a PRTR relevant facility occurs at two stacks (stack A and stack B). The total release exceeds the relevant release threshold. The release at stack A is measured and amounts 100 kg/year. The release at stack B is calculated and amounts 50 kg/year. Since the highest amount of release (100 kg/year) is measured, the total release (150 kg/year) has to be indicated as being based on measurement (M).

We propose the following alternative text:

> *"Where the total release of a pollutant at a facility is determined by more than one determination method (M/C/E), the determination method M is chosen for reporting only in case the amount quantified by M accounts for at least 50%. If M accounts for less than 50%, then C or E should be assigned depending on the corresponding amount of release."*

Section 1.1.11 of the E-PRTR Guidance document defines when M, C or E should be used, but does not provide information on data quality metrics (e.g. for M, the frequency of sampling and representativeness are crucial for data quality, but no requirements in this respect are set).

As M is considered the best quality method, the definition of method classes could be updated to avoid assignment of M to non-representative measurements. Suggested definitions, with new text highlighted in bold, are:

Class M: *Release data are based on measurements ('M')* ***of the pollutant or a substitute parameter having a demonstrated relationship with the pollutant.*** *Additional calculations are needed to convert the results of measurements into annual release data. For these calculations the results of flow determinations are needed* ***and should be directly measured or calculated based on*** **substitute measured parameters** ***with a demonstrated relation between flow and the measured parameter.*** *'M' should also be used when the annual releases are determined based on the results of short term and spot measurements* ***if based on representative sampling.*** *'M' is used when the releases of a facility are derived from direct monitoring results for specific processes at the facility, based on actual continuous or discontinuous measurements of pollutant concentrations for a given release route.*

Class C: *Release data are based on calculations ('C'). 'C' is used when the releases are based on calculations using activity data (fuel used, production rate, etc.) and emission factors or mass balances. In some cases, more complicated calculation methods can be applied, using variables like temperature, global radiance etc.* ***'C' should also be used where measurements are used but do not fulfil the abovementioned criteria.***

A3.5.3 Collect better information about the methodology used for the quantification of releases

Improvement of guidance concerning methodology description and required information can be addressed in several ways:

- The current E-PRTR Guidance considers it optional to provide additional information when using PER, NRB, mass balance (MAB) and other (OTH) methodologies. Substantial improvements are feasible by making it mandatory to provide additional explanatory information[109]. The reporting tool improvements described in Section 4.3.7.1 in relation to OTH could be extended to PER, NRB and MAB in order to ensure this additional information is provided. In the case of M, the frequency of measurements may be required to be provided.
- Update of methodology definitions, including new codes, and corresponding guidance in order to discourage the reporting of 'No info' and to minimise the percentage of reports using the 'Other measurement/calculation methodology' option. Such updates could be phased so that major updates rely on future information coming from the proposed mandatory description of the methodology when using 'Other measurement/calculation methodology'.
- Updated codes could reflect the reliability of methodologies with the aim to use them in a semi-quantitative data quality assessment.
- More than one methodology may fit to a specific case (for example, a permit prescribing a methodology based on an international standard). A hierarchical approach may be useful to deal with these situations.

Where there are different possibilities of coding the methodology a hierarchy of different approaches may be considered. As an example, the following hierarchy is proposed based on improving comparability. The following text could be added to the E-PRTR Guidance document:

"*When the description of the methodology for quantifying a release may be covered by more than one code, and in order to enhance comparability, the code to be reported should be chosen in the following order of preference:*

- *Measurement methodologies:*
  1. *EN (Internationally approved measurement standard)*
  2. *ALT (Alternative Measurement Method in accordance with existing CEN/ISO measurement standards)*
  3. *CRM (Measurement methodology the performance of which is demonstrated by means of certified reference materials and accepted by competent authority)*
  4. *NRB (National or regional binding measurement methodology prescribed by legal act for the pollutant and facility concerned)*
  5. *PER (Measurement methodology already prescribed by the competent authority in a licence or an operating permit for that facility)*
  6. *OTH (Other measurement methodology)*
- *Calculation methodologies:*
  1. *ETS, IPCC, UNECE/EMEP (Internationally approved calculation method)*
  2. *MAB (Mass balance method which is accepted by the competent authority)*
  3. *SSC (European-wide sector specific calculation method)*
  4. *NRB (National or regional binding calculation methodology prescribed by legal act for the pollutant and facility concerned)*

[109] The E-PRTR Regulation requires mandatory reporting of the analytical method or the method of calculation, so that the proposed additional information may be considered as covered by this requirement.

5. *PER (Calculation methodology already prescribed by the competent authority in a licence or an operating permit for that facility)*
6. *OTH (Other calculation methodology)"*

Note that the above rankings do not necessarily imply an improvement in the quality of quantification of releases. The criteria followed have been based on the 'universality' of the methodology, moving from more standardised methodologies to more particular ones and minimising regional or national specificity in order to improve the comparability of release reports.

- Information on measurement techniques in Annex 3 of the existing Guidance document is outdated. Instead of its review, an update to the Guidance document may consider an evolving approach, based on a hierarchical reference list made available at the E-PRTR web page:
  1. Standards and methods included in the annexes of the Reference Report on Monitoring of Emissions to Air and Water from IED Installations[110];
  2. Standards and methods included in documentation from international organisations such as the United Nations Institute for Training and Research (UNITAR) and the OECD.

A3.5.4 Define requirements for data validation by competent authorities

Harmonised criteria for the validation processes used by competent authorities are required in order to improve comparability of data reported to PRTR, and the development of the following would be helpful:

- Automated validation tool and 'informal review' for improving quality issues related to format, codes, completeness, etc.
- Additional guidance for competent authorities focussed on data credibility.

Other improvements in this area could include:

- Minimum requirements for consistency checks (incompatible combinations of method class and methodology, accidental releases, time series analysis, etc.).
- Detailed checks every year of a certain percentage (20% is suggested in the proposed wording below) of reporting facilities, focusing on credibility of values reported and improvement in methodology description.
- Validation at the EU level to check national data against warning criteria prior to submission.

The following text could be added to Section 1.2.3 of the E-PRTR Guidance document:

"On the other hand, it would be desirable for competent authorities to carry out:

- *Assessment of minimum requirements for consistency checks (incompatible method class and methodology combinations, accidental releases, time series analysis, etc.).*
- *A detailed check every year of 20% of reporting facilities, focusing on credibility of values reported and improvement in methodology descriptions*."

Additionally, the following text (highlighted in bold) could be added to Section 1.3.2 of the E-PRTR Guidance document:

[110] https://eippcb.jrc.ec.europa.eu/reference/BREF/ROM/ROM_2018_08_20.pdf

The E-PRTR data developed by the Member States will be stored and processed at the EEA ReportNet site for their incorporation on the E-PRTR website. All E-PRTR data could be downloaded for further use by the public. The Commission/EEA provide for a validation tool which is used by the Member States in order to ensure a harmonised data set for storage at the EEA. ***This validation tool, elaborated at EU level, should be used to check national data prior to submission to the EU against warning criteria, including checking the consistency of data reported for facilities in the same sectors located in different countries.*** *For specific aspects and for detailed data processing and evaluation, external consultants and topic centres will be assigned to carry out profound analyses and evaluation of the data.*

A3.5.5 Develop guidance to support competent authorities in improving the quality of facility level monitoring and reporting

Sectoral PRTR guidance has already been prepared and is helping facility operators' and competent authorities to improve the quality of reporting, in some countries (UK, France, Spain, etc) for some sectors (cement production, intensive livestock production, landfills, etc.) (see Section A3.3). In some cases, trade associations have also provided guidance for specific sectors and activities (see section A3.4). European level sector specific monitoring and reporting guidance, for several of the more significant and/or complex sectors/activities, could complement the general guidance and help to improve the quality of the E-PRTR data.

It may also be useful to provide competent authorities with more guidance on data collection. This guidance could help to gather together experience and inform competent authorities on:

- The pollutants to report for different activities, using, as a starting point, the indicative pollutant lists (see Section 5).
- Details on using **measurements** for collecting and reporting high quality information on releases. This could include information on likely minimum LoD according to expected flow and threshold of pollutant, frequency of measurement, etc.
- Details of appropriate quantification methods for **calculating** releases, e.g. highlighting activity specific considerations or making referrals to sectoral guidance documents.
- Data quality assurance and benchmarking including a range of checking, validation and verification activities.

A3.5.6 Accidental releases

A minimum level of quality control is necessary to avoid releases from normal operations being reported as accidental releases. It would be advisable for competent authorities to establish minimum criteria for quality assurance when accepting data from accidents, such as comparing the data reported with that reported for previous years or direct consultation with the facility about the nature, if any, of the alleged accident.

The following text (highlighted in bold) could be added to Section 1.1.4 of the E-PRTR Guidance document:

course of the operation of Annex I activities on the site of the facility. ***For transparency, and to add value to the accidental release information, reports could also include a brief description of the nature of the incident (fire, leak, explosion, spill, etc.).***

A3.5.7 Establishment of criteria for the quantification of diffuse or non-channelled releases

For most activities, channelled releases (from stacks, discharge pipelines, etc.) represent the main sources of pollutant releases. But diffuse or 'non-channelled' releases may be significant for some activities. The comparability of the data reported in those activities may be improved by establishing common criteria for which types of sources must be considered and specific guidelines for quantification in a consistent manner.

The following text (highlighted in bold) could be added to Section 1.1.4 of E-PRTR Guidance document:

The releases to air, water and land shall include all releases from all sources included in Annex I to the E-PRTR Regulation at the site of the facility, although there are special considerations for land releases, as described in Section 1.1.8.3. This includes also the fugitive and diffuse releases of facilities as addressed in the IPPC monitoring BREF. ***Such sources of releases include wastewater treatment, common elements in the service of gases or volatile liquids (e.g. valves, flanges, pumps, compressors), vents, pressure relief valves, outdoor storage of dusty substances, etc., should be considered.***

A3.5.8 Over-estimated reports due to the presence of pollutants in the inputs

The presence, in some natural locally sourced raw materials, of some substances can lead to the overestimation of real (nett) releases from the process (e.g. water, where pollutants are present in certain natural locally sourced water supplies). This is a concern expressed by industry trade associations (see Annex A3.3).

At present, the Guidance only allows for the subtraction of the pollutant load if the water abstraction and effluent discharge occur in the same catchment.

An E-PRTR Guidance document update could provide further advice and clarification on where the background loads of some pollutants can and cannot be subtracted.

Annex 4 Indicative pollutant lists

A4.1 "Present or not present" lists based on reported E-PRTR data

This section provides detailed information to supplement the key findings and discussion presented in Section 5 of the main report.

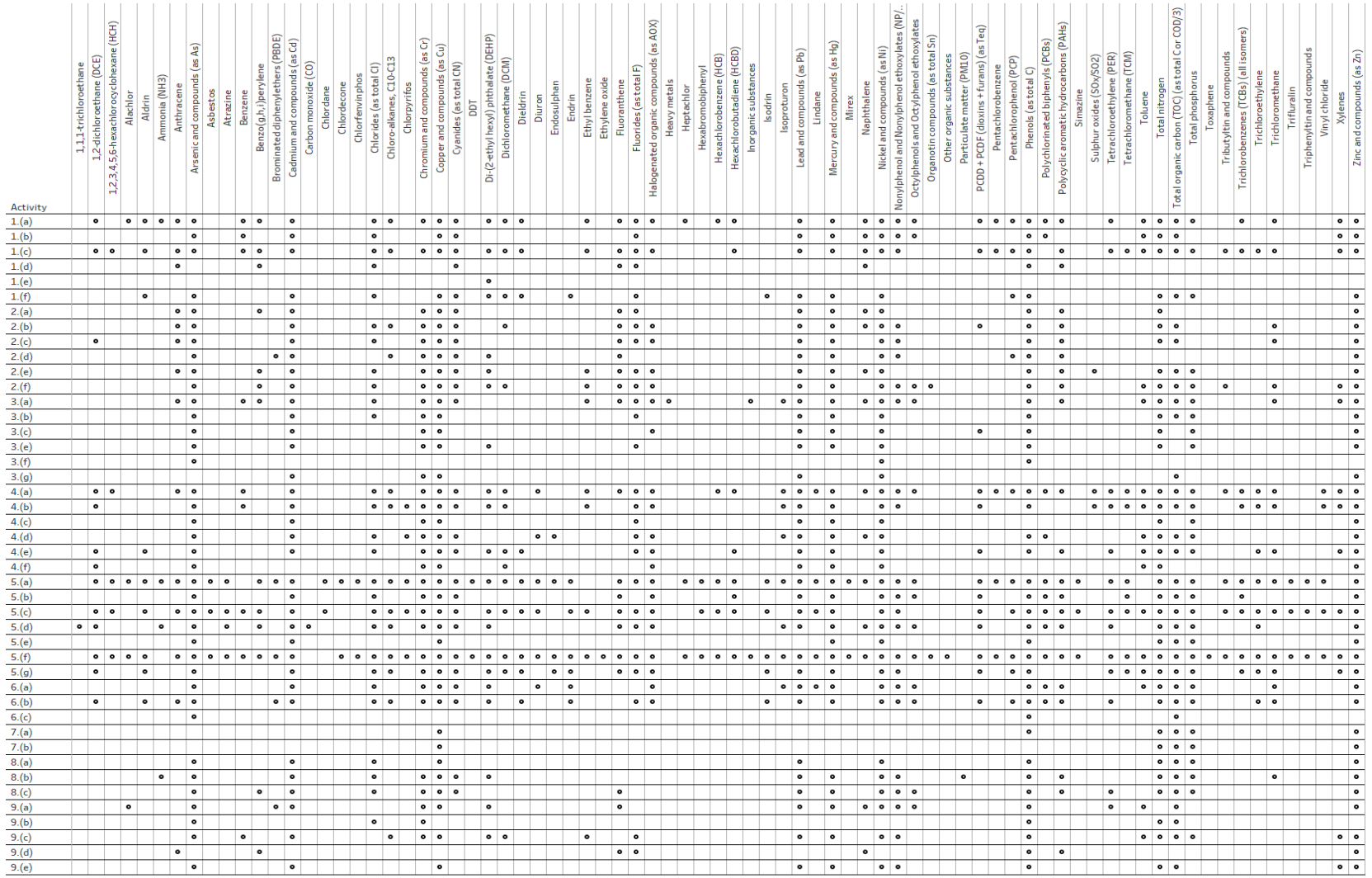
"Present or not present" indicative pollutant lists based on all previous E-PRTR reporting from 2007 to 2016, comprising all pollutant-activity combinations, are shown in Table A4.1 and Table A4.2. These present the combinations in the same format as the current Guidance document but using reported data from the E-PRTR. These "present or not present" lists exclude pollutant releases from all facilities that report secondary activities. This is because the E-PRTR database does not differentiate between releases from the different industrial activities (main or secondary) that take place at a facility. The presence of secondary activities could result in a spurious link between activities and pollutants that would never be seen at facilities where the secondary activity does not take place.

Table A4.1 “Present or not present” indicative list of pollutant releases to air based on E-PRTR data, excluding facilities with listed secondary activities

Activity	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,2-dichloroethane (DCE)	1,2,3,4,5,6-hexachlorocyclohexane (HCH)	Aldrin	Ammonia (NH_3)	Anthracene	Arsenic and compounds (as As)	Asbestos	Benzene	Benzo(g,h,i)perylene	Brominated diphenylethers (PBDE)	Cadmium and compounds (as Cd)	Carbon dioxide (CO_2)	Carbon dioxide (CO_2) excluding biomass	Carbon monoxide (CO)	Chlordecone	Chlorides (as total Cl)	Chlorine and inorganic compounds (as HCl)	Chlorofluorocarbons (CFCs)	Chromium and compounds (as Cr)	Copper and compounds (as Cu)	Di-(2-ethyl hexyl) phthalate (DEHP)	Dichloromethane (DCM)	Ethyl benzene	Ethylene oxide	Fluoranthene	Fluorides (as total F)	Fluorine and inorganic compounds (as HF)	Greenhouse gases	Halons	Hexachlorobenzene (HCB)
1.(a)	o	o	o			o		o		o			o	o	o	o			o	o	o	o		o		o						
1.(b)						o		o		o				o	o	o																
1.(c)		o			o	o		o		o	o		o	o	o	o			o	o	o	o	o	o					o	o	o	
1.(d)						o	o	o		o	o		o	o	o	o			o		o	o					o	o				
1.(e)																o																
1.(f)																																
2.(a)						o	o	o		o			o	o	o	o			o		o	o							o			
2.(b)						o	o	o		o	o		o	o	o	o			o		o	o		o			o		o			
2.(c)						o	o	o		o			o	o	o	o			o	o	o	o		o								
2.(d)	o							o		o	o		o	o		o					o	o										
2.(e)						o	o	o		o	o		o	o	o	o			o	o	o	o					o	o	o		o	
2.(f)			o			o	o	o		o			o	o		o			o	o	o	o	o	o		o			o		o	
3.(a)						o		o		o				o		o				o	o	o										
3.(b)						o		o						o	o	o													o			
3.(c)						o	o	o		o			o	o	o	o			o		o	o	o						o			
3.(e)						o		o		o			o	o	o	o			o	o	o	o							o			
3.(f)						o		o		o			o	o	o	o		o	o		o	o						o	o			
3.(g)								o		o			o	o		o			o		o	o	o						o			
4.(a)	o	o	o			o		o		o			o	o	o	o			o	o	o	o	o	o		o			o		o	o
4.(b)			o			o		o		o	o		o	o	o	o			o	o	o	o		o			o	o	o		o	o
4.(c)						o								o	o	o			o									o	o			
4.(d)			o											o					o	o		o		o							o	
4.(e)		o	o			o				o				o					o	o			o	o		o					o	
4.(f)																			o					o								
5.(a)	o	o	o			o		o	o	o	o		o	o	o	o			o	o	o	o		o			o	o	o			
5.(b)				o		o		o			o		o	o	o				o	o	o	o	o	o					o			o
5.(c)	o	o	o			o			o	o		o		o		o			o	o											o	
5.(d)	o	o				o		o		o				o	o	o			o	o	o	o		o						o	o	
5.(e)						o				o			o	o		o			o	o		o							o			
5.(f)	o					o				o				o		o			o					o								
5.(g)						o								o											o							
6.(a)						o		o		o			o	o	o	o			o		o	o							o			
6.(b)						o	o	o		o			o	o	o	o			o	o	o	o							o		o	
6.(c)										o						o								o								
7.(a)						o				o				o															o			
7.(b)						o																										
8.(a)						o										o				o												
8.(b)						o		o		o			o	o	o	o			o	o		o										
8.(c)						o				o				o	o	o				o												
9.(a)																o							o									
9.(b)																																
9.(c)	o		o			o		o		o			o	o		o	o		o	o		o	o	o		o						o
9.(d)						o	o	o		o	o		o	o		o					o	o					o	o	o			
9.(e)														o							o	o										

Activity	Hydro-fluorocarbons (HFCs)	Hydrochlorofluorocarbons(HCFCs)	Hydrogen cyanide (HCN)	Lead and compounds (as Pb)	Mercury and compounds (as Hg)	Methane (CH_4)	Naphthalene	Nickel and compounds (as Ni)	Nitrogen oxides (NO_x/NO_2)	Nitrous oxide (N_2O)	Non-methane volatile organic compounds (NMV..	Other gases	Particulate matter (PM10)	PCDD + PCDF (dioxins + furans) (as Teq)	Pentachlorobenzene	Pentachlorophenol (PCP)	Perfluorocarbons (PFCs)	Phenols (as total C)	Polychlorinated biphenyls (PCBs)	Polycyclic aromatic hydrocarbons (PAHs)	Sulphur hexafluoride (SF_6)	Sulphur oxides (SO_x/SO_2)	Tetrachloroethylene (PER)	Tetrachloromethane (TCM)	Toluene	Total nitrogen	Total organic carbon (TOC) (as total C or COD/3)	Trichlorobenzenes (TCBs) (all isomers)	Trichloroethylene	Trichloromethane	Vinyl chloride	Xylenes	Zinc and compounds (as Zn)
1.(a)	o	o	o	o	o	o	o	o	o	o	o		o						o	o		o		o	o					o		o	o
1.(b)	o	o		o		o		o	o	o	o		o	o						o		o											o
1.(c)	o	o	o	o	o	o	o	o	o	o	o	o	o	o			o		o	o	o	o		o					o	o	o		o
1.(d)	o	o	o	o	o	o	o	o	o	o	o		o							o		o											o
1.(e)	o										o									o									o				
1.(f)					o				o											o		o											
2.(a)	o	o	o	o	o	o	o	o	o	o	o		o	o						o		o							o				o
2.(b)	o	o	o	o	o	o	o	o	o	o	o		o	o	o				o	o		o							o				o
2.(c)	o	o	o	o	o	o	o	o	o	o	o		o	o					o	o		o							o				o
2.(d)	o	o	o	o	o	o	o	o	o	o	o		o	o				o		o	o	o							o				o
2.(e)	o	o	o	o	o	o	o	o	o	o	o		o	o			o	o	o	o	o	o	o				o		o				o
2.(f)	o	o	o	o	o	o	o	o	o	o	o		o	o			o			o	o	o	o						o				o
3.(a)	o	o		o	o	o		o	o	o	o		o						o	o		o											o
3.(b)	o	o		o		o		o	o	o	o		o							o		o											
3.(c)	o	o	o	o	o	o	o	o	o	o	o		o	o					o	o	o	o					o	o					o
3.(e)	o	o	o	o	o	o		o	o	o	o		o	o				o	o	o		o											o
3.(f)		o		o	o		o	o	o	o	o		o					o				o					o						o
3.(g)	o	o	o	o	o	o	o	o	o	o	o		o							o		o					o						o
4.(a)	o	o	o	o	o	o	o	o	o	o	o		o	o		o	o	o		o	o	o	o	o	o		o	o	o	o	o		o
4.(b)	o	o	o	o	o	o	o	o	o	o	o		o	o		o	o		o	o	o	o	o	o					o	o	o		o
4.(c)				o	o	o		o	o	o	o		o									o				o							o
4.(d)	o	o					o		o		o											o			o					o			o
4.(e)	o	o				o			o	o	o		o	o			o					o	o				o		o	o	o		o
4.(f)	o	o		o					o		o									o			o						o				
5.(a)	o	o	o	o	o	o	o	o	o	o	o		o	o					o	o		o	o	o			o	o	o	o	o		o
5.(b)	o	o		o	o	o	o	o	o	o				o		o			o	o	o	o					o	o					o
5.(c)	o	o			o	o			o	o	o		o	o			o		o		o	o						o			o		o
5.(d)		o		o	o	o		o	o	o	o	o	o	o						o		o		o	o			o			o		o
5.(e)	o	o			o			o	o	o	o		o	o						o		o											o
5.(f)		o			o	o	o		o	o	o			o	o							o		o				o		o	o		o
5.(g)						o				o															o					o		o	
6.(a)	o	o		o	o	o		o	o	o	o		o	o						o		o					o						o
6.(b)	o	o	o	o	o	o	o	o	o	o	o		o	o						o		o					o		o				o
6.(c)							o		o		o		o							o							o						
7.(a)					o	o			o	o	o	o	o																				
7.(b)																																	
8.(a)	o	o						o	o	o	o		o									o											
8.(b)	o	o				o		o	o	o	o		o	o	o		o			o		o					o			o			o
8.(c)	o	o		o		o		o	o	o	o		o							o		o											o
9.(a)	o	o	o					o	o	o	o											o	o	o					o		o		
9.(b)											o												o										
9.(c)	o	o			o	o	o	o	o	o	o		o				o			o	o	o	o		o			o	o	o	o		o
9.(d)			o	o		o	o	o	o		o	o		o			o			o		o											o
9.(e)		o						o	o		o		o																				

Table A4.2 “Present or not present” indicative list of pollutant releases to water based on E-PRTR data, excluding facilities with listed secondary activities



This updated list was then compared to the lists in the current Guidance document. Table A4.3 and Table A4.4 show:

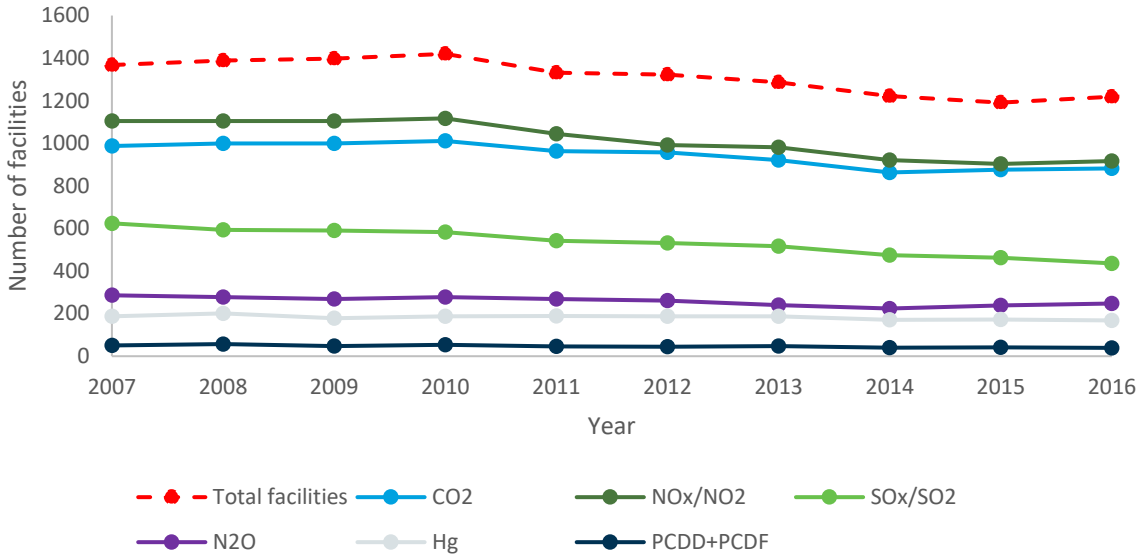
- Blue cells which highlight pollutant-activity combinations that are reported to the E-PRTR that are not in the current Guidance document;
- Yellow cells which highlight pollutant-activity combinations that were defined in the current Guidance document but have not been reported to the E-PRTR;
- Grey cells which highlight no change between the updated “present or not present” indicator list and the list in the current Guidance document.

Table A4.3 Comparison of the updated indicative pollutant list with the list in the current Guidance document (releases to air)

Table A4.4 Comparison of the updated indicative pollutant list with the list in the current Guidance document (releases to water)

There are a number of pollutant-activity combinations that are not reported to the E-PRTR but are present in the indicator list of the current Guidance document. To investigate this issue further, analysis was undertaken on the E-PRTR data set for an activity with significant polluting potential, 1.(c) (thermal power stations and other combustion installations). The number of facilities reporting for the most typical pollutants was compared (Figure A4.1).

Figure A4.1 Time series of the number of 1.(c) facilities reporting common pollutant releases to air compared to the total number of facilities with this activity



It would be expected that the majority of or all facilities would be reporting the pollutants investigated, as they are considered typical for this activity. However, Figure A4.1 shows that this is not the case in all years. There are three main potential reasons for this: reporting thresholds are not reached, these pollutants are not in fact emitted by the activities, or facilities are not reporting as would be expected.

In order to further highlight the effect of reporting thresholds, data from the Spanish PRTR were analysed. The Spanish PRTR has no pollutant release thresholds and therefore can be used to investigate the extent to which thresholds are affecting the indicative pollutant lists. Table A4.5 shows that even in the absence of the E-PRTR thresholds, a similar trend occurs with not all facilities reporting even the most typical pollutants of CO_2 and NO_2. These are possibly idle co-generation plants, which are not currently in operation due to a lower heat demand.

Table A4.5 Number of 1.(c) facilities in Spain reporting common pollutant releases to air compared to the total number of facilities

Pollutant	Total facilities reporting	Total facilities reporting	Total facilities reporting above the threshold
CO_2	143	136	78
NO_2		138	119
N_2O		112	23
Mercury and compounds (as Hg)		83	15
Sulphur oxides (SO_X/SO_2)		131	117
PCDD+PCDF		55	2

A4.2 E-PRTR data set review and new matrices

Updating Appendices 4 and 5 of the 2006 E-PRTR Guidance document has previously been explored as part of work to support the EEA-led initiative to streamline industrial emissions reporting. Updated lists of indicative pollutants were included in the 'Manual for Reporters'[111], a resource for reporting countries that sets out the requirements and submission procedure for the new integrated E-PRTR and LCP thematic reporting flow. The approach undertaken for this manual was to produce a strength matrix where the strength of the pollutant-to-activity combination, based on the number of releases since E-PRTR reporting began, is reflected by the strength of the colour in the matrix.

Using pollutant-to-activity strength-based[112] matrices in both the 'Manual for Reporters' and any future updates to the E-PRTR Guidance document would enable operators and competent authorities to prioritise review efforts. However, the reality of individual processes that generate pollutant releases, as well as activity and pollutant reporting thresholds, is too complex for these tables to be relied upon completely. Article 5(1) of the E-PRTR Regulation means the onus remains on operator to identify which pollutant releases from their facility are to be reported.

In addition, the E-PRTR data set is not entirely complete, and certain pollutants for specific activities tend to be under-represented or missed from reporting altogether. Therefore, in this project the strength-based matrix approach used in producing the tables in the 'Manual for Reporters' was further refined, by further analysing the E-PRTR data set.

The updated indicative pollutant-activity tables use an approach based on the count of releases, as opposed to of a sum of the mass of pollutant releases, since generally reporting errors in the data are due to the reported pollutant release amount being erroneous. The number of releases tend not to be in error. As such, using the count of releases reduces the impact of errors in the E-PRTR data on the indicator tables.

[111] http://cdrtest.eionet.europa.eu/help/eprtr_lcp/Guidance/E-PRTR-LCP%20Manual%20for%20reporters_v1.pdf

[112] Strength-based is referring to a count of the number of facilities per activity reporting a pollutant

However, using the count of facilities alone does not result in a fully satisfactory measure of the strength of a pollutant-activity combination. When based on count alone, the majority of pollutant-activity combinations are shown to be weak. This is due to a high number of facilities reporting for some activities compared to other activities. For example, the total number of facilities reporting with the main activity of 7.(a) (intensive rearing of poultry and pigs) was 6351 in 2016 while the number of facilities reporting with the activity 1.(c) (thermal power stations and other combustion installations) was 1083 in the same year. In this case the comparison of ammonia from farms renders almost all other pollutant-activity combinations invisible. Therefore, to obtain a more useful strength matrix for visualisation purposes, the release count was first normalised by the total number of facilities reporting for each activity for each year.

The E-PRTR data were also further refined so that only those pollutant-activity combinations that are consistently reported are shown. Firstly, analysis of the E-PRTR data has shown that reporting has evolved over the years and many pollutants reported in high quantities during the earlier years of reporting are reported in significantly lower quantities in recent years. For example, 50 facilities reported trichloroethylene releases to air, in 2007 but this had reduced to 17 facilities by 2010 and 6 facilities in 2016. Data from the first three years of E-PRTR reporting have therefore not been included.

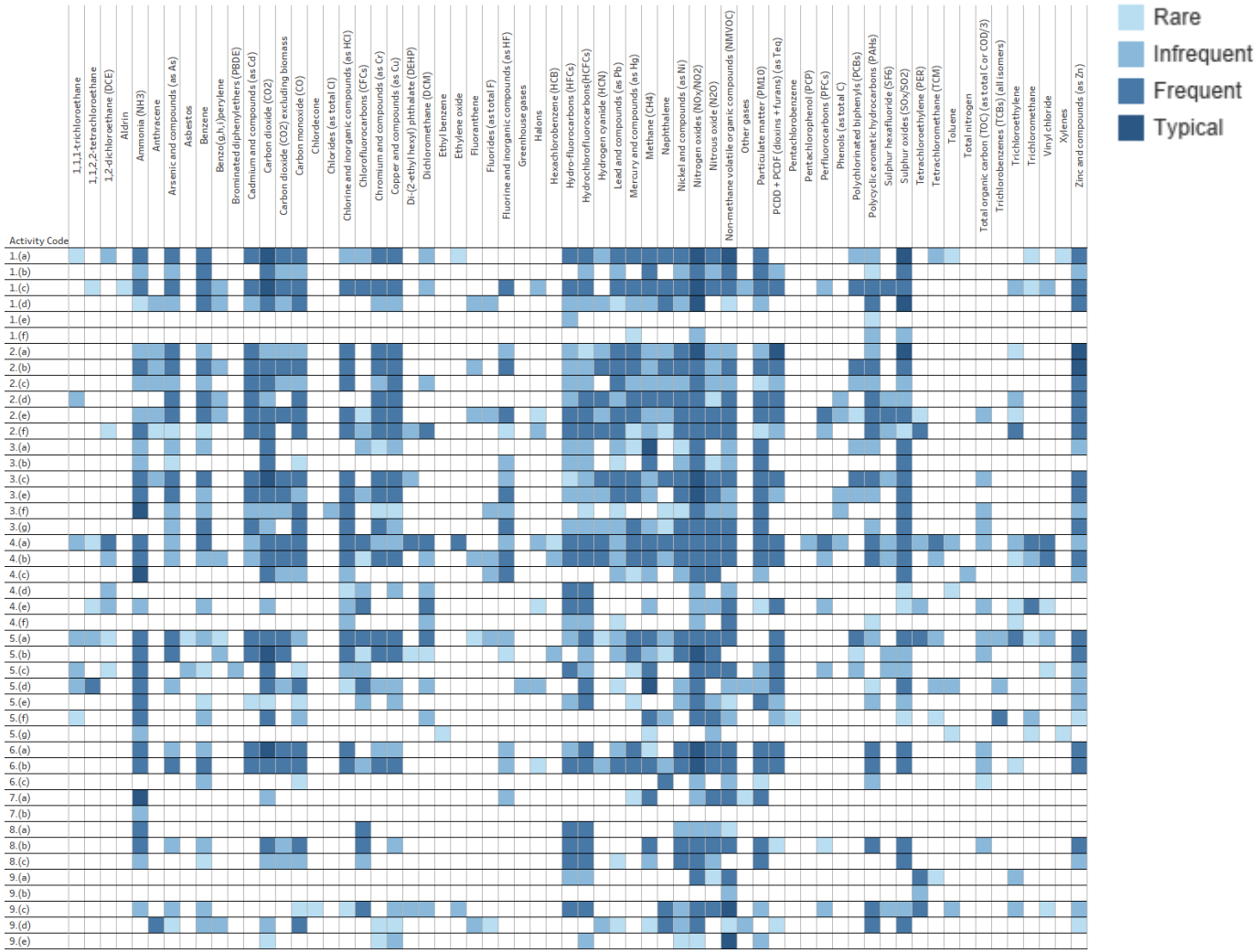
The data have been further filtered to only show the pollutant-activity combinations being reported from at least a specified number of countries, and over a specified number of years. The combination of 3, 5 and 7 years and 3, 5 and 10 countries were investigated to find the best combination (Table A4.6, Table A4.7 and Table A4.8). The strength of the pollutant-activity combination – the count of releases normalised by the number of facilities reporting for each activity – is shown through shades of blue, with ‘typical’ reporting being more than 50% facilities and ‘frequent’ reporting being less than 50% facilities. ‘Infrequent’ reporting describes reporting below the five years and five country threshold, and ‘rare’ reporting are pollutant-activity combinations reported only once or twice ever.

Filtering based on the number of countries reporting was found to have much more of an effect than the number of years, and as such it was decided that the minimum number of countries that would have to report a pollutant-activity combination should be five. Requiring any more countries than this resulted in too few pollutant-activity combinations being shown as relevant.

Table A4.6 Indicative pollutant-activity list for releases to air showing only pollutant-activity combinations that have been reported by 5 or more countries and for 5 or more years

Table A4.7 Indicative pollutant-activity list for releases to air showing only pollutant-activity combinations that have been reported by 10 or more countries and for 5 or more years

Table A4.8 Indicative pollutant-activity list for releases to air showing only pollutant-activity combinations that have been reported by 3 or more countries and for 3 or more years



The filtering of the data based on the number of countries and years in which a pollutant-activity combination was reported also helped to remove the influence of plant-specific situations. For example, one facility in the Netherlands whose activity is 9.(c) (treatment and processing of milk) reports CO_2 releases to air every year while none of the other 232 facilities report such releases. There are several possible reasons why only one facility might be reporting CO_2 for this activity: the facility uses a unique process, the high production rate means it is the only facility that emits CO_2 above the release threshold, or total facility releases include releases from secondary activities that are not reported (possibly due to the activity not being covered by the E-PRTR). Unfortunately, the influence of unreported secondary activities cannot be easily investigated.

However, a drawback to filtering the data based on how frequently a pollutant-activity combination is reported is the impact of the release thresholds. If these thresholds are too high, pollutant-activity combinations will not be inferred from using the E-PRTR data. For example, the threshold for hexachlorobenzene (HCB) releases to air is 10 kg and the highest reported release is 68.7 kg, although the majority of reported releases are around or under 20 kg. Releases of this pollutant are reported intermittently for all sectors. However, it is very likely that more releases are not being reported, especially as the Spanish PRTR shows 20 facilities reporting HCB releases to air that are below the E-PRTR reporting threshold. There could therefore be links between this pollutant and some activities that are identified when using the reported E-PRTR data.

The E-PRTR data do have some errors which are not mitigated by using the count of releases. One in particular is the reporting of pollutants to the wrong release medium, for example sulphur oxides releases to water. The refinement of the data using the 5 countries/5 years criteria removes these from the strength matrix, but they are still shown under ‘Infrequent reporting’. Therefore, such situations were manually removed from the data set. It should be noted, however, in cases where the pollutant-activity and release medium combination is identified in BAT conclusions it has been left in the data set.

A4.2.2 Review and incorporation of additional pollutants

Following on from the work described above, BAT reference documents were used to determine areas of ambiguity or incompleteness in the matrices from the previous sub-task, i.e. where pollutants should be reported for certain activities but are missing or thought to be under-represented. Table A4.9 and Table A4.10 show a comparison between the filtered data with pollutants that should be monitored through BAT conclusions. Pollutant-activity combinations highlighted in red are ones that have never been reported to the E-PRTR but are required to be monitored under BAT conclusions. Those in pink are also required to be monitored under BAT conclusions but are infrequently reported to the E-PRTR. There are a number of pollutants that are required to be monitored under BAT conclusions but have either never been reported or only infrequently to the E-PRTR.

Table A4.9 Comparison of the filtered data with BAT conclusions for releases to air

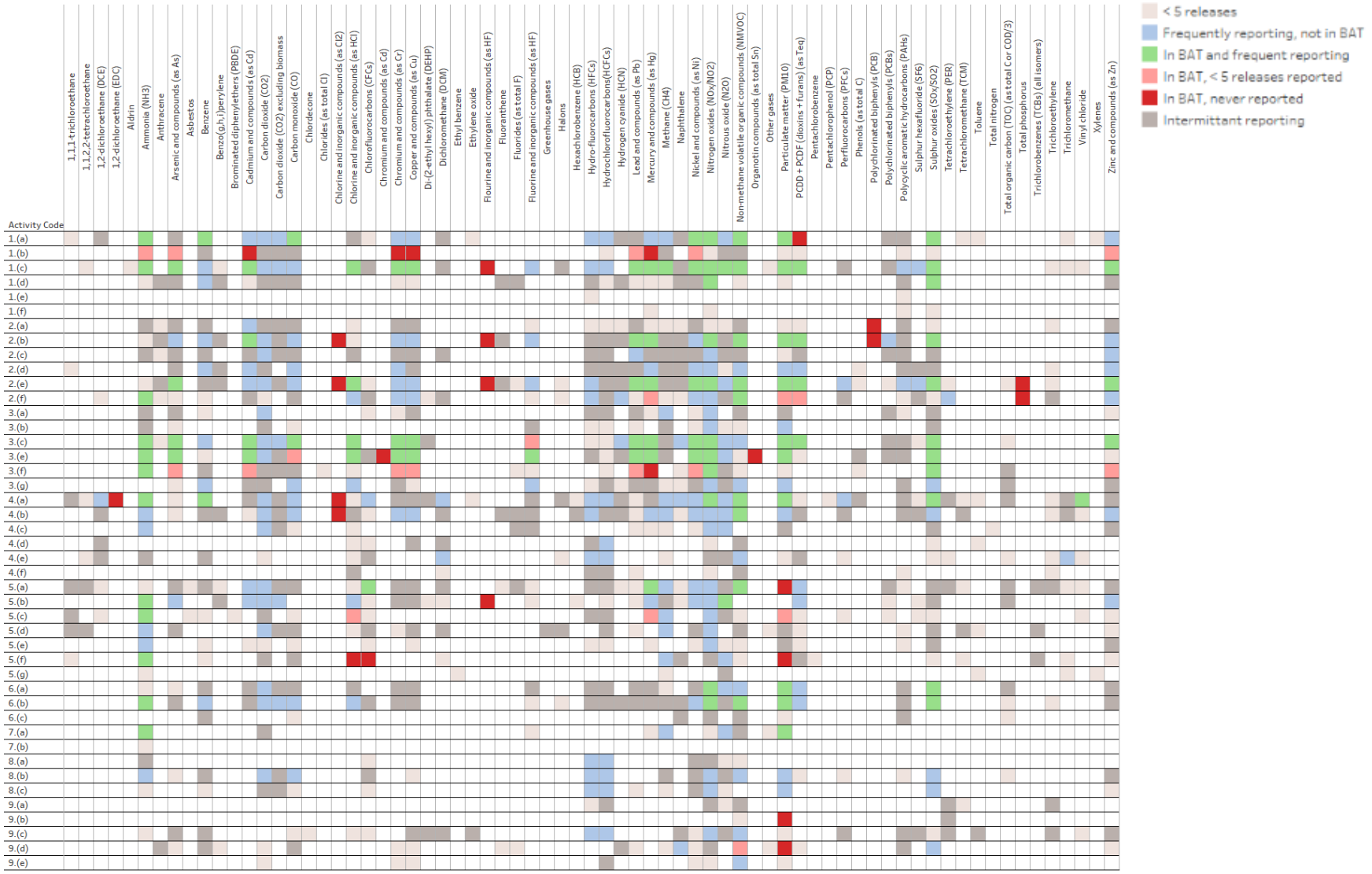


Table A4.10 Comparison of the filtered data with BAT conclusions for releases to air

However, the requirement for pollutants to be monitored under BAT conclusions does not mean that that pollutant-activity combination will be reported to the E-PRTR. Pollutant releases not reaching the release threshold and abatement technologies or a combination of the two could result in a pollutant-activity combination not being reported to the E-PRTR. For example, fluoride and inorganic compounds has never been reported to the E-PRTR for activity 2.(b) (production of iron and steel); however, BAT for the production of iron and steel is to reduce HF releases through the use of a wet scrubber or semi-dry absorption (with a subsequent de-dusting system)[113] and the use of these techniques appears to reduce HF releases below the E-PRTR threshold. As well as this, some BAT conclusions are very technique-specific, for example ammonia releases to air for pulp and paper production are only monitored under BAT conclusions from plants where selective non-catalytic reduction is used[114].

Despite these caveats, the pollutant-activity combinations required to be monitored through BAT were included in the indicator tables since they provide useful information for screening and reviewing. Table 5.1 and Table 5.2 in the main report show the suggested final output for releases to air with pollutant-activity combinations required to be monitored through BAT conclusions identified with black dots. While these indicator tables could be potentially useful for competent authorities to review their E-PRTR data, it is important to note that the reality of pollutant and activity thresholds is too complex to be able to rely on these tables completely.

Another part of this project (Section 3.3.1) investigated additional pollutants that could be potentially included in the E-PRTR Annex II pollutant list. Therefore, indicative pollutant lists for releases to air and water of these pollutants have been developed. These lists (Table 5.3 and Table 5.4) are simple “present or not present” lists, as release totals and the number of facilities that would be reporting these pollutants are not currently known in detail. The pollutant-activity combinations were determined based on the following sources: BAT AELs for specific sectors, pollutant-sector combinations in international PRTRs, inferred from status as a WFD priority substance, and inferred from the nature of the pollutant.

[113] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012D0135&from=EN

[114] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0687&from=EN

Annex 5 E-PRTR Expert Group Workshop report

An E-PRTR Expert Group workshop was held at the DG Environment offices in Brussels on 20 June 2019 to review the initial project findings.

A5.1 Attendees

- MS and EEA countries: ~ 40 representatives
- DG ENV: Alex Radway, Ian Hodgson, Cosmin Codrea, Chris Allen
- EEA: Bastian Zeiger
- Project team: Mark Gibbs (Aether), Jose María Cascajo (INERCO), Christian Tebert (Ökopol), Laura Pereira (ICF)

A5.2 Background / Context

- Project scope: initiated as a simple review, but since evolved.
- Guidance document is now 13 years old.
- It provides a common understanding of E-PRTR to all stakeholders to ensure consistent implementation.
- A number of issues with the Guidance document have been identified when querying MS if and how this guidance document should be updated.
- Impact of omnibus regulation – reporting obligations may change in the next few years.
- Project results will feed into the IED review (led by Ian and Cosmin), and will contribute to the deliberations on whether regulatory changes are appropriate.
- Guidance will not be updated at this time, but findings will be made available as a supplement.

A5.3 Project overview / Summary of key findings

- Task 1: List of activities under IED and E-PRTR have diverged
- Task 2: List of pollutants is quite dated. And how effective are the reporting thresholds?
- Task 3: Guidance doesn't say a great deal. And what it says is also quite outdated and has a big impact in the quality of the data reported. What could be improved?
- Task 4: Indicative list of pollutants contains known errors. Could be updated to better reflect reported transfers and releases.

A5.4 Task 1: Regulation: Review of Annex I activities

Ökopol (Christian Tebert) summarised an analysis and mapping exercise for E-PRTR and IED activities, with findings divided into three categories: sectors not covered by the E-PRTR but covered by the IED; sectors with different capacity thresholds; and sectors with different sub-categories. Coherence with other EU regulations was then reviewed. Of the additional industrial activities reported to the North Rhine-Westphalia inventory, combustion plants >20 MW and UWWTP >15,000 p.e. would be most relevant for capturing additional industrial releases. Aether (Mark Gibbs) also reviewed sectors covered by international PRTRs but not by the E-PRTR and suggested manufacture of motor vehicles and of fabricated metal products as possible new E-PRTR activities.

Germany questioned if data referred to installations or facilities, because E-PRTR is facilities, not installations as presented in the charts. Ökopol confirmed that it should be installations since this reflects the NRW inventory, but EEA corrected that it should be facilities at the E-PRTR level. The group concluded that this is something that should be clarified, since facilities can comprise various installations.

With regards to the proposal to include NH_3 releases from cattle rearing, Germany notes that CH_4 releases should perhaps be also accounted for. Ökopol agreed. A lengthy discussion started on the burden and risks that this could create to small farmers, and the information requirements (e.g. number of livestock, location). The differences between intensive and extensive rearing was also raised, given the use of anaerobic digesters for manure management in intensive rearing. DG Environment (Chris Allen) noted that information requirements will change depending on the calculation method chosen – i.e. a top-down vs bottom-up approach.

Ireland expressed concern in removing the capacity thresholds for UWWTP, claiming that this would create issues for other sectors. On the proposed inclusion of non-hazardous waste recovery, Ireland raised a concern over double counting. Denmark supported the inclusion of non-hazardous waste recovery justifying that even if seems minor (in releases or number of facilities), it might be representative in terms of N_2O and CH_4.

DG Environment (Cosmin Codrea) asked whether the project team checked the alignment both ways, i.e. what is included in the E-PRTR and not in the IED? Ökopol clarified that this was not the focus of the project, so IED pollutants/activities were assessed only when not currently covered by the E-PRTR.

Sweden noted that the Nordic countries have recently commissioned a joint study on the evaluation of different calculation methods and offered to share it with the group.

DG Environment (Alex Radway) reassured participants that any suggestions from this study would need to be considered by the Commission in conjunction with the ongoing IED evaluation work.

A5.5 Task 2: E-PRTR Regulation. Annex II substances and thresholds – suggested additions/removals, potential watch-list mechanism

Aether (Mark Gibbs) described comparisons of the E-PRTR pollutant list with Annex II of the IED, BAT conclusions pollutants with AELs, other relevant European legislation and international conventions, national PRTRs, the OECD short list of PRTR pollutants, and substances of concern in the scientific literature. 30 pollutants could be considered for inclusion in the E-PRTR while another 22 pollutants could be kept under review. A further 24 existing pollutants could potentially be removed from Annex II of the E-PRTR Regulation.

The presentation of the potential amendments initiated a discussion on the role of the E-PRTR. Led by DG Environment (Chris Allen), the group was invited to reflect on what the E-PRTR should be. What is the register trying to achieve – is it a tool to inform and support the IED or is it to consolidate information on releases from a broader range of sources? Should it be used to inform on environmental performance too?

As the purpose of the E-PRTR will then be translated into data requirements, MS need to have clarity on which type of releases they should be tracking or need to track – i.e. should it be just releases from production or also releases due to consumption (e.g. use of pesticides).

If it is concluded that E-PRTR should serve as a tool to inform on IED, perhaps all the pollutants covered in the BREFs and with AELs should be monitored.

If pollutants are no longer required in E-PRTR, it is important to consider ways to maintain the historical time series. Such pollutants might still be released outside the EU; ensuring global evaluations can be carried out is an important consideration.

Alignment with other legislation, including international protocols and PRTRs around the world (e.g. Water Framework Directive, Kiev and Stockholm Protocols) is recommended, but one should keep in mind the differences in the purpose and focus of other regulations/registries/protocols – for instance, the U.S. and Japanese PRTRs serve as a registry of chemicals rather than an inventory of industrial activities.

Switzerland and the Netherlands endorsed the discussion and noted that assessing pollutants and reporting thresholds are very relevant questions, because of the cost entailed to MS and operators by the E-PRTR requirements.

The Netherlands pointed out that countries can use the E-PRTR to integrate reporting requirements for purposes other than just IED compliance and explained that both IED and other reporting requirements are integrated in their national protocol which serves as their main guidance.

Aether clarified that the need for refreshing the pollutants list is also because some substitute chemicals/substance that were not relevant in the past, are now released in large quantities. Similarly, some pollutants are no longer of concern as they have been banned or severely restricted. 19 of the 24 pollutants that could potentially be removed from E-PRTR reporting requirements list are banned pesticides.

This statement led to a discussion on a watch list which would enable a more dynamic assessment of the reporting needs. MS seemed to welcome the approach.

Sweden specifically asked about inclusion of diffuse releases and expressed that these should be included in the E-PRTR requirements. Denmark recognised the value of tracking such releases but raised a concern on the internal limitations (e.g. limited competent authority resources) to enable that.

EEA raise the need to address the issues with waste water transfers, which are currently not adequately accounted, if the group ends up deciding to focus on the IED only.

A5.6 Task 2: E-PRTR Regulation. Annex II thresholds – suggested changes to existing substances, and thresholds for new substances

Aether presented a Weibull statistical analysis of pollutant reporting thresholds which had been checked against the NRW inventory and Spanish PRTR (which do not have pollutant reporting thresholds). The reporting thresholds for 11 pollutants to air and 19 to water could be lowered to ensure capture of 90% of industrial releases.

MS had different opinions on the trade-off of removing thresholds, i.e. increasing accuracy but also increasing effort. Overall there was limited appetite for this.

Denmark believes their operators would not be supportive of removing thresholds, as this would entail too much burden. On that basis, they would likely be more supportive of reaching 90% accuracy only. Germany agreed, saying that they would not be able to support the removal, as data are not easily available.

Spain explained that the removal of thresholds was a political and technical decision, justified by the fact that they perceive no extra burden for operators, since they would have to track and store the information regardless.

On the issue of historical releases not being comparable due to a sudden absence of reported values for companies operating near the threshold (and therefore having to report only when these are exceeded), Spain highlighted that they do not face such problems and all companies must report since there are no pollutant reporting thresholds in the Spanish PRTR.

Portugal would support lowering the thresholds but would have difficulties in justifying removing it entirely.

Denmark added that it is up to Member States to go beyond the E-PRTR and make reporting requirements stricter by lowering or removing thresholds, if that suits their operators.

The UK was neutral about removing thresholds, commenting that the effort involved would mostly be a matter of planning and putting systems in place, with reporting easier once these are established. However, the UK raised the importance of receiving direct inputs from the operators, to get their views. DG Environment (Alex Radway) agreed and asked whether MS have such fora. Sweden explained that, alongside other Nordic Countries, they have discontinued stakeholder engagement events to discuss reporting. Spain confirmed that sectors work together with competent authorities to define the most important pollutants and to simplify reporting.

A5.7 Task 3: E-PRTR Guidance. Release quantification methods – review of M/C/E methods, ensuring consistent reporting

INERCO (Jose María Cascajo) reported on an assessment of method classes and methodologies used for release quantification in the E-PRTR and how their usage has evolved. Insufficient information on the methodology affects more than 50% all reported data, while incompatible combinations of method class and methodologies are sometimes reported. This indicates there is wide scope for improvement in data validation.

On the issue about excessive number of operators reporting ‘No info’ on the method for calculation, Spain explained that their system forces operators to label the methodology or, if not already included on the list, to describe the accredited laboratory or alternative standards used. Member States and the Commission agreed that the situation is concerning and that reporting systems should discourage the use of ‘no info’ option through warning messages or blockers. EEA said that they could facilitate this, but Sweden noted that this screening should occur at the national level.

Germany added that prior to enforcing reporting restrictions, it is important to define what information is optional and what is mandatory, bearing in mind that quality will reduce when reporting is made optional.

Spain noted that, more important than adjusting the system, is informing operators what information is needed and the prioritisation for higher accuracy, e.g. if direct measurement is not available, they need to provide not only concentration but also flow.

Germany reflected on the importance of competent authorities in increasing the quality of reporting, since they are the ones interacting with operators.

A5.8 Task 3: E-PRTR Guidance. Release quantification methods – review of available guidance and reference material, proposed new guidance

INERCO (Jose María Cascajo) provided suggestions on release quantification that could be added to the E-PRTR Guidance document to improve the quality and comparability of E-PRTR data. These would address selection of method class and methodology descriptions, criteria to deal with measurements below limits of detection and quantification, and data validation by competent authorities. Three approaches to developing a data reliability indicator or quality index were presented.

DG Environment (Alex Radway) expressed an initial feeling that the creation of a quality index would add too much complexity for the benefit. Germany was more welcoming to the proposed improvements to validation and development of a quality index ("with a bit more [reporting] maybe we can get much more [useful data]"). Overall the group focused their concerns on the (perceived) burden that increasing quality would create to operators.

Ireland claimed that calculation guidance and tools would be useful to support operators becoming aware of the information needs. Denmark has guidance for the quantification of methane releases from landfills and would share this with the group. On the other hand, it noted that currently not much effort is put into quantifying accurate fugitive releases.

A5.9 Task 4: E-PRTR Guidance. Indicative air and water pollutants – suggested revisions

Aether compared historic reporting with the indicative pollutant lists in the 2006 Guidance document; many potential pollutants are not reported indicating the existing lists may be too broad. New lists were presented that show the strength of pollutant-activity linkages.

MS welcomed the proposed modification on the presentation of the new lists of expected pollutants per sector, moving from a "present or not present" to strength of linkage approach. They perceive this to be a good way to quality check whether the reports are complete. Spain added that this is particularly important for installations with more than one activity (e.g. cement industries which have kilns, co-incineration, etc.).

Annex 6 Additional Member State views

In response to an invitation to submit comments following the E-PRTR Expert Group workshop in Brussels on 20 June 2019, several countries commented on a number of issues relevant to the project findings.

A6.1 Member State views and comments on E-PRTR activities

- The **UK** commented, "We welcome the ambition of making the E-PRTR and IED more aligned".
- **Ireland** noted caution on the considerable extra reporting burden by adding new activities and by lowering the activity thresholds (e.g. including 20 to 50 MW combustion plants and cattle rearing with a threshold of 100 LSU) for the suggested activities above.
- **Slovakia** do not support lowering the **UWWTP threshold** to 15,000 p.e. Slovakia might have problems at the national level to get data, since reporting deadlines in the E-PRTR and Council Directive 91/271/EEC are different.
- The **UK** asked, "Should we consider the inclusion of facilities producing Waste Derived Fuels?"
- **Ireland** noted that **recovery of non-hazardous waste** >50 t/day (IED 5.3b), or **temporary storage of hazardous wastes** (IED 5.5) are relevant for the waste transfer aspect of PRTR but not currently covered by the E-PRTR. In addition, Ireland notes that IED **6.4biii (treatment and processing of animal and vegetable raw materials**) is not covered by the E-PRTR, but releases were assumed to be relatively low.
- **Slovakia** agree with adding **cattle rearing** as a new activity, but do not agree with capacity threshold >100 LSU. The extra administrative and reporting burden on smaller farms would be disproportionate. The threshold >200 LSU would be more acceptable in Slovakia's view.
- **Czech list of activities beyond E-PRTR: Czech Republic** can provide a complete list of activities beyond the scope of the E-PRTR which are taken into account in case of the Czech PRTR (they have lower capacity thresholds or are fully different). Their origin is the NACE classification but in some cases there are some differences (wording, splitting or merging of activities, etc.). The list of activities beyond the scope of E-PRTR is available at https://www.zakonyprolidi.cz/cs/2008-25#prilohy.
- **Nordic PRTR study: Sweden** provided a report[115] studying the Nordic countries' PRTRs which could be considered as useful background material for assessing the activities and their thresholds included in the E-PRTR.

A6.2 Member State views and comments on E-PRTR pollutants and reporting thresholds

- The **Czech Republic** commented that their "PRTR is collecting data for styrene as well as for formaldehyde since its establishment (year 2004). We are convinced that both pollutants are very important. So they should be a part of E-PRTR in the near future".
- The **Czech Republic** noted that their PRTR has collected data for pollutants in waste transfers since its establishment. A list of pollutants in waste transfers

[115] Evaluation of thresholds for capacities and pollutants according to the Protocol on PRTRs (SMED Report No 4, 2019)

(Annex 2) that are reported in the Czech Republic is given in https://www.zakonyprolidi.cz/cs/2008-145. The first column is the representing number (the same as in E-PRTR, excluding styrene and formaldehyde), the second column is the CAS number, the third column is the name of the pollutant and the last column is the relevant threshold.

- **UK** "Regarding having pollutants that are kept under review, we would emphasise the importance of certainty of reporting (as far in advance as possible) for operators and Competent Authorities. We support the review of pollutants, but it needs close consideration of the evidence base behind including/excluding".
- **UK** "Whilst we see merit in lowering thresholds for particular groups of pollutants – it will significantly increase the administration burden for operators and regulators. Any changes will need to be notified well in advance to enable collation of data/analyses/reporting procedures to be implemented. Regarding the detail of pollutants and thresholds, we think future engagement with Member States will be necessary and we are keen to contribute to discussions."
- **Ireland noted that pollutants considered** for the E-PRTR must be relevant to the environment. Ireland notes that the addition of pollutants to PRTR will require additional burden for operator reporting, and competent authority collection, validation of data and IT system modifications. Ireland highlighted that the scope of PRTR needs to consider if it has to contain all pollutants and whether there are any overlaps or double counting with other reporting websites (e.g. reporting to EU-ETS and reporting of F-Gases).
- **Ireland commented that thresholds must be relevant** and collect as much useful data as possible. However, Ireland noted that reducing the thresholds of some pollutants appears to be required but that any lowering/removal of thresholds has additional operator and competent authority reporting implications (e.g. facilities already reporting may need to report more pollutants; facilities not reporting may need to start reporting). It was noted that thresholds relevant at the moment may change again in future.
- **Slovakia do not support the total removing of pollutant thresholds**, since the data validation would place an enormous burden on the competent authority.

A6.3 Member State views and comments on E-PRTR guidance

- **Methodology for landfill estimation:** Following the workshop **Denmark** provided details of the Danish methodology concerning releases from landfills: https://mst.dk/erhverv/industri/prtr-groenne-regnskaber/beregning-af-emissioner-fra-deponeringsanlaeg/. The methodology is used for estimating methane releases and eight substances from leachate. Documentation comprises an Excel file with guidance.
- **Development of 'reliability indicators':** The **UK** highlighted that data quality "reliability indicators may be challenging to implement but we think it is beneficial to be moving in that direction".
- **General emissions inventory and intensive farming guidance: Natural Resources Wales** highlighted that they have the following guidance available on their website:
  - *General Emissions Inventory reporting*: https://naturalresourceswales.gov.uk/permits-and-permissions/environmental-permits/emissions-inventory-reporting/
  - *Intensive farming*: https://naturalresourceswales.gov.uk/guidance-and-advice/business-sectors/farming/intensive-farming-reporting-emissions/emissions-inventory-reporting-guidance-for-intensive-farming.

- **Additional guidance on M/C/E and measurements below the limit of detection: Ireland** said that additional guidance and tools would be welcome for various M/C/E situations, measurements below limits of detection, insufficient description of methodology selection, and limitations of various method classifications.
- **Clarification questions about the Guidance document: Slovakia** provided a detailed list of clarification questions regarding aspects of the reporting other than release quantification methods. It is suggested that these be considered for incorporation in a future update of the E-PRTR Guidance document.
- **Estimating emissions below reporting limits: Sweden** provided a report[116] on how low emission values are reported in Sweden.

A6.4 Member State views and comments on indicative pollutant lists

- **Activity/Pollutant matrix:** The **UK** commented that its competent authorities considered the matrix approach an aid to QA/QC and could be helpful but would have the most benefit if it covered all the activities on a site.

[116] Emissions based on values below reporting limit – a study on how low emission values are reported in Sweden (SMED Report No 9, 2018).