

2021 Pollutant emissions and waste transfers from SEPA regulated industrial sites

This statistical release shows emissions of pollutants to air and water and offsite waste transfers reported by operators of industrial sites under the **Scottish Pollutant Release Inventory (SPRI)** for the 2021 calendar year. Some historic data is included for comparison. Information about the SPRI and on the method used to prepare this release is provided in sections two and three of this document.

Complete SPRI data is available on Scotland's Environment Web at: <https://www.environment.gov.scot/data/data-analysis/scottish-pollution-release-inventory/>

This is a data analysis tool which allows you to view summarised information by industry sector for pollutants and waste transfers. Data can be downloaded in bulk, including at a site level. It is updated annually when the previous year's data is published.

Contents

1. The statistics.....	2
1.1 Key information for 2021	2
1.2 Emissions and Waste transfers for 2021.....	3
1.3 Greenhouse gas emissions.....	15
1.4 SPRI reporting data	21
2. Scope of this statistical release	25
2.1 User statement	25
2.2 Feedback	25
2.3 Revisions	26
2.4 Release	27
3. About the Scottish Pollutant Release Inventory	27
3.1 What is the Scottish Pollutant Release Inventory?	27
3.2 Who reports?	27
3.3 SEPA's role.....	28
3.4 Information to consider when using SPRI data and technical notes	28

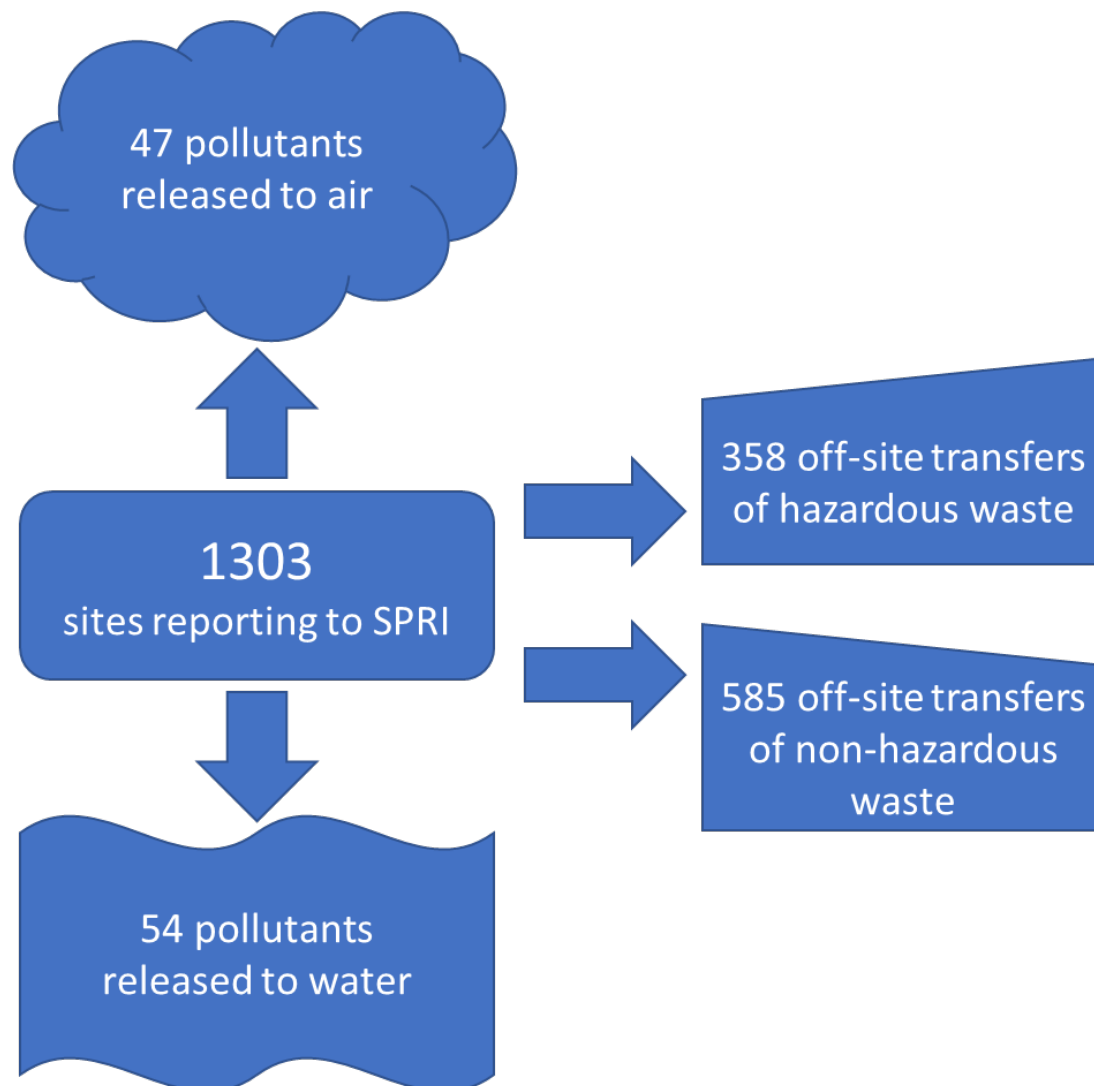
Media enquiries to: SEPA Communications Department: media@sepa.org.uk .

Feedback on this document to: SPRI.Administration@sepa.org.uk

This is an Official Statistics publication. These statistics have been produced to the high professional standards defined in the Code of Practice for Official Statistics, which sets out fourteen principles under the pillars of Trustworthiness, Quality and Value. More information on the Official Statistics Code of Practice can be found here: <http://www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html>. Lead statistician: Bob Boyce.

1. The statistics

1.1 Key information for 2021



Information reported by operators reflected an increase in productivity or activity following on from the Covid-19 lockdowns. From the set of around 416 main SPRI sites¹ who report pollutant emissions each year, 133 reported that some emissions were significantly different to those reported in 2020, which is a similar proportion to previous years. Of those, 11 sites mentioned in their qualifications² that they were back to full production after the Covid-19 pandemic and therefore had increased their emissions. A further two sites qualified their data that Covid-19 continued to negatively affect their 2021 productivity, and hence, emissions to some degree.² In many cases, as is normal for the main industrial sites, changes to production or throughput were noted.

The overall global warming potential of greenhouse gas emissions from the SEPA-regulated industrial sites which report to SPRI (measured as kilograms of carbon dioxide equivalent (kg CO₂e)) reduced by 5% between 2020 and 2021. This reduction continues the decreasing trend seen since 2007 (emissions in 2021 are around 38% of those in 2007), although since 2016 the rate of decrease has slowed.

Emissions of all six greenhouse gases which are reportable to SPRI are discussed in section 1.3.

¹ Main SPRI sites exclude Marine Fish Farms, Scottish Water, Radioactive Substances and sites which do not report pollutant emissions.

² Note that this information is derived from Qualifications which we do not release at a site level.

1.2 Emissions and Waste transfers for 2021

Emissions

Summary data is provided for all “above reporting threshold” (“ART” – see note below) emissions to air and water in the tables below (and on the accompanying data sheet). This is followed by more detailed information on greenhouse gas emissions data captured within SPRI.

Tables provided below show:

Table 1: Total ART emissions to air by pollutant and industry sector for 2021.

Table 2: Number of sites reporting ART emissions to air, and percentage of total ART emissions released, by industry sector and pollutant for 2021

Table 3: Total ART emissions to water by pollutant and industry sector for 2021.

Table 4: Number of sites reporting ART emissions to water, and percentage of total ART emissions released, by sector and pollutant for 2021

Notes on data provided in this publication:

- All values are in kilograms, with the exceptions of carbon dioxide to air which is given in tonnes (1,000kg) in some figures to simplify reporting.
- Most pollutants in SPRI have a threshold value. If a site’s emission is below this value, they report only “BRT” (Below Reporting Threshold). If emissions are “ART” (Above Reporting Threshold) they must supply us with a value. **Figures for total emissions and number of reporting sites provided in this document are for “ART” submissions only.**
- Percentage figures given to show proportion of total emissions from each industrial sector are rounded so may not total 100.
- Precision of figures. Operators are asked to supply figures to three significant figures. Many provide more precise figures, and we have used these here. For some official reporting we are required to round each individual value to three significant figures which may cause slight discrepancies from the totals reported here.
- There are nine SPRI Industry Sectors, as listed in the tables below. For details of the activities which place a site within those sectors, including the minimum capacity a site must have to be required to report to SPRI, see table 6 and section 3 (*About the Scottish Pollutant Release Inventory*).

Table 1: Total ART emissions to air by pollutant and industry sector for 2021. All values are kg except for carbon dioxide which is in tonnes

Pollutant name	Reporting threshold (kg)	Total Release (kg)	1 - Energy sector	2 - Production and processing of metals	3 - Mineral industry	4 - Chemical industry	5 - Waste and wastewater mgt	6 - Paper and wood production and processing	7 - Intensive livestock production and aquaculture	8 - Animal and vegetable products from the food and beverage sector	9 - Other activities
Ammonia	1,000	924,431			63,259	3,865	18,228	1,752	837,327		
Antimony	1	81.7	2.31		2.02		10.0	67.3			
Arsenic	1	96.1			31.2		3.86	61.1			
Benzene	1,000	96,027	42,056			53,971					
Butadiene	100	43,943	12,696			31,247					
Cadmium	1	37.4			1.30		25.7	10.4			
Carbon dioxide (tonnes)	10,000 t	10,087,976	4,611,914	61,388	715,866	1,488,031	2,031,894	841,390		326,433	11,060
Carbon monoxide	100,000	10,116,853	4,191,009		3,276,460	467,359	1,300,475	762,979		118,571	
Chlorine and total inorganic chlorine compounds - as HCl	10,000	40,915					25,048	15,867			
Chlorofluorocarbons (CFCs)	1	323					323				
Chromium	10	198			16.3		27.5	155			
Copper	10	157			21.7		17.7	118			
Dioxins and furans - as ITEQ	0.00001	0.000272					0.000041	0.000231			
Dioxins and furans - as WHO TEQ	0.00001	0.000229					0.000028	0.000201			
Ethylbenzene	100	551				551					
Fluorine and total inorganic fluorine compounds - as HF	1,000	21,707		20,287	1,420						
Formaldehyde	10	176,361			1,613	39.3		174,709			
Hydrochlorofluorocarbons (HCFCs)	1	199					199				
Hydrofluorocarbons (HFCs)	100	7,646				539				6,952	155

Pollutant name	Reporting threshold (kg)	Total Release (kg)	1 - Energy sector	2 - Production and processing of metals	3 - Mineral industry	4 - Chemical industry	5 - Waste and wastewater mgt	6 - Paper and wood production and processing	7 - Intensive livestock production and aquaculture	8 - Animal and vegetable products from the food and beverage sector	9 - Other activities
Hydrogen chloride	10,000	47,848					47,848				
Lead	100	1,507						1,507			
Manganese	10	191			34.6		122	34.2			
Mercury	1	11					5.25	5.70			
Methane	10,000	23,719,796	2,552,981		22,770	335,396	20,166,150		615,553	26,947	
Methyl chloride	1,000	15,730				15,730					
Methyl chloroform	10	50					50.2				
Methylene chloride	1,000	122,557				122,557					
Naphthalene	100	272			272						
Nickel	10	200	38.0		36.1		116	10.3			
Nitrogen oxides, NO and NO ₂ as NO ₂	100,000	11,858,259	6,727,335		1,255,729	2,076,772	1,002,454	690,307		105,662	
Nitrous oxide	10,000	43,952	43,952								
Non-methane volatile organic compounds (NMVOCs)	10,000	21,306,326	8,866,293		71,973	3,246,588		586,818		8,173,176	361,478
Particulate matter - PM10 and smaller	10,000	690,988	107,440	21,966	324,449	60,155	22,493		154,485		
Particulate matter - total	50,000	423,056				79,355		64,097	279,604		
Particulates - PM2.5 and smaller only	1,000	6,775	3,225		3,550						
Perfluorocarbons (PFCs)	10	4,597		608		3,989					
Phenols - total as C	10	681			681						
Polycyclic aromatic hydrocarbons (PAHs)	1	5.54					5.54				
Selenium	100	301			301						
Styrene	100	454				454					
Sulphur hexafluoride	10	222				222					

Pollutant name	Reporting threshold (kg)	Total Release (kg)	1 - Energy sector	2 - Production and processing of metals	3 - Mineral industry	4 - Chemical industry	5 - Waste and wastewater mgt	6 - Paper and wood production and processing	7 - Intensive livestock production and aquaculture	8 - Animal and vegetable products from the food and beverage sector	9 - Other activities
Sulphur oxides, SO ₂ and SO ₃ as SO ₂	100,000	3,411,682	1,896,644	473,036	1,042,002						
Tetrachloroethane	10	12.0					12.0				
Toluene	100	88,987	53,165			32,918					2,904
Vanadium	10	14.8	14.8								
Xylene - all isomers	1,000	49,223	46,023			3,200					
Zinc	100	143					143				

Table 2: Number of sites reporting ART emissions to air, and percentage of total ART emissions released, by industry sector and pollutant for 2021

Pollutant	Total no of ART sites	1 - Energy sector		2 - Production and processing of metals		3 - Mineral industry		4 - Chemical industry		5 - Waste and wastewater mgt		6 - Paper and wood production and processing		7 - Intensive livestock production and aquaculture		8 - Animal & vegetable products from food and beverage sector		9 - Other activities	
		Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021
Ammonia	117					2	6.8%	1	0.4%	9	2.0%	1	0.2%	104	90.6%				
Antimony	7	1	2.8%			1	2.5%			3	12.3%	2	82.4%						
Arsenic	4					1	32.5%			1	4.0%	2	63.5%						
Benzene	3	1	43.8%					2	56.2%										
Butadiene	4	1	28.9%					3	71.1%										
Cadmium	5					1	3.5%			1	68.7%	3	27.9%						
Carbon dioxide	82	26	45.7%	1	0.6%	6	7.1%	6	14.8%	30	20.1%	6	8.3%			6	3.2%	1	0.1%
Carbon monoxide	29	14	41.4%			1	32.4%	2	4.6%	8	12.9%	3	7.5%			1	1.2%		
Chlorine and total inorganic chlorine compounds - as HCl	2									1	61.2%	1	38.8%						
Chlorofluorocarbons (CFCs)	23									23	100%								
Chromium	5					1	8.2%			1	13.9%	3	78.0%						
Copper	5					1	13.8%			1	11.2%	3	75.0%						
Dioxins and furans - as ITEQ	4									2	15.0%	2	85.0%						
Dioxins and furans - as WHO TEQ	3									1	12.2%	2	87.8%						
Ethylbenzene	1							1	100%										
Fluorine and total inorganic fluorine compounds - as HF	2			1	93.5%	1	6.5%												
Formaldehyde	5					1	0.9%	1	0.0%			3	99.1%						
Hydrochlorofluorocarbons (HCFCs)	19									19	100%								
Hydrofluorocarbons (HFCs)	5							2	7.0%							2	90.9%	1	2.0%
Hydrogen chloride	2									2	100%								
Lead	2											2	100%						
Manganese	4					1	18.1%			2	64.0%	1	17.9%						
Mercury	6									3	47.9%	3	52.1%						
Methane	105	15	10.8%			1	0.1%	3	1.4%	61	85.0%			24	2.6%	1	0.1%		

Pollutant	Total no of ART sites	1 - Energy sector		2 - Production and processing of metals		3 - Mineral industry		4 - Chemical industry		5 - Waste and wastewater mgt		6 - Paper and wood production and processing		7 - Intensive livestock production and aquaculture		8 - Animal & vegetable products from food and beverage sector		9 - Other activities	
		Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021
Methyl chloride	1							1	100%										
Methyl chloroform	2									2	100%								
Methylene chloride	2							2	100%										
Naphthalene	1					1	100%												
Nickel	4	1	19.0%			1	18.0%			1	57.9%	1	5.1%						
Nitrogen oxides, NO and NO ₂ as NO ₂	27	11	56.7%			3	10.6%	4	17.5%	4	8.5%	4	5.8%			1	0.9%		
Nitrous oxide	3	3	100%																
Non-methane volatile organic compounds (NMVOCs)	39	18	41.6%			2	0.3%	8	15.2%			2	2.8%			4	38.4%	5	1.7%
Particulate matter - PM10 and smaller	24	3	15.5%	1	3.2%	9	47.0%	1	8.7%	2	3.3%			8	22.4%				
Particulate matter - total	5							1	18.8%			1	15.2%	3	66.1%				
Particulates - PM2.5 and smaller only	3	1	47.6%			2	52.4%												
Perfluorocarbons (PFCs)	3			1	13.2%			2	86.8%										
Phenols - total as C	1					1	100%												
Polycyclic aromatic hydrocarbons (PAHs)	2									2	100%								
Selenium	1					1	100%												
Styrene	1							1	100%										
Sulphur hexafluoride	2							2	100%										
Sulphur oxides, SO ₂ and SO ₃ as SO ₂	8	4	55.6%	1	13.9%	3	30.5%												
Tetrachloroethane	1									1	100%								
Toluene	7	1	59.7%					4	37.0%									2	3.3%
Vanadium	1	1	100%																
Xylene - all isomers	2	1	93.5%					1	6.5%										
Zinc	1									1	100%								

Table 3: Total ART emissions to water by pollutant and industry sector for 2021. All values are kg.

Pollutant name	Reporting threshold (kg)	Total Release (kg)	1 - Energy sector	4 - Chemical industry	5 - Waste and wastewater mgt	6 - Paper and wood production and processing	7 - Intensive livestock production and aquaculture	8 - Animal and vegetable products from the food and beverage sector	9 - Other activities
Ammonia	20	10,344,323	1,950	107	8,367,495			1,974,771	
Anthracene	0.1	35.9	1.31	0.863	33.8				
Arsenic	5	515	16.7	23.0	475				
Asbestos	0.1	73.9			73.9				
Azamethiphos	0.001	314					314		
Benzene	10	411	285	127					
Benzo (g,h,i) perylene	0.1	9.61		0.107	9.50				
Benzo(a) pyrene	1	1.05			1.05				
Brominated diphenylethers - total as Br	0.1	0.497			0.497				
Cadmium	1	42.4	2.17	7.60	25.7			7.00	
Chlorides - total as Cl	2,000,000	52,450,000		2,590,000	49,860,000				
Chloroform	5	43.5		5.82	37.7				
Chromium	20	430		69.6	245			115	
Copper	20	30,279	83.8	594	6,016		20,158	3,426	
Cyanides - total as CN	50	725			725				
Cypermethrin	0.005	0.314			0.314				
Deltamethrin	0.002	4.43					4.43		
Di(2-ethylhexyl) phthalate	0.1	1,703			1,703				
Diazinon	0.01	0.555			0.555				
Dioxins and furans - as ITEQ	0.0001	0.000708			0.000708				
Dioxins and furans - as WHO TEQ	0.0001	0.000708			0.000708				
Diuron	0.05	5.71			5.71				
Emamectin benzoate	0.001	42.2					42.2		
Ethylbenzene	10	31.6	31.6						

Pollutant name	Reporting threshold (kg)	Total Release (kg)	1 - Energy sector	4 - Chemical industry	5 - Waste and wastewater mgt	6 - Paper and wood production and processing	7 - Intensive livestock production and aquaculture	8 - Animal and vegetable products from the food and beverage sector	9 - Other activities
Fluoranthene	0.1	8.73		3.06	5.67				
Fluorides - total as F	2,000	174,300			174,300				
Halogenated organic compounds - total as AOX	1,000	82,060			82,060				
Hexachlorocyclohexane - all isomers	0.01	1.96			1.96				
Iron	1,000	409,124	2,044		407,080				
Isoproturon	0.01	0.18			0.18				
Lead	20	729	20.7		708				
Lindane	0.1	1.40			1.40				
Manganese	200	560						560	
Mercury	0.1	11.8	0.387	0.722	10.4			0.256	
Methylene chloride	10	44.6		44.6					
Naphthalene	1	989		10.3	978				
Nickel	20	5,607		131	4,270			1,206	
Nitrogen - total as N	50,000	31,942,415		145,000	16,876,951		10,679,857	4,240,607	
Nonylphenol ethoxylates	1	3,492			3,492				
Nonylphenols	1	557			557				
Nonyphenol and nonylphenol ethoxylates	1	2,348			2,348				
Octylphenol and octylphenol ethoxylates	1	4.67			4.67				
Octylphenols	1	4.67			4.67				
Organic tin compounds - total as Sn	5	6.47			6.47				
Permethrin	0.001	2.41			2.41				
Phenols - total as C	20	3,254	1,800	1,333	96.6			24.2	
Phosphorus - total as P	5,000	4,200,035		27,714	1,866,350		1,667,521	638,450	

Pollutant name	Reporting threshold (kg)	Total Release (kg)	1 - Energy sector	4 - Chemical industry	5 - Waste and wastewater mgt	6 - Paper and wood production and processing	7 - Intensive livestock production and aquaculture	8 - Animal and vegetable products from the food and beverage sector	9 - Other activities
Polychlorinated biphenyls	0.001	0.443			0.443				
Polycyclic aromatic hydrocarbons (PAHs)	1	67.8			67.8				
Toluene	10	311	262	48.8					
Total organic carbon or COD/3	50,000	69,908,376	66,300	1,257,370	9,964,800	204,301	41,286,956	17,128,649	
Tributyltin compounds	0.005	0.53			0.53				
Xylene - all isomers	10	224	195	29.4					
Zinc	100	70,855		732	29,733		34,093	6,297	

Table 4: Number of sites reporting ART emissions to water, and percentage of total ART emissions released, by sector and pollutant for 2021

Pollutant	Total no of ART sites	1 - Energy sector		4 - Chemical industry		5 - Waste and wastewater mgt		6 - Paper and wood production and processing		7 - Intensive livestock production and aquaculture		8 - Animal and vegetable products from the food and beverage sector		9 - Other activities	
		Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021
Ammonia	77	1	0.0%	2	0.0%	73	80.9%					1	19.1%		
Anthracene	53	1	3.6%	1	2.4%	51	94.0%								
Arsenic	27	2	3.2%	1	4.5%	24	92.3%								
Asbestos	73					73	100%								
Azamethiphos	96									96	100%				
Benzene	5	3	69.2%	2	30.8%										
Benzo (g,h,i) perylene	26			1	1.1%	25	98.9%								
Benzo(a) pyrene	1					1	100%								
Brominated diphenylethers - total as Br	3					3	100%								
Cadmium	15	1	5.1%	2	17.9%	11	60.5%					1	16.5%		
Chlorides - total as Cl	11			1	4.9%	10	95.1%								
Chloroform	4			1	13.4%	3	86.6%								
Chromium	5			1	16.2%	3	57.0%					1	26.8%		
Copper	142	1	0.3%	2	2.0%	58	19.9%			79	66.6%	2	11.3%		
Cyanides - total as CN	8					8	100%								
Cypermethrin	11					11	100%								
Deltamethrin	37									37	100%				
Di(2-ethylhexyl) phthalate	73					73	100%								
Diazinon	13					13	100%								
Dioxins and furans - as ITEQ	4					4	100%								
Dioxins and furans - as WHO TEQ	4					4	100%								
Diuron	25					25	100%								
Emamectin benzoate	100									100	100%				
Ethylbenzene	2	2	100%												

Pollutant	Total no of ART sites	1 - Energy sector		4 - Chemical industry		5 - Waste and wastewater mgt		6 - Paper and wood production and processing		7 - Intensive livestock production and aquaculture		8 - Animal and vegetable products from the food and beverage sector		9 - Other activities	
		Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021
Fluoranthene	22			2	35.1%	20	64.9%								
Fluorides - total as F	25					25	100%								
Halogenated organic compounds - total as AOX	25					25	100%								
Hexachlorocyclohexane - all isomers	15					15	100%								
Iron	49	1	0.5%			48	99.5%								
Isoproturon	8					8	100%								
Lead	12	1	2.8%			11	97.2%								
Lindane	3					3	100%								
Manganese	1											1	100%		
Mercury	32	2	3.3%	1	6.1%	28	88.4%					1	2.2%		
Methylene chloride	1			1	100%										
Naphthalene	74			1	1.0%	73	99.0%								
Nickel	41			1	2.3%	39	76.2%					1	21.5%		
Nitrogen - total as N	173			1	0.5%	51	52.8%			119	33.4%	2	13.3%		
Nonylphenol ethoxylates	73					73	100%								
Nonylphenols	68					68	100%								
Nonyphenol and nonylphenol ethoxylates	73					73	100%								
Octylphenol and octylphenol ethoxylates	3					3	100%								
Octylphenols	3					3	100%								
Organic tin compounds - total as Sn	1					1	100%								
Permethrin	22					22	100%								
Phenols - total as C	9	3	55.3%	2	41.0%	3	3.0%					1	0.7%		
Phosphorus - total as P	203			1	0.7%	50	44.4%			150	39.7%	2	15.2%		

Pollutant	Total no of ART sites	1 - Energy sector		4 - Chemical industry		5 - Waste and wastewater mgt		6 - Paper and wood production and processing		7 - Intensive livestock production and aquaculture		8 - Animal and vegetable products from the food and beverage sector		9 - Other activities	
		Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021	Sites	% of 2021
Polychlorinated biphenyls	22					22	100%								
Polycyclic aromatic hydrocarbons (PAHs)	22					22	100%								
Toluene	6	4	84.3%	2	15.7%										
Total organic carbon or COD/3	225	1	0.1%	3	1.8%	34	14.3%	1	0.3%	183	59.1%	3	24.5%		
Tributyltin compounds	26					26	100%								
Xylene - all isomers	5	4	86.9%	1	13.1%										
Zinc	206			1	1.0%	53	42.0%			150	48.1%	2	8.9%		

Waste transfers

Table 5: Offsite waste transfers by industry sector and type for 2021. All values are tonnes.

Industry sector	Hazardous Waste		Non-hazardous Waste	
	Disposal	Recovery	Disposal	Recovery
1 - Energy sector	3,966	4,196	3,206	7,805
2 - Production and processing of metals	2,841	1,644	171	5,304
3 - Mineral industry	524	34	14	3,868
4 - Chemical industry	246,554	57,436	9,088	15,377
6 - Paper and wood production and processing	1,090	7,337	6,919	28,174
7 - Intensive livestock production and aquaculture			4,308	61,209
8 - Animal and vegetable products from the food and beverage sector	4,375	30	64,965	80,477
9 - Other activities	351	1,275	6,603	15,197
Total	259,701	71,952	95,274	217,411

Notes:

1. Excludes waste transferred by industry sector 5 - *Waste and wastewater management*, as this is reported elsewhere. <https://www.sepa.org.uk/environment/waste/waste-data/waste-data-reporting/waste-data-for-scotland/>
2. The thresholds for reporting offsite waste transfers are 2 tonnes for hazardous and 2,000 tonnes for non-hazardous. No “BRT” report is necessary as it is assumed all sites will produce some waste.
3. “Disposal” and “Recovery” mean any of the operations provided for in Annex IIA and Annex IIB of [EU Waste Directive 2006/12/EC](#)

1.3 Greenhouse gas emissions

Emissions of four individual greenhouse gases, and two groups of greenhouse gases are reportable to SPRI.

Three of these are “Fluorinated greenhouse gases” or “F-gases”; a family of chemicals that contain fluorine which are also powerful greenhouse gases that contribute to climate change. The EU has regulation on the use of F-gases like hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆). Note that the Kyoto “basket” of greenhouse gases includes nitrogen trifluoride (an F-gas) which is not reportable to SPRI.

Individual gases	Carbon dioxide	
	Methane	
	Nitrous oxide	
	Sulphur hexafluoride	F-gas
Groups of gases	Hydrofluorocarbons (HFCs)	F-gas
	Perfluorocarbons (PFCs)	F-gas

Global warming potential: a note on the use of “carbon dioxide equivalent” (CO₂e) mass

The Intergovernmental Panel on Climate Change (IPCC) explains Global Warming Potentials as: “Global Warming Potentials (GWP) are calculated as the ratio of the radiative forcing of one kilogramme greenhouse gas emitted to the atmosphere to that from one kilogramme CO₂ over a period of time.”³

³ 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Available at: <https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/>

The GWP values used in this publication are taken from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) over a 100-year period (in line with the approach taken for UK inventory/national reporting purposes).⁴

The GWPs used for the individual greenhouse gases are:

Greenhouse gas	Lifetime (years)	100 years GWP (AR4)
Carbon dioxide	50-200	1
Methane	12	25
Nitrous oxide	114	298
Sulphur hexafluoride	3200	22,800

For grouped gases:

It is currently not possible for us to reliably convert these to carbon dioxide equivalent (CO₂e) values as we do not formally collect information identifying individual species of hydrofluorocarbons and perfluorocarbons. However, to provide an illustration of the scale of these emissions in the context of SPRI total greenhouse gas releases, figures 1 and 2 use a worst-case scenario value for each group.

- For hydrofluorocarbons, we have used the value for **HFC-23 (100 years GWP (AR4) = 14,800)** as the largest in the IPCC set. The smallest value for an HFC in this set is 12. In reality, most HFC releases are known to be of refrigerants and the gases most commonly specifically identified to SPRI have GWPs of between 1,000 and 4,000.
- For perfluorocarbons, we have used the value for **PFC-116 (100 years GWP (AR4) = 12,200)** as the largest in the IPCC set. The smallest value for a PFC in this set is 7,390. We have very limited information on the species of PFC released from SPRI sites.

SPRI provides information on greenhouse gas emissions from industrial sites only. The Scottish Greenhouse Gas Inventory⁵ is the key tool for understanding the origins and magnitudes of greenhouse gas emissions in Scotland.

Long term view of global warming potential of SPRI releases

Figures 1 and 2 show the global warming potential of total emissions from SPRI since 2007 (when the current regulations which our core reporting is based on came into force). Note that even when the worst-case scenario of hydrofluorocarbon and perfluorocarbon values are used, they form a very small part of the overall total.

Figure 1: Global warming potential of greenhouse gases reported to SPRI since 2007 (kg CO₂e)

⁴ AR4 Climate Change 2007: The Physical Science Basis. Available at: <https://www.ipcc.ch/report/ar4/wg1/>

⁵ [Scottish Greenhouse Gas Statistics 2020 - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/scottish-greenhouse-gas-statistics-2020/pages/introduction.aspx)

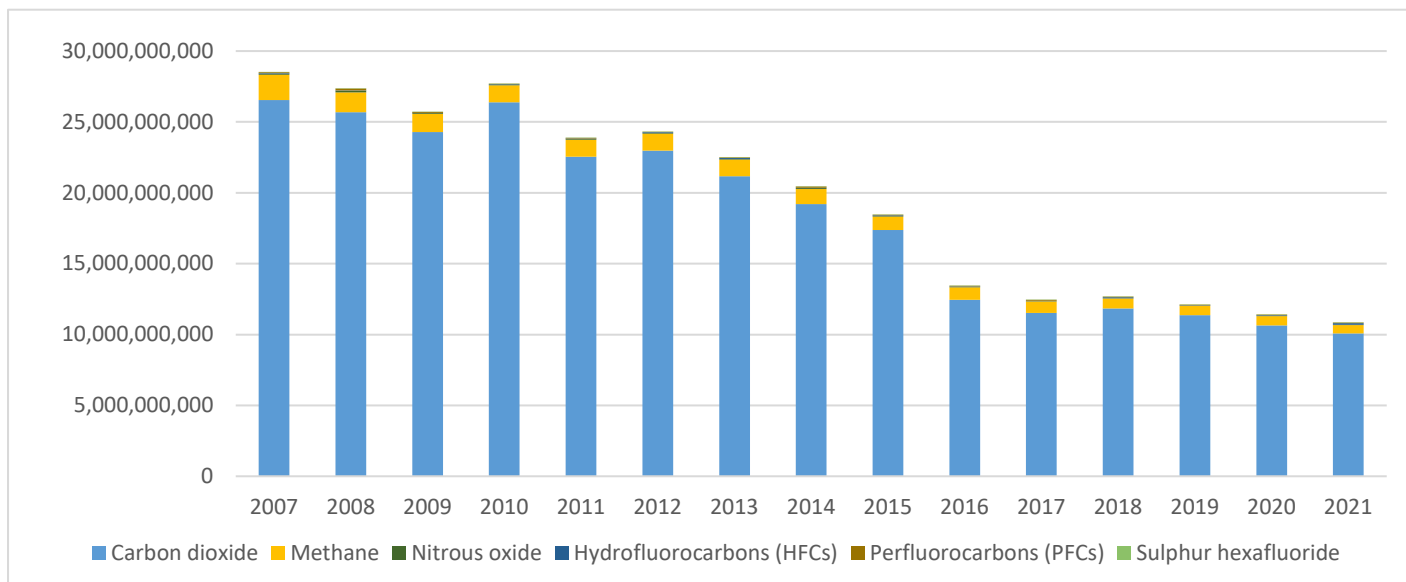
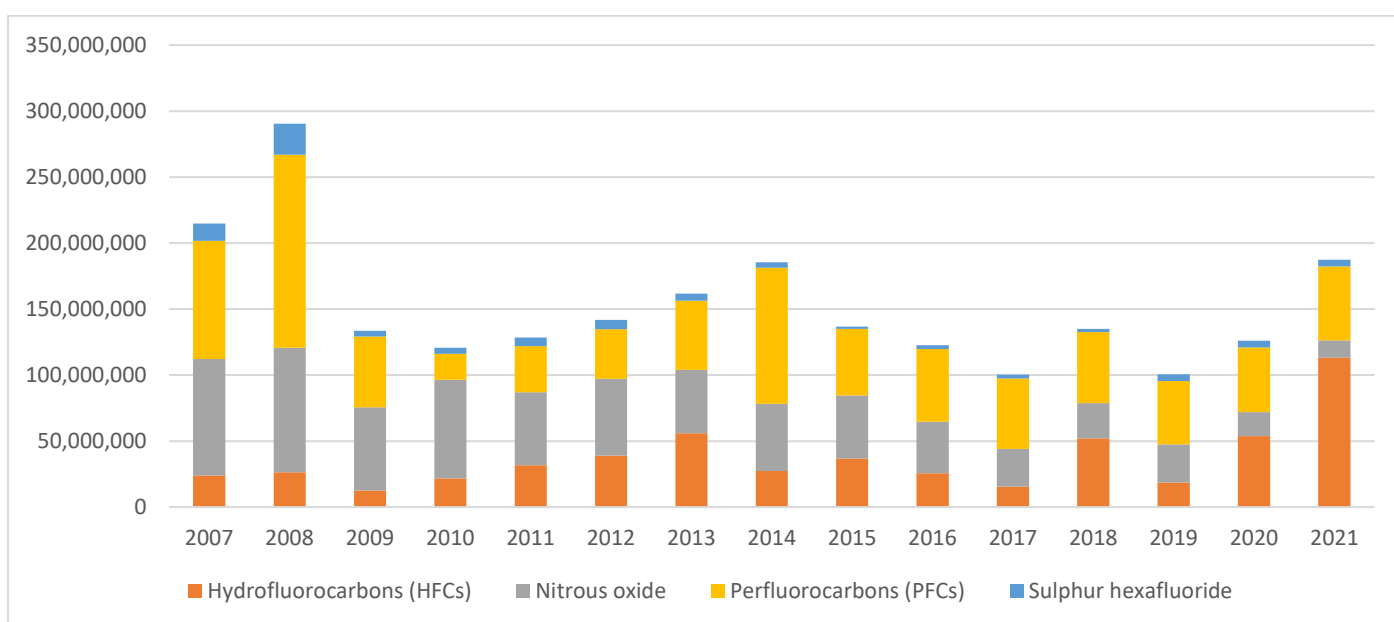


Figure 2: Global warming potential of greenhouse gases reported to SPRI since 2007 (kg CO₂e), excluding carbon dioxide and methane, to show relative scale of minor gases. Note that HFCs and PFCs use worst-case values.

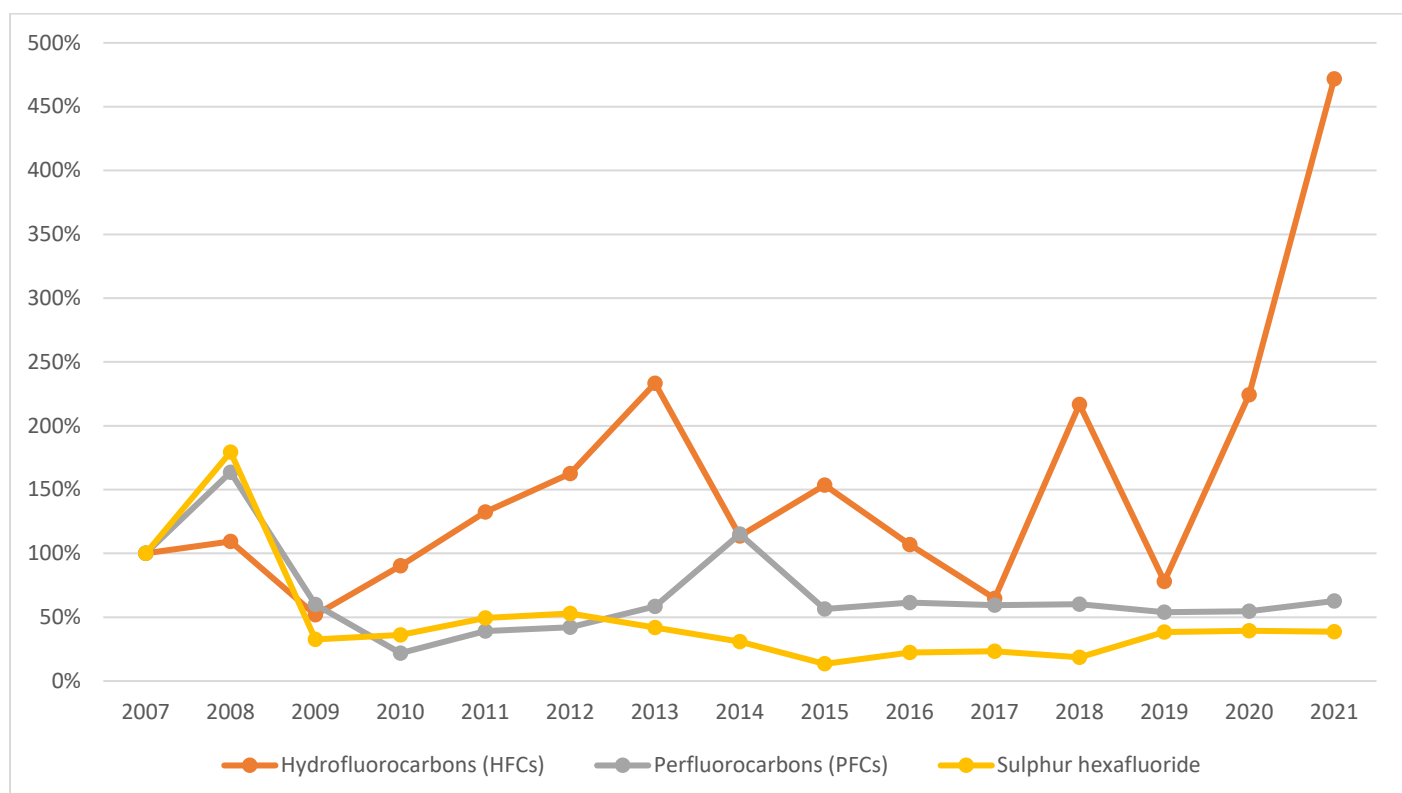
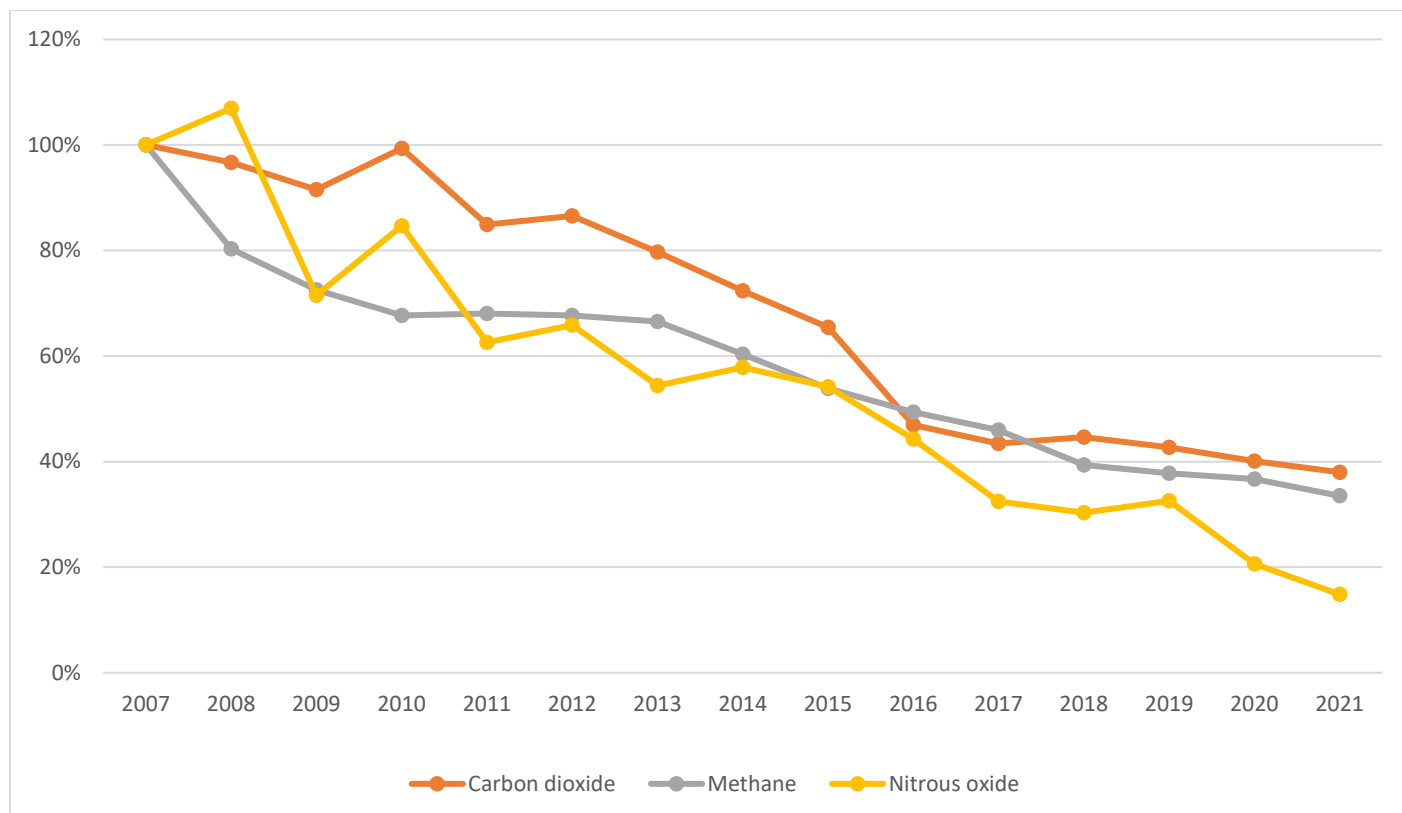


Long term trends in greenhouse gas emissions

Carbon dioxide, methane and nitrous oxide emissions continue to follow a downward trend, although less pronounced than in the period from 2007 to 2016.

Hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride do not follow this clear downward trend. For hydrofluorocarbons, this is partly because emissions are generally unplanned losses of refrigerant from chiller systems, from a relatively small number of sites. Perfluorocarbons and sulphur hexafluoride are now only reported from four sites in Scotland, and the biggest emissions for both come from one site which tends to be highly consistent between years. Two sites that reported unplanned losses in 2021 have switched away from using HFCs since then.

Figures 3 and 4: Annual SPRI Greenhouse gas emissions normalised against 2007 values



Short term variations in greenhouse gas emissions

Figure 5 shows the global warming potential of emissions by industry sector for 2020 and 2021, using the worst-case scenarios for hydrofluorocarbons and perfluorocarbons as described above. For reference, absolute figures for the three F-gases are provided in figure 6.

Figure 5: Global warming potential of greenhouse gases reported to SPRI by industry sector for 2020 and 2021 (kg CO₂e)

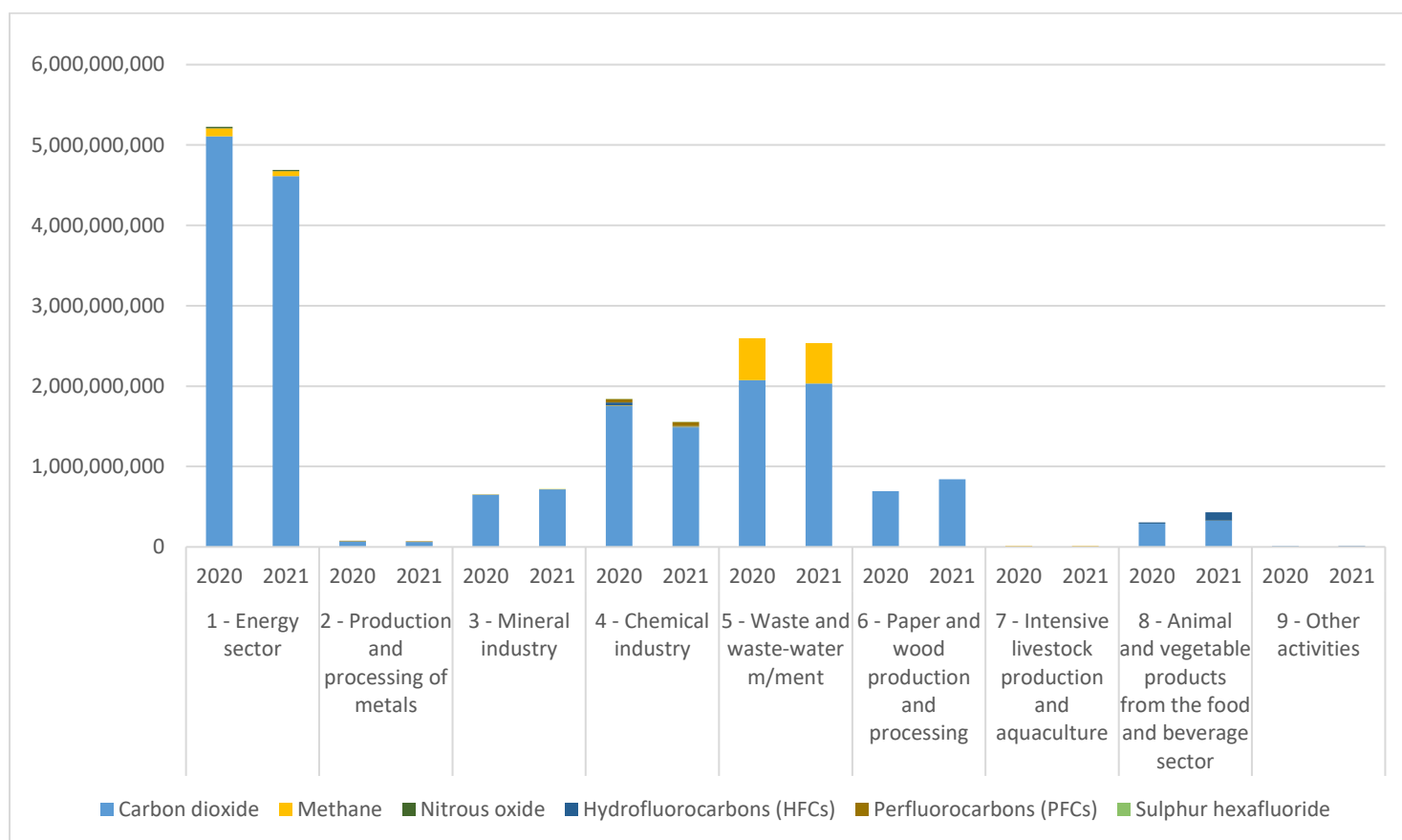
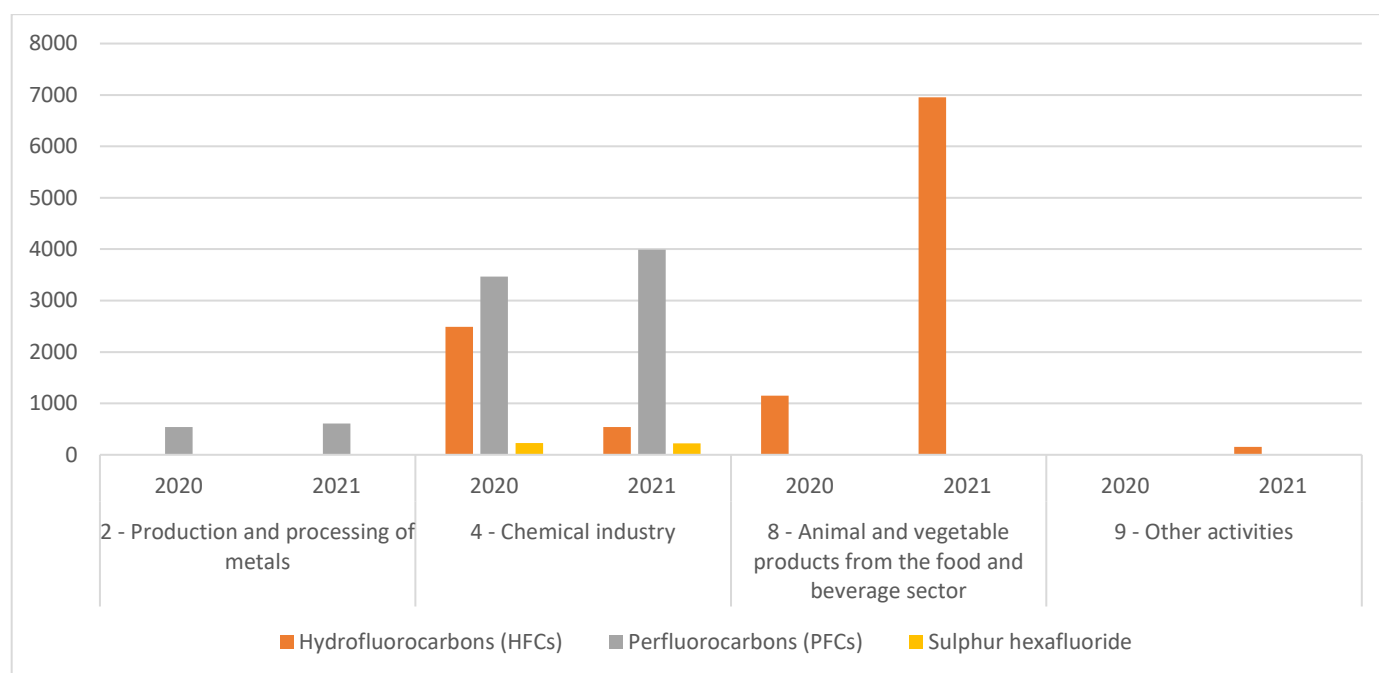


Figure 6: Emissions of F-gases reported to SPRI by industry sector for 2020 and 2021 (kg)



Notes on year to year variation in greenhouse gas emissions

Carbon dioxide	Total releases show a 5% reduction from 2020. This figure hides a large amount of variability: of the top ten sites, three reported increases of more than 10% and four reported decreases of more than 10%. Overall, the top ten sites decreased emissions by 10%. The 6 - <i>Paper</i> and wood production and processing sector reported an increase as four of the six sites increased their releases compared to 2020 and the other two remained steady. Generally, the increases were due to increased productivity. The 1 – <i>Energy sector</i> reported a 10% decrease in emissions. Of the nine large sites (over 100,000,000kg release), five reported significant reductions, three were within 10% of their 2020 value and one increased by 20%. Each operator cited a different reason for their reduced emissions. The 8 - <i>Animal and vegetable products from the food and beverage sector</i> had an increase of 13% mostly down to one site that has now fully commissioned a new combined heat and power plant. Also, one site reported above the reporting threshold for the first time due to increased productivity.
Methane	Total releases have remained largely static between 2020 and 2021, with a 3% reduction from 2020. Emissions from sites reporting under 5(d) Landfills (excluding landfills of inert waste) make up 83% of 2021's total methane emission.
Nitrous oxide	Three sites reported above the threshold in 2021; all of these reported reduced emissions in 2021, and one other site dropped below the threshold. Most of the decrease in total emissions is due to reduced output and variations around the reporting threshold. All sites are in the Energy sector.
Hydrofluorocarbons (HFCs)	Most reported emissions of HFCs are accidental. In 2021, one site reported a large and significant accidental release. As a result, there is a significant increase in the total emissions from 2020. Three other sites also reported emissions above the threshold as accidental releases.
Perfluorocarbons(PFCs)	The same three sites reported in 2020 and 2021. Overall PFCs have increased by 15% mostly due to increased productivity.
Sulphur hexafluoride	The same two sites reported in 2020 and 2021 with a 2% decrease form 2020.

1.4 SPRI reporting data

SPRI sites by Activity code

The SPRI activity code reflects the activity or activities permitted to take place on a site as specified in the site authorisation. The codes allow Scottish sites to be compared to European sites by providing a common system of categorising industrial activities. The codes are largely the same as those listed in the European Pollutant Release and Transfer Register Regulation⁶.

Note that when we refer to “Industry sectors” we mean the top-level Activity code (e.g., Industry sector 1 is Energy).

Table 6: Number of sites required to report to SPRI in 2021 under each Activity code (including sub-codes)

Code	Activity	Capacity Threshold	Operator submits return	Waste system transfer
1	Energy sector			46
1(a)	Mineral oil and gas refineries	*	15	
1(b)	Installations for gasification and liquefaction	*	2	
1(c)	Thermal power stations and other combustion installations	With a heat input of 50 megawatts (MW)	29	
2	Production and processing of metals			15
2(c).i	Hot-rolling mills	With a capacity of 20 tonnes of crude steel per hour	1	
2(c).ii	Smitheries with hammers	With an energy of 50 kilojoules per hammer, where the calorific power used exceeds 20 MW	1	
2(d)	Ferrous metal foundries	With a production capacity of 20 tonnes per day	1	
2(e).i	For the production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes	*	2	
2(e).ii	For the smelting, including the alloying, of non-ferrous metals, including recovered products (refining, foundry casting, etc.)	With a melting capacity of 4 tonnes per day for lead and cadmium or 20 tonnes per day for all other metals	2	
2(f)	Installations for surface treatment of metals and plastic materials using an electrolytic or chemical process	Where the volume of the treatment vats equals 30m ³	8	
3	Mineral industry			25
3(a)	Underground mining and related operations	*	1	
3(b)	Opencast mining	Where the surface of the area being mined equals 25 hectares	19	
3(c).i	Cement clinker in rotary kilns	With a production capacity of 500 tonnes per day	1	
3(e)	Installations for the manufacture of glass, including glass fibre	With a melting capacity of 20 tonnes per day	3	
3(g)	Installations for the manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain	With a production capacity of 75 tonnes per day, or with a kiln capacity of 4m ³ and with a setting density per kiln of 300 kg/m ³	1	
4	Chemical industry			35
4(a)	Chemical installations for the production on an industrial scale of basic organic chemicals, such as:	*	1	
4(a).i	Simple hydrocarbons (linear or cyclic, saturated or unsaturated, aliphatic or aromatic)	*	5	

⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32006R0166&from=EN#d1e32-12-1>

Code	Activity	Capacity Threshold	Operator submits return	Waste system transfer
4(a).ii	Oxygen-containing hydrocarbons such as alcohols, aldehydes, ketones, carboxylic acids, esters, acetates, ethers, peroxides, epoxy resins	*	3	
4(a).ix	Synthetic rubbers	*	1	
4(a).viii	Basic plastic materials (polymers, synthetic fibres and cellulose-based fibres)	*	1	
4(a).x	Dyes and pigments	*	1	
4(b).i	Gases, such as ammonia, chlorine or hydrogen chloride, fluorine or hydrogen fluoride, carbon oxides, sulphur compounds, nitrogen oxides, hydrogen, sulphur dioxide, carbonyl chloride	*	6	
4(b).ii	Acids, such as chromic acid, hydrofluoric acid, phosphoric acid, nitric acid, hydrochloric acid, sulphuric acid, oleum, sulphurous acids	*	2	
4(b).iv	Salts, such as ammonium chloride, potassium chlorate, potassium carbonate, sodium carbonate, perborate, silver nitrate	*	2	
4(b).v	Non-metals, metal oxides or other inorganic compounds such as calcium carbide, silicon, silicon carbide	*	4	
4(d)	Chemical installations for the production on an industrial scale of basic plant health products and of biocides	*	2	
4(e)	Installations using a chemical or biological process for the production on an industrial scale of basic pharmaceutical products	*	6	
4(f)	Installations for the production on an industrial scale of explosives and pyrotechnic products	*	1	
5	Waste and wastewater management		515	
5(a)	Installations for the recovery or disposal of hazardous waste.	Receiving 10 tonnes per day	47	18
5(b)	Installations for the incineration of municipal waste	With a capacity of 3 tonnes per hour	16	
5(c)	Installations for the disposal of non-hazardous waste	With a capacity of 50 tonnes per day	17	257
5(d)	Landfills (excluding landfills of inert waste)	Receiving 10 tonnes per day or with a total capacity of 25,000 tonnes	75	
5(d).i	Landfills (inert waste)	Receiving 10 tonnes per day or with a total capacity of 25,000 tonnes	1	
5(e)	Installations for the disposal or recycling of animal carcasses and animal waste	With a treatment capacity of 10 tonnes per day	7	1
5(f).i	Municipal wastewater treatment plants	With a capacity below 100,000 population equivalent	59	
5(f).ii	Municipal wastewater treatment plants	With a capacity of 100,000 population equivalent	14	
5(g)	Independently operated industrial wastewater treatment plants which serve one or more activities of this list	With a capacity of 10,000m ³ per day	1	
5(h).v	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.	2	
6	Paper and wood production and processing		36	
6(a)	Industrial plants for the production of pulp from timber or similar fibrous materials	*	1	

Code	Activity	Capacity Threshold	Operator submits return	Waste system transfer
6(b)	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	8	
6(c)	Industrial plants for the preservation of wood and wood products with chemicals	With a production capacity of 50m3 per day	26	
7	Intensive livestock production and aquaculture		486	
7(a).i	Installations for the intensive rearing of poultry	With 40,000 places for poultry	95	
7(a).ii	Installations for the intensive rearing of pigs	With 2,000 places for production pigs (over 30 kg)	14	
7(a).iii	Installations for the intensive rearing of pigs	With 750 places for sows	2	
7(b).i	Intensive aquaculture	Not exceeding 1,000 tonnes of fish and shellfish per year	159	
7(b).ii	Intensive aquaculture	With 1,000 tonnes of fish and shellfish per year	216	
8	Animal and vegetable products from the food and beverage sector		57	
8(a)	Slaughterhouses	With a carcass production capacity of 50 tonnes per day	18	
8(b).i	(i) Animal raw materials (other than milk)	With a finished product production capacity of 75 tonnes per day	14	
8(b).ii	(ii) Vegetable raw materials	With a finished product production capacity of 300 tonnes per day (average value on a quarterly basis)	20	
8(c)	Treatment and processing of milk	With a capacity to receive 200 tonnes of milk or more per day (average value on an annual basis)	5	
9	Other activities		20	
9(a)	Plants for the pre-treatment (operations such as washing, bleaching, mercerization) or dyeing of fibres or textiles	With a treatment capacity of 10 tonnes per day	2	
9(b)	Plants for the tanning of hides and skins	With a treatment capacity of 12 tonnes of finished product per day	3	
9(c)	Installations for the surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating	With a consumption capacity of 150 kg per hour or 200 tonnes per year	12	
9(e)	Installations for the building of, and painting or removal of paint from ships	With a capacity for ships 100m long	3	
10	Radioactive Substances sites		70	
10(a)	All nuclear installations (including plants undergoing decommissioning) and all non-nuclear installations holding authorisation for air, water and waste water releases: Radioactive substances activity – nuclear		5	
10(b)	All nuclear installations (including plants undergoing decommissioning) and all non-nuclear installations holding authorisation for air, water and waste water releases: Radioactive substances activity – non- nuclear		64	
Total sites required to report to SPRI in 2020			1303	

As the table shows, a set of sites which have an activity of waste handling (under industry sector 5 - *Waste and wastewater management*) have SPRI data taken from their Waste Licensed Site Return data submission. These sites do not release pollutants, so the data is only for waste, and is provided as a condition of their Licence.

Excluding these waste sites, 30 sites did not submit SPRI returns for 2021. All are non-operational and the majority are either in administration or abandoned. We would not expect any to release pollutants from these processes, but disused waste sites may potentially still have emissions, although not at a level which would significantly affect pollutant totals for 2021.

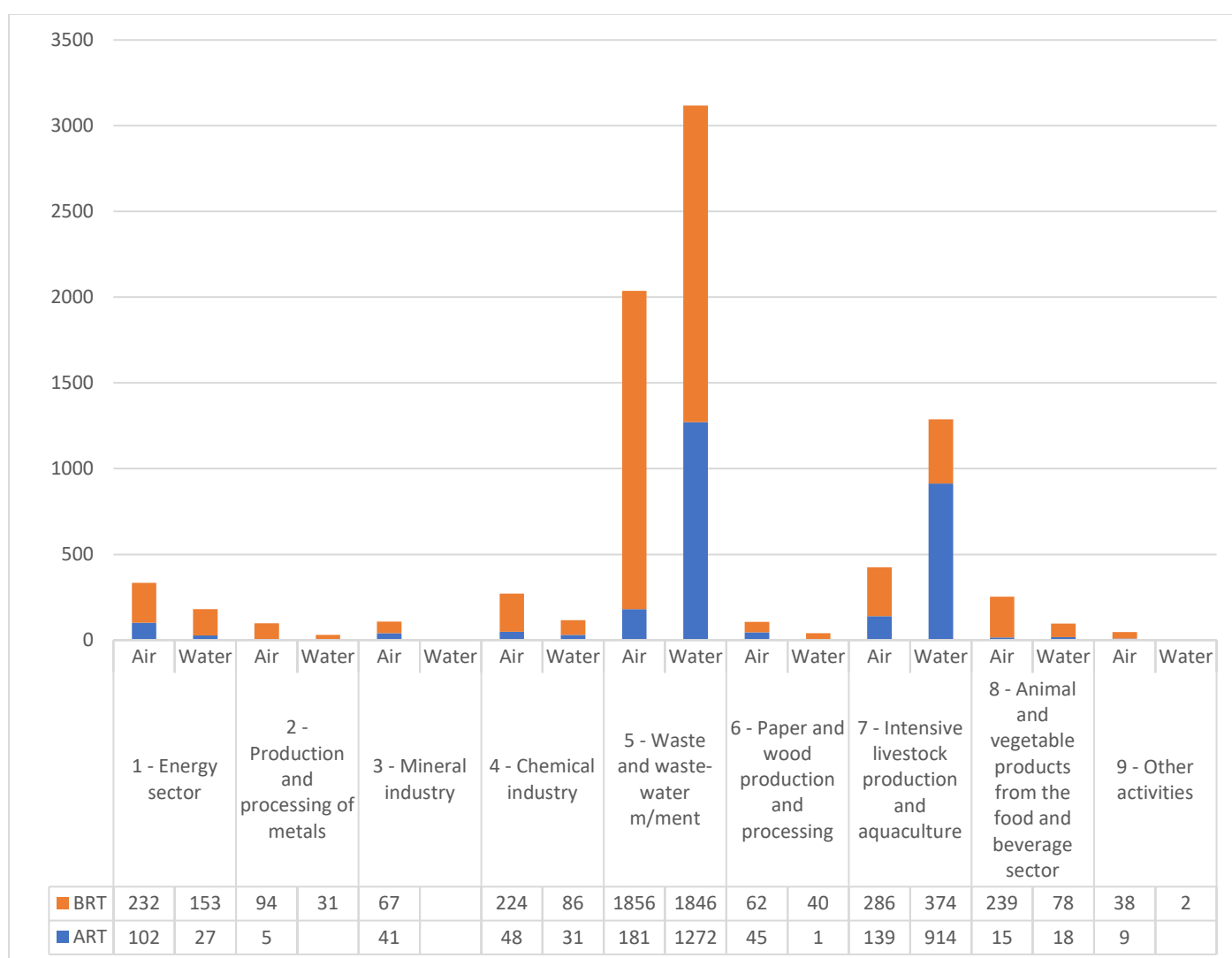
Pollutants reported by Activity code

As noted above, the quantitative figures provided in this statistical release include only those reports of pollutants at levels above reporting thresholds (ART). SPRI also requires all sites to report where they do emit a pollutant but at a level below reporting thresholds (BRT), and there may be substantial numbers of these unquantified minor releases.

The graph shows the total number of individual pollutant releases reported by each industry sector, identified as either ART or BRT. For example, Energy sector sites reported 334 individual emissions to air, of which 102 were ART. (Tables 2 and 4 show more detail on the numbers of sites reporting each pollutant at ART).

A full breakdown by pollutant is included in the accompanying datasheet.

Figure 7: Number of individually-reported emissions to air and water at above and below reporting thresholds in each industry area for 2021



2. Scope of this statistical release

We have focussed on the emissions of pollutants to the environment and on offsite waste transfers from non-waste sites, as these are the areas where SEPA receives the most enquiries, and where SPRI provides data which is both significant and unavailable elsewhere. We have not included data on the areas below but all are available on Scotland's Environment Web:

- radioactive substances
- releases to wastewater
- offsite waste transfers from waste sector sites

2.1 User statement

SPRI provides the Scottish part of the UK Pollutant Release and Transfer Register (PRTR). The UK is a Party to the UN Kiev Protocol on Pollutant Release and Transfer Registers⁷ which aims 'to enhance public access to information through the establishment of coherent, nationwide PRTRs'. The Protocol requires Parties to provide information on pollution sources to members of the public. See [Section 3](#) for more details.

SPRI data are also used to fulfil various other reporting requirements and obligations including those of the UK National Atmospheric Emissions Inventory (NAEI)⁸, and the UK Greenhouse Gas Inventory, which fulfills the UN Kyoto Framework Convention on Climate Change (UNFCCC)⁹. Other obligatory uses are the OSPAR Convention¹⁰ and Scotland's Marine Atlas¹¹.

The data are also used by central government, researchers and the general public.

2.2 Feedback

We welcome feedback on this publication and the data from all users including information on how and why the data are used. This helps us to understand the value of the statistics to external users. Please see our contact details at the bottom of the first page of this notice.

⁷ <https://unece.org/env/pp/protocol-on-prtrs-introduction>

⁸ <https://naei.beis.gov.uk/>

⁹ <https://unfccc.int/process-and-meetings/the-convention/what-is-the-united-nations-framework-convention-on-climate-change>

¹⁰ <https://www.ospar.org/>

¹¹ <http://marine.gov.scot/data-source-types/scotlands-marine-atlas>

2.3 Revisions

SEPA will provide information about any revisions made to published information in this statistics release and the associated datasets. Revisions could occur for various reasons, including when data from third parties is unavailable or provisional at the time of publishing or if there are subsequent methodological improvements or refinements. Requests for revisions may be made by SEPA or by Operators.

Note that revisions to individual returns may occur throughout the year. The revision process requires similar Quality Assurance checks to those carried out on annual data submissions and the return may be unavailable during this period.

Data available on Scotland's Environment Web¹² updates annually and will include all significant revisions to previous years. Where necessary, PRTR data revisions will be resupplied to Defra to allow the UK-PRTR to be updated.

Table 7: Revisions to historic SPRI pollutant emission data since last publication (all values are kg)

Site name	Dataset year	Pollutant	Medium	Mass (kg)	
				original	updated
Newton Toll Landfill Site, Elgin	2020	Carbon dioxide	Air	NA	BRT
Newton Toll Landfill Site, Elgin	2020	Methane	Air	NA	BRT
Flotta Terminal, Orkney	2020	Benzo(a) pyrene	Air	NA	BRT
Flotta Terminal, Orkney	2020	Carbon monoxide	Air	289,273	126,279
Flotta Terminal, Orkney	2020	Methane	Air	39,198	24,221
Flotta Terminal, Orkney	2020	Nitrogen oxides, NO and NO ₂ as NO ₂	Air	364,700	203,083
Flotta Terminal, Orkney	2020	Nitrous oxide	Air	12,497	6,737
Head of Work STW, St Ola, Orkney	2020	Permethrin	Water	BRT	0.002497
Head of Work STW, St Ola, Orkney	2020	Polychlorinated biphenyls	Water	BRT	0.0015
Meadowhead Sewage Treatment Works, Irvine	2020	Methane	Air	17,000	14,000
Barkip Anaerobic Digestion Plant	2020	Methane	Air	unsubmitted	BRT
INEOS Chemicals Grangemouth	2020	Carbon monoxide	Air	1,665,312	370,435

Table 8: Revisions to historic SPRI waste data since last publication (all values are tonnes)

Site name	Dataset year	Waste type	Recovery or disposal	Mass (tonnes)	
				original	new
PX Limited, St Fergus Gas Terminal, Aberdeen	2020	Hazardous	Disposal	12	3.94
PX Limited, St Fergus Gas Terminal, Aberdeen	2020	Hazardous	Recovery	12.11	20.231
Peterhead STW, Burnhaven, Peterhead	2020	Non-Hazardous	Recovery	5653.06	5656.1
Dounreay, Caithness	2020	Hazardous	Recovery	0	3.54
Dounreay, Caithness	2020	Hazardous	Disposal	0	1.98
Flotta Terminal, Orkney	2020	Hazardous	Disposal	0	14.5
Nigg Oil Terminal, Tain, Ross-shire	2020	Hazardous	Disposal	0	21.99
Nigg Oil Terminal, Tain, Ross-shire	2020	Hazardous	Recovery	0	468

¹² <https://informatics.sepa.org.uk/SPRI/>

2.4 Release

The release of this publication is in line with practices specified in the Code of Practice for Official Statistics. The statistics are released at the standard time of 9.30 am on a preannounced weekday date. Pre-release access to the statistics in their final form is provided to Scottish Ministers and those on a list of named officials advising them five working days before the public release. This is to ensure that at the time of release Scottish Ministers are able to comment publicly on the statistics based on a correct understanding of them.

3. About the Scottish Pollutant Release Inventory

3.1 What is the Scottish Pollutant Release Inventory?

The SPRI is a Pollutant Release and Transfer Register (PRTR) and has the primary purpose of making publicly available officially reported annual releases of specified pollutants to air and water from SEPA-regulated industrial facilities. It also provides information on offsite transfers of waste and wastewater from these facilities.

The SPRI data is collected, quality assured and made public under the requirements of Freedom of Information and can be compared with PRTR information from other countries. SPRI datasets from 2002 to the present year (except 2003) are available and reported annually.

A full list of the pollutants whose emissions must be reported can be found on the SPRI Schedule¹³, which is updated annually. SPRI pollutants are substances considered to be environmentally significant and of interest to the public.

3.2 Who reports?

Operators of sites carrying out specific activities (67 activities covering 10 major sectors) above defined capacity thresholds are obliged to report to SPRI on an annual basis. The activities and their thresholds are largely determined by European reporting requirements but some activity thresholds have been lowered so more Scottish sites are included.

Below is a brief summary of the SPRI activities and thresholds:

- Most Part A processes defined in the Pollution Prevention and Control (Scotland) Regulations 2012 (as amended), together with any directly associated activities. These are the bigger industrial activities covering the energy, mineral, metal, chemical, waste management, food and drink, paper and pulp and intensive agricultural sectors;
- Municipal sewage treatment works with a design population equivalent of >15,000 population equivalent (where population equivalent has the meaning given in the Urban Wastewater Treatment (Scotland) Regulations (UWWTR);
- All industrial wastewater treatment plants with a capacity to treat at least 10,000 m³/d (cubic metres per day);
- All marine-caged fish farms (no capacity limit);
- All opencast mining and quarrying sites where the surface area of the area effectively under extractive operation equals 25 hectares and above and includes all underground mining;
- All sites having a waste management licence (WML) with a capacity to accept at least 50 tonnes/day for the disposal of non-hazardous waste and sites with a capacity of receiving 10 tonnes/day for the recovery and disposal of hazardous waste

¹³ <https://www.sepa.org.uk/media/594098/spri-schedule-2021.pdf>

- All nuclear installations (including plants undergoing decommissioning) and all non-nuclear installations holding authorisation for air, water and wastewater releases.

Most sites which are required to report to SPRI will have been notified by SEPA by either a Pollution Prevention and Control (PPC) Regulation 63(2) Notice or a notification letter. Sites with only Waste Management Licences (WML) report their offsite waste transfers quarterly to SEPA and are notified that SEPA will use this data to fulfil their reporting obligations.

Sites which have not operated and have no emissions must still submit a return while they retain an active authorisation or permit. Reports must be submitted annually for the previous calendar year; for most sites by February 28th each year.

3.3 SEPA's role

We collect and quality assure (QA) the SPRI data, and then make it publicly available.

SPRI data remains the operator's and it is their legal responsibility to supply accurate information. Our QA process is there to check that the data is complete, coherent and credible. In outline:

- We carry out data checks using historic data from the site and similar sites.
- Where data are flagged in our checking process, we may ask the operator to confirm their figures and provide more detail on the reasons for any variations. We also ask Site Officers to cross reference against other available data and to use their knowledge of the site to assess whether information is credible.
- We carry out a set of cross checks against other SEPA data sources – for example the Emissions Trading System data on carbon dioxide emissions. We check that accidental releases have been notified to SEPA where appropriate.
- The overall data for each industry sector is reviewed by colleagues who have substantial knowledge of the sites and the processes they use, to help us understand each individual return's place in the sector.
- Once data has been through QA, we will submit the required sub-set to Defra, who will use it in the UK-PRTR. Defra will carry out further checks and inform us of any issues they identify.
- Sub-sets of SPRI data are used to fulfil national and international reporting obligations (e.g. UK National Atmospheric Emissions Inventory), and these will often have their own quality assurance processes which provide us with feedback.

Note that we do not use SPRI data to assess regulatory compliance.

3.4 Information to consider when using SPRI data and technical notes

Regulatory and environmental impact

SPRI data can be used to broadly compare facilities or sectors and it provides a general overview of the total amounts of pollutants released or waste transferred. However, direct, detailed comparisons between sites are only possible where significant further information is available about all of the processes carried out on site; even where this is possible, few sites have direct equivalents.

SPRI data cannot provide assessments of the regulatory compliance of the facilities or the health or environmental impact of their releases. Compliance information can be found on SEPA's website¹⁴.

Annual mass emissions alone are not necessarily directly related to concentrations being emitted at any particular time and cannot be used to directly predict the resulting concentrations in the environment. High annual mass emissions are often due to the large size of the industrial process, where relatively low concentrations are released

¹⁴ <https://www.sepa.org.uk/regulations/authorisations-and-permits/compliance-assessment-scheme/>

in very large flows of air or water. The efficiency of the site's industrial abatement and treatment processes will have a significant impact on emissions. These are guided by relevant UK legislation and Scottish Regulations.

Annual mass releases are not directly comparable with air or water quality standards. Reporting thresholds for each pollutant are set based on characteristics of the pollutant (its toxicity, transport and persistence in the environment) to indicate what mass emission may give rise to 'significant' environmental concentrations.

Technical notes on data:

Annual variability

Caution should be used when comparing one year's data to the previous year's, particularly on a site by site basis. Substantial year to year variability is expected within some sections of the SPRI data, and we allow for this in our QA process.

For example, within the industry sector 7 – Intensive livestock production and agriculture we would expect emissions from poultry farms to be some of the most consistent in SPRI, because operators will tend to stock to similar levels across the whole year, every year. Marine fish farms, on the other hand, have clearly defined production cycles which include fallow periods, so emissions are expected to vary accordingly.

Many sites will base their emission values on spot testing which has happened at different points throughout the year and again, in some industry sectors we can expect these to be quite variable.

Methods

There are three broad ways operators can produce their SPRI figures: measuring, calculating or estimating. Guidance on the SPRI webpage explains where and when each should be used in detail, but we expect the operator to use the best available data and method to produce their figure. In many cases this will be to use the methodologies described under their SEPA authorisations. In some cases, it may be modelled (e.g., many of the pollutants from landfills and wastewater treatment works), or we ask the operator to use an emission factor (e.g., poultry farmers' ammonia emissions). The best available methods therefore have a wide range of both precisions and accuracies, and this should be kept in mind when data is used.

Figures reported

Related to the point about methods; we formally ask operators to supply data to three significant figures but, as noted in Section one, they normally provide much more than this. We do not receive information on confidence intervals; be aware that a figure which provides high precision may have lower accuracy.

Note that:

- All non-radioactive pollutants are reported in kilograms (kg)
- All radioactive pollutants are reported in megabecquerel (MBq)
- Offsite waste transfers are reported in metric tonnes (t)

We may display data using different units for ease of use. Commonly, carbon dioxide and overall greenhouse gas emissions are reported in kilotonnes (kt – 1,000,000kg) and megatonnes (Mt – 1,000,000,000kg).

Accidental releases

Figures for accidental releases are included within the main total. It is possible to have a quantified accidental release but for the total emission to be below the reporting threshold (BRT). SPRI has very clear and specific definitions of accidental releases; please see the SPRI website¹⁵ for more detail.

¹⁵ <https://www.sepa.org.uk/environment/environmental-data/spri/>

United Kingdom Pollutant Release and Transfer Register – UK-PRTR

Most SPRI waste transfer data and a sub-set of pollutant emissions data, covering roughly half of the SPRI sites, is supplied to the UK PRTR and will be published on the UK's PRTR webpage. The datasets have different reporting requirements: the UK-PRTR remains focused on emissions significant at the national and European scale, whereas SPRI is tailored to gather information which is useful from the Scottish national perspective. Around 20% of individual reported rows of SPRI pollutant data is included in the UK-PRTR, but as it covers the largest releasees, it will generally represent around 90% of SPRI's total emission for each pollutant. Around 50% of the SPRI sites report releases and transfers above the PRTR thresholds although this varies from year to year.

Various Scotland-relevant pollutants and industrial sectors are included in the SPRI but not required by the UK-PRTR Regulation; for example the radioactive substances. In addition, Urban Wastewater Treatment Plants and marine fish farms have a lower activity threshold in SPRI, so more of our sites come into reporting requirements. Thresholds for some pollutants are set to less than the UK thresholds.

Full details of the SPRI and UK-PRTR reporting requirements are available on the SPRI website¹⁶ and the UK-PRTR website¹⁷.

¹⁶ <https://www.sepa.org.uk/environment/environmental-data/spri/>

¹⁷ <https://www.gov.uk/guidance/uk-pollutant-release-and-transfer-register-prtr-data-sets#search-the-prtr-database-on-your-chosen-parameters>