

1. ENVIRONMENTAL TRENDS

Sulphur oxides (SO_x) and nitrogen oxides (NO_x) emissions

Atmospheric pollutants from energy transformation and energy consumption, but also from industrial processes, are the main contributors to regional and local air pollution. Major concerns relate to their effects on human health and ecosystems.

In the atmosphere, emissions of sulphur and nitrogen compounds are transformed into acidifying substances such as sulphuric and nitric acid. When these substances reach the ground, acidification of soil, water and buildings arises. Soil acidification is one important factor causing forest damage; acidification of the aquatic environment may severely impair the life of plant and animal species.

Nitrogen oxides (NO_x) also contribute to ground-level ozone formation and are responsible for eutrophication, reduction in water quality and species richness. They are associated with adverse effects on human health as high concentrations cause respiratory illnesses.

Definitions

The indicators presented here refer to total emissions from human activities of sulphur oxides (SO_x) and nitrogen oxides (NO_x), given as quantities of SO₂ and NO₂. They show changes in emissions over time, as well as emission intensities per unit of GDP and per capita.

It should be kept in mind that SO_x and NO_x emissions provide only a partial view of air pollution problems. They should be supplemented with information on the acidity of rain and snow in selected regions, and the exceedance of critical loads in soil and water, which reflect the actual acidification of the environment.

Overview

Compared to 2000, SO_x emissions have continued to decrease for the OECD as a whole as a combined result of changes in energy demand through energy savings and fuel substitution, pollution control policies and technical progress.

- SO_x emission intensities per capita and per unit of GDP show significant variation among OECD countries (ranging from 1 kg to 262 kg for per capita values, and from 0.1 kg to 7.1 kg for per GDP values). A strong decoupling of emissions from GDP is seen in almost all countries.
- The Gothenburg Protocol, adopted in Europe and North America to reduce acid precipitation even further, has been in force since May 2005. All countries reached the goal they fixed for 2010.

NO_x emissions have continued to decrease in the OECD overall since 2000, but less than SO_x emissions. This was mainly due to changes in energy demand, pollution control policies and technical progress. In the late 2000s, the slowdown in economic activity following

the 2008 economic crisis further contributed to reduce emissions. However, these results have not compensated in all countries for steady growth in road traffic, fossil fuel use and other activities generating NO_x.

- Several countries attained the emission ceilings of the Gothenburg Protocol for 2010, but other countries had difficulties in doing so. Further efforts will be required to meet the new objectives for reducing emissions by 2020.
- Emission intensities per capita and per unit of GDP show significant variations among OECD countries (ranging from 9 kg to 86 kg for per capita values, and from 0.2 kg to 2 kg for per GDP values). Almost all OECD countries have achieved a strong decoupling from economic growth since the 2000.

Comparability

International data on SO_x and NO_x emissions are available for almost all OECD countries. The details of estimation methods for emissions such as emission factors and reliability, extent of sources and pollutants included in estimation, etc., may differ from one country to another.

The high emission levels of SO_x for Iceland are due to H₂S emissions from geothermal power plants (expressed as SO₂), which represented 80% of total emissions in 2012.

OECD totals do not include Chile and Mexico.

For additional notes, see the Annex.

Sources

OECD (2014), "Air Emissions by Source", OECD Environment Statistics (database), <http://dx.doi.org/10.1787/data-00598-en>.

UNFCCC (2014), Greenhouse Gas Inventory Data, http://unfccc.int/ghg_data/items/3800.php.

European Monitoring and Evaluation Programme (EMEP) (2014), www.emep.int.

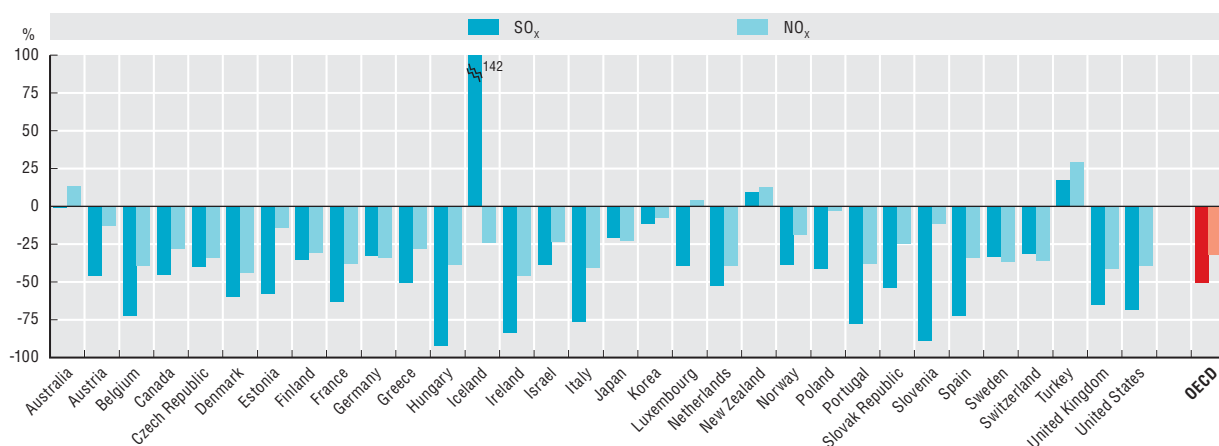
Further information

OECD (2014), *The Cost of Air Pollution: Health Impacts of Road Transport*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264210448-en>.

UNECE (2014), "Convention on Long-Range Transboundary Air Pollution", www.unece.org/env/lrtap/multi_h1.html.

Information on data for Israel: <http://dx.doi.org/10.1787/888932315602>.

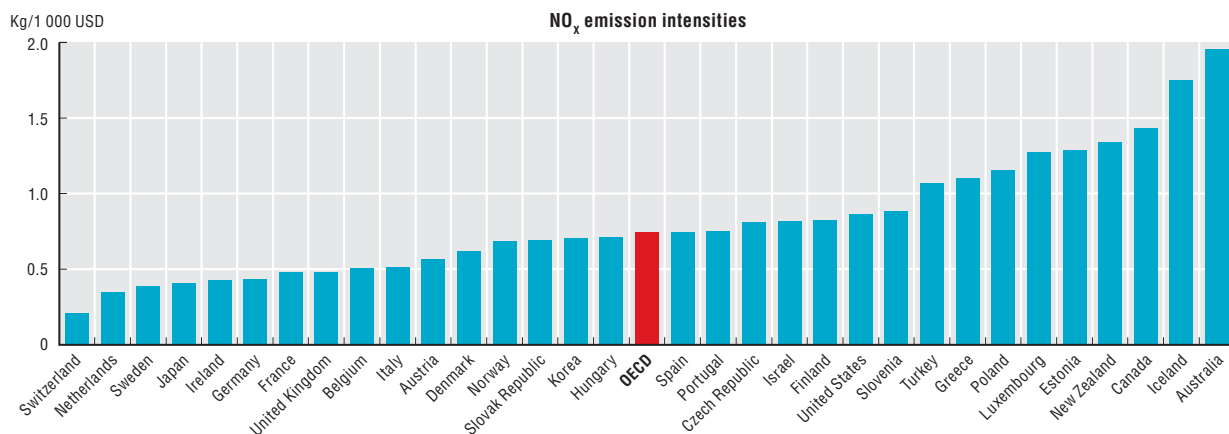
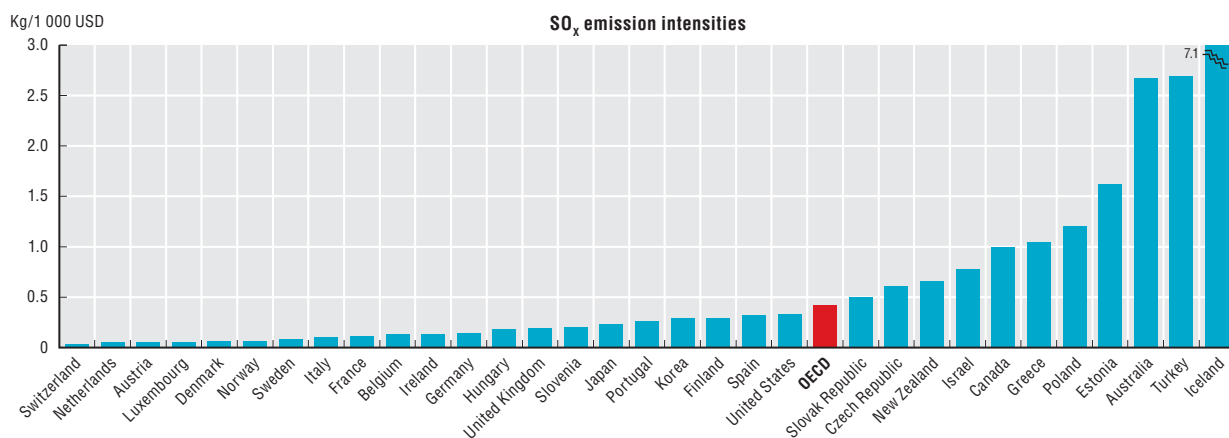
Figure 1.11. Change in SO_x and NO_x emissions, since 2000



Source: OECD (2014) "Air Emissions by Source", OECD Environment Statistics (database); European Monitoring and Evaluation Programme (EMEP) (2014); UNFCCC (2014), Greenhouse Gas Inventory Data.

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Figure 1.12. SO_x and NO_x emission intensities per unit of GDP, 2012 or latest available year



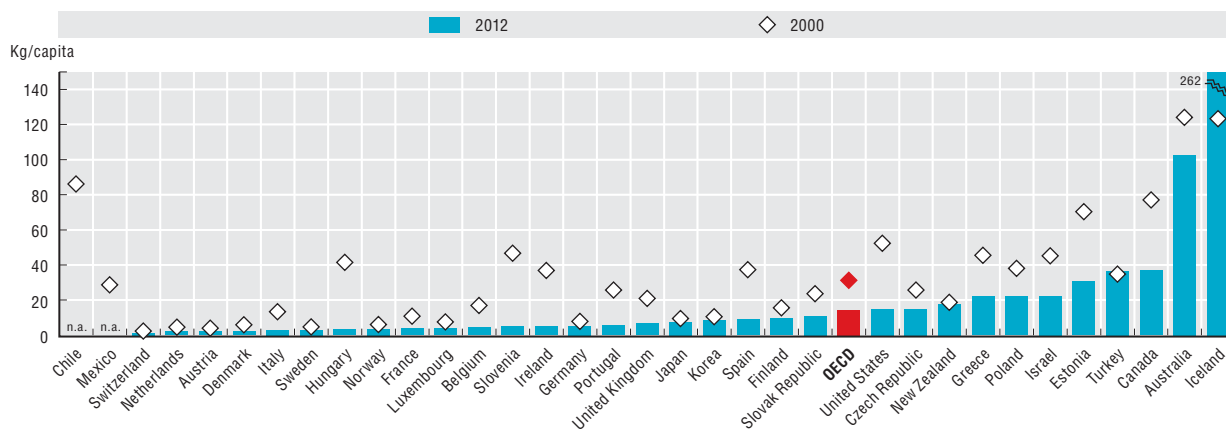
Source: OECD (2014) "Air Emissions by Source", OECD Environment Statistics (database); European Monitoring and Evaluation Programme (EMEP) (2014); UNFCCC (2014), Greenhouse Gas Inventory Data.

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Figure 1.13. SO_x emission intensities per capita, 2000, 2012



Source: OECD (2014) "Air Emissions by Source", OECD Environment Statistics (database); European Monitoring and Evaluation Programme (EMEP) (2014); UNFCCC (2014), Greenhouse Gas Inventory Data.

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Table 1.3. SO_x emissions and intensities

	Total SO _x emissions			Intensities per unit of GDP		Intensities per capita		GDP
	1 000 tonnes	% change		Kg/1 000 USD	% change	Kg/cap	% change	% change
	2012 or latest	1990-2012	2000-12	2012 or latest	2000-12	2012 or latest	2000-12	2000-12
Australia	2 334	50	-1	2.7	-31	103	-17	44
Austria	17	-77	-46	0.1	-55	2	-48	21
Belgium	48	-87	-72	0.1	-76	4	-74	18
Canada	1 288	-58	-45	1.0	-57	37	-52	27
Chile	..	..	..	..	..	..	..	68
Czech Republic	158	-92	-40	0.6	-57	15	-42	38
Denmark	12	-93	-60	0.1	-63	2	-62	8
Estonia	41	-85	-58	1.6	-73	31	-57	58
Finland	52	-79	-35	0.3	-46	10	-38	20
France	232	-82	-63	0.1	-68	4	-66	16
Germany	427	-92	-33	0.1	-41	5	-33	14
Greece	245	-49	-51	1.0	-51	22	-51	1
Hungary	32	-96	-92	0.2	-94	3	-92	22
Iceland	84	295	142	7.1	79	262	113	35
Ireland	23	-87	-83	0.1	-87	5	-86	31
Israel	174	..	-39	0.8	-58	22	-50	49
Italy	178	-90	-76	0.1	-77	3	-78	1
Japan	937	-25	-21	0.2	-28	7	-21	9
Korea	434	-47	-12	0.3	-45	9	-16	63
Luxembourg	2	-87	-39	0.1	-55	4	-50	33
Mexico	..	..	..	..	..	..	..	30
Netherlands	34	-82	-53	0.1	-59	2	-55	15
New Zealand	78	34	9	0.7	-19	18	-5	35
Norway	17	-68	-39	0.1	-49	3	-45	21
Poland	853	..	-41	1.2	-62	22	-42	56
Portugal	59	-82	-78	0.3	-78	6	-78	2
Slovak Republic	59	-89	-54	0.5	-72	11	-54	67
Slovenia	10	-95	-89	0.2	-91	5	-89	27
Spain	408	-81	-73	0.3	-78	9	-76	21
Sweden	28	-74	-33	0.1	-47	3	-38	26
Switzerland	11	-73	-32	0.0	-45	1	-38	24
Turkey	2 739	57	17	2.7	-28	36	5	62
United Kingdom	426	-89	-65	0.2	-71	7	-68	21
United States	4 695	-78	-68	0.3	-74	15	-71	22
OECD	16 053	-70	-51	0.4	-59	14	-54	22
OECD Asia-Oceania	3 981	..	-9	0.6	-25	19	-13	24
OECD Europe	6 195	-75	-43	0.4	-53	11	-47	19

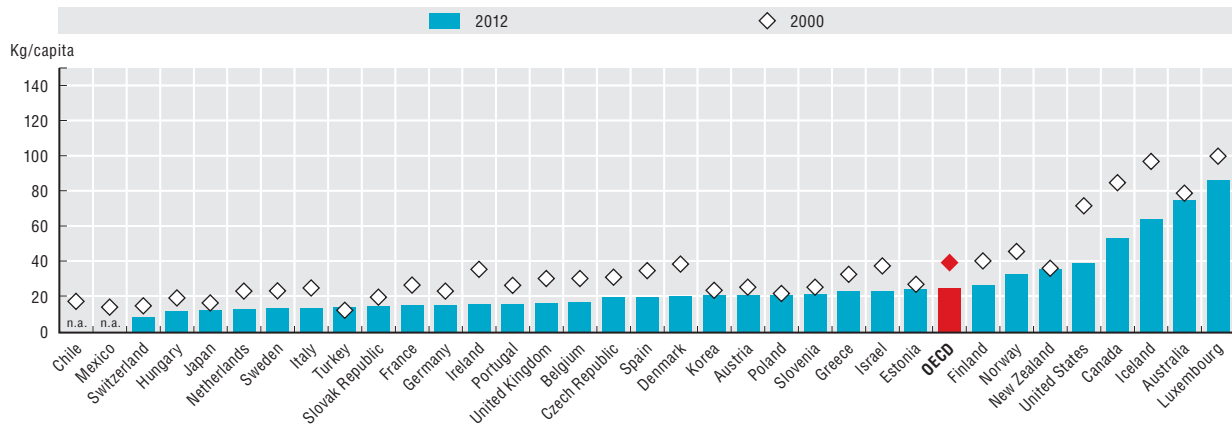
Note: See the Annex for country notes.

Source: OECD (2014) "Air Emissions by Source", OECD Environment Statistics (database); European Monitoring and Evaluation Programme (EMEP) (2014); UNFCCC (2014), Greenhouse Gas Inventory Data.

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Sulphur oxides (SO_x) and nitrogen oxides (NO_x) emissions

Figure 1.14. NO_x emission intensities per capita, 2000, 2012



Source: OECD (2014) "Air Emissions by Source", OECD Environment Statistics (database); European Monitoring and Evaluation Programme (EMEP) (2014); UNFCCC (2014), Greenhouse Gas Inventory Data.

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Table 1.4. NO_x emissions and intensities

	Total NO _x emissions			Intensities per unit of GDP		Intensities per capita		GDP
	1 000 tonnes	% change		kg/1 000 USD	% change	kg/cap	% change	% change
	2012 or latest	1990-2012	2000-12	2012 or latest	2000-12	2012 or latest	2000-12	2000-12
Australia	1 707	33	14	2.0	-21	75	-5	44
Austria	178	-8	-13	0.6	-28	21	-17	21
Belgium	190	-49	-39	0.5	-49	17	-44	18
Canada	1 862	-27	-28	1.4	-44	53	-37	27
Chile	..	..	..	..	..	..	..	68
Czech Republic	211	-72	-34	0.8	-53	20	-36	38
Denmark	115	-58	-44	0.6	-48	21	-47	8
Estonia	32	-56	-14	1.3	-46	24	-11	58
Finland	146	-51	-31	0.8	-42	27	-34	20
France	982	-47	-38	0.5	-46	15	-42	16
Germany	1 269	-56	-34	0.4	-42	15	-34	14
Greece	259	-21	-28	1.1	-29	23	-29	1
Hungary	122	-51	-39	0.7	-50	12	-37	22
Iceland	21	-25	-25	1.7	-44	64	-34	35
Ireland	74	-40	-46	0.4	-54	16	-55	31
Israel	182	..	-23	0.8	-47	23	-38	49
Italy	849	-58	-41	0.5	-41	14	-45	1
Japan	1 627	-20	-23	0.4	-30	13	-24	9
Korea	1 040	19	-7	0.7	-42	21	-13	63
Luxembourg	45	17	4	1.3	-22	86	-13	33
Mexico	..	..	..	..	..	..	..	30
Netherlands	227	-59	-39	0.3	-47	14	-42	15
New Zealand	158	60	13	1.3	-17	36	-2	35
Norway	166	-13	-19	0.7	-33	33	-28	21
Poland	817	..	-3	1.2	-38	21	-4	56
Portugal	170	-31	-38	0.7	-39	16	-39	2
Slovak Republic	81	-62	-25	0.7	-55	15	-25	67
Slovenia	45	-26	-11	0.9	-30	22	-14	27
Spain	928	-31	-34	0.7	-46	20	-43	21
Sweden	132	-51	-37	0.4	-50	14	-41	26
Switzerland	69	-51	-36	0.2	-48	9	-42	24
Turkey	1 088	93	29	1.1	-21	14	16	62
United Kingdom	1 057	-63	-41	0.5	-52	17	-46	21
United States	12 258	-46	-40	0.9	-51	39	-46	22
OECD	28 108	-40	-32	0.7	-44	25	-37	22
OECD Asia-Oceania	4 728	..	-8	0.7	-24	22	-12	24
OECD Europe	9 273	-46	-30	0.6	-41	17	-34	19

Note: See the Annex for country notes.

Source: OECD (2014) "Air Emissions by Source", OECD Environment Statistics (database); European Monitoring and Evaluation Programme (EMEP) (2014); UNFCCC (2014), Greenhouse Gas Inventory Data.

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