# MIT Global Change Outlook


***Webinar***

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# The Outlook

The **MIT Joint Program**'s latest projections for:

- the **future of the Earth**'s energy, managed resources (including water, agriculture and land), and climate;
- as well as prospects for achieving the **Paris Agreement**'s short-term targets;
- and long-term goals of keeping average global temperatures below **2°C** or even **1.5°C**.


# What's new in the 2021 Outlook?

## Larger impacts from Climate Change

With only a partial look: increased pressures for water use, agriculture, and land-use

Half of the world population will undergo stresses on water supply by 2050

## Confirmed that without aggressive actions the world will surpass critical GHG concentration thresholds and climate targets in the coming decades

## Good news: While costs of inaction are getting higher, costs of action are more manageable

Reduction in costs of wind and solar

Aggressive mitigation actions by many governments

In addition to our usual *Paris Forever* scenario, we consider *Paris 2°C* and *Accelerated Actions* (*Paris 1.5°C*) scenarios (Excel files for 18 EPPA model regions are available)

**<u>Achieving aggressive climate targets reduces the impacts of climate change</u>**

# Invitation: Explore the Outlook Results

## MIT Joint Program Outlook Dashboard

**Select Scenario to Plot**

Paris Forever

Current (as of March 2021) Paris Nationally Determined Contribution (NDC) targets are met by all countries by 2030 and retained thereafter

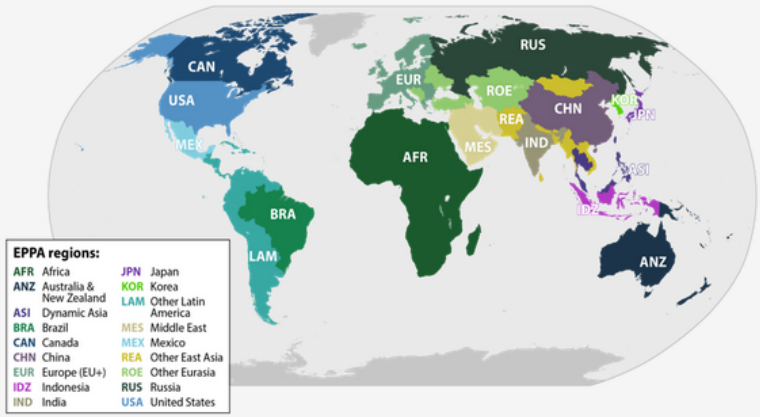
**Data Type**

(•) Emissions and Climate
( ) Energy and Economics

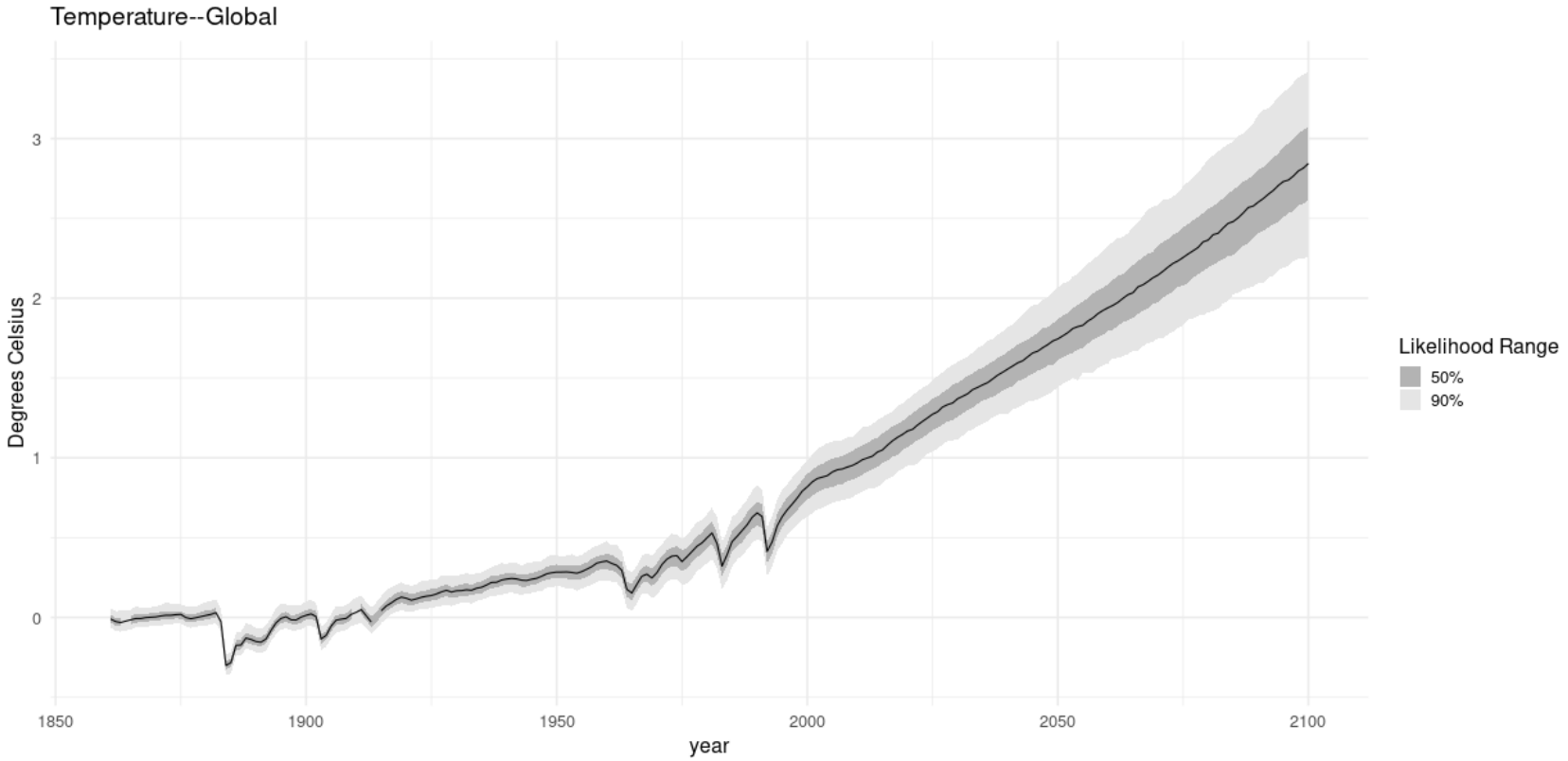
**Select Data to Plot**

Temperature--Global

[ ] Plot Difference vs Another Scenario




Download the full Outlook report




Change in global average surface air temperature relative to pre-industrial (1861-1880) levels. The thick black line is the median, the 50% likelihood range reflects the 25th to 75th percentiles, and the 90% likelihood range reflects the 5th to 95th percentiles. Likelihood ranges in historical years reflect measurements errors.

# Scenarios

| Scenario | Description |
|---|---|
| ***Paris Forever*** | Current (as of March 2021) Paris Nationally Determined Contribution (NDC) targets are met by all countries by 2030 and retained thereafter |
| ***Paris 2°C*** | Paris Nationally Determined Contribution (NDC) targets are met by all countries by 2030, after which there is an emissions cap based on a global emissions trajectory designed to ensure that the 2100 global surface mean temperature does not exceed 2°C above pre-industrial levels with a 50% probability |
| ***Accelerated Actions*** | More near-term actions are taken relative to Paris 2°C (including those planned changes to NDCs announced in April 2021), and global emissions are consistent with ensuring that the 2100 global surface mean temperature does not exceed 1.5°C above pre-industrial levels with a 50% probability. Note: Climate results are shown for a slightly different 1.5°C scenario (Paris 1.5°C) that uses a global emissions price. |

Accelerated Actions = Accelerated Paris

# New Announcements for 2030 from April 22, 2021

**USA**: 50-52% (old target: 26-28% in 2025) relative to 2005

**Canada**: 40-45% (old target: 30%) relative to 2005

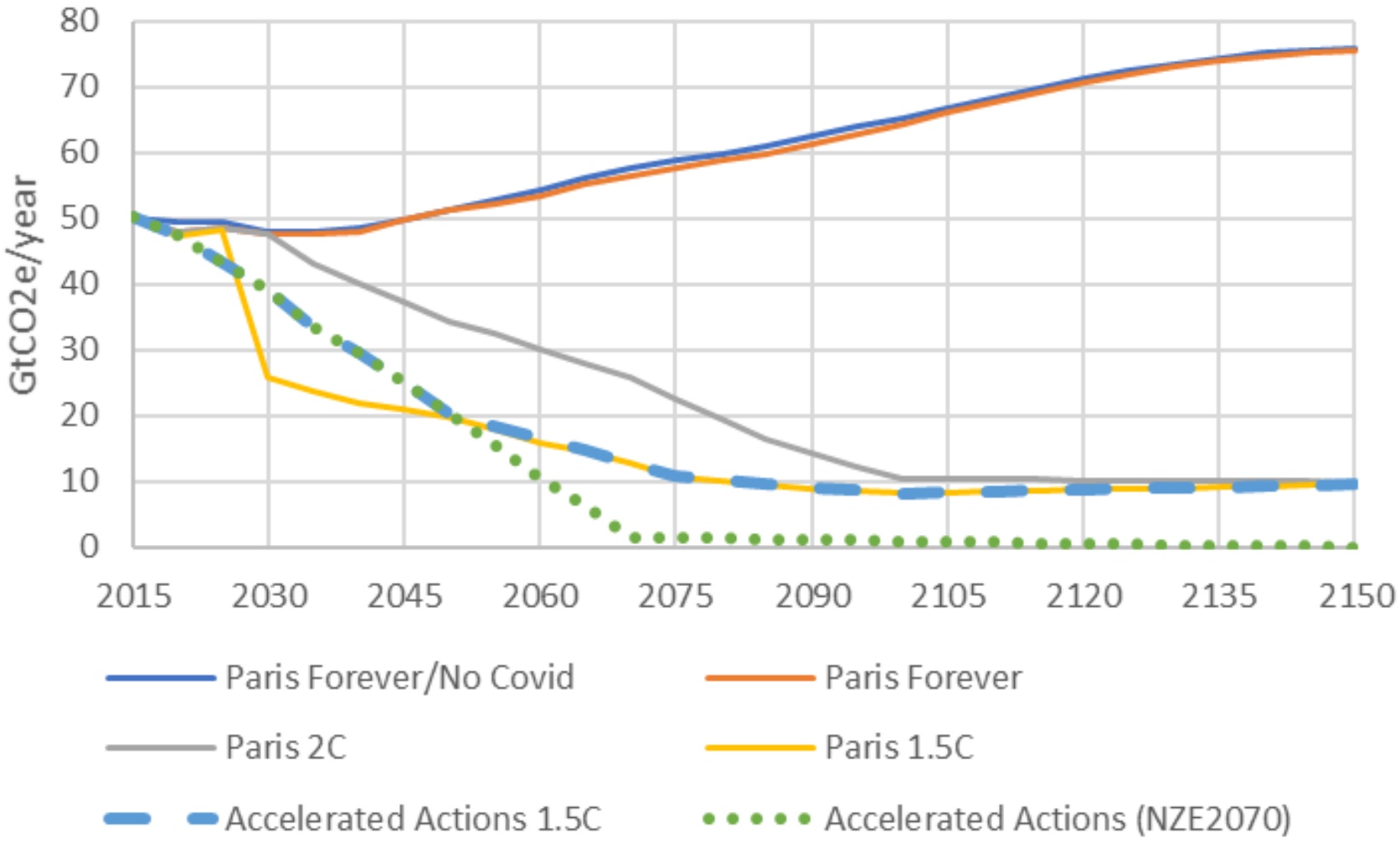
**Japan**: 46% (old target: 26%) relative to 2013

**Korea**: later in the year (old target: 24.4%) relative to 2017

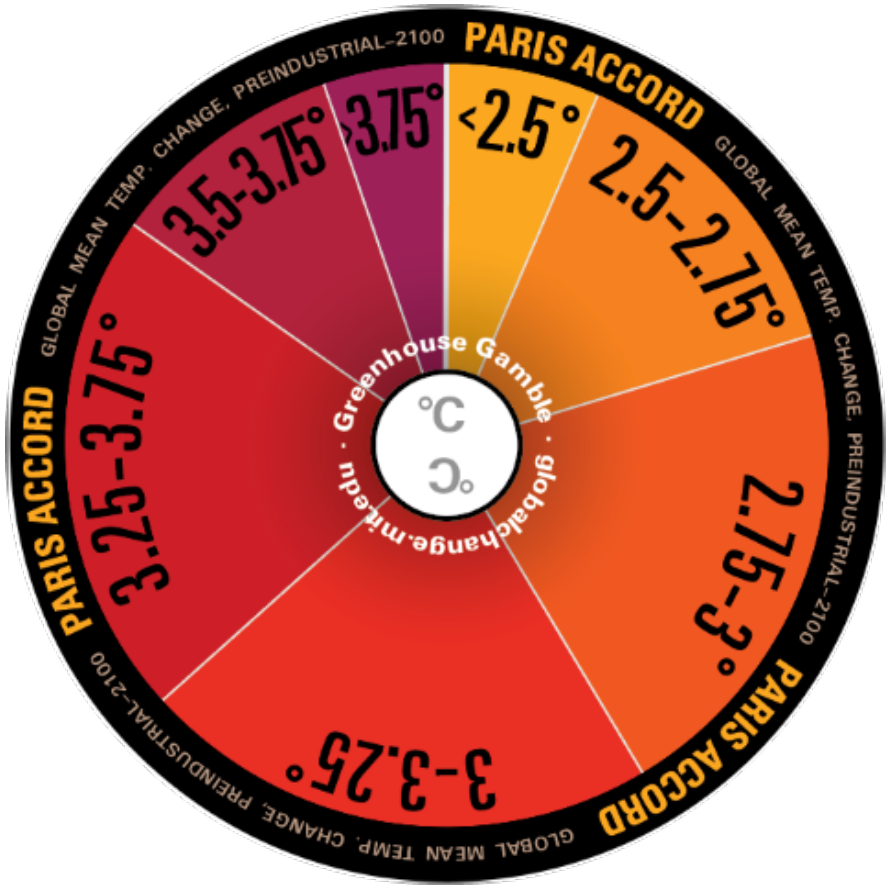
**China**: starts reducing coal production from 2026

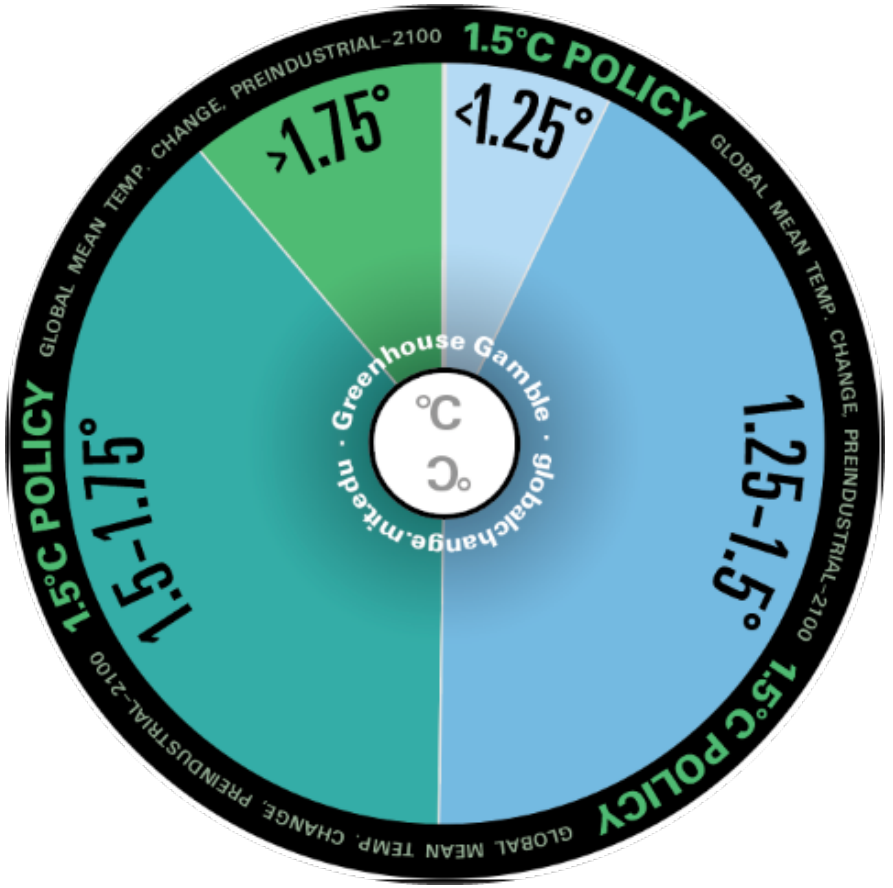
Accelerated Actions = Accelerated Paris

# Global GHG Emissions



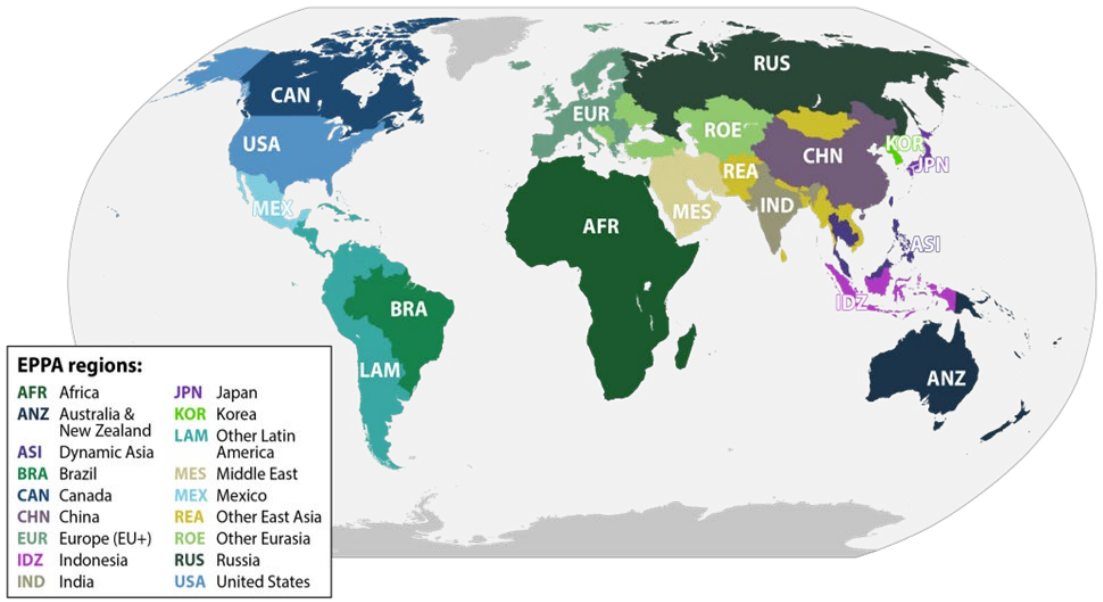
# Greenhouse Gamble



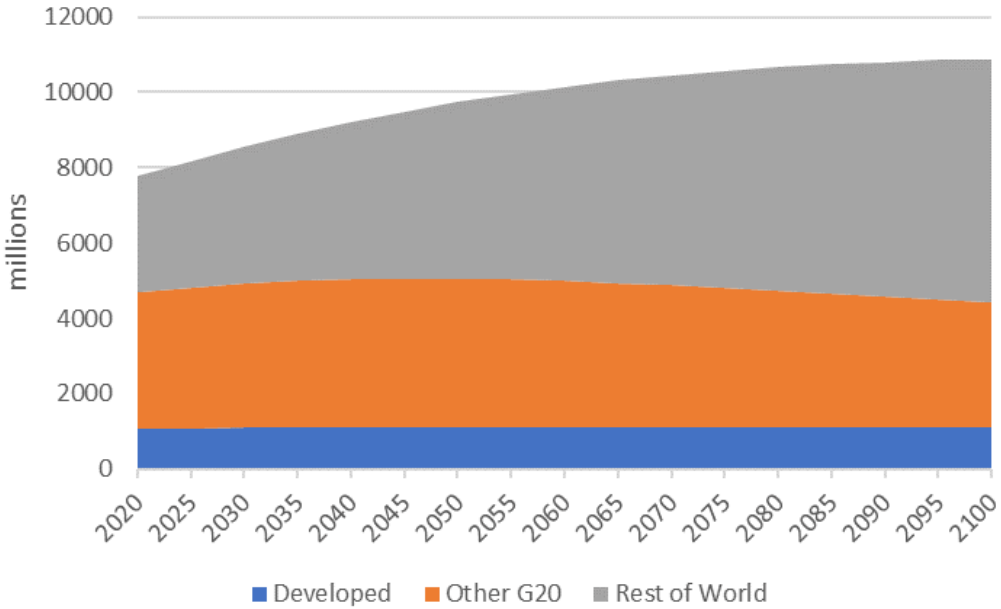

**Which wheel would you rather spin?**

# Regional Groups



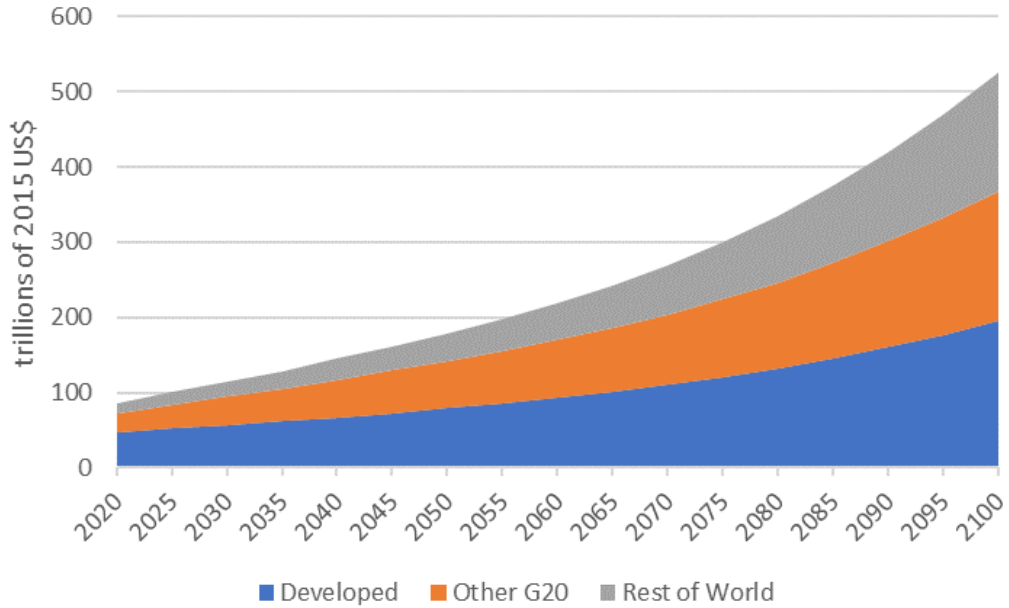

| Regional Group | Region | Abbreviation |
|---|---|---|
| Developed | United States | USA |
| | Canada | CAN |
| | Europe | EUR |
| | Japan | JPN |
| | Australia, New Zealand and Oceania | ANZ |
| Other G20 | China | CHN |
| | India | IND |
| | Brazil | BRA |
| | Russia | RUS |
| | Mexico | MEX |
| | Korea | KOR |
| | Indonesia | IDZ |
| Rest of the World | Africa | AFR |
| | East Asia | ASI |
| | Other Latin America | LAM |
| | Middle East | MES |
| | Other Europe and Central Asia | ROE |
| | Other East Asia | REA |

# Global Drivers



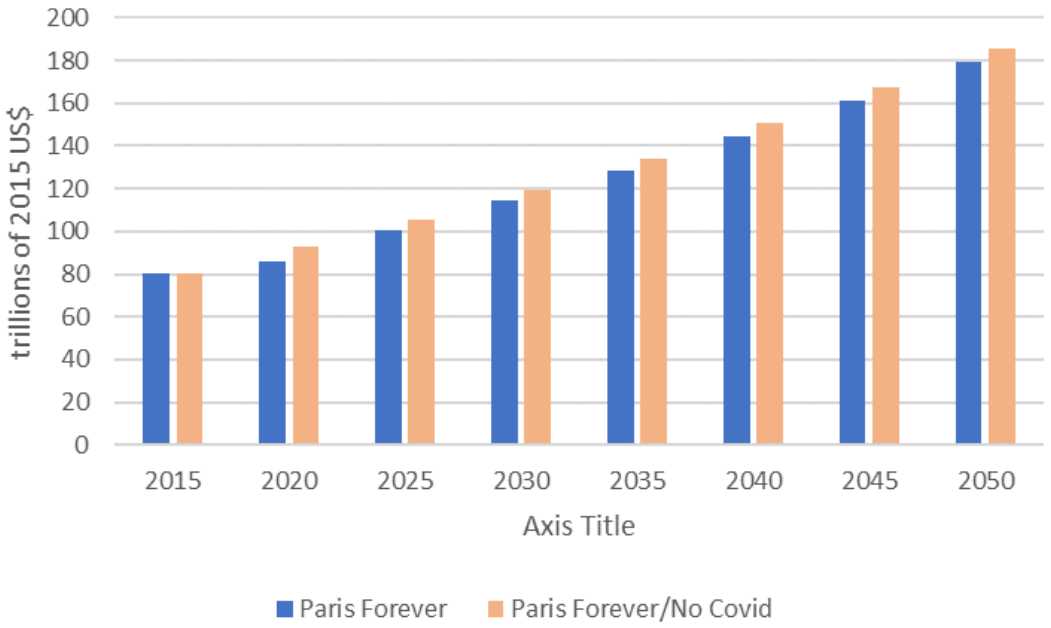

Global population grows from 7.8 billion people in 2020 to 9.7 billion in 2050, and to 10.9 billion in 2100

In contrast to population, most of the global economic value in 2020 was in the Developed region



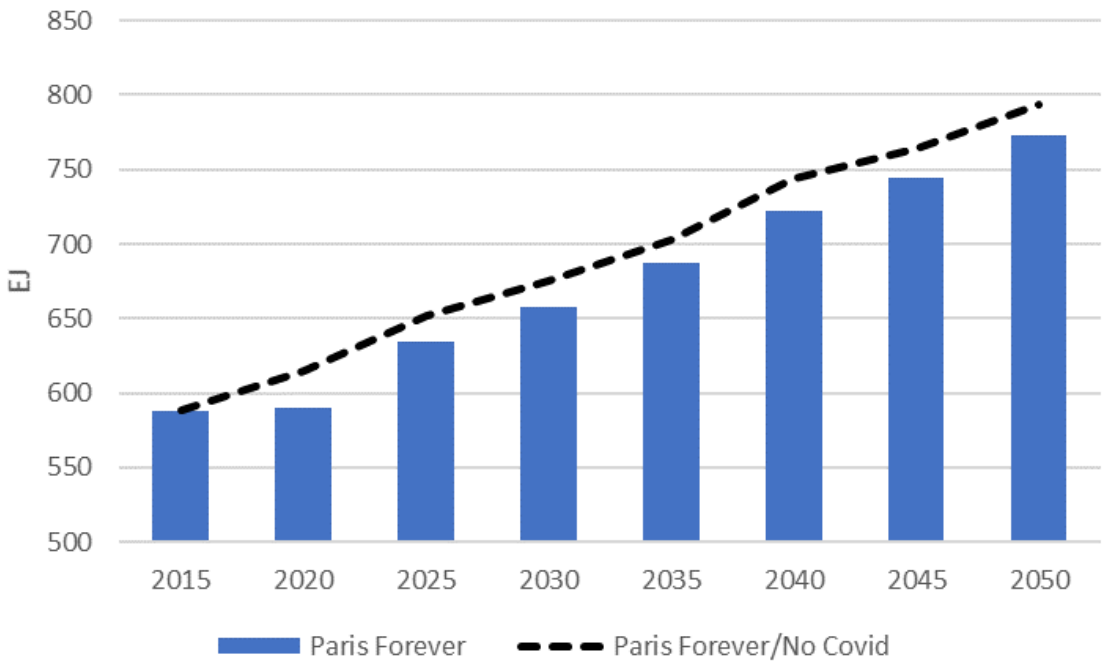

Despite the higher economic growth in non-Developed region, their shares of global GDP catch up with the Developed region only by the end of the century.

# Impact of Covid-19

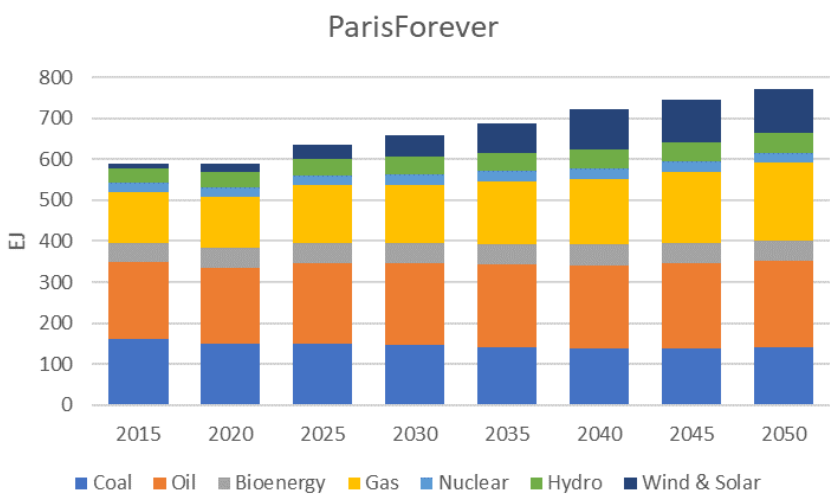


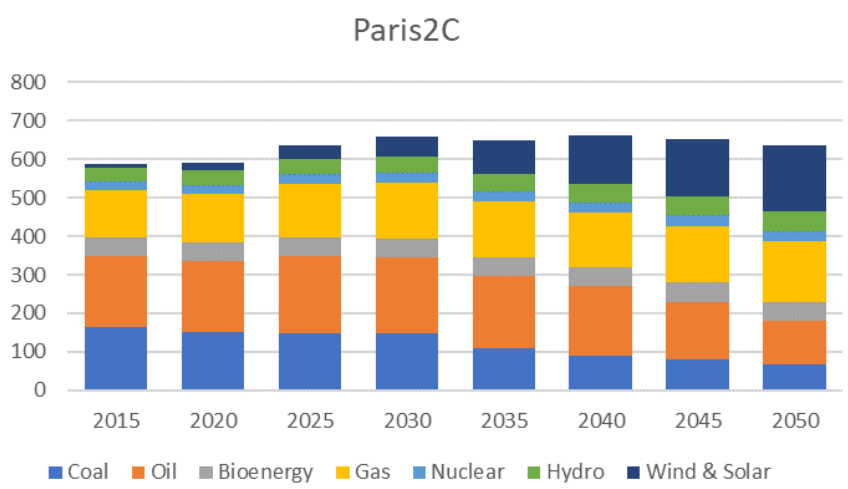

For the years 2025-2050, we project that global GDP will remain about 3-4% below what it would be in a world without Covid.

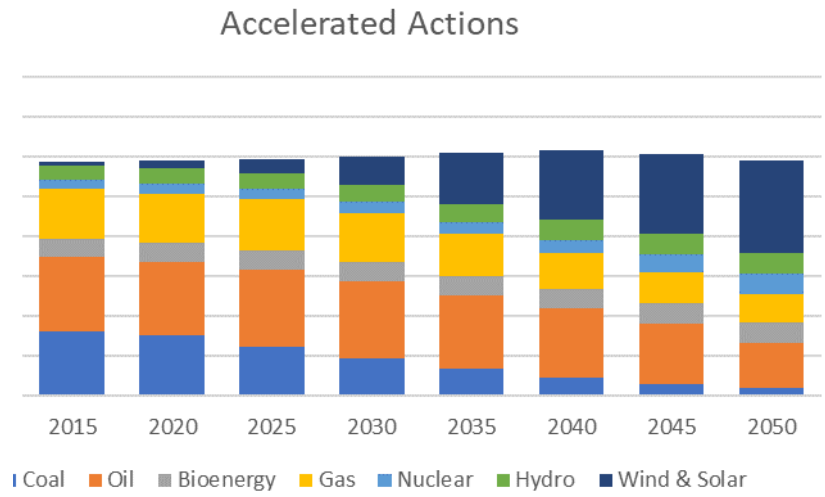
From 2020 to 2050, Covid-19 impacts on energy use and renewable energy deployment are relatively modest (2-4% reduction in energy use each year and virtually the same pathway for renewables relative to the non-Covid trajectory).



# Global Primary Energy



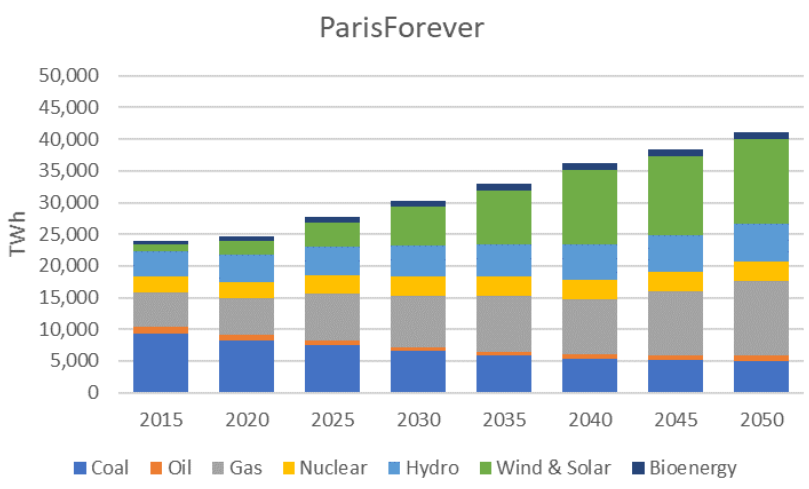



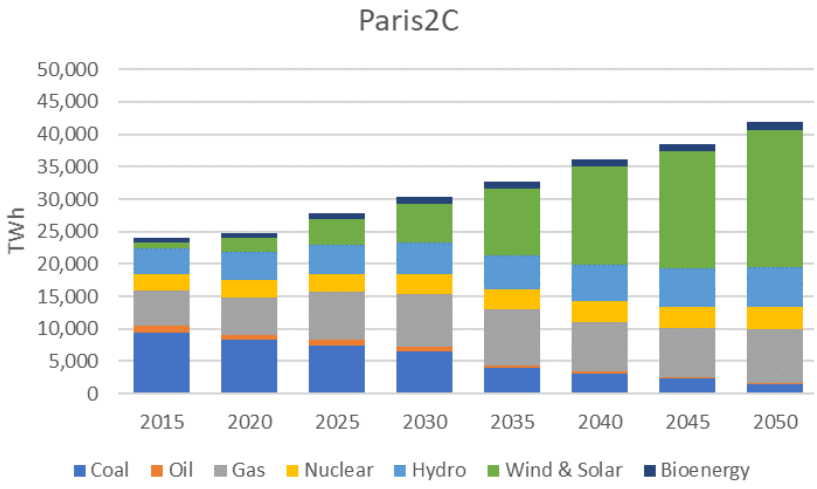

Global primary energy use in the *Paris Forever scenario* grows to about 770 exajoules (EJ) by 2050, up by 31% from about 590 EJ in 2020. The share of fossil fuels drops from the current 80% to **70%** in 2050. Wind and solar – **6**-fold increase.

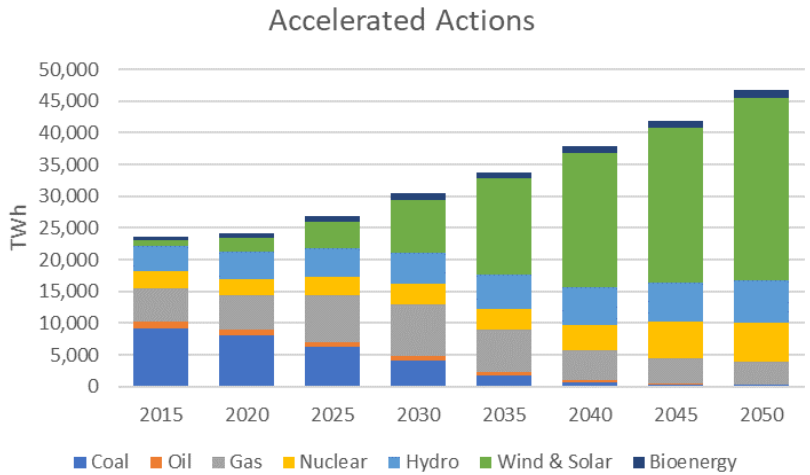
In the *Paris 2°C* scenario, the fossil fuel share drops to about **50%** in 2050, wind and solar energy grow almost **9** times from 2020 to 2050.

In the *Accelerated Actions* scenario, the fossil fuel share drops to about **34%**, wind and solar energy grow almost **13** times from 2020 to 2050.

# Global Electricity Production



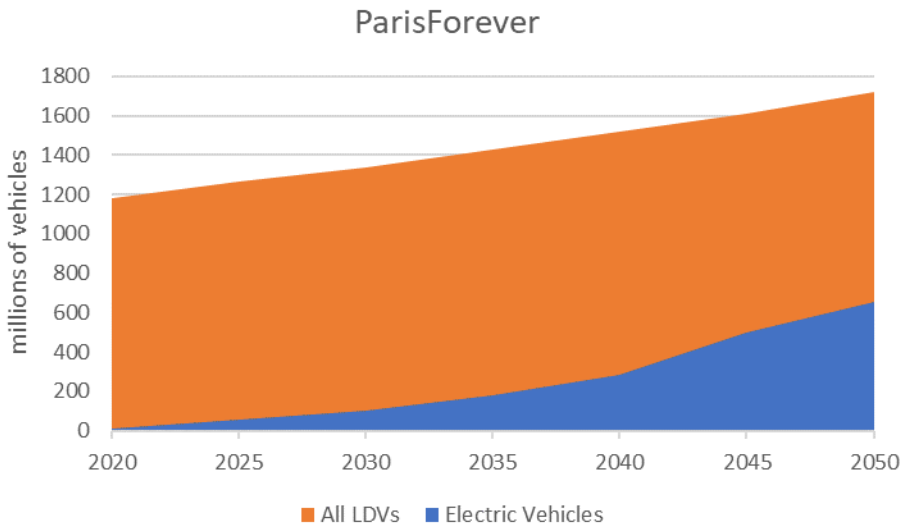



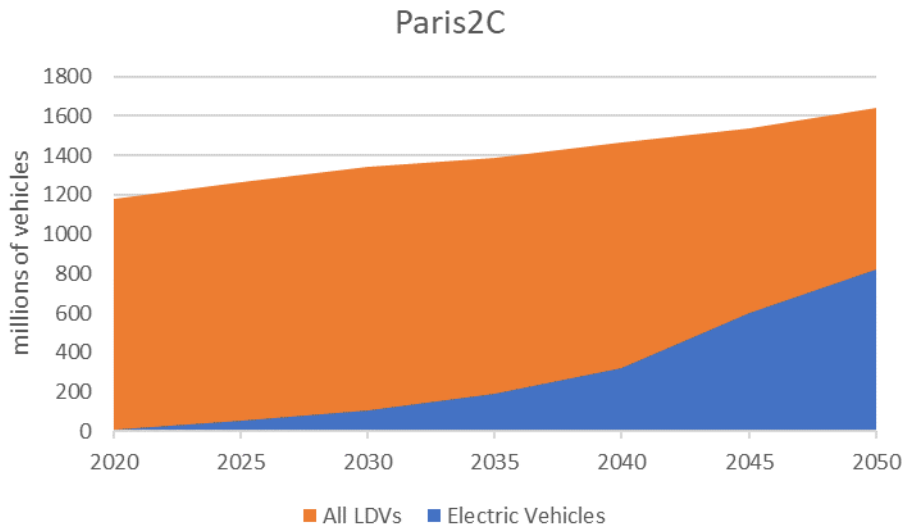

In the *Paris Forever* scenario, global electricity production (and use) grows by 67% from 2020 to 2050. In comparison to primary energy growth of 31% over the same period, electricity grows about twice as fast, resulting in a continuing electrification of the global economy.

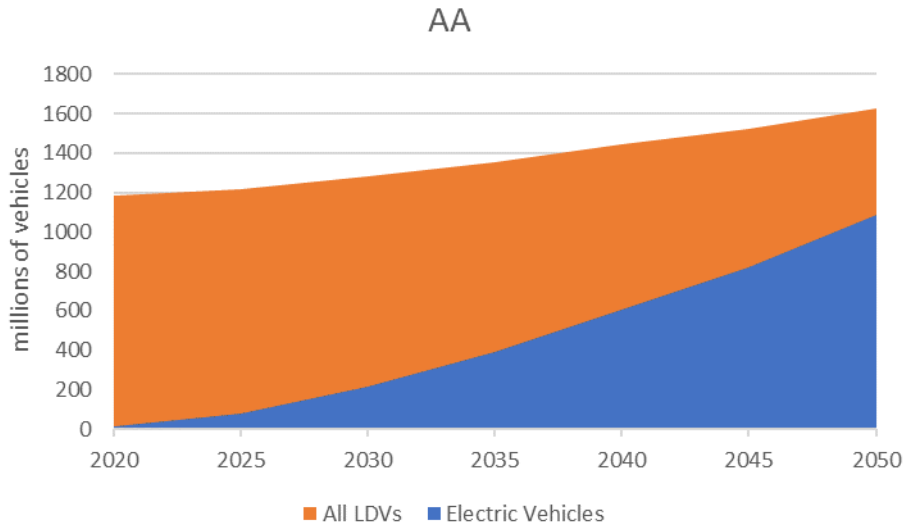
Electricity generation from renewable sources becomes a dominant source of power by 2050 in all scenarios, providing 70-80% of global power generation by midcentury in the climate stabilization scenarios

# Global Electric Vehicle Fleet

From about 10 million EVs in 2020, EV stock in the *Paris Forever* scenario reaches 100 million EVs in 2030, almost 300 million in 2040 and nearly 650 million in 2050.

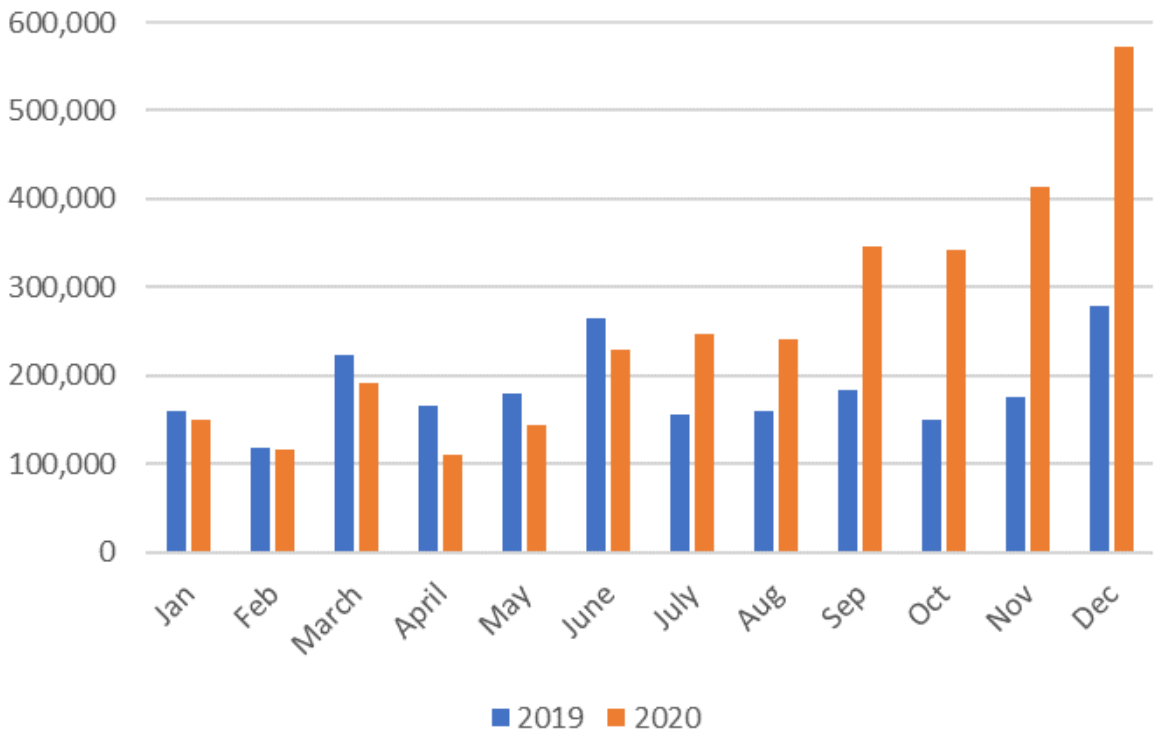



For a 67% electrification of the global LDV stock in 2050, global EV sales would exceed 30 million in 2030, 60 million in 2040, and 100 million in 2050.

# Global Electric Car Sales in 2019-2020

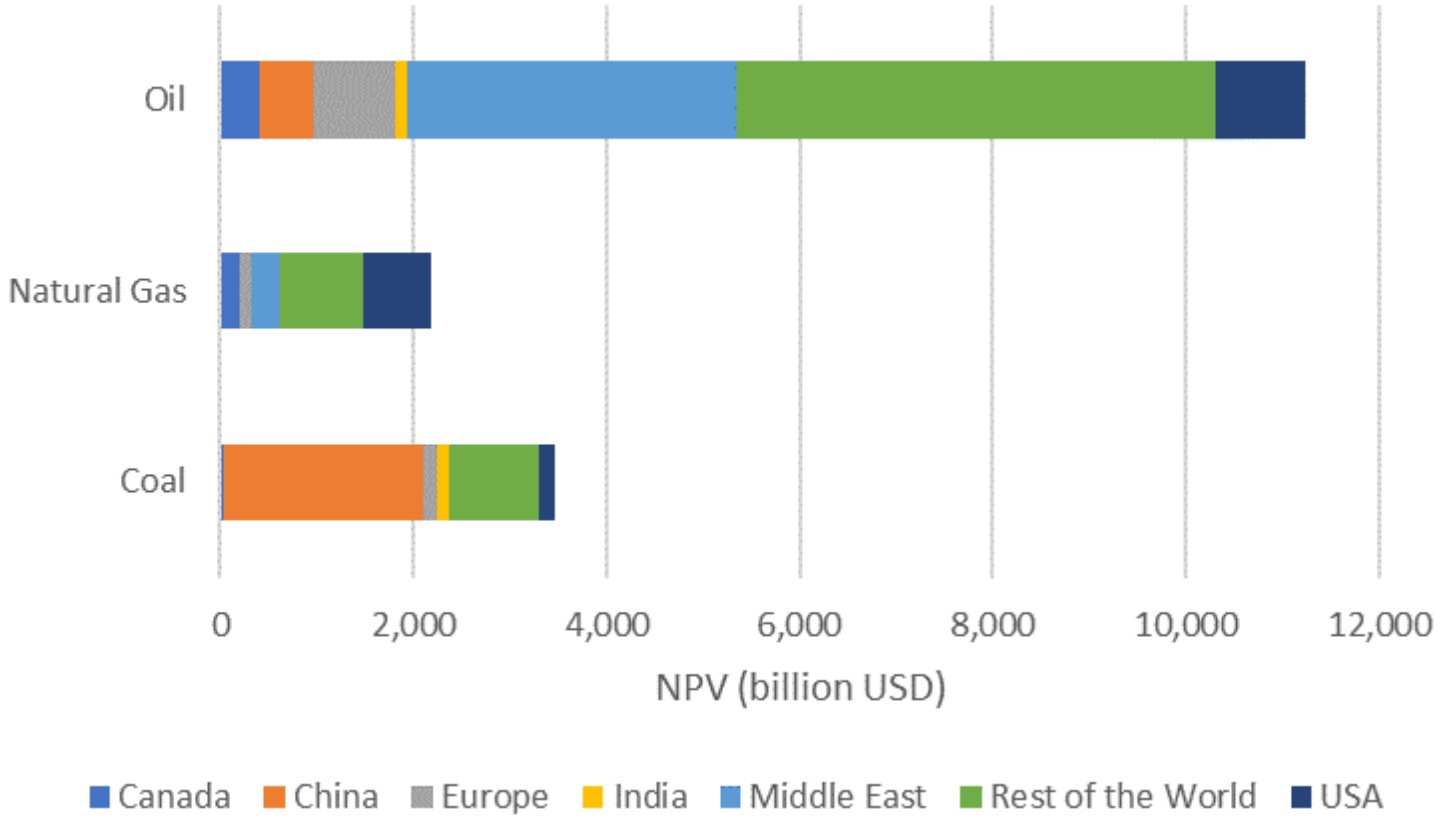



In the first half of 2020, global EV sales were down by 15% relative to their corresponding 2019 levels due to lockdowns and shutdowns of EV manufacturing facilities in several countries.

Overall, it is estimated that in 2020 about 3 million EVs sold, which is 40% more than in 2019 despite the pandemic.

Europe: 1.4 million EVs sold in 2020 (5% imported from China).

# Fossil Fuels: Stranded Value




Net present value (NPV) of economic output lost from fossil fuels not produced in the *Paris 2°C* scenario.

Earnings from fossil fuel assets and resources are reduced due to lower prices, more fuels are left in the ground, and restrictions are imposed on certain types of power plants (e.g., coal-based).

$17 trillion in stranded assets—more than the current GDP of China and slightly less than the U.S. GDP.

Note: the value is measured as a difference between scenarios. Forward-looking behavior can reduce losses.

# Global Food Production

Under the *Paris Forever* scenario, overall food production increases by 90% from 2020 to 2050, crop production by 70% and livestock production by 81%. Livestock grows faster than crop due to higher shares of protein-rich food in diets when income rises.

Greater agricultural yields will prevent high increases in prices.

Global land-use projections from 2020 to 2050 are quite stable. Natural forest areas decrease by 1% and natural grasslands by 3%.