

# THE COMPOSITION OF GLOBAL EMISSIONS – INSIGHTS FROM RECENT REPORTS



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## EXECUTIVE SUMMARY

Proponents of urgent action to reduce greenhouse emissions in Canada usually maintain that the countries of the world are all cooperating to sharply reduce emissions, and that Canada must not separate itself from the “international community”. The purpose of this note is to provide data from some authoritative sources to test the validity of these claims.

British Petroleum is one of the most expert and respected sources of statistics on historical and current energy supply, demand and emissions. It produces an annual Statistical Review of World Energy and makes it available without charge. The 2018 edition of the Review provides data concerning the carbon dioxide equivalent emissions from energy combustion from countries, regions and the whole world over the period 2007 to 2017 inclusive.

From 2006 to 2017:

- Global emissions increased by 3,365 megatonnes (Mt), from 30,079 Mt to 33,444 Mt.
- The only regions that reduced emissions over the past decade are Europe, the Russian Commonwealth (CIS) countries, and North America.
- Emissions grew significantly in all other regions, but especially in the Middle East and Asia-Pacific regions.
- The non-OECD countries increased their emissions by 4,547 Mt, almost four times as fast as OECD countries’ emissions declined.
- Emissions in China and India alone increased by 3,000 Mt.

- China's emissions alone increased at the monthly rate of 166 Mt; the increases in China's emissions every three and a half months exceeded Canada's 2017 annual emissions.

Using data from the BP Statistical Reviews back to 1990, when governments began setting emission reduction targets:

- The use of fossil fuels (coal, oil and natural gas) grew from 7 billion tonnes of oil equivalent (Gtoe) in 1990 to 11.4 Gtoe in 2016.
- The share of total world energy consumption held by fossil fuels declined from 88% to 86%; in effect, the world is “decarbonizing” at the rate of about 1% per decade, not urgently as claimed by proponents.

The International Energy Agency, in its Global Energy and CO2 Status Report of 2017, used a slightly different methodology than BP, but made similar findings. In 2017:

- Global emissions grew by 1.4% to 32.5 Gt.
- 72% of the growth in global energy demand was met by fossil fuels.
- World oil demand rose by 1.6% (or 1.5 million barrels per day), exceeding the annual average rate on 1% during the previous decade.
- Global natural gas demand grew by 3%.
- Global coal demand grew by 1%, reversing the decline in the previous two years.

The continuing growth in global emissions is the complete opposite of what the U.N and the Intergovernmental Panel on Climate Change claim is required to meet the goals set out in the 2015 COP21 Agreement in Paris. The continuing growth in emissions, driven by the desire of the developing countries for higher incomes and living standards, show that there is nothing countries like Canada can do affect the overall trends, regardless of the costs incurred.

*Robert Lyman is an Ottawa energy policy consultant and former public servant of 27 years; a diplomat for 10 years prior to that service. Commentary and analysis herein are copyright Robert Lyman 2018.*

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## THE GLOBAL CONTEXT OF THE CHANGES IN CARBON DIOXIDE EQUIVALENT (CO<sub>2</sub>) EMISSIONS

Discussions of climate policy in Canada frequently refer to the international agreements made in the context of the Framework Convention on Climate Change. Rarely do they situate Canada's emissions trends and commitments within the context of the changes in carbon dioxide equivalent emissions actually taking place in other countries. When they do, advocates for urgent action to reduce Canadian emissions to "save the planet" usually maintain that, due to the 2015 Paris Agreement, the countries of the world are all cooperating to sharply reduce emissions soon. The purpose of this brief is to provide data from a number of sources to test the validity of these claims.

### BRITISH PETROLEUM STATISTICAL REVIEW OF WORLD ENERGY 2018

The BP review is one of the most authoritative sources of information available concerning energy supply, demand and emissions. In addition to its long record as an expert source, it has two additional advantages in this context. It is produced by a company headquartered in Europe, so those who produce it are sensitive to the views of the European Green movement and give favourable treatment to the analysis and discussion of renewable energy sources; it thus cannot be realistically accused of bias. It also freely offers its background analysis and information for all to see. The BP Review reports on carbon dioxide emissions from energy sources only, so its figures differ somewhat from those of other sources.

Page 49 of the 2018 review shows the composition of global carbon dioxide emissions by country and region over the period 2007-2017. It can be read here:

<https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review/bp-stats-review-2018-co2-emissions.pdf>

The following tables are drawn from the data provided.

Table 1 shows global carbon dioxide emissions by major geographic area over the period 2007 to 2017, in terms of millions of tonnes (Mt) of carbon dioxide equivalent.

**Table 1**

<b><u>Region</u></b>	<b>2007Mt</b>	<b>2016 Mt</b>	<b>2017 Mt</b>	<b>Growth Rate 2006-2016 (%)</b>
<b>North America</b>	6862	6161	6121	-0.9
<b>South America</b>	1106	1327	1310	2.3
<b>Europe</b>	4689	4061	4152	-1.5
<b>Russian CIS</b>	2303	2212	2213	-0.3
<b>Middle East</b>	1530	2058	2112	3.6
<b>Africa</b>	966	1185	1205	2.5
<b>Asia-Pacific</b>	12623	16013	16339	3.1
<b>World</b>	30079	33018	33444	1.3

Points to note:

- **Global emissions rose by 3,365 Mt over the period. This represents a continuation of the trend that has existed since 1990, when governments first began setting political emission reduction targets.** Emissions growth has been slowing, and in fact, stayed essentially flat in 2014 and 2015 (according to BP data) but resumed the increases in 2017 and are on track to increase again in 2018.

- The only regions that have reduced emissions continuously over the past decade are Europe, the Russian Commonwealth (CIS) countries and North America.
- The fastest growth in emissions has occurred in the Middle East and Asia-Pacific regions, although growth is occurring in all the developing country regions.

Table 2 shows the same information according to major economic grouping. The Organization for Economic Cooperation and Development (OECD) includes 36 countries: Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.

**Table 2**

<b>Grouping</b>	<b>2007 Mt</b>	<b>2016 Mt</b>	<b>2017 Mt</b>	<b>Growth Rate 2006-2016 (%)</b>
<b>OECD</b>	13630	12399	12448	-0.8
<b>Non-OECD</b>	16449	20619	20996	2.9
<b>World</b>	30079	33018	33444	1.3

Points to note:

- The emissions growth from the non-OECD region totaled 4547 Mt, significantly exceeding the emissions decline in the OECD region of 1182 Mt. **In fact, non-OECD emissions grew almost four times as fast as OECD emissions declined.**
- By 2017, the non-OECD region, formerly considered the “developing countries”, constituted 63% of global emissions.

Further insights can be gained by examining the trends with respect to the five largest single country emitters, as can be seen in Table 3.

**Table 3**

<b>Country</b>	<b>2007 Mt</b>	<b>2016 Mt</b>	<b>2017 Mt</b>	<b>Growth Rate 2006-2016 (%)</b>
<b>China</b>	7213	9114	9233	3.2
<b>USA</b>	5881	5130	5088	-1.2
<b>Russia</b>	1528	1511	1525	-0.2
<b>India</b>	1366	2251	2344	6.0
<b>Japan</b>	1266	1181	1177	-0.6

Points to note:

- **China is by far the largest emitter; in 2017, it constituted almost 28% of the world's emissions.**
- Contrary to many public perceptions, the United States has reduced its emissions considerably (i.e. by 793 Mt) over the decade.
- India surpassed Russia as an emitter during this period. Based on current trends, India may surpass the United States by the middle of the next decade.

Canada's emissions from energy combustion in 2017 were listed by BP at 560 Mt, which ranks tenth in the world according to BP's data. China's emissions growth from 2007 to 2016 was 2,200 Mt, or 166 Mt per month. **In effect, the increases in China's emissions every three and a half months exceeded Canada's total annual emissions in 2017.**

Finally, Table 4 shows the trends for the 10 "fast risers" – the countries of the Asia-Pacific, the Middle East and Latin America that are experiencing the fastest rates of emissions growth.



**Table 4**

<b>Country</b>	<b>2007 Mt</b>	<b>2016 Mt</b>	<b>2017 Mt</b>	<b>Increase 2006-2016 (Mt)</b>
<b>China</b>	7213	9114	9233	2020
<b>India</b>	1366	2251	2344	978
<b>Saudi Arabia</b>	393	591	595	202
<b>Iran</b>	491	599	634	143
<b>South Korea</b>	545	665	680	135
<b>Indonesia</b>	387	486	512	125
<b>Vietnam</b>	79	195	196	117
<b>Brazil</b>	351	462	467	116
<b>UAE</b>	186	272	267	81
<b>Qatar</b>	54	104	115	61

Points to note:

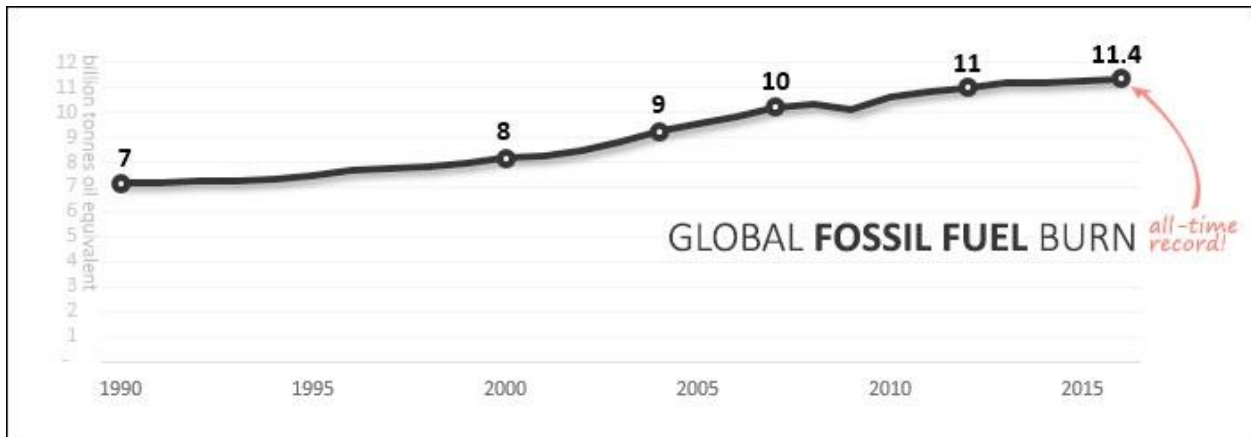
- The emissions growth in China and India alone from 2007 to 2016, at 2,998 Mt, exceeded the net growth in global emissions increases during that period. **In other words, the emissions growth in two countries offset the emissions reductions in the rest of the world.**
- The emissions growth in the ten fastest-growing emitters combined totaled 3,978 Mt.

## THE “MISSING CHARTS”

Barry Saxifrage, a climate reporter who writes articles in the National Observer, did some very useful analysis based on the 2017 BP Statistical Review of World Energy. Saxifrage, who supports the “alarmist” view of global warming, describes his findings as potentially influencing how people think about “fossil fuel addiction”. His article can be read here:

<https://www.nationalobserver.com/2017/07/13/analysis/these-missing-charts-may-change-way-you-think-about-fossil-fuel-addiction>

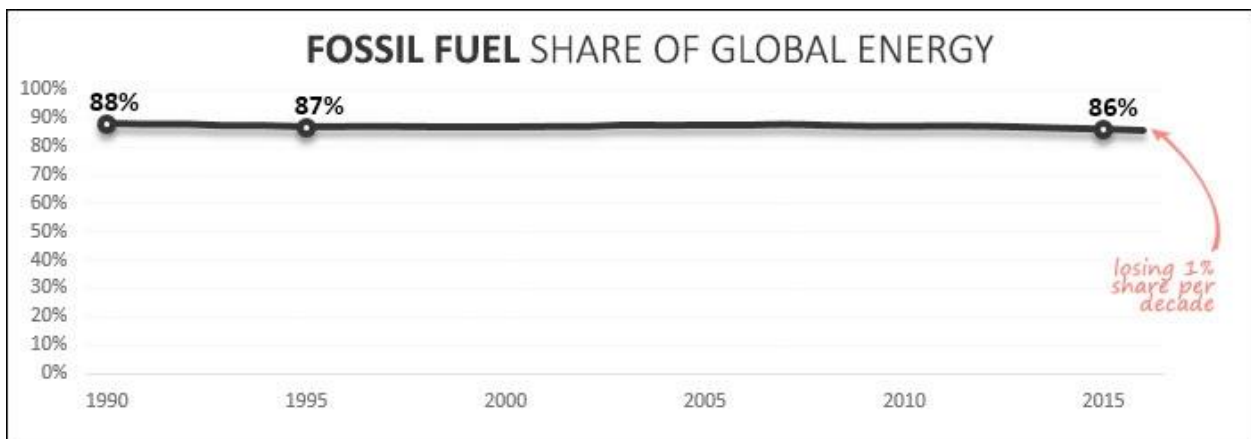
For those who take a more skeptical view of allegedly catastrophic human-caused global warming, the charts Saxifrage developed using BP data on fossil fuel use confirm what they already knew or suspected. The first chart shows the total energy consumed from burning fossil fuels each year from 1990 to 2016.



GLOBAL FOSSIL FUEL CONSUMPTION, 1990 - 2016. Billions of tonnes of oil equivalent. SOURCE: Sum of Oil, Gas and Coal consumption listed in BP Statistical Review of World Energy June 2017. CHART by Barry Saxifrage at VisualCarbon.org. June 2017.

As you can see, the amount of fossil fuels that the world consumes continues to rise every year and, in 2016, set another record of 11.4 billion tonnes of oil equivalent (Gtoe).

In another chart, he shows the share that fossil fuels have held of global energy consumption.



GLOBAL FOSSIL FUEL CONSUMPTION, 1990 - 2016. Percent of total energy consumption. SOURCE: Sum of Oil, Gas and Coal consumption vs total energy in BP Statistical Review of World Energy June 2017. CHART by Barry Saxifrage at VisualCarbon.org. June 2017.

What this chart shows is that, despite almost three decades of governments' setting policies to reduce greenhouse gas emissions, and trillions of dollars spent to subsidize and promote alternatives, fossil fuels continue to dominate the world energy mix. **The “decarbonization” that environmentalists advocate and claim is “just around the corner” has not shown up yet. In fact, fossil fuel use has been declining at the rate of only about 1% of global energy use per decade.**

## INTERNATIONAL ENERGY AGENCY GLOBAL ENERGY AND CO2 STATUS REPORT 2017

The most recent IEA report on global energy and emissions, published in March 2018, can be read here:

<https://www.iea.org/publications/freepublications/publication/GECO2017.pdf>

The International Energy Agency uses a different methodology than British Petroleum to calculate energy supply and demand and carbon dioxide equivalent emissions. The IEA reports that carbon dioxide emissions were essentially flat in 2014, 2015 and 2016, but rose in 2017 by 1.4% to 32.5 gigatonnes (Gt). Like BP, however, the IEA found trends in energy consumption and emissions to vary considerably in different countries and regions:

- Some countries, such as the United States, the United Kingdom, Mexico and Japan, experienced emissions declines.
- Asian economies accounted for two-thirds of the global increase in emissions.
- **72% of the growth in global energy demand in 2017 was met by fossil fuels.**
- World oil demand rose by 1.6% (or 1.5 million barrels per day) in 2017, a rate that was much higher than the 1% annual rate over the past decade.
- Global natural gas demand grew by 3%, with 80% of the growth coming from industry and buildings.
- Global coal demand grew by 1% in 2017, reversing the decline over the previous two years.

- Electricity demand grew by 3.1% in 2017, with China and India accounting for 70% of this growth.
- Renewables grew quickly, meeting a quarter of global energy demand growth, mainly in China and the USA.
- **The continuing growth in emissions is the complete opposite of what the U.N. and IPCC claim is required to meet climate change goals.**

## CHINA AND INDIA

Pursuant to the COP21 Agreement reached in Paris in 2015, China and India submitted Nationally Determined Contributions (NDC), or five-year plans, indicating how they planned to meet the goals of the agreement. **Neither country committed to reduce emissions.**

China committed to “peak” its emissions by 2030 at the latest, lower the carbon-intensity of its GDP by 60 to 65% below 2005 levels by 2030, increase the share of non-fossil fuel energy sources to around 20% of primary energy supply by 2030, and increase its forest stock. Those goals, if reached, would result in carbon dioxide equivalent emission levels of 12.7 to 13.8 Gt by 2030, according to Climate Action Tracker. The carbon intensity targets on their own would lead to 2030 emission levels of 13.7 to 15.6 Gt of emissions.

China is notoriously poor in reporting statistics on actual performance, and has no legal requirement to do so under the Paris Agreement. **Even if it did meet the carbon intensity target, its emissions by 2030 likely would be two to three times those of the United States.**

China has invested heavily in all forms of energy supply over the last decade. This has included replacing inefficient coal-burning power plants with more advanced ones, using more natural gas and nuclear energy and adding more wind and solar energy. **In 2017, China consumed just over half of the coal used in the world and use of thermal coal increased by 12% over 2017 levels during the first half of 2018.**

On May 31, 2018 China’s National Development and Reform Commission (NDRC), Ministry of Finance and National Energy Board issued a statement halting all subsidies for utility-scale solar projects in favor of

competitive bidding, and greatly reducing feed-in-tariffs. This move is likely to effectively slash demand in the country's solar market by about 40%.

China is the largest solar market in the world and has installed capacity of around 130 GW. Yet the incentive system, including feed-in-tariffs which are essentially guaranteed prices at which the government will buy power from solar developers, has created a monster. Responding to these generous government incentives, solar installations have mushroomed, from 2.5 GW of cumulative installation in 2011 to around 130 GW today, according to figures from Roth Securities. But the end result has been a costly burden on consumers. China's state-run renewable energy fund, financed by a surcharge on users' energy bills, is in deficit by more than 100 billion yuan (\$15.5 billion).

India's commitment in its NDC is to reduce the carbon intensity of its economy by 33-35% by 2030, compared to 2005 levels.

India still has over 300 million people without access to electricity. It has announced ambitious industrial development goals intended to increase national income and raise a substantial number of its citizens from poverty. The country's focus over the past decade has been on developing coal: greatly expanding mining, facilitating transportation of coal and adding coal-fired power generation capacity. The capacity of coal and lignite-powered generating stations grew from about 60 gigawatts (GW) in 2005 to almost 200 GW in 2017. Renewables electricity generation capacity has also grown to about 50 GW by 2017. However, renewables only generate electricity about 30% of the time, while the figure for coal is 60%, and the Indian government's goal is to increase the utilization of coal-fired plants to 80%. The government also has announced ambitious plans to add more coal generating capacity. During the period 2017 to 2022, around 50 GW of additional coal-fired generating capacity is already under construction and planned to be commissioned.

India does not yet publish timely estimates of CO2 emissions or growth rates. The last "official" figures are for 2010. There is thus no authoritative source for reliable projections. Almost all observers, however, expect India's emissions to grow significantly over the next few decades.

## CONCLUSION

The most authoritative sources of data and analysis on global energy supply, demand and carbon dioxide emissions confirm that emissions continue to grow due to economic activity in the developing countries and especially in Asia. The magnitude of this growth over the past decade dwarfs emissions from countries like Canada. Indeed, as the OECD countries represent only one third of global emissions, and that share is shrinking every year, it is not clear how anything that countries like Canada do will have an effect on attaining the global emission reduction goals established in international agreements. It should be clear by now that these goals are based on political aspirations, not economic reality.

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Dr. Curry discusses her findings here:

<https://curryja.files.wordpress.com/2014/01/curry-senatetestimony-2014-final.pdf>



## About

Friends of Science Society is an independent group of earth, atmospheric and solar scientists, engineers, and citizens who are celebrating its 16th year of offering climate science insights. After a thorough review of a broad spectrum of literature on climate change, Friends of Science Society has concluded that the sun is the main driver of climate change, not carbon dioxide (CO<sub>2</sub>).

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