# Promises vs Performance

## The World's Largest Emitters Since COP-21

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# Contents

# Executive Summary

At the COP21 Conference in December 2015, most member countries of the United Nations agreed to reduce greenhouse gas emissions (GHGs) in accordance with Independent Nationally Determined Contributions (INDCs) to be updated every five years. Almost four years later, how are the largest emitters performing?

The Intergovernmental Panel on Climate Change (IPCC) estimated that avoiding a two degree Celsius ( C ) rise in average global temperatures over pre-industrial levels would require GHG emissions to decline by 2030 to 40 gigatonnes (Gt) of carbon dioxide equivalent, and to avoid a 1.5-degree C. rise would require a 24.3 GT reduction. This is roughly equivalent to reductions in carbon dioxide emissions to 24.3 Gt for the two-degree C. goal and 15 Gt for the 1.5-degree C. goal.

The ten largest emitters in the world, in order, are: China, the United States, the European Union, India, Russia, Japan, South Korea, Iran, Saudi Arabia, and Canada.

Th following table indicates the projected emissions of these countries by 2030, based on the analysis of Climate Action Tracker and my own assessment.

**Projected Emissions of Largest Emitters by 2030 (Mt)**

| Country/Group | Emissions |
|---|---|
| **China** | 14400 – 16600 |
| **United States** | 4900 |
| **India** | 4500 |
| **European Union** | 2770 |
| **Russian Federation** | 1590 - 1740 |
| **Japan** | 1040 |
| **Saudi Arabia** | 810 – 1040 |
| **Iran** | 700 - 750 |
| **South Korea** | 700 |
| **Canada** | 468 |
| **Total** | 27468 – 30098 |

In summary, none of the largest emitters, except the EU, will meet the emissions targets they set for themselves in 2015. This makes it highly likely that global emissions in 2030 will be well above, not below, those today. There is no “global decarbonization transition” occurring.

In other words, based on current trends, the IPCC’s goals will not be met. Indeed, it is highly likely that emissions from China, India and the United States combined will exceed 24 GT by 2030. That means that all the other countries of the world could completely eliminate their emissions, and indeed cease to exist, within twelve years and the two-degree C. goal would not be met.

# PROMISES VS. PERFORMANCE

## The World's Largest Emitters Since COP21



In December, 2015, the 21st "Conference of the Parties" (COP) – Conference of the Framework Convention on Climate Change was held in Paris, France. In an agreement that was hailed by the global environmentalist movement as a historic breakthrough, the countries of the world concluded an agreement that they would seek to reduce global greenhouse gas emissions (GHG) by an amount sufficient to avoid a rise in global average temperatures of more that 2 degrees Celsius over those that prevailed in the pre-industrial era. Knowing that agreement of a single global or country-specific emissions reduction target was impossible, they agreed instead to commit to formulate and submit to the United Nations Independent Nationally Determined Contributions to emissions reduction every five years. Almost four years later, how is that working out?

This note will answer that question mainly by examining the performance of the countries that were in 2018 the ten largest GHG emitters, as well as the trends in the European Union and the world as a whole.

The primary sources of information for this note are the British Petroleum Statistical Review of World Energy 2019, an excellent 2018 report from the Netherlands Environmental Assessment Agency[1], a 2018 Emissions Gap Report of the Intergovernmental Panel on Climate Change (IPCC) and the online reports of Climate Action Tracker (an organization that analyzes and advocates for emissions reduction) and recent media reports.

## Context

Comparing trends in GHG emissions can be difficult for several reasons, one of which is that annual emissions quantities are stated by different authorities in different terms. In this paper, I will refer primarily to the figures published by the British Petroleum Statistical Review of World Energy 2019, because this source is the most up-to-date (i.e. with figures up to the end of 2018) and permits the easiest comparison of emissions over time (from 2008 to 2018) and across countries. The BP Review presents carbon dioxide emissions, primarily from energy consumption. While these are the largest single component of greenhouses gas emissions, the figures for GHG's are considerably higher. The IPCC and many other sources use the figures for total GHG emissions. To show the difference, global GHG emissions in 2017 were 53.5 gigatonnes (Gt) of carbon dioxide equivalent, whereas

[1] Jos Oliver and Jeroen Peters. *Trends in Global CO2 and Total Greenhouse Gas Emissions*. Netherlands Environmental Assessment Agency, December 2018

carbon dioxide emissions were 33.2 Gt. Canada's GHG emissions in 2017 were 716 megatonnes (Mt), whereas its carbon dioxide emissions were 550 Mt.

The broad objective of countries party to the Framework Convention on Climate Change since the mid-1990's has been to reduce carbon dioxide equivalent emissions so as to reduce the concentration of GHGs in the atmosphere and thereby allegedly reduce the risks of catastrophic global warming. Over time, the global objectives have been stated in more and more specific terms. Thus, at COP21 in 2015, the stated goal was to reduce global emissions so as to reduce the risk of global temperatures rising more than 2 degrees Celsius over pre-industrial levels and ideally to avoid the risk of temperatures rising above 1.5 degrees C. over pre-industrial levels.



In its most recent analysis of what this would mean, the IPCC estimated that attainment of the two-degree C. goal would require global GHG emissions to decline by 2030 to 40 Gt and to meet the 1.5-degree C. goal would require global emissions to decline to 24 Gt. These are roughly equivalent to reductions in carbon dioxide emissions to 24.3 Gt for the two-degree C. goal and 15 Gt for the 1.5-degree goal. See the IPCC analysis here: https://www.ipcc.ch/site/assets/uploads/2018/12/UNEP-1.pdf

The countries, and groups of countries, that we will examine in this paper accounted for 25.2 Gt of carbon dioxide emissions in 2018, or 78 % of the global total. Their performance in reducing emissions to meet the 2030 goal will be of critical importance in determining whether that goal is met.

## The Top 10 plus EU

Table 1 lists the countries that are the ten largest carbon dioxide emitters in the world, as well the European Union, whose members tend to set joint policy on emissions reduction, along with data showing trends over the past decade. The emissions are listed in terms of megatonnes (Mt):

**Table 1**
**Carbon Dioxide Emissions Trends**

| Country/Group | 2008(Mt) | 2018(Mt) | Change (Mt) | Change (%) |
|---|---|---|---|---|
| **China** | 7379 | 9429 | 2050 | 28 |
| **USA** | 5676 | 5145 | -531 | -9 |
| **European Union** | 4149 | 3479 | -670 | -16 |
| **India** | 1467 | 2479 | 1021 | 69 |
| **Russia** | 1554 | 1551 | -3 | -0.2 |
| **Japan** | 1275 | 1148 | -127 | -10 |
| **South Korea** | 558 | 698 | 140 | 25 |
| **Iran** | 504 | 656 | 152 | 30 |
| **Saudi Arabia** | 424 | 571 | 147 | 35 |
| **Canada** | 545 | 550 | 5 | 1 |
| **World** | **30,337** | **33,891** | **3554** | **12** |

*Source: BP Statistical Review of World Energy 2019*

The above table illustrates some important points:

- Despite the fact that the last decade has witnessed the most serious economic recession since the Great Depression, global carbon dioxide emissions grew by 12 %.
- The growth has been very unequal. The developing countries like China, India, South Korea, and Iran have experienced rapid growth. In fact, by 2018 the non-members of the Organization for Economic Cooperation and Development (OECD) constituted 63% of global emissions.
- China is far and away the largest emitter, with 28% of the global total in 2018. It also has been the scene of the largest emissions growth over the past decade, twice as much as the nearest other country, India.
- India's emissions grew at the remarkable pace of 69% in one decade.
- The European Union, the United States and Japan have been the largest reducers of emissions.



## Performance Against the INDC Targets

### China

In 2005, China surpassed the United States as the world's largest emitting country. Since 2013, China's emissions have been more than twice those of the United States.

China's 2015 commitment to the UN did not include an agreement to achieve a specific GHG emissions target. Rather, it promised to "peak" its emissions at the latest by 2030. It also committed by 2030 to increase the share held by non-fossil fuels in its energy consumption to 20%; to add 4.5 billion cubic metres to its forest stock; and to reduce its carbon intensity to 60 % to 65% below 2005 levels.

According to Climate Action Tracker, China now has policies in place that would result in GHG emissions of roughly 14.4 to 16.6 megatonnes in 2030. That is almost 7 Mt higher than 2018 levels. That would be three and a half times United States emissions by then.

In terms of the emissions intensity objectives, Carbon Action Tracker considers that China will meet its goals. China's 13$^{th}$ Five-Year Plan stipulates a maximum 58% share of coal in national energy consumption by 2020. The country has very low carbon dioxide prices applied at the regional level of about $2 per tonne. It has begun to implement an emissions trading system, with first trades expected in 2020. Operating within a centrally planned, tightly controlled economy, China has imposed several regulatory restrictions on coal consumptions, mostly to improve local air quality, and it has provided very large subsidies for renewable energy additions and for electric vehicle manufacture and purchase.

Despite these actions, a recent analysis by Coalswarm concluded that 259 Gigawatts (GW) of coal-fired power generation capacity is now under development in China, roughly equivalent to the total present coal fleet of the United States. If completed, this would lead

to a 25% increase in the Chinese coal fleet and exceed the 1100 GW coal cap in China's present Five-Year-Plan. Also, in August 2018, the Chinese government sharply reduced subsidies for solar projects.

According to Carbon Action Tracker analysis, China's emissions will be between 14% and 25% above 2015 levels by 2030. Whether it will stay below that "peak" thereafter remains to be seen.



## United States

The Obama Administration in the United States signed the COP21 Agreement, while insisting that it was not a "treaty" so as to avoid the necessity for ratification by the U.S. Senate. In the INDC that the U.S. filed with the U.N. in 2015, it committed to reduce GHG emissions by 26-28% below 2005 levels by 2025 including LULUCF (allowances for changes in land use and forestry biomass). The Trump Administration subsequently communicated the U.S.'s intention to withdraw from the agreement, which will take effect in 2020.

The U.S. has subsequently amended its Clean Power Plan, which would have sharply reduced electricity generation from coal-fired plants, and indicated its intention to freeze auto fuel efficiency standards from 2020 to 2026. The government has reduced restrictions on exploration and development for oil and gas on federal lands and promoted oil and gas development, with the result that the United States has become the world's largest producer of oil and natural gas. LNG exports increased 53% in 2018 alone.

Meanwhile, a number of factors have combined to significantly decrease U.S. emissions. Increased production and lower prices of natural gas has caused many utilities to convert their generation systems from coal to natural gas. Largely due to mandatory standards for the use of renewable energy in 29 states, and the use of voluntary targets for use of renewable energy in others, the use of costly renewable energy has increased. The U.S. Energy Information Administration projects the share of renewables in electricity generation to reach 24% in 2030. Total U.S. emissions are projected to decline to 13 to 15 % below 2005 levels (about 4,900 Mt) by 2025.

Future emissions reduction policies promise to be a highly contentious issue in the forthcoming 2020 U.S. national election campaign. More than half of the candidates competing to lead the Democratic Party in the Presidential election have endorsed the concept of a "Green New Deal" that calls for a rapid transition to a zero GHG emission economy. Realistically, even if such a goal were to be endorsed, it would take several decades to achieve.

## European Union

There is no separate Climate Action Tracker analysis for Germany, so I will use its analysis of emissions prospects for the entire European Union (EU). The EU includes 28-member countries in eastern and western Europe. The countries with the largest populations are Germany, France, the United Kingdom, Italy, Poland and Romania.



The INDC submitted by the EU in 2015 committed the group to emissions reduction of at least 40% below 1990 levels by 2030, the most ambitious reduction of any country or group of countries. The EU has so far adopted a highly intrusive regulatory approach to emissions reductions. Ten EU member states have ended coal-fired power generation or pledged to phase it out by 2030 (Austria, Belgium, Denmark, Finland, France, Italy, Netherlands, Portugal, Sweden, and the United Kingdom). However, at present, six EU countries have new coal-fired capacity under development or construction (Germany, Czech Republic, Greece, Hungary, Poland and Romania). In 2018, two thirds of the emissions from the EU power sector still came from coal-fired power plants. Germany's declared objective is to close all coal-fired plants by 2038, but this is combined with a Green Party-led insistence on eliminating the use of nuclear power as well.

The 2018 EU Renewable Energy Directive introduced a new goal of a 14% share of renewable in the transport sector by 2030, combined with limitations on the use of first-generation biofuels to attain this goal (i.e. an indirect subsidy for second generation biofuels for use in transportation). The region has the most demanding vehicle fuel efficiency regulations in the world, extremely demanding requirements for use of renewables in power generation (with resulting high electricity rates), and a new Buildings Directive that aims to "decarbonize" the building infrastructure by 2050 (in a continent with hundreds of thousands of buildings that range from 50 to 100 years old or older).

The EU Emissions Trading System (ETS) for years had a limited effect because too many free permits were issued. As recently as 2017, the average permit price was 5.84 euros (about Cdn $8.30) per tonne. The ETS has now been reformed. During the first five months of 2019, the permit price remained above 20 euros (Cdn $28.40), and further increases can be expected, although some analysts foresee considerable price volatility after 2023 if there is an accelerated coal phaseout.

The Climate Action Tracker analysis of the EU used two different models with different sets of assumptions, and projected that EU emissions by 2030 would be between 30.6% and 48% below 1990 levels. A continuation of the trends set in the past decade (1.7% annual average reduction) would see a 2030 emissions level of about 2770 Mt.

This 'success' comes at a cost. In 2013, Antonio Tajani, the European industry commissioner said, "We face a systemic industrial massacre," The Telegraph reported that:

"Mr Tajani warned that Europe's quixotic dash for renewables was pushing electricity costs to untenable levels, leaving Europe struggling to compete."[2]

## India



In its IDNC, India committed unconditionally to reduce GHG emissions intensity (i.e. not emissions) to 33% to 35% below 2005 levels by 2030, excluding LULUCF. Under the condition that it receive major financial and technology assistance, it committed to increase the non-fossil fuel share of its electricity generation capacity to 40% by 2030.

India's actions often seem to diverge from official statements concerning what it will do. While the country appears to be easily on track to increase the share of its power generation capacity held by renewable energy generation, today fossil fuel power plants (93% coal) provide more than 80% of India's electric power production. From 2006 to 2017, India installed 152 GW of coal power capacity, second only to China. Its most recent National Energy Plan included more than 90 GW of planned coal-fired power plant capacity. After stating a commitment to a 100% share of electric vehicles in new vehicle sales by 2030 (in a country with a very low motorization rate), the government has publicly abandoned this goal.

Climate Action Tracker projects that, under current policies, India's emissions would rise to about 3300 Mt in 2020 and 4,500 Mt in 2030. While close to India's COP21 commitment, it is a long, long way from the emissions reductions being asked of the rest of the world. Whether this will happen depends on India's rates of economic and population growth. By 2028, India is projected to overtake China as the largest country in terms of population, and reach 1.5 billion by 2030.

## Russian Federation

Russia never ratified the COP21 Agreement, so it does not have any legal or political commitments to live up to. It did submit an INDC in 2015, in which it stated a target of having emissions at 25-30 % below 1990 levels by 2030. Due to the collapse of the Russian economy after the end of the Soviet Union, emissions have already declined to almost 30% below 1990 levels, so the commitment represented very little change.

In 2018 the Russian Environment Ministry drafted an "Ecology" program that focused on air pollution reduction, reforestation and improving waste management. None of the ten "directions" in the Ecology Program relate directly to GHG emissions reductions. In December 2018, the government introduced new draft legislation that would establish a cap and trade emissions trading system for major carbon dioxide emitters by 2025 and require companies to report their emissions.

[2] https://www.telegraph.co.uk/finance/financialcrisis/10295045/Brussels-fears-European-industrial-massacre-sparked-by-energy-costs.html

According to Climate Action Tracker's estimates, Russia's policies will lead to emissions that are 6-14% above 2016 emission levels. Using the British Petroleum figures, that would mean emissions of 1590 Mt to 1740 Mt.

## Japan



In its 2015 INDC, Japan committed to reduce emissions to 26% below 2013 levels by 2030.

It is difficult to project Japan's future emissions because of ongoing controversies over the role that nuclear energy, or alternatively coal, will play in Japan' electrical power system. The 2030 electricity mix assumed in Japan's INDC is based on its 2015 Long-Term Energy Supply and Demand Outlook, which foresees 20-22% of electricity being supplied by nuclear energy, 22-24% being supplied by renewable energy and the remaining 56% being supplied by fossil fuel sources. By 2030, fossil fuel power plants would still play an important role. Their share could increase further depending on the effect of strong public opposition to nuclear power. After the Fukushima Daiichi nuclear disaster (caused by the tsunami on 2011), Japan's nuclear plants were almost completely shut down for inspection. In the years before 2011, nuclear plants had a 30% share of power production. In 2017, only 4 of the 54 reactors were in operation. To fill the gap, in the following years natural gas-fired generation increased by a quarter and coal-fired generation by about 10%.

There are uncertainties as well about whether 15 GW of planned new coal-fired plants will be built in the face of declining electricity demand.

Climate Action Tracker estimates that Japan's current policies will lead to 2030 emission levels 10-15% below 1990 levels by 2030. Based on Japan's record over the last decade (i.e. an average 0.8% emission reduction per year), it would seem that a more accurate projection would be about 1040 Mt.

## South Korea

South Korea's INDC includes a target of reducing GHG emissions, excluding land use (i.e. LULUCF), by 37% below business-as-usual emissions (or 18% below 2010 levels) by 2030.

In July, 2018, South Korea also announced a plan with the objective of "peaking" GHG emissions around 2020, and added a target of reducing emissions by 32.5% by 2030.

South Korea's 2017 15-year "Plan for Electricity Supply and Demand included an increased share of renewables in electricity generation, but an intention to remain heavily dependent on coal-fired generation. Coal would still account for more than a third of generated electricity in 2030.

Climate Action Tracker did not offer a projection of South Korea's GHG emissions by 2030. The country seems to be sending very conflicting signals as to what its real intentions are.

Even a "stabilization" of current emissions for a decade, which seems unlikely given past history, would still leave Emissions around 700 Mt per year in 2030.

## Iran



Carbon Action Tracker did not assess emissions from Iran, so it is not even clear whether Iran was a party to the COP21 Agreement. Information coming out of the country is very limited. According to press reports, Iran's Meteorological Organization acknowledged that the country's GHG emissions increased 3% in the past decade, which is interesting given that the BP statistics show a 30% increase.

Again, based on press reports, the Iranian government pledged in 2016 to reduce its emissions by 4% (from an unspecified base) by 2030. "If sufficient financial aid is allocated, Iran says that it can reduce emissions by another 8%".

Projecting Iran's future emissions is guesswork. Assuming continuation of current trade sanctions would adversely affect Iran's economy so as to reduce emissions by a third to two thirds of the past decade's growth, Iran's 2030 emissions could be somewhere between 700 Mt and 750 Mt.

## Saudi Arabia

In its INDC, Saudi Arabia committed to reduce its annual emissions by up to 130 Mt in 2030. However, Saudi Arabia has not published the baseline from which its "abatement target" is deducted. Rather, it has specified that a "dynamic baseline will be developed on a basis of a combination of two scenarios" which are scenarios based on whether more oil is consumed locally or exported.

In short, no one knows which GHG emissions reductions, if any, Saudi Arabia plans to aim for. Further, Saudi Arabia may choose to weaken its INDC by 2020, as it has maintained an exit clause – i.e. if it decides the COP21 Agreement creates an "abnormal burden" on its economy.

Climate Action Tracker estimates that Saudi emission levels will be somewhere between 38% and 77% above 2015 levels by 2030. Using BP emissions figures, that equates to emissions levels in 2030 ranging from 810 Mt and 1040 Mt by 2030.

## Canada

In its INDC, Canada committed to reduce emissions to 30% below 2005 levels by 2030.

Regular readers of the Friends of Science blog will be very familiar with the policies and programs of the Canadian federal and provincial governments. Most media attention is probably given to the carbon dioxide pricing system, which is in fact a mixture of carbon

dioxide taxes and emissions trading (cap and trade) systems varying considerably across the provinces. The Canadian carbon pricing rate is one of the highest in the OECD, scheduled to rise to $50 per tonne in 2022, much higher than the rates faced by companies in the countries with which Canadian companies must compete.



To this complex pricing system is added over 600 different regulatory, tax, subsidy, and administrative programs and other measures that touch almost every sector of the economy and are growing in number almost every month. In December 2018, Canada adopted performance standards on coal and natural gas-fired power stations, which may ensure that it meets its 2030 coal phase-out date. Canada also has adopted sales targets for zero-emission passenger vehicles of 10% by 2025, 30% by 2030 and 100% by 2040.

Climate Action Tracker noted that Canada is likely to miss its 2030 target. For reasons I have explained elsewhere,[3] [4] I think that may be an understatement. Environment and Climate Change Canada has acknowledged that, under present policies, the target will be missed by at least 80 Mt. Using the BP data, my expectation is that Canada may at most reduce emissions by 15% by 2030, to around 468 Mt.

## The Results

Table 2 shows the projected GHG emissions of the largest emitters, using the European Union as one of the units measured.

**Table 2**

**Projected Emissions of Largest Emitters by 2030 (Mt)**

| Country/Group | Emissions |
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| **China** | 14400 – 16600 |
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[3] https://blog.friendsofscience.org/2019/06/21/a-target-made-to-be-missed/
[4] https://blog.friendsofscience.org/2019/06/19/the-stakes-are-too-high-to-be-tricked-by-the-numbers/

## Conclusion



Based on experience over the past four years, none of the largest emitters, except the EU, will meet the emissions targets they set for themselves in 2015. China and India, which mainly set targets in terms of emissions intensity, may achieve those targets, but the results will still be very large emissions growth. In some cases, as for Iran, Saudi Arabia and perhaps South Korea, the countries appear to be paying only lip service to the goal of major emissions reduction.

As noted in Table 1, global emissions grew by 12% from 2008 to 2018. In fact, global emissions grew 2% from 2017 to 2018, twice as fast as the annual average over the previous ten years. This trend, along with the projected growth in emissions from the ten largest sources, makes it highly likely that global emissions in 2030 will be well above, not below, those today. There is no "global decarbonization transition" occurring.

Referring back to the IPCC's goals (i.e. equivalent to global carbon dioxide emissions of 24.3 Gt for the two-degree C. goal and 15 Gt for the 1.5-degree goal), Table 2 indicates that the world will come nowhere near to meeting them, based on current trends. Indeed, it is highly likely that emissions from China, India and the United States combined will exceed 24 GT by 2030. That means that all the other countries of the world could completely eliminate their emissions, and indeed cease to exist, within twelve years and the two-degree C. goal would not be met. China and India's emissions combined would exceed the global total the IPCC claims must be met to avoid "climate catastrophe".

One can debate whether the IPCC's assessment is based on sound science. One thing that should be well beyond debate is whether major, costly emissions reductions by Canada will have any effect at all on the global climate outlook.

*Shanghai Financial Centre, China – Image licensed from Shutterstock*
*Shanghai is a city of 23.65 million people.*

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*Robert Lyman is an Ottawa energy policy consultant and former public servant of 27 years, a diplomat for 10 years prior to that. His complete biography can be read here.*

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 (CO2).

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