An overview of PFAS Reporting, Testing and Regulations in the EU
Prepared for the NGO members of the NPRI WG, PFAS Subgroup
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The memo aims to provide an overview of the reporting mechanism on PFAS in the European Union (EU), plus PFAS testing and the extent of contamination.

Introduction to E-PRTR and current PFAS reporting

The E-PRTR Regulation was set up in response to the Protocol on Pollutant Release and Transfer Registers to the Convention on Access to Information, Public Participation in Decision-making and Access to Justice on Environmental Matters "the Aarhus Convention" issued by the United Nations Economic Commission for Europe (UN-ECE). The EU is a signatory to the UN-ECE PRTR Protocol and was obliged to develop a European-wide register.

E-PRTR includes 91 pollutants under the following seven groups:

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

PFAS are not covered by Annex II of the E-PRTR Regulation.[1]

In 2019, the Commission Implementing Decision (EU) 2019/1741 revised the reporting requirements of the E-PRTR. By early 2020, the Commission conducted a thorough review of the implementation of the E-PRTR, focusing on the industrial activities and pollutants falling within its scope.

Collaborating with reporting countries, the Commission and the European Environment Agency established a new system that seamlessly

[1] https://eipie.eu/wp-content/uploads/2022/06/Annex-II-loss-IED-briefing.pdf

incorporates reporting for both the E-PRTR and the closely associated Industrial Emissions Directive (IED).

The IED is the primary EU tool overseeing the emission of pollutants from industrial facilities. Approximately 52,000 installations engaged in industrial activities outlined in Annex I of the Directive are mandated to operate under a permit issued by the authorities of the Member States. These permits should include conditions aligned with the principles and provisions of the Directive. The integrated approach signifies that permits must consider the overall environmental performance of the plant. This encompasses emissions into air, water, and land, waste generation, raw material usage, energy efficiency, noise levels, accident prevention, and site restoration upon closure.[2] The current list of substances relevant to water in the current Annex II of the IED is identical to Annex VIII of the Water Framework Directive. PFAS chemicals are covered by organohalogen compounds under Annex II.[3]

The integration between E-PRTR and IED reporting is manifested in the EU Registry on Industrial Sites,[4, 5] where E-PRTR data is reported alongside information pertaining to the IED and Large Combustion Plants (LCP).[6]

The EU Registry on Industrial Sites enhances the accessibility and interoperability of spatial and geographical information. It establishes a clear connection between data provided by industrial facilities subject to the E-PRTR and those regulated under the IED.

Industrial Emissions Portal offers opportunity to improve data transparency and accessibility

In 2021, the Industrial Emissions Portal (IEP) [7] replaced the E-PRTR[8] website to improve data transparency and public access to environmental

[2] https://environment.ec.europa.eu/topics/industrial-emissions-and-safety/industrial-emissions-directive_en
[3] https://eipie.eu/wp-content/uploads/2022/06/Annex-II-loss-IED-briefing.pdf
[4] https://cdr.eionet.europa.eu/help/euregistry
[5] https://cdr.eionet.europa.eu/help/euregistry/Documents/EU%20Registry_Manual%20for%20Reporters_v1.12.pdf
[6] https://cdr.eionet.europa.eu/help/eprtr_lcp
[7] https://industry.eea.europa.eu/
[8] https://environment.ec.europa.eu/topics/industrial-emissions-and-safety/european-pollutant-release-and-transfer-register-e-prtr_en

information. The Portal, having replaced the E-PRTR website, brings together data on industrial activities reported under IED and E-PRTR Regulation. The need for replacement is described in the Explanatory Memorandum prepared by the European Commission.[9]

The Industrial Emissions Portal covers over 60 000 industrial sites from 65 economic activities across Europe within the following sectors:

- energy
- production and processing of metals
- mineral industry
- chemical industry
- waste and wastewater management
- paper and wood production and processing
- intensive livestock production and aquaculture
- animal and vegetable products from the food and beverage sector, and
- other activities

The portal shows the sites' location and administrative data, along with their releases and transfers of regulated substances to air, water, and land, as well as transfers of waste. For large combustion plants, there is more detailed data on energy input and emissions.

Data can be browsed on the European Industrial Emissions Portal on the industrial site map.[10] Full datasets and guidance documents are also available on the Portal.[11] This comprises the website's data repository, encompassing all the information featured on the site, along with a compilation of additional pertinent databases that prove valuable for the analysis and study of industry domains. Examples include the EU emission inventories covering both air pollutants and greenhouse gases, the dataset related to the EU emission trading system, and the Energy Community database.

[9] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022PC0157
[10] https://industry.eea.europa.eu/explore/explore-data-map/map
[11] https://industry.eea.europa.eu/download

For example, the portal displays data about pollutant releases and accidental pollutant releases into the air reported by 27 EU countries under E-PRTR.[12] Pollutants include Ammonia, Arsenic and compounds, Cadmium and compounds, Carbon dioxide, Carbon dioxide, Carbon monoxide, Chromium, Copper, Lead, Mercury and compounds, Methane, Nickel and compounds, Nitrogen oxide, Nitrous oxide, Non-methane volatile organic compounds**,** Particulate matter, PCDD + PCDF (dioxins + furans), Polycyclic aromatic hydrocarbons, Sulphur oxides, Zinc and compounds.

The complete list of pollutants for reporting, their description, characteristics and reporting thresholds is available on the portal website.[13]

The information contained in the portal is reported annually and required under the Industrial Emissions Directive (IED)[14] via the EU Registry on Industrial Sites (EU Registry)[15] and E-PRTR.

The parts of Annex I sector 4 of IED that are relevant for PFAS include:

4.1 Production of organic chemicals such as

(f) halogenic hydrocarbons

(h) plastic materials (polymers, synthetic fibres and cellulose-based fibres)

(k) surface-active agents and surfactants.

4.4 Production of plant protection products or of biocides

4.5. Production of pharmaceutical products including intermediates.[16]

In addition, the release of PFAS into the environment may also take place during the production of products containing PFAS. Several of these activities are outlined in Annex I of the IED, such as metal surface treatment, the manufacturing of plant protection products, biocides, and

[12] https://industry.eea.europa.eu/analyse/air
[13] https://industry.eea.europa.eu/pollutants/pollutant-index
[14] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1404121608038&uri=CELEX:32010L0075
[15] https://rod.eionet.europa.eu/obligations/721
[16] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1404121608038&uri=CELEX:32010L0075

pharmaceuticals, textile production, leather tanning, and the production of pulp, paper, cardboard, and wooden panels.

Annex II of the IED enumerates the pollutants necessitating the establishment of Emission Limit Values (ELVs) within permits, indirectly encompassing certain PFAS substances. Moreover, Article 14(1)a of the IED mandates the imposition of emission limit values in permits for "other polluting substances likely to be emitted from the installation in significant quantities, considering their nature and potential to transfer pollution across different mediums."[17]

The IED extends its coverage to waste treatment facilities, which have the potential to release PFAS. While the Best Available Techniques (BAT) conclusions for waste treatment specifically address PFOA and PFOS, other PFAS are not covered.[18] Permits granted to waste treatment plants must adhere to the obligations outlined within four years of BAT conclusion publication. Authorities possess the flexibility to establish emission limits for all PFAS, including PFOS and PFOA.

Given these considerations, there is an opportunity to enhance the IED's treatment of PFAS as a chemical class. Various approaches can be employed to achieve this goal.

One avenue involves revisiting the IED's sectoral scope to ensure comprehensive coverage of the most environmentally impactful industrial activities. The ongoing review of the IED will assess whether additional measures are necessary to address chemicals of concern, such as PFAS, and evaluate the need for Best Available Techniques Associated Emission Levels (BAT-AELs) and/or specific technical requirements like closed circuit manufacturing and PFAS substitution.

Simultaneously, the periodic review of Best Available Techniques Reference Documents (BREFs) offers an opportunity to incorporate PFAS considerations if they emerge as Key Environmental Issues within specific industrial sectors. This process may result in identifying PFAS use as non-BAT and establishing BAT-AELs for relevant environmental compartments.

[17] *Ibid*

[18] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018D1147&rid=1

Notably, the review of the textile industries BREF has already commenced as part of the rolling review program. [19, 20]

The table below summarises data on the applicability/efficiency of certain waste water

treatment techniques to remove certain pollutants, including PFAS, from textile effluents.[21]

Table 4.20: Overview of applicable waste water purification techniques for the removal of NP/NPE, PAHs, brominated flame retardants, Sb_2O_3, and PFAS

Waste water treatment technique	Parameter/pollutant				
	NP/NPE	PAHs	Brominated flame retardants	Sb_2O_3	PFAS (e.g. PFOA)
Anaerobic treatment	ND	ND	ND	0	ND
Biological (active sludge) treatment	0	x	(x)(1)	0	0
Active carbon dosage in biological treatment (PACT)	(x)	x	ND	0	x
Membrane bioreactor (MBR)	ND	(x)	x	(x)(2)	ND
Chemical precipitation (with coagulation-flocculation)	ND	x	x	x	ND
Microfiltration, ultrafiltration	ND	x	(x)	x	ND
Nanofiltration, reverse osmosis	(x)	x	(x)	x	ND
Sand filtration	ND	x	x	x	ND
Adsorption (e.g. active carbon filtration)	X	x	x	0	ND
Chemical oxidation	(x)	x	ND	0	ND
Ozonisation	ND	(x)	ND	0	ND
Evaporation	ND	ND	ND	0	ND
Incineration	ND	ND	ND	ND(3)	ND

NB:
x: Parameter (group) removed.
(x): Parameter (group) possibly / potentially partly removed.
0: Parameter (group) not removed.
ND: No data.
(1) Adsorbed on sludge.
(2) Increased concentration and toxicity of Sb_2O_3 on the UF membrane prevent MBR from functioning.
(3) Would need to be removed from waste gases due to high-temperature volatility and toxicity of Sb_2O_3.
Source: [108, Derden et al. 2010], DE 408 and CZ_B 36 comments from [324, TWG 2020]

[19] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX%3A52020SC0249
[20] https://eippcb.jrc.ec.europa.eu/reference/textiles-industry
[21] *Ibid*

Current review of PFAS in the E-PRTR and IED

E-PRTR publicly discloses emission data from major industrial activities reported by Member States. This includes emissions from activities outlined in Annex I of the E-PRTR Regulation, which closely aligns with Annex I of the IED. Notably, certain activities within this framework, such as those in the chemical industry, surface treatment of metals, waste and wastewater management, and the production of textiles and leather, serve as sources of PFAS. The recently concluded 'Review of E-PRTR implementation and related guidance'[22] suggested expanding the E-PRTR reporting requirements to encompass PFHxS, PFOS, and PFOA, along with their salts and precursors. Incorporating PFAS emissions in reporting would enhance understanding of release sources, facilitating the identification of potentially contaminated sites.

The Impact Assessment for the revision of the E-PRTR Regulation presents an opportunity to broaden the inclusion of relevant PFAS, extending beyond PFHxS, PFOA, and PFOS. Potentially, the list of 20 PFAS included in the Drinking Water Directive could be considered. Additionally, it could explore the feasibility of mandating the reporting of emissions for the entire PFAS family, considering “Total Organic Fluorine” parameter until an analytical method for “total PFAS” is available.

In November 2023, the European Council and the Parliament introduced a general review clause to assess activities and pollutants covered by IED, as well as the applicable thresholds in Annex I (concerning the activities that require reporting above set thresholds) and II (concerning the pollutants that need to be reported above set thresholds). The co-legislators added dicofol and two types of PFAS — PFOA and its salts and PFHxS — to the substances listed in Annex II. By 2026, the Commission must issue a review of Annex II and provide guidance on the measurement methodology for these substances.[23, 24, 25, 26]

[22] https://circabc.europa.eu/ui/group/f80de80b-a5bc-4c2b-b0fc-9c597dde0e42/library/b4eacd6d-4425-479a-a225-77306de6b060?p=1&n=10&sort=modified_DESC
[23] https://www.consilium.europa.eu/en/press/press-releases/2023/11/29/industrial-emissions-council-and-parliament-agree-on-new-rules-to-reduce-harmful-emissions-from-industry-and-improve-public-access-to-information/
[24] https://sustainablefutures.linklaters.com/post/102iunq/revised-industrial-emissions-directive-eu-institutions-reach-political-agreement
[25] https://www.europarl.europa.eu/doceo/document/TA-9-2023-0260_EN.html
[26] https://www.europarl.europa.eu/doceo/document/A-9-2023-0211_EN.html

The map of Europe's extensive PFAS contamination

In February 2023, *Le Monde* and its 17 partners published a “Map of Forever Pollution” illustrating the widespread contamination of Europe by PFAS substances.[27] The Map was developed as part of the Forever Pollution Project.[28] It displays facilities involved in PFAS production, locations where PFAS are utilized, along with sites where contamination has been identified and those susceptible to contamination.

Scientific teams and environmental agencies have sampled PFAS in water, soil, or living organisms at over 17 000 PFAS contaminated sites from 2003 to 2023. The measurements have revealed the presence of PFAS at concentrations equal to or exceeding 10 nanograms per liter (ng/L).

The methodology used by Le Monde and its partners for the Map

In October 2022, the EU Commission listed nine industrial activities “where PFAS are likely used (textiles, leather, carpets, paper, paints and varnishes, cleaning products, metal treatments, car washes, plastic/resins/rubber)”[29] based on codes from the European Nomenclature of Economic Activities (NACE).[30]

During project implementation, nearly 3,000 industrial facilities were pinpointed. Among these, the predominant category comprises approximately 1,000 paper mills, individually releasing between 31 and 76 tonnes of PFAS into the environment daily.[31] Following this, the next significant contributors are metal manufacturing and processing (812 sites), the production of plastics in primary forms (221), manufacturing of refined petroleum products (213), textile finishing (126), and chemical and leather

[27] https://foreverpollution.eu/maps-and-data/maps/
[28] https://foreverpollution.eu/
[29] https://environment.ec.europa.eu/system/files/2022-10/Staff%20Working%20Document%20-%20Impact%20Assessment%20Report%20accompanying%20the%20Proposal_0.pdf
[30] https://ec.europa.eu/competition/mergers/cases/index/nace_all.html
[31] https://environment.ec.europa.eu/system/files/2022-10/Staff%20Working%20Document%20-%20Impact%20Assessment%20Report%20accompanying%20the%20Proposal_0.pdf

processing plants. Additionally, the investigation revealed approximately 240 PFAS user facilities, most of which were random discoveries.[32]

The Forever Pollution Map classifies sites into three distinct categories:

- "known contamination sites"
- "presumed contamination sites"
- "known PFAS users."

Known Contamination Sites

Known PFAS contamination sites encompass:

- Locations where PFAS presence has been confirmed through water and/or solids testing.
- PFAS chemical production facilities, even in the absence of publicly available testing data, on the assumption that they have historically emitted PFAS.[33]

A color-coded system on the map differentiates the levels of contamination.

- Sites with Detected PFAS

Known contamination sites and hotspots are areas where environmental monitoring, conducted by authorities or scientists, has identified the presence of PFAS.

- Current and Legacy PFAS Chemical Production Facilities or "Producers"

Current and legacy PFAS producers refer to industrial facilities actively manufacturing PFAS and those that have produced PFAS, such as PFOS, PFOA, or Teflon-like products in the past.

[32] https://assets-decodeurs.lemonde.fr/decodeurs/medias/foreverpollution/Methodology___The_Map_of_Forever_Pollution_2023.02.23.pdf
[33] https://www.sciencedirect.com/science/article/abs/pii/S016041201400124X?via%3Dihub

Presumed PFAS contamination sites

Presumed PFAS contamination sites are locations where the testing has not officially confirmed the existence of PFAS. However, these sites are presumed to be contaminated as they are located near facilities known to produce, use, and/or release PFAS.[34]

PFAS regulation in the EU

The utilization of the most harmful PFAS compounds has been globally and within the EU restricted for over a decade. The Stockholm Convention on Persistent Organic Pollutants (POPs) prohibits using PFOS, PFOA, PFHxS, and related compounds, except for specific applications where effective substitutes are unavailable. Moreover, various groups of PFAS compounds have been included in the Candidate List[35] of the REACH Regulation[36]. If these chemicals are employed in products, manufacturers or importers are mandated to inform the European Chemicals Agency (ECHA) and furnish customers with adequate information regarding the safe usage of the product.

Moreover, numerous PFASs are slated for assessment in the upcoming years, as outlined in the Community Rolling Action Plan[37], or have already undergone evaluation. These evaluations aim to address initial concerns regarding the potential risks to human health or the environment associated with the manufacturing or usage of these substances.[38]

In early 2023, the European Union implemented two legislative measures to mitigate human exposure to excessive levels of PFAS. Commission Regulation (EU) 2022/2388 governs the concentrations of PFAS compounds in food, while Directive (EU) 2020/2184 sets restrictions on the presence of PFAS in drinking water.

The updated regulations on PFAS in the EU Drinking Water Directive are scheduled to be enforced in January 2024, coinciding with the expected

[34] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9648201/
[35] https://echa.europa.eu/candidate-list-table
[36] https://echa.europa.eu/regulations/reach/understanding-reach
[37] https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table
[38] https://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/countryinformation/european-union.htm

release of technical testing guidelines by the European Commission. The new standard mandates a maximum combined concentration of all PFAS compounds at 0.5 µg per liter of water. Alternatively, member states have the option to monitor the sum of 20 specific PFAS compounds, with a maximum limit set at 0.1 µg/l.[39]

In January 2023, a comprehensive proposal to restrict per- and polyfluoroalkyl substances (PFAS) was released by the European Chemicals Agency (ECHA). This proposal, formulated by authorities in Denmark, Germany, the Netherlands, Norway, and Sweden, seeks to control the production, market placement, and utilization of PFAS both in their pure form and as components in other substances, mixtures, and articles, exceeding specified concentrations. Notably, PFAS employed in firefighting foams is not covered by this restriction proposal. [40]

Starting from February 2023, perfluorinated carboxylic acids (C9-14 PFCA), along with their salts and precursors, were subject to restrictions in the European Union/European Economic Area (EU/EEA), as per a decision made by the European Commission based on a proposal from Germany and Sweden. Germany has also proposed further restrictions on undecafluorohexanoic acid (PFHxA), its salts, and related substances. This proposal underwent evaluation by ECHA's scientific committees in December 2021. The European Commission, in collaboration with EU member states, will determine the fate of this proposed restriction.

In 2006, the European Union imposed a ban on Aqueous Film-Forming Foams (AFFF) containing PFOS, with a complete phase-out by 2011. However, subsequent AFFF replacements still incorporated PFAS substances.[41] From 2020 onward, there were restrictions on AFFFs with more than 25 parts per billion (ppb) of PFOA or its salts, as well as those containing over 1000 ppb of PFOA-related substances. Additionally, in February 2022, the European Chemicals Agency proposed a comprehensive EU-wide restriction on PFAS in firefighting foams.[42]

[39] https://measurlabs.com/blog/pfas-testing-in-the-eu/
[40] https://echa.europa.eu/hot-topics/perfluoroalkyl-chemicals-pfas
[41] https://www.kemi.se/en/publications/pms/2015/pm-5-15-survey-of-fire-fighting-foam
[42] https://echa.europa.eu/fr/-/proposal-to-ban-forever-chemicals-in-firefighting-foams-throughout-the-eu

PFAS in surface water and groundwater

The primary goal of European Union water legislation is to safeguard both human health and the environment from the cumulative impact of toxic and/or persistent pollutants. In 2022, the European Commission proposed revising the list of priority substances in surface water and groundwater.[43][44] Several substances are proposed for addition, including a list of PFAS. If the Council and the European Parliament agree the proposal, Member States will be required to take measures to reduce the emissions of all these pollutants where necessary to meet the quality standards.

PFAS testing

PFAS testing is often performed using the LC-MS method, which combines liquid chromatography and mass spectrometry. With LC-MS, it is possible to detect more than 30 PFAS compounds in water with a detection limit of 0.01 to 0.05 µg/l. The method is, therefore, well-equipped for compliance testing by the limits set in EU legislation.[45]

Measurlabs offers PFAS testing for food, water, and other environmental samples. A PFAS testing package for plastics is also available, and other sample types may be analyzed upon request.

The analysis package includes the determination of 22 PFAS substances including PFOS, PFOA, and PFHxS regulated under the Stockholm Convention on Persistent Organic Pollutants.[46]

The following 22 substances are included in the PFAS analysis package:

[43] https://environment.ec.europa.eu/publications/proposal-amending-water-directives_en
[44] https://environment.ec.europa.eu/system/files/2022-10/Proposal%20for%20a%20Directive%20amending%20the%20Water%20Framework%20Directive%2C%20the%20Groundwater%20Directive%20and%20the%20Environmental%20Quality%20Standards%20Directive.pdf
[45] https://measurlabs.com/blog/pfas-testing-in-the-eu/
[46] https://measurlabs.com/products/perfluoroalkyl-compounds-pfas-in-plastic-narrow-package/

Substance	Abbreviation	CAS number
Perfluorooctanesulphonic acid	PFOS	1763-23-1
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorobutanoic acid	PFBA	375-22-4
Perfluoropentane acid	PFPeA	2706-90-3
Perfluorononanoic acid	PFNA	375-95-1
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorheptanoic acid	PFHpA	375-85-9
Perfluorooctane-sulfonamide	PFOSA	754-91-6
Perfluorhexanesulfonic acid	PFHxS	355-46-4
Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluordecanoic acid	PFDA	335-76-2
Perfluoroundecanoic acid	PFUnA	2058-94-8
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluorotridecanoic acid	PFTrA	72629-94-8
Perfluorotetradecanoic acid	PFTA	376-06-7
Perfluoro-3,7-dimethyloctanoic acid	PF-3,7-DMOA	172155-07-6
7H-Dodecafluoroheptanoic acid	HPFHpA	1546-95-8
1H,1H,2H,2H-Perfluorooctane sulfonic acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic acid	4:2 FTS	757124-72-4
8:2 Fluorotelomer sulfonic acid	8:2 FTS	39108-34-4

In addition, the following results will be reported:

- total PFOS/PFOA excl. LOQ,
- total PFOS/PFOA incl. LOQ,
- total PFAS (22) excl. LOQ,
- total PFAS (22) incl. LOQ.

The results of the analysis will be reported in µg/kg.