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The Paris Agreement in 2021: Canada in a Global Context

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EXECUTIVE SUMMARY

- Virtually all countries have ratified the 2015 Paris Agreement on Climate Change and have adopted climate and energy legislation to implement it.
- Most major economies have adopted policies to reduce greenhouse gas (GHG) emissions by enhancing energy efficiency, stimulating renewable energy development and decarbonizing industries. A growing number of major economies have also declared plans to decarbonize their economies by the middle of the century.
- The environmental results fall short, however, as current policies will likely fail to achieve the declared global targets for emission reductions as well as the temperature goals of the Paris Agreement.

The 2015 Paris Agreement on Climate Change (PA) is the main international policy agreement that defines the global response to climate change. Its environmental goal is to keep the global temperature rise to "well below 2°C" and preferably to 1.5°C. Policies required to meet these goals include expanding renewable energy, enhancing energy efficiency and decarbonizing transportation, energy systems and energy-intensive industries. Efforts to reach the 1.5°C goal would require global investments of US$1.6 trillion to US$3.8 trillion per year between 2020 and 2050.[1] The 2020 global pandemic of COVID-19 temporarily reduced this cost as it slashed energy consumption and led to a record drop in global emissions in modern history, but the hard work of implementing the PA is still ahead.

The PA imposes legally binding obligations on countries to develop climate and energy policies for greenhouse gas (GHG) emission reductions. The treaty gives full freedom to each government to formulate its "nationally determined contribution" (NDC) to global climate policy but requires governments to revise their policy plans every five years and increase the level of ambition. Each country has an obligation to regularly strengthen its national policy plans and submit its actions to a robust system of international oversight. Five years after the agreement was negotiated, are major economies fulfilling their policy pledges? What are the main climate policy developments and economic trends around the world? How do Canada's policies compare to actions abroad? What is the status of the presumed "global green shift" and what are its implications for Canada?

THE PARIS AGREEMENT: AN UPDATE

The PA seeks to bring under control global emissions of carbon dioxide and other GHGs that have increased rapidly since the middle of the 20th century **(Figure 1 and 2)**. As of October 2020, 189 countries have ratified the treaty and accepted legal obligations under it.[2] They account for 96% of global emissions of greenhouse gases and include the biggest emitters and most of the major economies such as China, India, the European Union, the United States, Japan, Brazil, Canada, and Australia. Only seven countries that account for 4% of global GHG emissions have not ratified the agreement: Eritrea, Iraq, Iran, Libya, South Sudan, Turkey, Yemen.[3] The Trump administration suspended climate policy in the past four years and the U.S. withdrew from the PA on November 4, 2020. This left global leadership on climate governance to the European Union and China, and raised questions about the credibility of the PA without the second biggest emitter. However, no other country followed the U.S. example or changed their existing domestic policy plans. On the contrary, the EU and China significantly increased their policy ambitions for emissions reductions (see below).

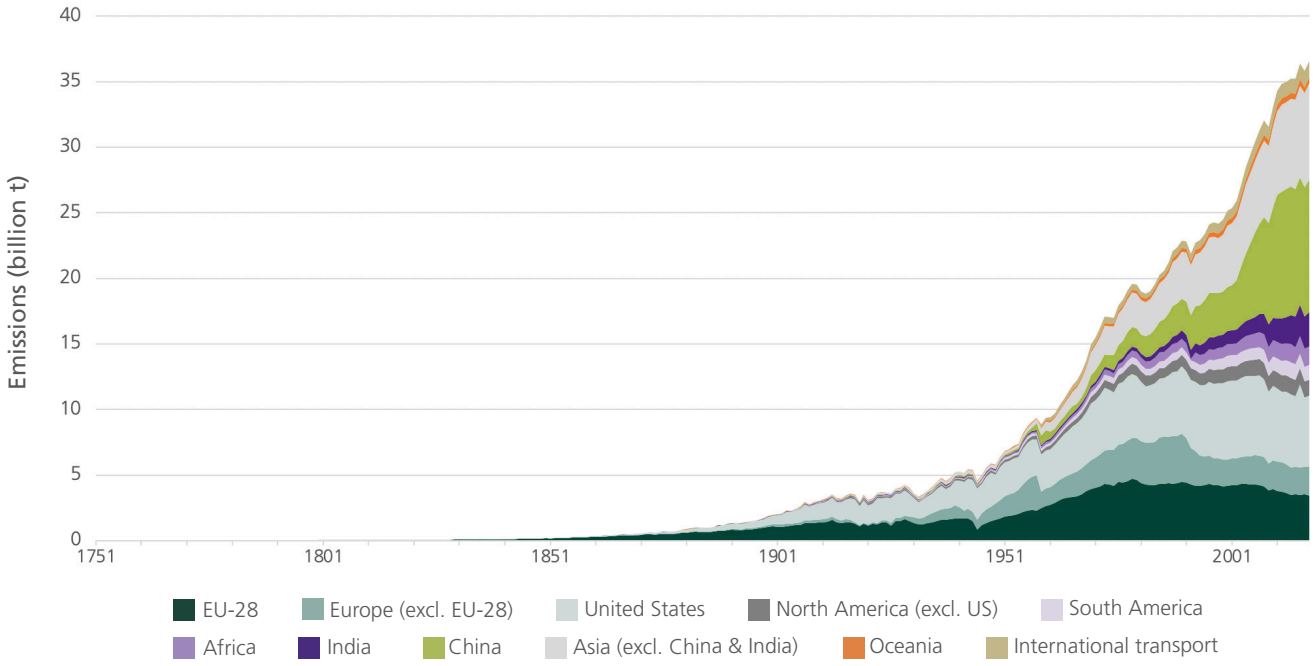
The PA continues to evolve. At the 2018 annual UN climate conference in Katowice, Poland, governments negotiated a "rulebook" of guidelines for the implementation of the treaty. This "Katowice Climate Package" contains a series of decisions on mitigation, adaptation, finance and technology that operationalize the PA, facilitate compliance and help countries achieve their national policy goals.[4] The new agreements signal progress in resolving longstanding global political disagreements. Notably, the issue of "differentiation" between developed and developing country obligations has been the cardinal point of contention since the 1990s. In 2018, countries adopted common and uniform NDC guidance and now all face the same requirements for accounting and transparency for their actions. The new decisions also give teeth to a compliance committee that can now initiate investigations into noncompliance, and attach a global Adaptation Fund to the PA (ibid.). Progress in overcoming these historic conflicts in climate diplomacy signals that more hurdles to climate policy have been eliminated and makes implementation of the PA more likely.

However, there are also political difficulties that hamper action under the Paris Agreement. Countries have so far failed to agree on the role of markets in climate policy and have made little progress in establishing a global carbon price. The main aspect of the PA that has not been finalized pertains to international emissions trading and carbon markets. Article 6 of the PA stipulates that there will be an international mechanism for joint implementation and market-based approaches but leaves its details to future negotiations. The 2019 UN climate conference in Madrid demonstrated that this is the most contentious issue in climate diplomacy today. The meeting was the longest in the history of climate negotiations, as it went 44 hours overtime due to disagreements on Article 6, yet countries failed to establish rules for international emissions trading. Other outstanding questions include long-term climate finance and the absence of a credible global framework for climate adaptation policy. Developing countries protest that the 100 billion dollars per year by 2020 promised by the developed countries and enshrined in the PA has not materialized, and that discussions on finance beyond 2020 have not delivered new pledges.[5]

Overall, implementation of the PA has triggered national and international decarbonization policies on a global scale. Virtually every country has announced national policy pledges under the PA. In 2018, 89% of global GHG emissions were subject to national GHG emission targets, compared to 67% in 2012 and 45% in 2007.[6] New and revised NDCs are due by the end of 2020 and while only 23 countries have updated theirs, 125 countries representing 44.6% of global emissions have stated intention to enhance

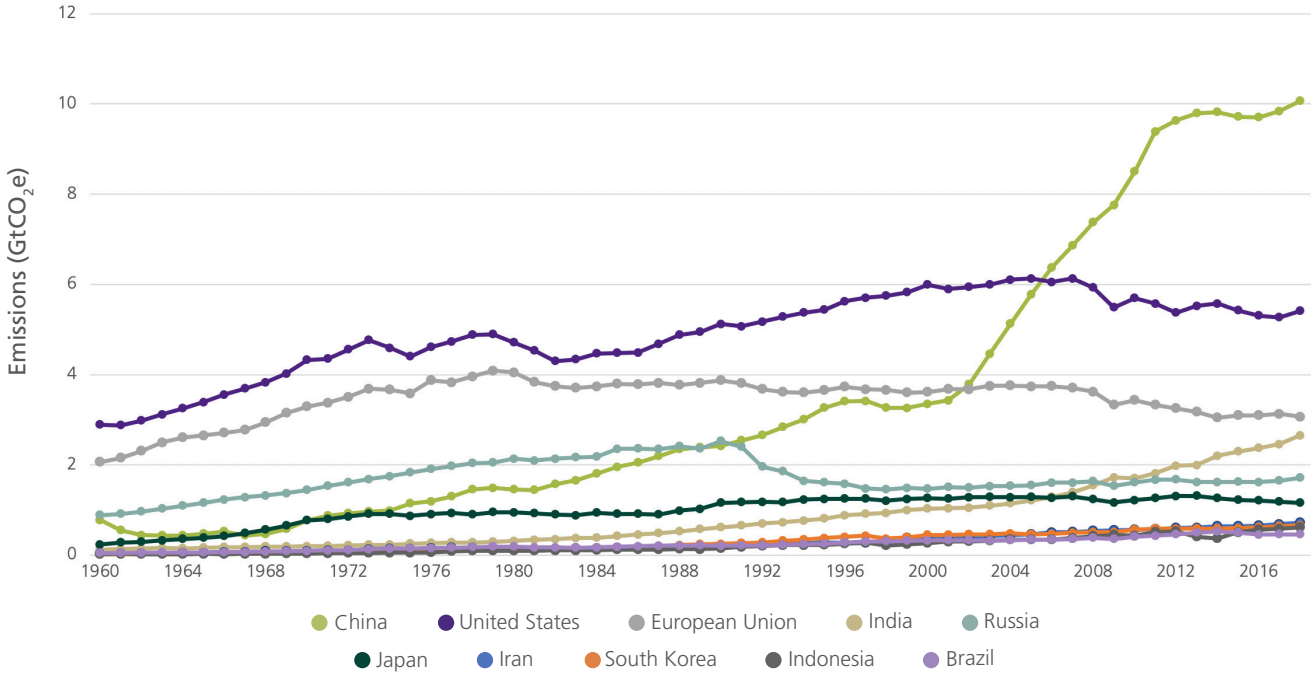
their ambition.[7] Governments are required to conduct a major global review of PA implementation in 2023 and every five years thereafter, to assess progress and reconsider the effectiveness of existing policies.

Figure 1 | Historic Emissions By Region



Source: *Our World in Data.* Available at https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions Accessed Dec. 17, 2020.

Figure 2 | Historical Emissions of Top Ten Major Emitters



Source: World Resources Institute's Climate Watch data platform (climatewatchdata.org).

POLICY DEVELOPMENTS AROUND THE WORLD

There has been a widespread acceleration of national climate and energy policies since the PA entered into force in 2016.[8] One hundred and twenty-six countries accounting for 51% of global GHG emissions have declared climate neutrality goals by 2050 or 2060, including China, the EU, Japan and Korea.[9] This implies that most of the world's economies plan for decarbonization by the middle of the century. Several industrial countries aim to achieve net-zero emissions earlier: Finland by 2035, Austria by 2040 and Sweden by 2045.[10] France, New Zealand, and the United Kingdom have enshrined the goal in national laws.[11] With the exception of Australia and India, all G-20 countries have either implemented or are developing carbon-pricing schemes such as emissions trading systems or carbon taxes. All G-20 countries are discussing national green finance strategies, and Brazil, France and South Africa have climate-related risk disclosure requirements for financial institutions.[12]

There are considerable differences between countries and regions in their policy ambitions and implementation progress (Table 1). One comprehensive assessment of policies in the G-20 concluded that only six of the twenty major economies are projected to meet their NDCs with current policies: China, India, Indonesia, Japan, Russia and Turkey.[13] In addition, the European Union, including its former member the UK, can meet their NDC targets with little additional effort. Seven other countries require further policy action to achieve their targets, and Australia, Canada, and the Republic of Korea are furthest off track to meet their NDCs.[14]

Table 1 | Policy Pledges and Emissions Changes of Major Economies

Country	Base year	2030 reduction targets	Previous 2050 reduction target	New long-term target by 2050 (unless noted otherwise)	2015 GHG Emissions ($MtCO_2e$)	2018 or 2017* GHG Emissions ($MtCO_2e$)
Australia	2005	26-28%	None	None	538	558
Brazil	2005	43%	None	None	1711	1392*
Canada	2005	30%	80%	Net zero emissions	720	729
China	2005	Emissions peaking & 60-65 % cuts *(carbon intensity)*	None	Net zero *carbon* emissions *(by 2060*)*	11578	11780*
European Union (28)	1990	40%	80-95%	Net zero emissions	4335	4224
India	2005	33-35% *(carbon intensity)*	None	None	3188	3356*
Japan	2005	25.4%	80 %	Net zero *carbon* emissions	1319	1238
Korea	BAU	37%	40-75% below 2017 levels	Net zero *carbon* emissions	692	N.A.
Norway	1990	40%	80-95%	Net zero emissions	54	52
Russia	1990	25-30%	None	None	2094	2220
Switzerland	1990	50%	70-85%	Net zero emissions	48	46
United States	2005	26-28% *by 2025**	80%	N.A.	6676	6676

Sources: OECD and World Resources Institute data.[15]

The regions with the most ambitious decarbonization policies are Europe and Asia. Recently, all major economies on the two continents declared they will decarbonize by the middle of the century. On September 22, 2020, China made a surprise announcement at the UN General Assembly that they will aim for carbon neutrality by 2060 (that is, net zero carbon emissions).[16] One month later, both Japan and the Republic of Korea announced a goal of climate neutrality by 2050.[17] The European Union (EU) had already committed to the same goal in 2018. Today, Asia and Europe contain all the countries with the largest installed renewable energy capacity at the end of 2018: China (727 GW), the European Union (469 GW), India (124 GW), Germany (119 GW), Japan (86 GW) and the United Kingdom (44 GW).[18]

In the ***European Union***, implementation of the Paris Agreement is in full swing and part of a major transformation of the European economy away from fossil fuels. There is a highly institutionalized economic policy to modernize the economy and increase global competitiveness by achieving decarbonization and energy security.[19] The EU sees climate policy in the context of a clean energy transition that is driven by economic interests. The European Commission estimated that reaching net-zero emissions could add up to 2% to GDP, save €200 billion from health costs and slash €2-3 trillion from fossil fuel imports by 2050.[20] On December 11, 2020, European leaders agreed to reduce EU emissions by 55% compared to 1990 levels by 2030.[21] This is a step up from the original EU commitment under the PA to cut emissions by at least 40% by 2030 and a long term goal of 91-94% cuts by 2050.[22]

The EU has sought to decouple industrial emissions from economic growth. Between 1990 and 2018, it reduced its emissions by 23% while its economy grew 61%.[23] Emissions in 2020 are expected to be 34-35% below 1990, albeit partly due to the Covid-19-induced recession. In 2019, emissions in the European power sector alone were 44% below 1990 levels and the share of renewables in power generation reached 34.6% while the share of coal declined to 14.6%, almost 4.4% less than the previous year. Coal will continue its steady decline in Europe as Sweden and Austria became coal-free in April 2020 and Spain switched off seven coal plants that accounted for almost half of the EU's installed coal capacity.[24]

One reliable indicator of the depth of the EU's commitment to building a clean economy is the high level of financial expenditure for the various programs that support the energy transition. Currently, 20 percent of all EU spending is on climate and energy policy.[25] In its blueprint for the 2021-27 budget, the Commission proposed increasing this share to at least 25 percent. In July 2020, the European Council went even further and agreed to spend an astonishing 30% of the EU multi-annual budget on climate mitigation, which amounts to 547 billion euros.[26] Over the next decade, the EU will need around 180 billion euros per year in investments to implement the PA through further improvements in energy efficiency and deployment of renewables (EC 2018, p. 6). The European Investment Bank has announced its plan to stop funding natural gas infrastructure in 2021 and to spend 1 trillion euros on investments in climate policy and environmental sustainability between 2021 and 2030.[27]

The European Commission has developed strategies for decarbonizing the European economy. In December 2018, it presented its 2050 Long-Term Climate Neutrality Strategy for decarbonization by 2050 and launched the Clean Energy Industrial Forum and the European Strategic Energy Technology Plan that aim to accelerate the development and deployment of low-carbon technologies.[28] In the same year, the Energy Union Governance Regulation was adopted, with targets to achieve 32% share of renewable energy and 32.5% energy savings by 2030.[29] In 2019, the Commission under the leadership of Ursula Von der Leyen issued a "European Green Deal" that charts the long-term development under a new paradigm that is based on sustainable development, climate neutrality by 2050, and improving human wellbeing.[30] In the same year, the EU completed a comprehensive revision of its energy policy framework and adopted a policy package called "Clean Energy for All Europeans" that consists of eight legislative acts.

The United Kingdom has the most ambitious policy in the industrialized world. In December 2020, it announced a target of 68% reductions of emissions below 1990 levels by 2030. It has already cut its emissions more than any developed economy and was the first country to declare a climate neutrality goal by 2050.[31] Similarly, Germany plans to reduce its GHG emissions by 55% (including 61-62% in the energy sector) by 2030, compared to 1990 levels, and aims at climate neutrality by 2050.[32] To achieve this, the country plans to close all coal plants by 2038 and works on continued expansion of renewables, major improvements in energy efficiency, development of hydrogen fuel, battery storage and clean technology.[33]

In ***China***, the notion of a clean economy has become integral to long-term development planning. It is important to emphasize that the country's implementation of the Paris Agreement is consistent with policies launched before the agreement was negotiated. Concerned with air pollution, China began to reduce coal use and promote clean energy in 2012.[34] President Xi Jinping has prioritized ecological modernization and green development, and the country is aiming at achieving an "ecological civilization" by 2035, a concept enshrined in the constitution of the People's Republic of China in 2018.[35] The recently outlined 14th Five-Year Plan to be released in early 2021 further prioritizes low-carbon development and "aims to make new progress in building an ecological civilization … and achieve notable results in green transformation of production."[36] These factors suggest that China's green policies will remain in place and will likely accelerate.

China prioritized climate policy even in the face of U.S. withdrawal from the Paris Agreement. Its pledge under the PA identifies three mitigation targets: 1) peaking of emissions of carbon dioxide by 2030; 2) reducing carbon intensity of its GDP by 60-65% below 2005 levels and 3) achieving 20% share of non-fossil fuels in primary energy consumption by 2030. Emissions continue to rise and are projected to keep growing until 2030 but at a lower rate compared to historic emissions.[37] China is still building coal fired power plants and nuclear power facilities and the government plans to eliminate renewable subsidies in 2021.[38] At the same time, the PRC leadership has focused on restructuring the energy industry and inefficient coal mines and power plants are being shut down while renewable energy is rapidly expanding.[39] China has the most progressive public transport policy among G20 countries and the number of electric vehicles almost doubled between 2017 and 2018.[40] Non-fossil energy grew at an annual average rate of 10.3% between 2005 to 2016, and its proportion in primary energy consumption increased from 7.4% to 13.3%. In 2030 the proportion of non-fossil energy power capacity in total power capacity is expected to rise to more than 60% from 36% in 2016.[41]

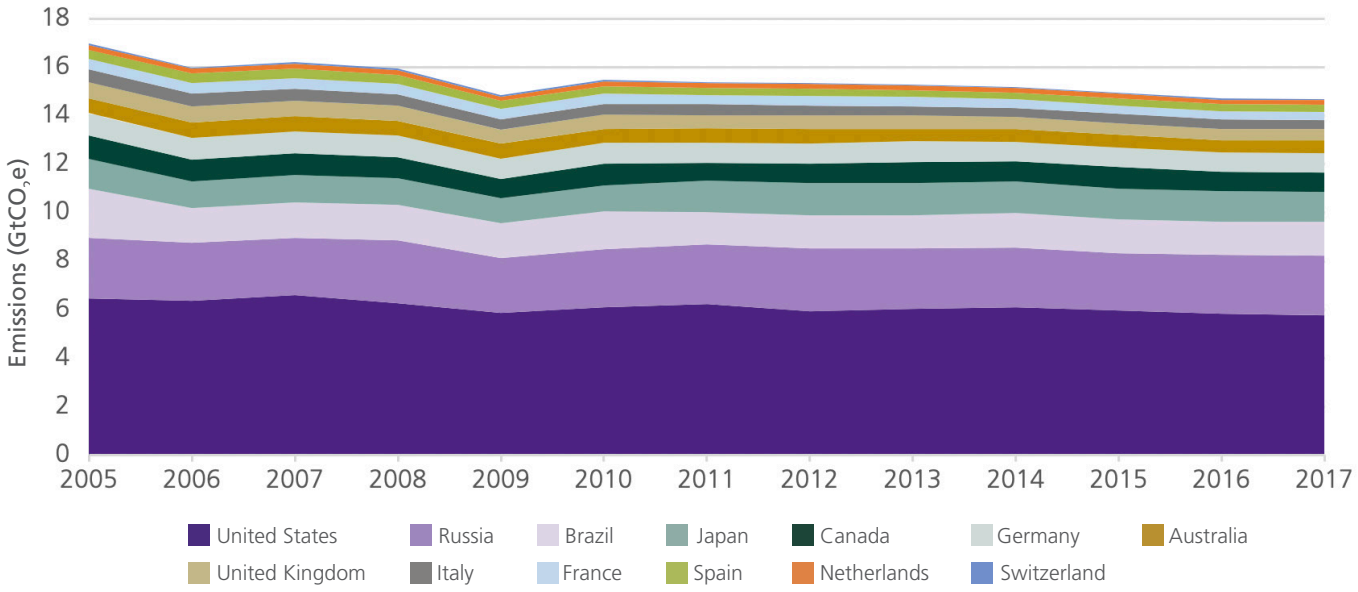
India and Japan are also on track to achieve their pledges under the PA but those are relatively modest. ***India***, the third largest emitter of GHGs aims to reduce emission intensity of GDP by 33-35% below 2005 by 2030. In 2018, its investments in solar energy exceeded those in coal.[42] In ***Japan***, the picture is complicated by the fallout of the 2011 nuclear disaster at Fukushima. Most of the country's 34 nuclear reactors closed and the government compensated for the decline of nuclear energy by increasing coal imports. At the same time, energy saving programs have led to substantial gains in energy efficiency, reduction in energy demand and greater focus on clean technologies and renewables.[43] Japan's NDC aims to reduce GHG emissions by 26% below 2013 levels by 2030, a relatively modest target that current policies are on track to achieve.[44] Recently, Japan increased its policy ambition. Their long-term strategy had been to seek 80% emission reductions by 2050 and decarbonization "as early as possible in the second half of the century."[45] In October 2020, however, Japan joined the EU and China and announced a climate neutrality goal by 2050. In making the announcement, Prime Minister Yoshihide Suga stated publicly: "Responding to climate change is no longer a restraint on economic growth. … Taking assertive measures against climate change will lead to changes in industrial structure and the economy that will bring about great growth."[46]

In the ***United States***, there is a contrast between recent federal policies and overall trends. Since 2016, the Trump administration strongly opposed climate policy and clean development. Through Executive Order 1378, Trump effectively dismantled federal climate policy and repealed the Clean Power Act of the Obama administration that aimed to reduce emissions from the power sector by 32% below 2005 levels by 2030. In September 2018, the Department of the Interior adopted a rule that loosened methane requirements in the oil and gas sectors, rolling back a regulation that had required the industry to detect and capture methane leaks from oil and gas operations on federal lands. In 2018, the US became the world's largest producer of crude oil and it is also the largest producer of natural gas.[47]

Yet, even in the U.S. under Trump, there has been a discernible trend compatible with the PA and clean development. Today US emissions are actually lower than before the PA **(see Figure 3)**. Emissions from the power sector declined by 28% between 2005 and 2018 and are projected to be 33% lower in 2030 compared to 2005, due to a shift away from coal power and slower demand growth.[48] Despite the repeal of the Clean Power Act, the power sector is set to overachieve the Act's goals as market forces have led to the decline of coal and the rise of natural gas and renewables.[49] And despite Trump's campaign to revive the coal industry, coal continued its decline: coal power generation is down 22% and employment in the coal industry is down 5% between 2016 and 2019. In 2016, coal produced twice as much electricity as renewables did; in 2020, renewable power matched coal power for the first time.[50]

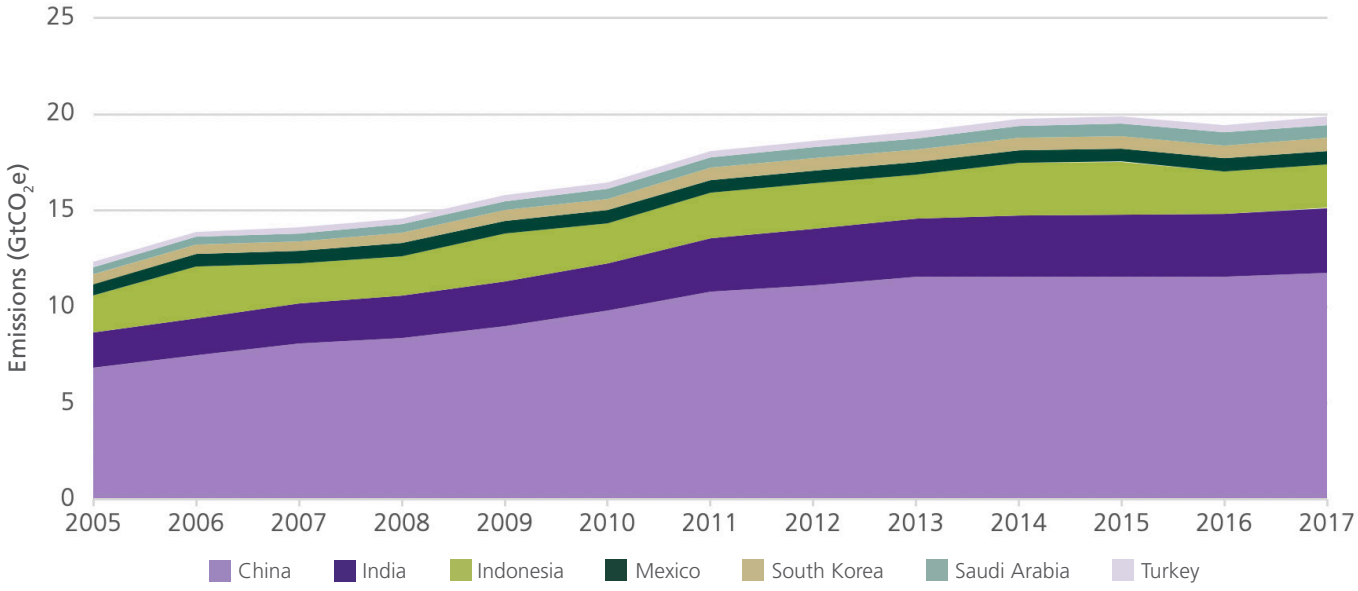
Policy actions by multiple US states and non-state actors are in line with the PA goals. The US Climate Alliance, a coalition of 25 states, defied withdrawal from the PA and remained committed to reducing emissions to achieve the US NDC target of 26-28% cuts below 2005 levels by 2025. The alliance represents 55% of the US population and more than one-third of US emissions, and its member states reduced their emission by 16 percent between 2005 and 2017, compared to the national 7 percent reductions.[51] California's governor issued Executive Order B-55-18 for the state to become carbon neutral and Senate Bill 100 mandated carbon-free electricity by 2045. Green New Deal resolutions both in the Senate and the House of Representatives have called for major emissions cuts, 100% renewable energy, elimination of emissions from the agricultural sector, and achieving carbon neutrality.[52] Incoming President Biden is expected to change US climate and energy policies, and to seek reentry into the Paris Agreement.

Figure 3 | Major Economies With Lower Emissions in 2017 Than in 2005



Source: *Climate Watch.*

Figure 4 | Major Economies With Higher Emissions in 2017 Than in 2005

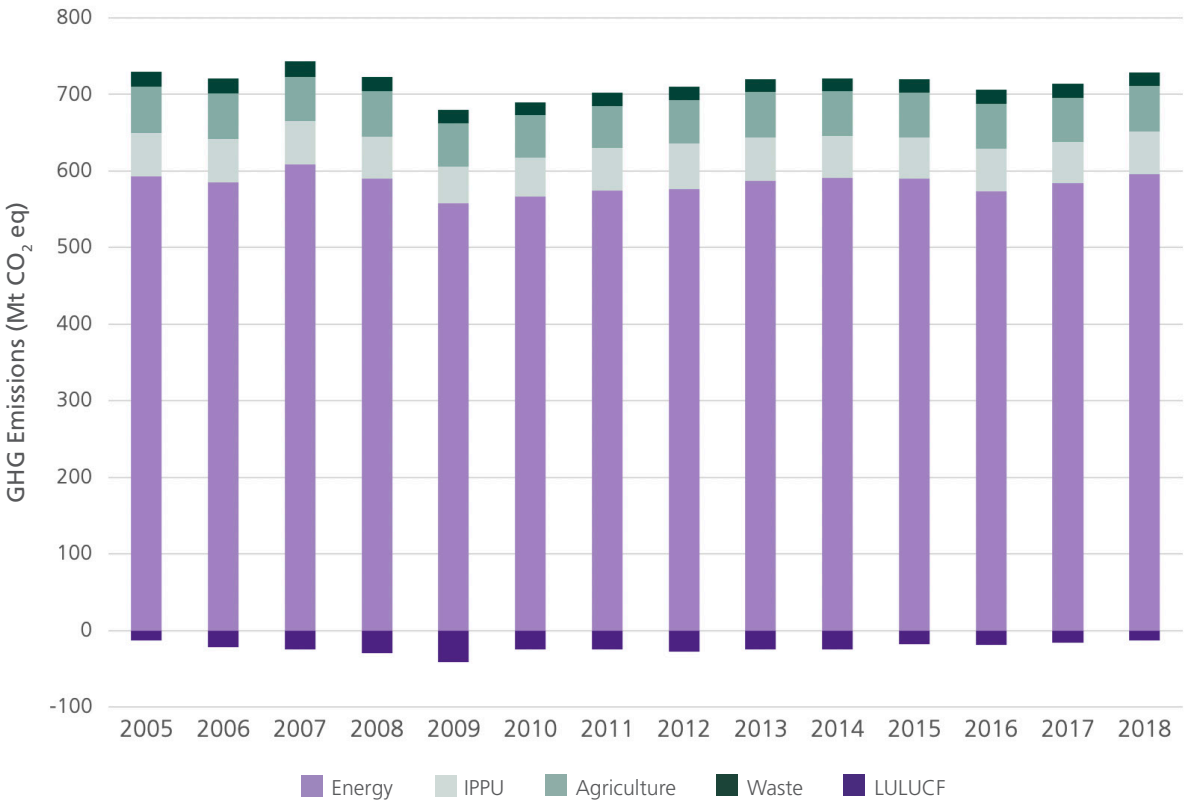


Source: *Climate Watch.*

The emissions of several major economies continue to increase **(Figure 4)** and some resource-rich countries have not followed the global trend towards decarbonization. Australia does not have plans for carbon neutrality and production in the coal and natural gas industries is expected to increase by 4% and 6% between 2020 and 2030, respectively, while investments in renewable energy have declined.[53] The Russian Federation is another major emitter whose policies focus on supporting fossil fuel energy. The Russian Energy Strategy 2035 was released in June 2020 and aims to grow the fossil fuel sectors, specifically expand natural gas productions and exports. Russia has a particularly slim 2.5% renewable energy share target by 2020 and 4.5% by 2024.[54] Saudi Arabia has few policies in place and a target of reducing emissions by 130 $MtCO_2e$ below BAU by 2030 (which would amount to 562% increase above 1990 levels). The Kingdom stated its intention to phase-out fossil fuel subsidies by 2030, but put brakes on the policy in 2017 in order to stimulate the economy.[55]

CANADA'S CLIMATE POLICIES

Figure 5 | Trends in Canadian GHG Emissions (2005-2018)



Source: Environment and Climate Change Canada, 2020 National Inventory Report.

Canadian policy declarations have proliferated. An April 2015 declaration, supported by all 13 provinces and territories, committed Canada to a transition to a low-carbon economy.[56] The Conservative government of Stephen Harper released a Canadian Energy Strategy in July 2015 that sought to ensure energy resource management "in a manner compatible with a low-carbon future."[57] The Liberal government of Justin Trudeau launched the Pan-Canadian Framework on Clean Growth and Climate Change in 2016, stating a commitment to the PA and building a clean economy: "We also agree on the importance of having globally competitive Canadian businesses, as we transition to a low-carbon economy.[58]

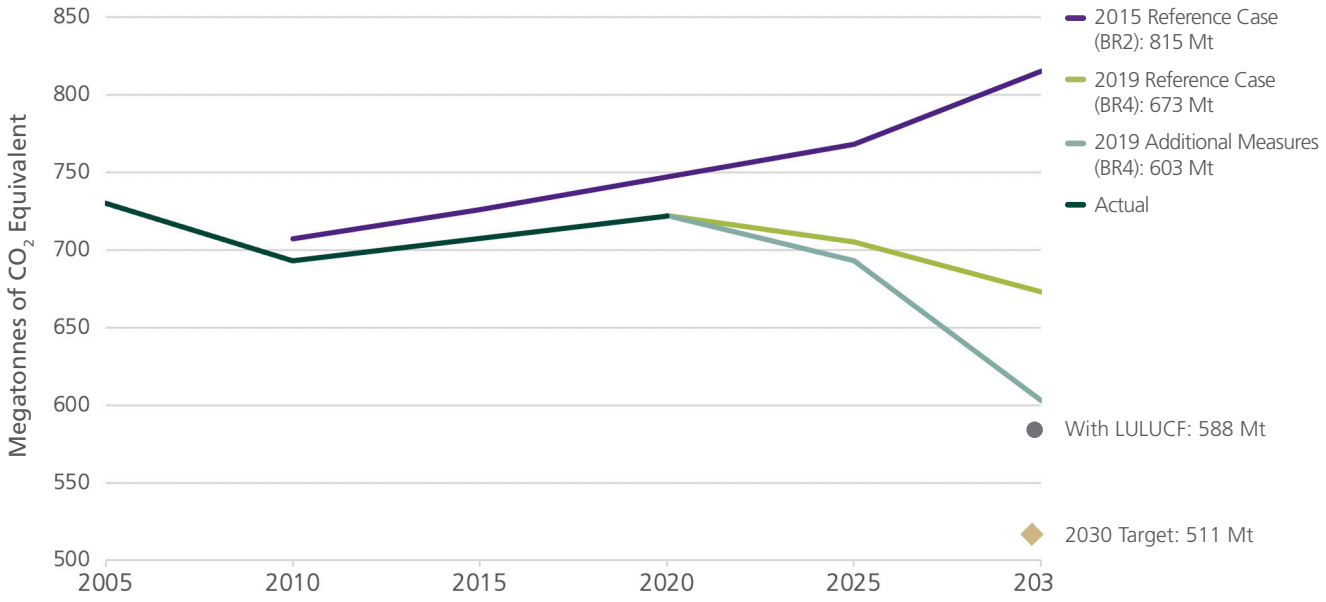
The Pan-Canadian Framework includes fifty policy measures to reduce emissions and promote clean economic growth, including pricing carbon pollution and fostering clean technology. Mandatory carbon pricing that applies to fossil fuels and major industrial facilities has been in effect since 2019. There is an expectation that all provinces and territories must have either a cap-and-trade system or a carbon tax in place. Current policies also include efficiency standards for passenger vehicles: new passenger vehicles and light trucks must meet fleet-wide emissions standards of 135g/km in 2016 and 98 g/km in 2025.[59] Oil and gas facilities must adopt methane control technologies.[60]

Recent legislative developments at the provincial level also point to the intention to build a diversified economy that is compatible with the PA. Almost every province has a new legal framework to reduce emissions. Quebec and Ontario have 2030 targets of 37.5% and 37% reductions below 1990 levels, and Manitoba's Climate Change and Green Economy Plan. British Columbia has a carbon tax that increases every year and will reach $50 per tonne of CO_2e in 2021.[61] Alberta has a carbon tax on fossil fuels of $30/tonne and its Climate Leadership Plan seeks to cap oil sands emissions to 100 megatons per year and reduce methane emissions from the oil sands.[62] Quebec has a cap-and-trade system for industrial and electricity sectors as well as fossil fuel distributors, revenues from which are invested in low-carbon technology.[63]

However, despite these policies, the end results are not yet meeting expectations. Government data shows that Canada's total emissions have remained generally constant since 2005 (see Figure 5). Studies conclude that Canada will miss its own national targets unless different policies are put in place. Canada's commitment under the PA is to reduce GHG emissions 30% compared to 2005 levels, which equals 13% reductions below 1990 levels. To achieve its targets, Canada has to produce no more than 511 $MtCO_2e$ per year by 2030. However, its emissions are projected to be 724 $MtCO_2e$ in 2030.[64] Another study shows that even with the 11-13% decline in emissions in 2020 due to Covid-19, Canada is likely to miss its 2030 targets by 15-20%.[65]

The Canadian government's own reports have acknowledged they may fail to achieve the 2030 policy target.[66] In a 2019 report to the UNFCCC, the government projected that extant policies would bring its national GHG emissions to 673Mt, instead of the 511Mt needed by 2030 (see Figure 6).[67] Assuming additional future measures that have not been introduced, projected 2030 emissions were 588Mt which is 19% lower than in 2005, instead of the targeted 30% cuts by 2030.[68]

Figure 6 | Canada's Historical and Projected GHG Emissions



Source: Government of Canada. 2019. *Canada's Fourth Biennial Report on Climate Change.* Report to the United Nations Framework Convention on Climate Change.[69]

In late 2020, the federal government proposed a new plan to reach net-zero emissions by 2050.[70] The plan seeks to integrate environmental and economic interests and includes 64 measures to promote clean energy, green jobs, sustainable transportation, energy efficiency and resilient communities.[71] Those include a rapid increase in the existing carbon tax by $15 per ton of carbon every year until it reaches $170 per ton in 2030, one of the most stringent prices on carbon globally. The government plans to spend $15 billion on the plan, including $1.5 billion to develop clean fuels such as hydrogen, $6.1 billion on building energy efficiency, and $287 million over two years to encourage electric vehicle use.[72] The Prime Minister's office justified the plan with job creation and economic growth, noting that the global clean technology market is expected to be worth between US$2.4 and $6.4 trillion dollars by 2022-23.[73]

Canada's Net-Zero Emissions Accountability Act (Bill C-12), currently under parliamentary consideration, stipulates a legally binding process to achieve the goal of climate neutrality, establishes an advisory body on the best pathways, and requires each government to be transparent about its policies. The new bill has been criticized since it does not have an enforcement mechanism, does not specify how emissions will be reduced, and it fails to require actions from provinces that are crucial to environmental policy.[74] While recent policies are ambitious and far reaching, these gaps, as well as prior discrepancies between political declarations and policy achievements, raise questions about the feasibility of the new 2050 goal.

GLOBAL ECONOMIC TRENDS

Concurrent with government policies are economic trends that may not be causally related but reinforce a pattern towards green development. Global clean energy investments have surpassed fossil fuel investments even though total global energy investment is estimated to have dropped 18% in 2020.[75] Oil and gas investments have fallen by one-third between 2019 and 2020 and major oil and gas companies have lost $50 billion dollars of their assets worth.[76] The International Energy Agency (IEA) reports that both the supply and demand for renewables grew during the Covid-19 pandemic, while total energy demand and demand for fossil fuels decreased.[77]

These recent developments are a continuation of longer-term trends in the global energy sector. Renewable capacity growth has doubled in the past decade, with total installed capacity reaching nearly 2,400 GW in 2018.[78] Renewables are expected to continue to grow rapidly in all scenarios developed by the IEA and to meet 80% of growth in global electricity demand by 2030.[79] The costs of solar energy have decreased by 70 percent between 2010 and 2017 and solar PV is cheaper than new coal and gas-fired power plants in some countries.[80] Global markets for climate-friendly technologies have grown to 1 trillion euro annually, and the European battery market is projected to be worth 250 billion euro per year by 2025.[81]

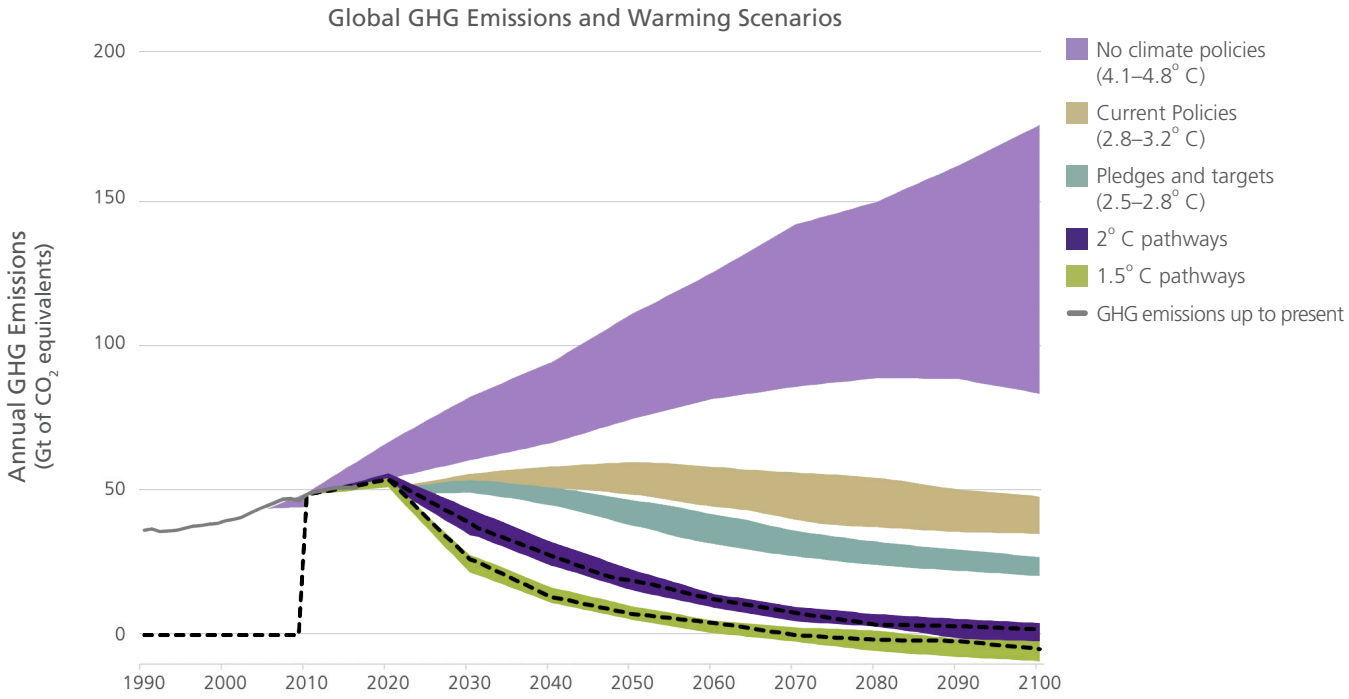
While current fossil fuel demand remains high, government subsidies to coal, oil and gas in the G20 countries declined nearly by half, from $248 to $127 billion between 2013 and 2017.[82] Among fossil fuels, only natural gas is expected to fare well because of environmental policy priorities to improve air quality and expand gas infrastructure. The IEA expects growth in oil demand to come to an end within ten years and coal to continue its decline as coal phase-out policies and the rise of renewables lead to a retirement of 275 GW of capacity worldwide.[83]

ENVIRONMENTAL RESULTS

What is the aggregate impact of policies and trends on GHG emissions and projected global temperatures? In short, the environmental results of PA policies are lacking and falling short of fulfilling the treaty's purpose. The economic effects of the Covid-19 pandemic temporarily obscure this picture as they led to the collapse of oil prices and a dramatic reduction in global energy consumption. Global GHG emissions in 2020 are 7% below 2019, the biggest drop since World War II.[84] This effect, however, is a temporary pause in the global growth of emissions.

Current national policies around the world are likely to collectively fail to achieve the declared NDC policy targets as well as the global temperature goals of the PA. This is the conclusion that comprehensive assessments by international organizations and research institutions reach. To achieve the goal of limiting global temperature rise to 1.5 degrees, governments need to reduce GHG emissions by 45% by 2030 compared to 2010, then bring CO_2 emissions to net zero by 2050 and all GHGs to net zero by 2070.[85] Yet, the Emissions Gap Report from the UN Environment Programme submits that global emissions continue to increase steadily and have risen at a rate of 1.5% per year in the last decade.[86] Global energy-related CO_2 emissions reached an all-time high in 2017.[87] While France, Brazil and the UK reduced emissions in the power sector, 82% of the energy mix in G-20 countries is fossil fuels; energy-related emissions increased in 2018 by 1.8%, and industrial emissions rose 3.4%.[88]

Figure 7 | Global Emissions Pathways



Source: *Our World in Data.*

Current policies worldwide would lead to global GHG emissions of 60 $GtCO_2e$ in 2030. Reaching the 2030 goals of the PA, on the other hand, would require emissions to be 41 $GtCO_2e$ for 2 degrees and 25 $GtCO_2e$ for 1.5 degrees. This means there is a large 'emissions gap' of 15 $GtCO_2e$ by 2030, compared to a 2°C scenario.[89] The end result for global temperatures is alarming: current policies are projected to lead to a temperature rise of 3.2°C by the end of the century, instead of the aspired "below 2°" **(see Figure 7)**. Another assessment projects a temperature rise of up to 3.9°C under current-policies scenario and a best-estimate of 2.7°C even if targets under NDCs are reached.[90] All published assessments agree that scaling up of climate policy action is necessary to reach the PA goals, and global emissions need to decline by 7.6% every year until 2030.

CONCLUSIONS

The international community is moving forward with the implementation of the Paris Agreement. Most advanced economies are fulfilling their international obligations under the treaty and have ambitious policies to reduce GHG emissions by enhancing energy efficiency, stimulating renewable energy development and decarbonizing industries. Apart from the level of policy ambition, there is a clear acceleration of such policies over time. In 2020, a growing number of major powers have declared intentions to decarbonize their economy by the middle of the century. These government policy developments are occurring at the same time as macroeconomic trends, investment patterns and technological developments suggest a shift to a green economy. The renewable energy sector has continued to improve its position, despite the economic turmoil related to the Covid-19 pandemic that hurt energy demand. Today implementation of the Paris Agreement appears to reinforce a global socioeconomic transformation away from reliance on fossil fuels and towards low-carbon development.

REFERENCES

Climate Action Tracker. 2019. *Warming Projections Global Update: Governments Still Showing Little Sign of Acting on Climate Crisis.* Available at https://climateactiontracker.org/publications/governments-still-not-acting-on-climate-crisis/. Accessed Nov. 4, 2020.

Climate Action Tracker. 2020. *Warming Projections Global Update.* Available online at https://climateactiontracker.org/documents/790/CAT_2020-09-23_Briefing_GlobalUpdate_Sept2020.pdf. Accessed Nov. 4, 2020.

Climate Transparency. *2019 Brown to Green Report: The G20 Transition Towards a Net-Zero Emissions Economy.* Available at https://www.climate-transparency.org/g20-climate-performance/g20report2019. Accessed November 10, 2020.

Den Elzen, Michel; Kuramochi, Takeshi ; Höhne, Niklas ; Cantzler, Jasmin ; Esmeijer, Kendall ; Fekete, Hanna ; Fransen, Taryn ; Keramidas, Kimon ; Roelfsema, Mark ; Sha, Fu ; van Soest, Heleen ; Vandyck, Toon. 2019. Are the G20 Economies Making Enough Progress To Meet Their NDC Targets? *Energy Policy* 126 (March), pp. 238-250.

Dubash, N.K., Hagemann, M., Höhne, N., & Upadhyaya, P. 2013. Developments in National Climate Change Mitigation Legislation and Strategy. *Climate Policy* 13(6), pp. 649-664.

ENB (Earth Negotiations Bulletin). 2018. "Summary of the Katowice Climate Change Conference: 2-15 December 2018," vol. 12, no. 747. Available at http://enb.iisd.org/climate/cop24/enb/. Accessed October 20, 2020.

ENB. 2019. "Summary of the Chile/Madrid Climate Change Conference: 2-15 December 2019," vol. 12, no. 747. Available at https://enb.iisd.org/climate/cop25/enb/. Accessed October 20, 2020.

European Commission. 2018. *A Clean Planet for all. A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy.* Retrieved from https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_en.pdf. Accessed November 10, 2020.

European Commission. 2019. *The European Green Deal.* Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee on the Regions (COM(2019) 640 final). Brussels, 11 December. https://doi.org/10.1017/CBO9781107415324.004. Accessed November 10, 2020.

Government of Canada. 2016. Growing the Middle Class. A budget proposal available at www.fin.gc.ca. Accessed November 10, 2020.

Government of Canada. 2018a. Regulations Amending the Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations. http://www.gazette.gc.ca/rp-pr/p2/2014/2014-10-08/html/sor-dors207-eng.html. Accessed November 10, 2020.

Government of Canada. 2018b. Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2018-66. https://laws-lois.justice.gc.ca/eng/regulations/SOR-2018-66/index.html. Accessed November 10, 2020.

Government of Canada. 2019. Canada's Fourth Biennial Report on Climate Change. Report to the United Nations Framework Convention on Climate Change. Available at https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/1687459_Canada-BR4-1-Canada%E2%80%99s%20Fourth%20Biennial%20Report%20on%20Climate%20Change%202019.pdf. Accessed December 21, 2020.

Government of Canada. 2020. National Inventory Report 2020. Environment and Climate Change Canada. Available at https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/inventory.html. Accessed November 10, 2020.

He, Jiankun. 2018. Situation and measures of China's CO 2 emission mitigation after the Paris Agreement. *Frontiers in Energy* vol.12, no. 3, pp.353-361.

Iacobuta, G., Dubash, N. K., Upadhyaya, P., Deribe, M., & Höhne, N. (2018). National Climate Change Mitigation Legislation, Strategy and Targets: A Global Update. Climate Policy, 18(9), 1114–1132.

IEA (International Energy Agency). 2020a. World Energy Outlook 2000: Executive Summary. Available at https://www.iea.org/reports/world-energy-outlook-2020. Accessed Nov. 4, 2020.

IEA. 2020b. Renewables 2020. https://www.iea.org/reports/global-energy-review-2020/renewables. Accessed November 10, 2020.

IRENA 2019. Renewable Energy Statistics. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jul/IRENA_Renewable_energy_statistics_2019.pdf. Accessed Nov. 4, 2020.

REN21. 2019. Renewables 2019: Global Status Report. Paris: REN21 Secretariat.

Schreurs, Miranda. 2020. Competing perspectives on EnergyTransitions: A Global Comparison. *Z Politikwiss* https://doi.org/10.1007/s41358-020-00214-7. Accessed November 10, 2020.

UNEP. 2019. Emissions Gap Report 2019: Executive Summary. United Nations Environment Programme, Nairobi. Available at www.unenvironment.org/emissionsgap. Accessed November 10, 2020.

NOTES

[1] UNEP 2019, p. xii.
[2] Status of Ratification page of the United Nations Framework Convention on Climate Change. Available at https://unfccc.int/process/the-paris-agreement/status-of-ratification Accessed October 15, 2020.
[3] Climate Home News, "Which countries have not ratified the Paris Agreement?" August 13, 2020. Available at https://www.climatechangenews.com/2020/08/13/countries-yet-ratify-paris-agreement/. Accessed December 16, 2020.
[4] ENB 2018.
[5] ENB 2019.
[6] Iacobuta et. al., 2018, p. 1123; Dubash et al., p. 2013.
[7] Molly Bergen and Helen Mountford, "6 signs of progress since the adoption of the Paris Agreement," World Resources Institute (December 8, 2020). Available at https://www.wri.org/blog/2020/12/paris-agreement-progress-climate-action. Accessed December 16, 2020.
[8] All the NDCs are recorded in a public registry and are available on the UNFCCC website at https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx (accessed October 21, 2020). Climate Action Tracker is the most comprehensive source of data on climate policies and achievements around the world. Other useful tools for exploring all national policy commitments are the Netherlands' PBL Climate Pledge NDC (at https://themasites.pbl.nl/o/climate-ndc-policies-tool/), the NDC Explorer (https://klimalog.die-gdi.de/ndc/#NDCExplorer/worldMap?NDC??income???catIncome), and Climate Watch (https://www.climatewatchdata.org/). Accessed December 16, 2020.
[9] Climate Action Tracker, "China going carbon neutral before 2060." Available at https://climateactiontracker.org/press/china-carbon-neutral-before-2060-would-lower-warming-projections-by-around-2-to-3-tenths-of-a-degree/ Accessed December 15, 2020.
[10] UN news, "Live: Climate ambition Summit" 12 December 2020. Available at https://news.un.org/en/story/2020/12/1079862 Accessed December 16, 2020.
[11] Climate Action Tracker 2019.
[12] Climate Transparency. *2019 Brown to Green Report: The G20 Transition Towards a Net-Zero Emissions Economy*, p. 9. Available at https://www.climate-transparency.org/g20-climate-performance/g20report2019. Accessed November 10, 2020.
[13] Den Elzen et al. 2019; UNEP 2019.
[14] Climate Transparency 2019.
[15] Emissions including LULUCF (land use and land-use change). Available at https://stats.oecd.org/Index.aspx?DataSetCode=AIR_GHG and https://www.climatewatchdata.org/ghg-emissions?end_year=2017&start_year=1990 Accessed December 18, 2020.
[16] The BBC, "China aims for 'carbon neutrality by 2060.' Available at https://www.bbc.com/news/science-environment-54256826. Accessed November 3, 2020. The phrase 'carbon neutrality' was carefully chosen to distinguish China's plans from the closely related 'climate neutrality.' The former implies next zero emissions of carbon dioxide while the latter implies net zero emissions of all GHG gases including methane and nitrous oxides that derive mostly from agriculture and transportation.
[17] The Financial Times, "South Korea follows Japan and China in carbon neutral pledge," October 28, 2020. Available at https://www.ft.com/content/185e5043-fd72-4fef-a05c-f2a5001c7f4b. Accessed November 10, 2020.
[18] REN21 2019.
[19] EC 2019.
[20] Sam Morgan, "Financing the energy transition: Where is the money?" Euractiv policy brief. Available at https://www.euractiv.com/section/energy/linksdossier/financing-the-energy-transition/. Accessed December 16, 2020.
[21] DW, "EU agrees on tougher climate goals for 2030," December 11, 2020. Available at https://www.dw.com/en/eu-agrees-on-tougher-climate-goals-for-2030/a-55901612#:~:text=European%20Commis-

sion%20President%20Ursula%20von,1990%20levels%20within%20a%20decade.&text=EU%20leaders%20agreed%20on%20Friday,to%201990%20levels%20by%202030. Accessed December 16, 2020.
[22] European Commission 2018.
[23] European Commission 2019, p. 4.
[24] Climate Action Tracker 2020.
[25] European Commission 2018, p. 7.
[26] Climate Action Tracker, EU profile. Available at https://climateactiontracker.org/countries/eu/ Accessed December 17, 2020.
[27] BBC, "European Investment Bank drops fossil fuel funding," 14 November 2019. Available at https://www.bbc.com/news/business-50427873 . Accessed December 17, 2020. See also European Investment Bank press release at https://www.eib.org/en/press/all/2019-313-eu-bank-launches-ambitious-new-climate-strategy-and-energy-lending-policy
[28] European Commission 2018, p. 7.
[29] Den Elzen et al. 2019, p. 242.
[30] European Commission 2019.
[31] UK government press release, "UK sets ambitious new climate target ahead of UN summit," December 3, 2020. Available at https://www.gov.uk/government/news/uk-sets-ambitious-new-climate-target-ahead-of-un-summit. Accessed December 16, 2020.
[32] Government of Germany, "Climate Action Plan 2050" available at https://unfccc.int/sites/default/files/resource/Klimaschutzplan_2050_eng_bf.pdf. Accessed October 21, 2020.
[33] Schreurs 2020, 114-115.
[34] Den Elzen et. al 2019, p. 242.
[35] Schreurs 2020, 119.
[36] Xinhuanet, "China proposes development targets for 14th Five-Year Plan period," October 29, 2020. Available at http://www.xinhuanet.com/english/2020-10/29/c_139476451.htm Accessed November 3, 2020.
[37] Den Elzen et al. 2019, p. 242.
[38] Climate Action Tracker 2019, p. 17.
[39] Schreurs 2020, p. 119.
[40] Climate Transparency 2019, p. 7.
[41] He 2018, p. 358.
[42] Climate Action Tracker 2019, p. 20.
[43] Schreurs 2020, p. 120.
[44] Den Elzen et. al 2019.
[45] The Government of Japan, "The Long-term strategy under the Paris Agreement," June 2019. Available at https://unfccc.int/sites/default/files/resource/The%20Long-term%20Strategy%20under%20the%20Paris%20Agreement.pdf. Accessed October 21, 2020.
[46] EU Observer, "EU welcomes Japan's 2050 climate-neutrality pledge," Oct. 27, 2020. Available at https://euobserver.com/environment/149870?utm_source=euobs&utm_medium=email. Accessed Nov. 3, 2020.
[47] Climate Action Tracker 2019, p. 26.
[48] IEA 2018.
[49] Climate Action Tracker 2019, p. 26.
[50] The Economist, "Pumped up: Donald Trump's record," (October 24-30, 2020), pp. 22-23.
[51] US Climate Alliance, 2019 Factsheet. Available at https://static1.squarespace.com/static/5a4cfbfe18b27d4da21c9361/t/5f1f0b2cf13e090f828e58dc/1595869997700/USCA+Factsheet_Dec+2019.pdf. Accessed November 2, 2020.
[52] Schreurs 2020, p. 117.
[53] Climate Action Tracker country profile: Australia. Available at https://climateactiontracker.org/countries/australia/ Accessed December 17, 2020.

[54] Climate Action Tracker, country profiles: Russia. Available at https://climateactiontracker.org/countries/russian-federation/. Accessed November 10, 2020.
[55] Climate Action Tracker country profile: Saudi Arabia. Available at https://climateactiontracker.org/countries/saudi-arabia/. Accessed November 10, 2020.
[56] Declaration of the Premiers of Canada, Quebec Summit on Climate Change, April 14, 2015. Available at http://www.mddelcc.gouv.qc.ca/changementsclimatiques/sommet2015/pdf/Declaration-SommetCC-ANG.pdf Accessed October 19, 2017.
[57] Government of Canada. 2016. Canada's Second Biennial Report on Climate Change. Available at http://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_reports/application/pdf/canadas_2nd_biennial_report.pdf. Accessed October 9, 2017.
[58] Government of Canada. Pan-Canadian Framework on Clean Growth and Climate Change. Available at https://www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework.html. Accessed December 16, 2020.
[59] Government of Canada 2018a.
[60] Government of Canada 2018b.
[61] Government of British Columbia. (2019). BC's Carbon Tax. https://www2.gov.bc.ca/gov/content/environment/climatechange/
planning-and-action/carbon-tax. Accessed November 10, 2020.
[62] Climate Leadership Plan: Program and Policy Highlights. Available at https://open.alberta.ca/dataset/83285ecd-dbbe-4b6f-a1a2-ceaebf289fa3/resource/9932c8ce-516a-4fcc-9bda-97cbedbc581a/download/clp_policyandprogramhighlights.pdf. Accessed November 2, 2020. See also Government of Alberta. 2019. Carbon levy and rebates. www.alberta.ca/climate-carbon-pricing.aspx. Accessed November 10, 2020.
[63] Gouvernement du Québec. 2019. The Carbon Market.
www.environnement.gouv.qc.ca/changements/carbone/Systeme-plafonnement-droits-GES-en.htm. Accessed Nov. 4, 2020.
[64] Den Elzen et al. 2019, p. 243.
[65] Climate Action Tracker: https://climateactiontracker.org/countries/canada/current-policy-projections/. Accessed November 10, 2020.
[66] Environment and Climate Change Canada (2020) Progress towards Canada's greenhouse gas emissions reduction target. Available at: https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/progress-towards-canada-greenhouse-gas-emissions-reduction-target.html Accessed Dec. 14, 2020.
[67] Government of Canada 2019.
[68] Government of Canada 2019, pp. 26-28.
[69] Available at https://unfccc.int/sites/default/files/resource/br4_final_en.pdf. Accessed December 14, 2020.
[70] Environment and Climate Change Canada, "Government of Canada charts course for clean growth …" Available at https://www.canada.ca/en/environment-climate-change/news/2020/11/government-of-canada-charts-course-for-clean-growth-by-introducing-bill-to-legislate-net-zero-emissions-by-2050.html. Accessed December 15, 2020.
[71] The full text of the proposed plan is available at www.canada.ca/content/cam/eccc/documents/pdf/climate-change/climate-plan/healthy_environment_healthy _economy_plan.pdf Accessed December 20, 2020.
[72] *The Globe and Mail*, "Liberals pitch $15 billion in new spending …" December 11, 2020 (available at https://www.theglobeandmail.com/politics/article-liberals-pitch-15-billion-in-new-spending-170-carbon-tax-by-2030-to/) and The CBC, "Ottawa to hike federal carbon tax…", December 11, 2020. Available at https://www.cbc.ca/news/politics/carbon-tax-hike-new-climate-plan-1.5837709 Accessed December 21, 2020.
[73] Prime Minister's Office website: http://pm.gc.ca/en/news/news-releases/2020/12/11/prime-minister-announces-canadas-strengthened-climate-plan-protect. Accessed December 20, 2020.

[74] CBC, "New federal climate bill unlikely to solve Canada's greenhouse gas reduction problem," December 9, 2020: https://www.cbc.ca/news/opinion/opinion-federal-climate-change-bill-c12-1.5823235. For a legal analysis, see David V. Wright, "Bill C-12, *Canadian Net-Zero Emissions Accountability Act:* A Preliminary Review" (November 23, 2020). Available at http://ablawg.ca/wp-content/uploads/2020/11/Blog_DVW_Bill_C12.pdf. Accessed December 16, 2020.
[75] IEA 2020a, p. 17; IAE 2020b.
[76] IEA 2020a, p. 20-21.
[77] IEA 2020a; IEA 2020b.
[78] IRENA 2019.
[79] IEA 2020a, p. 18.
[80] Financial Times, "The key energy questions for 2018," December 2017; and IEA 2020a, p. 18.
[81] European Commission, "10 Trends Reshaping Climate and Energy," European Political Strategy Centre, p. 6. Available at https://op.europa.eu/en/publication-detail/-/publication/a6014988-10d2-11ea-8c1f-01aa75ed71a1 . Accessed November 10, 2020.
[82] Climate Transparency 2019, p. 9.
[83] IEA 2020a, 19.
[84] Los Angeles Times, "Global carbon emissions dropped 7%..." December 10, 2020. Available at https://www.latimes.com/world-nation/story/2020-12-10/2020-global-carbon-emissions-drop-covid-19. Accessed December 16, 2020.
[85] IPCC. 2018. Global Warming of 1.5°C: An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels. Available at https://www.ipcc.ch/sr15/download/. Accessed November 10, 2020.
[86] UNEP 2019.
[87] Den Elzen et al. 2019, 242.
[88] Climate Transparency 2019, p. 6-8.
[89] UNEP 2019, p. ix.
[90] Climate Action Tracker 2020, p. 3.

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