



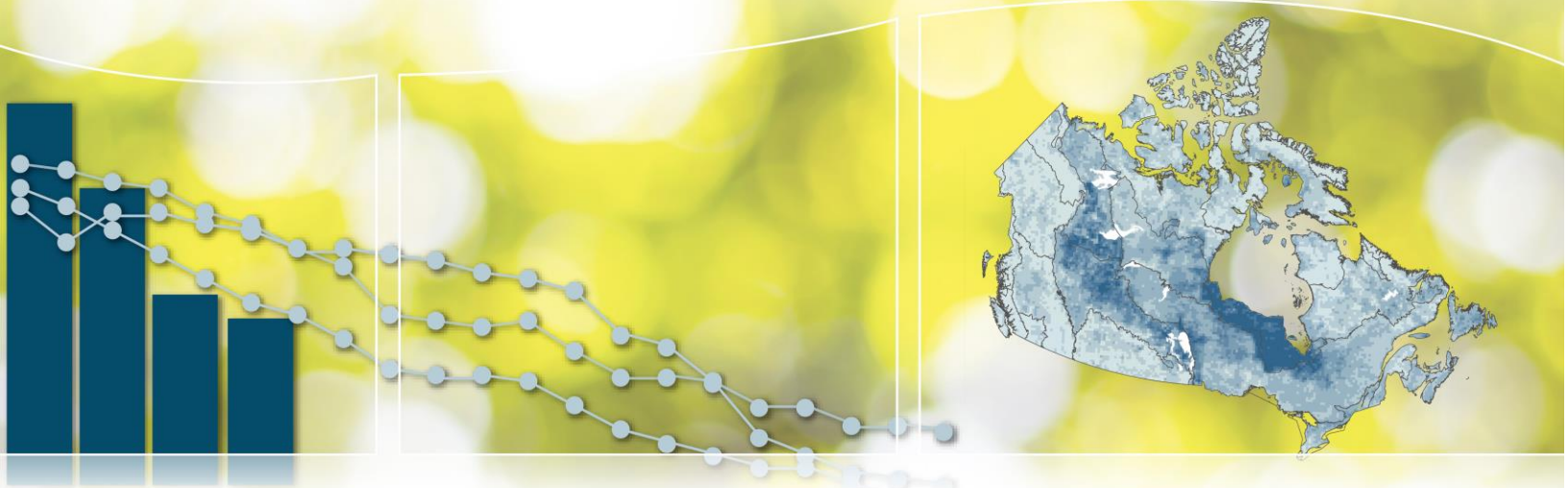
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Canadian Environmental Sustainability Indicators

International comparison of air pollutant emissions



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Canadian Environmental Sustainability Indicators

International comparison of air pollutant emissions

August 2017

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International comparison of air pollutant emissions indicator

Air pollution problems such as smog and acid rain result from the release of pollutants into the atmosphere. Canada's emissions of 5 key air pollutants are compared with those of top emitting member countries of the Organisation for Economic Co-operation and Development (OECD).

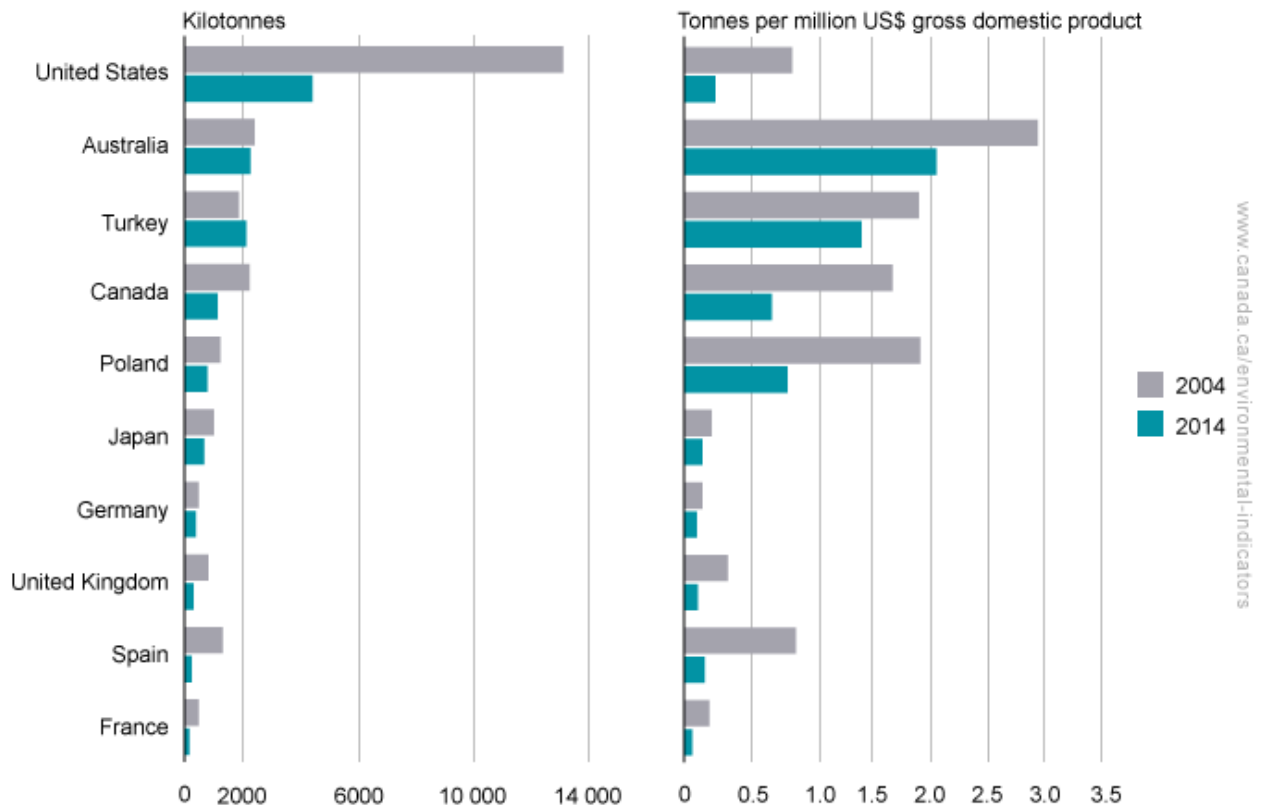
Sulphur oxides

Key results

In 2014, Canada:

- saw a decrease of 50% in sulphur oxide (SO_x) emissions from 2004 levels
- ranked fourth highest in SO_x emissions among OECD member countries
- had the fourth highest ratio of SO_x emissions to gross domestic product

Figure 1. Sulphur oxide emissions and emissions intensity of the top 10 emitting member countries of the Organisation for Economic Co-operation and Development, 2004 and 2014



[Data for Figure 1](#)

Note: Definitions of pollution sources and estimation methods may differ from country to country. Comparisons should be made with caution. Gross domestic product values are in millions of constant United States dollars, constant purchasing power parity, for the base year 2010. The use of purchasing power parity facilitates international comparison of gross domestic product by creating an equivalent purchasing power basis for each country compared.

Source: Organisation for Economic Co-operation and Development (2016) [OECD.Stat](#).

Although Canada's SO_x emissions declined by 50%, or 1120 kilotonnes, from 2004 to 2014, Canada ranked as one of the highest emitters among OECD member countries, behind the United States, Australia and Turkey. In 2014, the United States had the highest emissions but experienced the largest reduction (8705 kilotonnes) from 2004 levels.

The majority of the top 10 emitting member countries experienced declines in emissions between 2004 and 2014, with the exception of Turkey where emissions increased by 14%.

In terms of the ratio of SO_x emissions to gross domestic product, all top 10 emitting member countries reported declines ranging between 24% and 82% from 2004 to 2014.

Among the 35 member countries of the OECD, 32 countries had SO_x emissions data available for 2004 and 30 countries had 2014 data available for reporting.

For the latest national data and additional national information, see Canada's [Air pollutant emissions indicators](#).

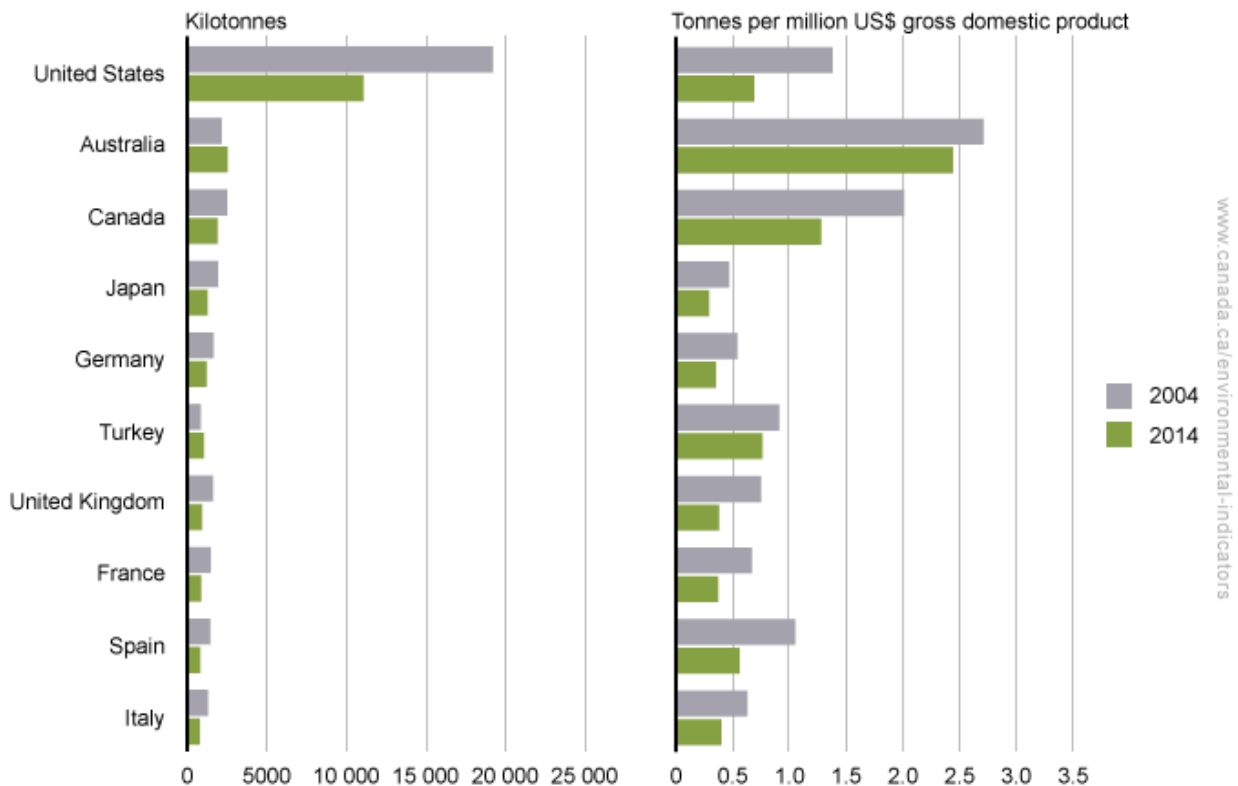
Nitrogen oxides

Key results

In 2014, Canada:

- saw a decrease of 23% in nitrogen oxide (NO_x) emissions from 2004 levels
- ranked third highest in NO_x emissions among OECD member countries
- had the second largest ratio of NO_x emissions to gross domestic product

Figure 2. Nitrogen oxide emissions and emissions intensity of the top 10 emitting member countries of the Organisation for Economic Co-operation and Development, 2004 and 2014



[Data for Figure 2](#)

Note: Definitions of pollution sources and estimation methods may differ from country to country. Comparisons should be made with caution. Gross domestic product values are in millions of constant United States dollars, constant purchasing power parity, for the base year 2010. The use of purchasing power parity facilitates international comparison of gross domestic product by creating an equivalent purchasing power basis for each country compared.

Source: Organisation for Economic Co-operation and Development (2016) [OECD.Stat](#).

In 2014, Canada ranked as one of the highest emitters among OECD member countries, behind the United States and Australia, despite a reduction of 23%, or 584 kilotonnes, in NO_x emissions between 2004 and 2014. The United States experienced the largest reduction over that period (42%, or 8156 kilotonnes) but still ranked as the highest emitter. Emissions in 2014 were higher than in 2004 in Turkey and Australia, by 25% and 18% respectively, but were lower in all other top 10 emitting member countries.

Emissions intensity, the ratio of NO_x emissions to gross domestic product, was lower in 2014 than it was in 2004 for all top 10 emitting member countries. The reductions in intensity were between 10% and 50%.

Among the 35 OECD member countries, 32 countries had NO_x emissions data available for 2004 and 30 countries had 2014 data available for reporting.

For the latest national data and information, see Canada's [Air pollutant emissions](#) indicators.

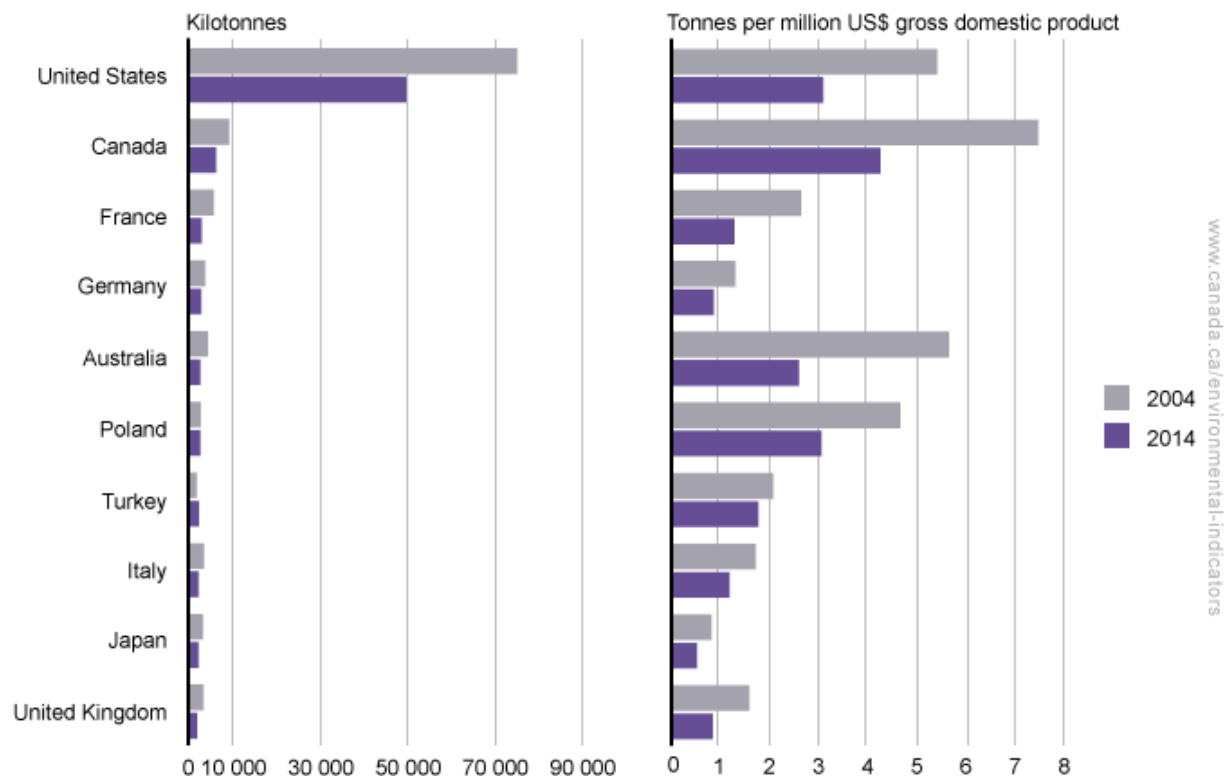
Carbon monoxide

Key results

In 2014, Canada:

- saw a decrease of 31% in carbon monoxide (CO) emissions from 2004 levels
- ranked second highest in CO emissions among OECD member countries
- had the largest ratio of CO emissions to gross domestic product

Figure 3. Carbon monoxide emissions and emissions intensity of the top 10 emitting member countries of the Organisation for Economic Co-operation and Development, 2004 and 2014



[Data for Figure 3](#)

Note: Definitions of pollution sources and estimation methods may differ from country to country. Comparisons should be made with caution. Gross domestic product values are in millions of constant United States dollars, constant purchasing power parity, for the base year 2010. The use of purchasing power parity facilitates international comparison of gross domestic product by creating an equivalent purchasing power basis for each country compared.

Source: Organisation for Economic Co-operation and Development (2016) [OECD.Stat](#).

In 2014, the United States was the highest CO emitting country, followed by Canada. Except for Turkey, the top 10 emitting member countries of the OECD experienced declines in emissions between 5% and 47% in 2014 from 2004 levels.

Declines were also observed in the ratio of CO emissions to gross domestic product between 2004 and 2014; they ranged from 15% to 54% for the top 10 emitting countries.

Among the 35 OECD member countries, 32 countries had CO emissions data available for 2004 and 30 countries had 2014 data available for reporting.

For the latest national data and information, see Canada's [Air pollutant emissions](#) indicators.

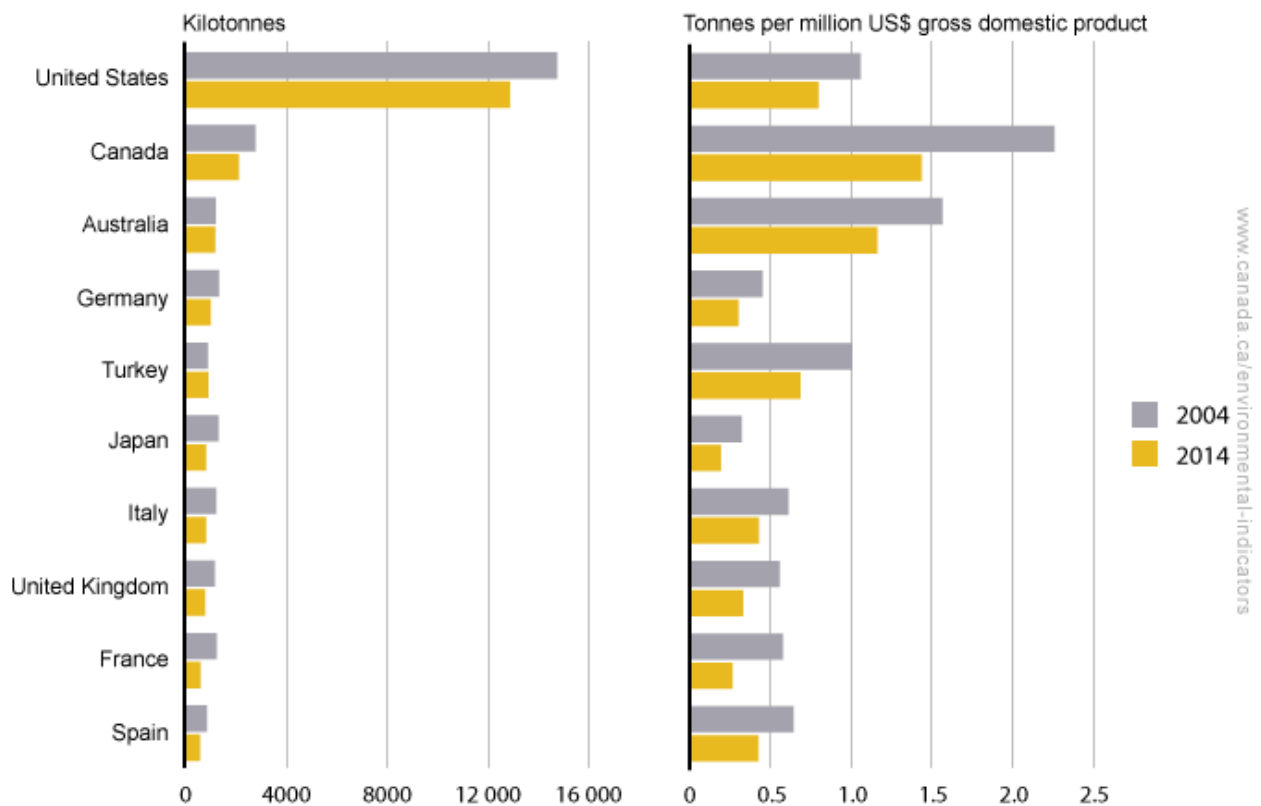
Volatile organic compounds

Key results

In 2014, Canada:

- saw a decrease of 24% in volatile organic compound (VOC) emissions from 2004 levels
- ranked second highest in VOC emissions among OECD member countries
- had the largest ratio of VOC emissions to gross domestic product

Figure 4. Volatile organic compound emissions and emissions intensity of the top 10 emitting member countries of the Organisation for Economic Co-operation and Development, 2004 and 2014



[Data for Figure 4](#)

Note: Definitions of pollution sources and estimation methods may differ from country to country. Comparisons should be made with caution. Gross domestic product values are in millions of constant United States dollars, constant purchasing power parity, for the base year 2010. The use of purchasing power parity facilitates international comparison of gross domestic product by creating an equivalent purchasing power basis for each country compared.

Source: Organisation for Economic Co-operation and Development (2016) [OECD.Stat](#).

Although Canada's VOC emissions declined by 24%, or 667 kilotonnes, between 2004 and 2014, Canada ranked as one of the highest emitters among the member countries of the OECD, behind the United States. The majority of the top 10 emitting member countries experienced declines in emissions between 2004 and 2014, with the exception of Turkey, where emissions increased slightly.

The reductions in emissions intensity range from 25% to 52% between 2004 and 2014 for the top 10 emitting member countries.

Among the 35 OECD member countries, 32 countries had VOC emissions data available for 2004 and 30 countries had 2014 data available for reporting.

For the latest national data and information, see Canada's [Air pollutant emissions](#) indicators.

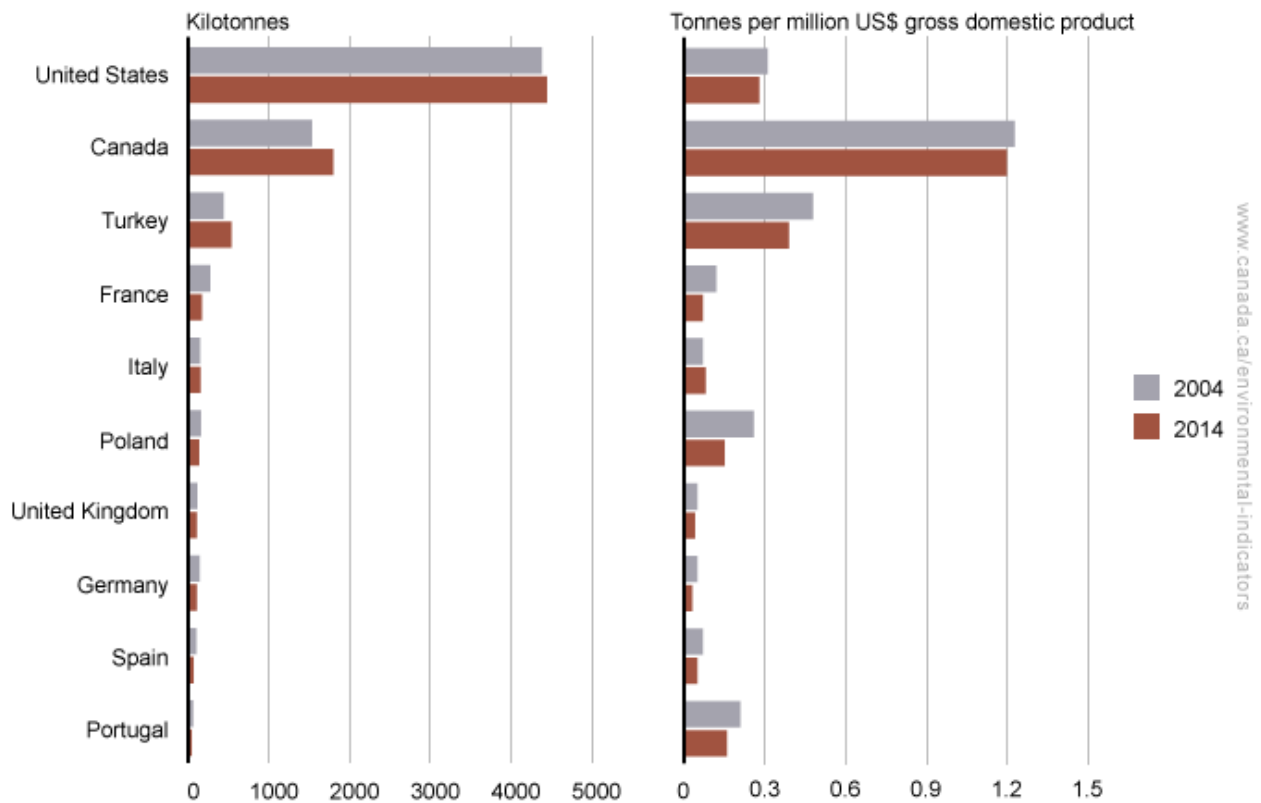
Fine particulate matter

Key results

In 2014, Canada:

- saw an increase of 17% in fine particulate matter (PM_{2.5}) emissions from 2004 levels
- ranked second highest in PM_{2.5} emissions among OECD member countries
- had the highest ratio of PM_{2.5} emissions to gross domestic product

Figure 5. Fine particulate matter emissions and emissions intensity of the top 10 emitting member countries of the Organisation for Economic Co-operation and Development, 2004 and 2014¹



[Data for Figure 5](#)

Note: Definitions of pollution sources and estimation methods may differ from country to country. Comparisons should be made with caution. Gross domestic product values are in millions of constant United States dollars, constant purchasing power parity, for the base year 2010. The use of purchasing power parity facilitates international comparison of gross domestic

¹ It is important to note that the United States and Canada include open source emissions such as dust from roads, prescribed forest fires and agriculture. These sources are not always reported by the other member countries of the Organisation for Economic Co-operation and Development.

product by creating an equivalent purchasing power basis for each country compared.
Source: Organisation for Economic Co-operation and Development (2016) [OECD.Stat](#).

Canada and 3 of the top 10 emitting member countries of the OECD, the United States, Turkey and Italy, experienced an increase in PM_{2.5} emissions in 2014 from 2004 levels. Canada's emissions increased the most, by 263 kilotonnes, making it one of the highest emitters among the member countries, behind the United States.

Despite these increases in emissions, most of the top 10 member countries experienced declines in their emissions intensity, which varied between 3% and 44%, from 2004 to 2014. The exception was Italy, where emissions intensity increased 11%.

It is important to note that Canada and the United States include open sources² such as dust from roads, prescribed forest burning and agriculture in their PM_{2.5} emissions. These sources are not always reported by other OCDE member countries.

Among the 35 member countries of the OECD, 26 countries had PM_{2.5} emissions data available for 2004 and 25 countries had 2014 data available for reporting.

For the latest national data and information, see Canada's [Air pollutant emissions](#) indicators.

About the indicators

What do the indicators measure

The International comparison of air pollutant emissions indicators provide emissions and emissions intensity for member countries of the Organisation for Economic Co-operation and Development (OECD). The emissions of 5 pollutants are reported: sulphur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), and fine particulate matter (PM_{2.5}). The indicators focus on the top 10 emitting member countries of the OECD.

Why are these indicators important

Exposure to air pollutants on a daily basis can cause adverse health and environmental effects. Fine particulate matter is a key component of smog along with ground-level ozone (O₃) and has been associated with pulmonary and cardiovascular health issues. While causing effects of their own, NO_x (such as nitrogen dioxide [NO₂]) and VOCs are the main contributors to the formation of O₃. Nitrogen oxides, SO_x (such as sulphur dioxide [SO₂]), and VOCs also lead to the formation of PM_{2.5} in the air in addition to the PM_{2.5} that is emitted directly from such sources as road dust and prescribed forest burning. Sulphur oxides and NO_x can also lead to the formation of acid deposition that can harm the environment, materials, living organisms, and humans.

Consult the [Air pollution: drivers and impacts](#) webpage for more information on the human health, environmental and economic impacts of air pollution.

These indicators help to inform Canadians about how Canada's emissions compare to those of other countries. The indicators report on key air pollutants that contribute to smog and acid rain and help the government to identify priorities, track progress, and develop strategies and policies for reducing or controlling air pollution.

² In 2014, national emissions from agriculture, dust and fires accounted for 1339 kilotonnes (81%) of Canada's total of PM_{2.5}.

What are the related indicators

Canada's [Air pollutant emissions](#) indicators track emissions from anthropogenic sources of 6 key air pollutants: SO_x, NO_x, VOCs, ammonia (NH₃), CO, and PM_{2.5}. Additional indicators on emissions from [transportation, off-road vehicles and mobile equipment](#), [electric utilities](#) and the [oil and gas industry](#) are also included to provide detailed analysis on the largest sources of Canada's emissions.

The [Air quality](#) indicators track ambient concentrations of PM_{2.5}, O₃, SO₂, NO₂, and VOCs at the national and regional level and at local monitoring-stations.

The [International comparison of urban air quality](#) indicators compare concentrations in the air of PM_{2.5}, O₃, SO₂ and NO₂ in selected Canadian urban areas with a population greater than one million to the air quality in selected international urban areas having comparable data.

Data sources and methods

What are the data sources

Air pollutant emissions and gross domestic product data for the indicators come from the Organisation for Economic Co-operation and Development [OECD.Stat](#) database. More specifically, emissions data come from the Air emissions by source table, under the Environment (Air and Climate) grouping.

The gross domestic product data were obtained from the Main aggregate tables of the National accounts (Annual national accounts) in the same database.

More information

The OECD.Stat database included emissions data current up to the end of 2014 at the time of this update, reflecting delays in the collection and aggregation of international data. Data are collected for each member country from the following sources:

- the [Centre on Emission Inventories and Projections database](#) (as of May 2016) of the Convention on Long-Range Transboundary Air Pollution
- the [National Inventory Submissions 2016](#) (as of May 2016) of the United Nations Framework Convention on Climate Change
- the replies to the 2016 OECD Questionnaire on the State of the Environment and comments from member countries received before the end of February 2016
- national data from specific countries

[Annex A](#) provides the list of data sources included in the OECD database by pollutant for each OECD member country covered in the indicators.

How are these indicators calculated

To produce the indicators, 2 years of data are used to compare the 35 member countries of the Organisation for Economic Co-operation and Development (OECD): 2014, which is the latest year with available information, and 2004, 10 years prior.

For each air pollutant, 2004 and 2014 emissions are compiled and ranked in relation to total emissions in 2014. While the focus is on the top 10 emitting OECD member countries, emissions for all 35 member countries are provided.

The emission intensity indicators are calculated by dividing a country's emissions by its gross domestic product value for that year.

More information

International comparison of air pollutant emissions indicators

Emissions for each member country are estimated or measured using one or several of the following methods:

- continuous emission monitoring systems
- predictive emission monitoring
- source testing
- mass balance
- site-specific emission factors
- published emission factors
- engineering estimates
- special studies

Generally, each country compiles and estimates its air pollutant emissions using a combination of top-down and bottom-up approaches. Top-down approaches involve the multiplication of sector activity levels by emissions factors. Bottom-up approaches are based on facility emissions reporting.

Canada's data are derived from the annual Convention on Long-Range Transboundary Air Pollution submission to the Centre on Emission Inventories and Projections database. The submitted air pollutant emission data are based on Canada's [Air Pollutant Emission Inventory](#). This includes information reported by facilities to the National Pollutant Release Inventory as well as emission estimates that are compiled for other sources such as motor vehicles.

International air pollution emissions per unit of gross domestic product

The intensity indicators are expressed in tonnes of pollutants emitted per million United States dollars using constant gross domestic product at purchasing power parity for the base year 2010. Purchasing power parity is a weighted average of the relative prices, quoted in national currency, of comparable items between countries. Their use facilitates international comparison of gross domestic product by creating an equivalent purchasing power basis for each country compared.

Countries included in the comparison

The indicators include all member countries of the OECD as of December 2016. The data presented in the indicator reflect data completeness in the OECD.Stat database at the time of reporting. Table 1 provides a summary of data availability by country and pollutant.

Table 1. Data coverage of the Organisation for Economic Co-operation and Development member countries

Country	Sulphur oxides, nitrogen oxides, carbon monoxide and volatile organic compounds	Fine particulate matter
Australia	Data available	Data not available
Austria	Data available	Data available
Belgium	Data available	Data available
Canada	Data available	Data available

Country	Sulphur oxides, nitrogen oxides, carbon monoxide and volatile organic compounds	Fine particulate matter
Chile	Data not available	Data not available
Czech Republic	Data available	Data available
Denmark	Data available	Data available
Estonia	Data available	Data available
Finland	Data available	Data available
France	Data available	Data available
Germany	Data available	Data available
Greece	Data available	Data not available
Hungary	Data available	Data available
Iceland	Data available	Data available for 2004 only
Ireland	Data available	Data available
Israel	Data available for 2004 only	Data not available
Italy	Data available	Data available
Japan	Data available	Data not available
Korea	Data available for 2004 only	Data not available
Latvia	Data not available	Data not available
Luxembourg	Data available	Data available
Mexico	Data not available	Data not available
Netherlands	Data available	Data available
New Zealand	Data available	Data not available
Norway	Data available	Data available
Poland	Data available	Data available
Portugal	Data available	Data available
Slovak Republic	Data available	Data available
Slovenia	Data available	Data available
Spain	Data available	Data available
Sweden	Data available	Data available
Switzerland	Data available	Data available
Turkey	Data available	Data available
United Kingdom	Data available	Data available
United States	Data available	Data available

What has recently changed

In the previous release of the indicator, emissions data were compiled from countries' inventory submissions to the Centre on Emission Inventories and Projections database. When data was unavailable from the database, data were compiled from National Inventory Submissions to the United Nations Framework Convention on Climate Change. The indicator now takes data from the Organisation for Economic Co-operation and Development database OECD.Stat for all countries.

What are the caveats and limitations

Air pollutant emission inventories from different countries are being estimated with the best data, measurements and methodologies available. While national emission inventories follow a common reporting structure, emissions estimation methodologies and coverage among countries may differ. Users should be cautious when comparing the data.

The indicators generally exclude non-anthropogenic (natural sources) emissions and emissions from international bunker fuels (aviation and maritime transport). However, estimation methodologies used by Canada cannot permit the separation of the international components from the domestic values. As a result, Canada's values include international emissions from aviation and marine sources.

Emissions from open sources such as dust from roads, prescribed forest fires and agriculture are also included in Canada's values. These sources are not always reported by other countries.

Emissions reported for Canada in this indicator may be slightly different from the emissions reported in the Canadian Environmental Sustainability Indicators' [Air pollutant emissions](#) indicators. Those indicators are based on data from Canada's Air Pollutant Emission Inventory.

Corrections may be made to Canada's national totals after the final submission to the database OECD.Stat, which may result in slight differences in the values reported.

Resources

References

Centre on Emission Inventories and Projections, European Monitoring and Evaluation Programme (2016) [Submissions 2016](#). Retrieved on January 19, 2017.

European Environmental Agency (2016) [European Monitoring and Evaluation Programme/ European Environmental Agency air pollutant emission inventory guidebook 2016: Technical guidance to prepare national emission inventories](#). Retrieved on January 19, 2017.

Intergovernmental Panel on Climate Change (2007) [2006 IPCC Guidelines for National Greenhouse Gas Inventories](#). Retrieved on January 19, 2017.

Organisation for Economic Co-operation and Development (2016) [OECD.Stat](#). Retrieved on December 2, 2016.

United Nations Framework Convention on Climate Change (2016) [National Inventory Submissions 2016](#). Retrieved on January 19, 2017.

Related information

[Air pollutant emissions](#)

[Air pollution: drivers and impacts](#)

Annexes

Annex A. Data tables for the figures presented in this document

Table A.1. Data for Figure 1. Sulphur oxide emissions and emissions intensity of the top 10 emitting member countries of the Organisation for Economic Co-operation and Development, 2004 and 2014

Countries	2004 sulphur oxide emissions (kilotonnes)	2014 sulphur oxide emissions (kilotonnes)	2004 sulphur oxide emissions intensity (tonnes per million US dollars of gross domestic product)	2014 sulphur oxide emissions intensity (tonnes per million US dollars of gross domestic product)
Top 10 emitting OECD member countries in 2014				
United States	13 146	4441	0.94	0.27
Australia	2440	2287	3.07	2.19
Turkey	1881	2148	2.04	1.54
Canada	2263	1142	1.81	0.76
Poland	1249	800	2.05	0.90
Japan	1017	689	0.24	0.16
Germany	497	388	0.16	0.11
United Kingdom	834	307	0.38	0.12
Spain	1334	255	0.97	0.18
France	484	170	0.22	0.07
Other emitting OECD member countries in 2014				
Greece	552	138	1.69	0.52
Italy	486	131	0.23	0.07
Czech Republic	212	127	0.90	0.43
New Zealand	87	74	0.72	0.49
Iceland	32	65	2.93	4.82
Portugal	192	47	0.70	0.17
Slovak Republic	96	45	0.98	0.31
Finland	84	44	0.44	0.21
Belgium	154	42	0.39	0.09
Estonia	88	41	3.36	1.24
Netherlands	64	29	0.09	0.04
Hungary	149	27	0.71	0.12
Sweden	37	24	0.11	0.06

Countries	2004 sulphur oxide emissions (kilotonnes)	2014 sulphur oxide emissions (kilotonnes)	2004 sulphur oxide emissions intensity (tonnes per million US dollars of gross domestic product)	2014 sulphur oxide emissions intensity (tonnes per million US dollars of gross domestic product)
Ireland	74	19	0.40	0.09
Norway	25	17	0.09	0.05
Austria	27	16	0.08	0.04
Denmark	29	11	0.13	0.05
Slovenia	51	9	1.03	0.16
Switzerland	15	8	0.04	0.02
Luxembourg	2	2	0.07	0.03
Korea	447	n/a	0.38	n/a
Israel	256	n/a	1.50	n/a
Chile	n/a	n/a	n/a	n/a
Latvia	n/a	n/a	n/a	n/a
Mexico	n/a	n/a	n/a	n/a

Note: **n/a = not available**. Definitions of pollution sources and estimation methods may differ from country to country. Comparisons should be made with caution. Gross domestic product values are in millions of constant United States dollars, constant purchasing power parity, for the base year 2010. The use of purchasing power parity facilitates international comparison of gross domestic product by creating an equivalent purchasing power basis for each country compared. **Source:** Organisation for Economic Co-operation and Development (2016) [OECD.Stat](#).

Table A.2. Data for Figure 2. Nitrogen oxide emissions and emissions intensity of the top 10 emitting member countries of the Organisation for Economic Co-operation and Development, 2004 and 2014

Countries	2004 nitrogen oxide emissions (kilotonnes)	2014 nitrogen oxide emissions (kilotonnes)	2004 nitrogen oxide emissions intensity (tonnes per million US dollars of gross domestic product)	2014 nitrogen oxide emissions intensity (tonnes per million US dollars of gross domestic product)
Top 10 emitting OECD member countries in 2014				
United States	19 248	11 092	1.38	0.69
Australia	2160	2549	2.71	2.44
Canada	2506	1923	2.01	1.28
Japan	1952	1276	0.47	0.29
Germany	1649	1223	0.54	0.35
Turkey	839	1051	0.91	0.76
United Kingdom	1623	945	0.75	0.38

Countries	2004 nitrogen oxide emissions (kilotonnes)	2014 nitrogen oxide emissions (kilotonnes)	2004 nitrogen oxide emissions intensity (tonnes per million US dollars of gross domestic product)	2014 nitrogen oxide emissions intensity (tonnes per million US dollars of gross domestic product)
France	1473	883	0.67	0.37
Spain	1448	807	1.05	0.56
Italy	1310	795	0.63	0.40
Other emitting OECD member countries in 2014				
Poland	828	798	1.43	0.99
Greece	398	249	1.28	0.54
Netherlands	369	240	0.55	0.04
Czech Republic	294	208	0.78	0.10
Belgium	288	181	1.28	0.48
Portugal	235	162	0.75	0.05
New Zealand	245	161	0.91	0.16
Austria	160	157	1.34	0.48
Norway	195	154	0.76	0.06
Finland	215	145	1.16	0.23
Sweden	186	126	0.55	0.07
Hungary	226	124	1.03	0.06
Denmark	207	121	1.04	0.13
Slovak Republic	98	80	1.05	0.38
Ireland	131	79	0.77	0.12
Switzerland	96	72	0.28	0.02
Slovenia	52	43	1.09	0.21
Estonia	47	31	1.35	0.03
Luxembourg	42	30	1.69	1.13
Iceland	27	21	2.71	5.51
Korea	1378	n/a	1.16	n/a
Israel	202	n/a	1.18	n/a
Chile	n/a	n/a	n/a	n/a
Latvia	n/a	n/a	n/a	n/a
Mexico	n/a	n/a	n/a	n/a

Note: n/a = not available. Definitions of pollution sources and estimation methods may differ from country to country. Comparisons should be made with caution. Gross domestic product values are in millions of constant United States dollars, constant purchasing power parity, for the base year 2010. The use of purchasing power parity facilitates international

comparison of gross domestic product by creating an equivalent purchasing power basis for each country compared.
Source: Organisation for Economic Co-operation and Development (2016) [OECD.Stat](#).

Table A.3. Data for Figure 3. Carbon monoxide emissions and emissions intensity of the top 10 emitting member countries of the Organisation for Economic Co-operation and Development, 2004 and 2014

Countries	2004 carbon monoxide emissions (kilotonnes)	2014 carbon monoxide emissions (kilotonnes)	2004 carbon monoxide emissions intensity (tonnes per million US dollars of gross domestic product)	2014 carbon monoxide emissions intensity (tonnes per million US dollars of gross domestic product)
Top 10 emitting OECD member countries in 2014				
United States	75 383	49 945	5.41	3.09
Canada	9314	6381	7.47	4.26
France	5837	3085	2.64	1.28
Germany	3924	2959	1.30	0.86
Australia	4497	2707	5.65	2.59
Poland	2836	2704	4.66	3.05
Turkey	1912	2467	2.07	1.77
Italy	3547	2337	1.71	1.18
Japan	3389	2297	0.81	0.52
United Kingdom	3419	2068	1.58	0.84
Other emitting OECD member countries in 2014				
Spain	2318	2010	1.68	1.39
New Zealand	731	691	5.99	4.59
Netherlands	736	564	1.08	0.74
Austria	711	535	2.21	1.46
Czech Republic	766	532	3.24	1.82
Sweden	620	498	1.76	1.20
Greece	810	463	2.49	1.75
Belgium	812	351	2.08	0.79
Finland	495	349	2.58	1.71
Denmark	460	311	2.04	1.28
Hungary	594	289	2.84	1.26
Portugal	520	265	1.90	0.99
Norway	401	244	1.50	0.79
Slovak Republic	292	225	2.97	1.56

Countries	2004 carbon monoxide emissions (kilotonnes)	2014 carbon monoxide emissions (kilotonnes)	2004 carbon monoxide emissions intensity (tonnes per million US dollars of gross domestic product)	2014 carbon monoxide emissions intensity (tonnes per million US dollars of gross domestic product)
Switzerland	348	196	1.00	0.46
Estonia	169	126	6.46	3.84
Iceland	54	115	4.93	8.53
Ireland	218	113	1.19	0.53
Slovenia	159	108	3.18	1.91
Luxembourg	51	31	1.38	0.64
Korea	817	n/a	0.69	n/a
Israel	263	n/a	1.5	n/a
Chile	n/a	n/a	n/a	n/a
Latvia	n/a	n/a	n/a	n/a
Mexico	n/a	n/a	n/a	n/a

Note: n/a = not available. Definitions of pollution sources and estimation methods may differ from country to country. Comparisons should be made with caution. Gross domestic product values are in millions of constant United States dollars, constant purchasing power parity, for the base year 2010. The use of purchasing power parity facilitates international comparison of gross domestic product by creating an equivalent purchasing power basis for each country compared. **Source:** Organisation for Economic Co-operation and Development (2016) [OECD.Stat](#).

Table A.4. Data for Figure 4. Volatile organic compound emissions and emissions intensity of the top 10 emitting member countries of the Organisation for Economic Co-operation and Development, 2004 and 2014

Countries	2004 volatile organic compound emissions (kilotonnes)	2014 volatile organic compound emissions (kilotonnes)	2004 volatile organic compound emissions intensity (tonnes per million US dollars of gross domestic product)	2014 volatile organic compound emissions intensity (tonnes per million US dollars of gross domestic product)
Top 10 emitting OECD member countries in 2014				
United States	14 787	12 917	1.06	0.80
Canada	2823	2157	2.26	1.44
Australia	1247	1216	1.57	1.16
Germany	1366	1041	0.45	0.30
Turkey	930	956	1.01	0.69
Japan	1359	863	0.32	0.19
Italy	1267	849	0.61	0.43
United Kingdom	1211	818	0.56	0.33
France	1275	638	0.58	0.26

Countries	2004 volatile organic compound emissions (kilotonnes)	2014 volatile organic compound emissions (kilotonnes)	2004 volatile organic compound emissions intensity (tonnes per million US dollars of gross domestic product)	2014 volatile organic compound emissions intensity (tonnes per million US dollars of gross domestic product)
Spain	888	614	0.64	0.43
Other emitting OECD member countries in 2014				
Poland	586	606	0.96	0.68
Sweden	220	184	0.63	0.44
New Zealand	181	180	1.49	1.20
Portugal	226	170	0.82	0.63
Czech Republic	231	152	0.98	0.52
Netherlands	174	142	0.25	0.19
Norway	268	139	1	0.45
Greece	191	125	0.59	0.47
Belgium	182	122	0.46	0.27
Hungary	176	116	0.84	0.51
Austria	139	110	0.43	0.3
Denmark	152	106	0.67	0.43
Slovak Republic	72	106	0.74	0.73
Finland	150	91	0.78	0.44
Ireland	116	84	0.34	0.20
Switzerland	71	63	0.76	0.45
Slovenia	50	33	1.04	0.61
Estonia	43	33	1.76	1.02
Luxembourg	12	8	0.36	0.17
Iceland	7	5	0.63	0.35
Korea	772	n/a	0.65	n/a
Israel	229	n/a	1.3	n/a
Chile	n/a	n/a	n/a	n/a
Latvia	n/a	n/a	n/a	n/a
Mexico	n/a	n/a	n/a	n/a

Note: n/a = not available. Definitions of pollution sources and estimation methods may differ from country to country. Comparisons should be made with caution. Gross domestic product values are in millions of constant United States dollars, constant purchasing power parity, for the base year 2010. The use of purchasing power parity facilitates international comparison of gross domestic product by creating an equivalent purchasing power basis for each country compared.

Source: Organisation for Economic Co-operation and Development (2016) [OECD.Stat](#).

Table A.5. Data for Figure 5. Fine particulate matter emissions and emissions intensity of the top 10 emitting member countries of the Organisation for Economic Co-operation and Development, 2004 and 2014

Countries	2004 fine particulate matter emissions (kilotonnes)	2014 fine particulate matter emissions (kilotonnes)	2004 fine particulate matter emissions intensity (tonnes per million US dollars of gross domestic product)	2014 fine particulate matter emissions intensity (tonnes per million US dollars of gross domestic product)
Top 10 emitting OECD member countries in 2014				
United States	4389	4452	0.31	0.28
Canada	1537	1800	1.23	1.20
Turkey	441	539	0.48	0.39
France	275	169	0.12	0.07
Italy	144	152	0.07	0.08
Poland	160	135	0.26	0.15
United Kingdom	110	105	0.05	0.04
Germany	139	104	0.05	0.03
Spain	99	68	0.07	0.05
Portugal	58	43	0.21	0.16
Other emitting OECD member countries in 2014				
Slovak Republic	28	30	0.29	0.21
Belgium	39	28	0.10	0.06
Norway	38	27	0.14	0.09
Hungary	30	26	0.14	0.11
Finland	40	24	0.21	0.12
Czech Republic	36	23	0.15	0.08
Sweden	26	21	0.07	0.05
Denmark	28	18	0.12	0.08
Austria	22	16	0.07	0.05
Ireland	19	15	0.10	0.07
Slovenia	13	12	0.26	0.22
Netherlands	23	12	0.03	0.02
Estonia	15	8	0.58	0.24
Switzerland	10	7	0.03	0.02
Luxembourg	3	2	0.08	0.04
Iceland	1	n/a	0.07	n/a

Countries	2004 fine particulate matter emissions (kilotonnes)	2014 fine particulate matter emissions (kilotonnes)	2004 fine particulate matter emissions intensity (tonnes per million US dollars of gross domestic product)	2014 fine particulate matter emissions intensity (tonnes per million US dollars of gross domestic product)
Australia	n/a	n/a	n/a	n/a
Chile	n/a	n/a	n/a	n/a
Greece	n/a	n/a	n/a	n/a
Israel	n/a	n/a	n/a	n/a
Japan	n/a	n/a	n/a	n/a
Korea	n/a	n/a	n/a	n/a
Latvia	n/a	n/a	n/a	n/a
Mexico	n/a	n/a	n/a	n/a
New Zealand	n/a	n/a	n/a	n/a

Note: n/a = not available. Definitions of pollution sources and estimation methods may differ from country to country. Comparisons should be made with caution. Gross domestic product values are in millions of constant United States dollars, constant purchasing power parity, for the base year 2010. The use of purchasing power parity facilitates international comparison of gross domestic product by creating an equivalent purchasing power basis for each country compared.

Source: Organisation for Economic Co-operation and Development (2016) [OECD.Stat](#).

Annex B. Data sources used by the Organisation for Economic Co-operation and Development by country, pollutants and years

UNFCCC: Data were retrieved from the [National Inventory Submissions 2016](#) of the United Nations Framework Convention on Climate Change (UNFCCC).

CLRTAP: Data were retrieved from the [Submissions 2016](#) of the Centre on Emission Inventories and Projections database of the Convention on Long-Range Transboundary Air Pollution (CLRTAP).

CLRTAP^[A]: Expert estimates from the European Monitoring and Evaluation Programme under the CLRTAP.

National: Data from the specific country emissions compilation organization or from the 2016 Organisation for Economic Co-operation and Development Questionnaire on the State of the Environment.

Unknown: The OECD.Stat database does not indicate the source used to report emissions.

No data: The OECD.Stat database does not report emissions.

Table B.1. Data sources used by the Organisation for Economic Co-operation and Development database by country, pollutants and years: sulphur oxides, nitrogen oxides and carbon monoxide

Countries	Sulphur oxides 2004	Sulphur oxides 2014	Nitrogen oxides 2004	Nitrogen oxides 2014	Carbon monoxide 2004	Carbon monoxide 2014
Australia	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC
Austria	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Belgium	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC
Canada	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Chile	No data	No data	No data	No data	No data	No data
Czech Republic	CLRTAP ^[A]	CLRTAP ^[A]	CLRTAP ^[A]	CLRTAP ^[A]	CLRTAP ^[A]	CLRTAP ^[A]
Denmark	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Estonia	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Finland	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC
France	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Germany	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Greece	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC
Hungary	National	CLRTAP	National	CLRTAP	National	CLRTAP
Iceland	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC
Ireland	CLRTAP	CLRTAP	CLRTAP	CLRTAP	UNFCCC	UNFCCC
Israel	National	No data	National	No data	National	No data
Italy	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Japan	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC
Korea	National	No data	National	No data	National	No data
Latvia	No data	No data	No data	No data	No data	No data
Luxembourg	National	National	National	National	National	National
Mexico	No data	No data	No data	No data	No data	No data
Netherlands	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP
New Zealand	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC	UNFCCC

Countries	Sulphur oxides 2004	Sulphur oxides 2014	Nitrogen oxides 2004	Nitrogen oxides 2014	Carbon monoxide 2004	Carbon monoxide 2014
Norway	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Poland	CLRTAP ^[A]	CLRTAP	CLRTAP ^[A]	CLRTAP ^[A]	CLRTAP ^[A]	CLRTAP ^[A]
Portugal	UNFCCC	UNFCCC	National	National	National	National
Slovak Republic	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Slovenia	National	UNFCCC	National	UNFCCC	National	UNFCCC
Spain	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Sweden	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Switzerland	CLRTAP	CLRTAP	CLRTAP	CLRTAP	National	National
Turkey	National	National	National	National	National	National
United Kingdom	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP	CLRTAP
United States	National	National	National	National	National	National

Table B.2. Data sources used by the Organisation for Economic Co-operation and Development by country, pollutants and years: volatile organic compounds and fine particulate matter

Countries	Volatile organic compounds 2004	Volatile organic compounds 2014	Fine particulate matter 2004	Fine particulate matter 2014
Australia	UNFCCC	UNFCCC	Unknown	Unknown
Austria	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Belgium	UNFCCC	UNFCCC	CLRTAP	CLRTAP
Canada	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Chile	No data	No data	No data	No data
Czech Republic	CLRTAP ^[A]	CLRTAP ^[A]	Unknown	Unknown
Denmark	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Estonia	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Finland	UNFCCC	UNFCCC	CLRTAP	CLRTAP
France	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Germany	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Greece	Unknown	Unknown	No data	No data
Hungary	National	CLRTAP	CLRTAP	CLRTAP
Iceland	UNFCCC	UNFCCC	Unknown	No data
Ireland	Unknown	Unknown	CLRTAP	CLRTAP
Israel	National	No data	No data	No data
Italy	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Japan	UNFCCC	UNFCCC	No data	No data
Korea	National	No data	No data	No data
Latvia	No data	No data	No data	No data
Luxembourg	National	National	Unknown	Unknown
Mexico	No data	No data	No data	No data
Netherlands	CLRTAP	CLRTAP	CLRTAP	CLRTAP
New Zealand	UNFCCC	UNFCCC	No date	No data
Norway	Unknown	Unknown	Unknown	Unknown

Countries	Volatile organic compounds 2004	Volatile organic compounds 2014	Fine particulate matter 2004	Fine particulate matter 2014
Poland	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Portugal	National	National	CLRTAP	CLRTAP
Slovak Republic	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Slovenia	National	UNFCCC	CLRTAP	CLRTAP
Spain	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Sweden	CLRTAP	CLRTAP	CLRTAP	CLRTAP
Switzerland	Unknown	Unknown	CLRTAP	CLRTAP
Turkey	National	National	CLRTAP ^[A]	CLRTAP ^[A]
United Kingdom	CLRTAP	CLRTAP	CLRTAP	CLRTAP
United States	National	National	National	National

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