Japan’s NDC target is to reduce emissions 17% below 2010 levels, or to approximately 1,079 MtCO$_2$e, by 2030. To keep below the 1.5°C temperature limit, Japan’s 2030 emissions would need to be around 491 MtCO$_2$e (or 62% below 2010 levels), leaving an ambition gap of 588 MtCO$_2$e. All figures exclude land use emissions.

Japan’s per capita emissions are 1.24 times the G20 average. Total per capita emissions have decreased by 9.9% between 2013 and 2018.

Key Opportunities for Enhancing Climate Ambition

Japan has proposed a new 2030 emissions reduction target of 46% below 2013 levels, with continuous strenuous efforts to meet a goal of a 50% reduction. While this is a significant step, a 1.5°C compatible pathway would necessitate a reduction of over 60% below 2013 levels.

Promotion of renewable energy capabilities, in particular offshore wind is essential, to facilitate the production of green hydrogen and ammonia.

Decarbonising transport requires a rapid transition from fossil fuel to electric vehicles (EVs) powered by renewable energy and the use of hydrogen for heavy-duty transport.

Recent Developments

In October 2020 Japan announced a 2050 carbon neutrality goal and, in April 2021, a new 2030 target of 46% below 2013 levels. Draft Strategic Energy and National Climate Action plans, which provide a framework for achieving these goals, followed.

Despite announcing the retirement of inefficient domestic coal plants and making overseas funding conditional on decarbonisation strategies of the host countries, the government still promotes “abated” fossil fuels and sees coal and LNG playing significant roles in the post-2030 power mix.

In early 2021, the Bank of Japan launched a new scheme to support projects addressing climate change, which includes the provision of no-interest loans to financial institutions undertaking climate-related disclosure initiatives.

Coronavirus Response and Recovery

In Japan, self-restraint measures taken in response to COVID-19 led to a reduction in overall CO$_2$ emissions during the first half of 2020. While reduced car traffic resulted in lower emissions from the transportation sector, household emissions (from e.g., gas consumption) increased. In its most recent stimulus package, the Japanese government established a Green Innovation Fund (JPY 2tn or USD 18bn) to support companies engaged in research, development, demonstration and implementation of decarbonisation technologies, with the goal of achieving the 2050 carbon neutrality target.
We unpack Japan’s progress and highlight key opportunities to enhance climate action across:

- in the power sector ........... 8
- in the transport sector .......... 10
- in the building sector ........... 12
- in the industrial sector .......... 13
- in land use ........... 14
- in agriculture ........... 14

Energy used:
- in the power sector
- in the transport sector
- in the building sector
- in the industrial sector

Non-energy uses:
- in land use
- in agriculture

In its Long-Term Strategy (LTS), the Japanese government stated that vocational training would be provided, and other measures implemented to ensure a just transition to a decarbonised society. The details, however, remain vague. The recently-released draft outline of the new LTS is expected to regard just transition as one of six key pillars of transition toward carbon neutrality, and provide more detailed policy direction. Japan’s policies should take into account that 1) the location of existing fossil fuel plants and those with the greatest renewable energy potential differ, and 2) due to urbanisation, the working age population in rural areas has declined, particularly in those areas with a large potential for renewable energy development. More importantly, Japan would need to set dates to reduce fossil fuel consumption, such as phasing-out all the country’s coal-fired power plants by 2030, which provide policy predictability and, in turn, encourage smooth job transition.

Institute for Health Metrics and Evaluation, 2020
This source differs from the source used in last year’s profiles and, therefore, the data are not comparable.

Japan’s population is projected to decrease by 17% from 2018 levels by 2050, but still become more urbanised.

Ambient air pollution attributable death rate per 1,000 population per year, age standardised in 2019

42,600 people die in Japan every year as a result of outdoor air pollution due to stroke, heart disease, lung cancer and chronic respiratory diseases. Compared to total population, this is still one of the lower levels in the G20.

Human Development Index (HDI)
The HDI reflects life expectancy, level of education, and per capita income. Japan ranks very high.

Population and urbanisation projections
(in millions)

Death rate attributable to air pollution

42,600 people die in Japan every year as a result of outdoor air pollution due to stroke, heart disease, lung cancer and chronic respiratory diseases. Compared to total population, this is still one of the lower levels in the G20.
ADAPTATION | ADDRESSING AND REDUCING VULNERABILITY TO CLIMATE CHANGE

Increase the ability to adapt to the adverse effects of climate change and foster climate resilience and low-GHG development.

Japan is increasingly exposed to heavy rain and snowfall, typhoons, and extreme heat, resulting in the emergence of multiple risks from health hazards such as infectious diseases.

Climate change undermines the quality and quantity of agriculture, fisheries, and forestry in conjunction with damage to the ecosystem.

Extreme weather increases the vulnerability of infrastructure, including disruption of transportation networks, power generation and water sanitation systems, which also has a negative impact on the economy of Japan.

ADAPTATION NEEDS

Climate Risk Index

Impacts of extreme weather events in terms of fatalities and economic losses that occurred. All numbers are averages (1999-2018).

Annual weather-related fatalities

<table>
<thead>
<tr>
<th>Deaths</th>
<th>PER 100,000 INHABITANTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>139</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Based on Germanwatch, 2019

Annual average losses (US$ millions PPP)

<table>
<thead>
<tr>
<th>Losses</th>
<th>PER UNIT GDP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,018</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Based on Germanwatch, 2019

Exposure to future impacts at 1.5°C, 2°C and 3°C

Impact ranking scale:

Very low    Low    Medium    High    Very high

<table>
<thead>
<tr>
<th>WATER</th>
<th>% of area with increase in water scarcity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Low</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HEAT AND HEALTH</th>
<th>Heatwave frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Low</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AGRICULTURE</th>
<th>Rice</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reduction in crop duration</td>
</tr>
<tr>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Low</td>
</tr>
</tbody>
</table>

|             | Reduction in rainfall |
|             | High |
|             | Medium |
|             | Low |

Water, Heat and Health: own research; Agriculture: Arnell et al., 2019

Note: These indicators are national scale results, weighted by area and based on global data sets. They are designed to allow comparison between regions and countries and, therefore, entail simplifications. They do not reflect local impacts within the country. Please see technical note for further information.

CORONAVIRUS RESPONSE AND RECOVERY

Prior to the Coronavirus pandemic, the Japanese government had recognised the urgency of implementing strong climate change adaptation policies and measures. A National Adaptation Plan was released in 2015, and the Climate Change Adaptation Act was passed in 2018. The 2019 Annual Report on the Environment included a chapter dedicated to adaptation, and the 2020 report listed “disaster-resilient city planning” as key to realising decarbonisation and the Sustainable Development Goals. However, the government’s recent pandemic responses, including the Green Growth Strategy, have focused on supply chain resiliency rather than overall adaptation.

Adaptation Readiness

The figure shows 2000-2018 observed data from the Notre Dame Global Adaptation Initiative (ND-GAIN) Index overlaid with projected Shared Socioeconomic Pathways (SSPs) from 2020 to 2060.

Japan exhibits a high average readiness and is well above the G20 average trend from 2000 to 2018. As Japan’s governance structures and adaptation readiness are very advanced, it makes little difference whether it follows an SSP1 or SSP2 compatible projection. Other choices in relation to socio-economic development, as represented by SSP3, represent a slightly slower rate of adaptation readiness improvement.

The readiness component of the Index created by the ND-GAIN encompasses social (social inequality, information and communications technology infrastructure, education and innovation), economic, and governance indicators to assess a country’s readiness to deploy private and public investments in aid of adaptation. The index ranges from 0 (low readiness) to 1 (high readiness).

The overlaid SSPs are qualitative and quantitative representations of a range of projections of future governance and, therefore, of possible adaptation readiness. The three scenarios shown here in dotted lines are described as a sustainable development-compatible scenario (SSP1), a middle-of-the-road (SSP2), and a ‘Regional Rivalry’ (SSP3) scenario.

Based on Andrijevic et al., 2020; ND-Gain Index, 2021

ADAPTATION POLICIES

National Adaptation Strategies

<table>
<thead>
<tr>
<th>Document name</th>
<th>Publication year</th>
<th>Fields of action (sectors)</th>
<th>Monitoring &amp; evaluation process</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Plan for Adaptation to the Impacts of Climate Change</td>
<td>2015</td>
<td>Agriculture, Biodiversity, Coastal areas and fishing, Education and research, Energy and industry, Finance and insurance, Forestry, Health, Infrastructure, Tourism, Transport, Urbanism, Water</td>
<td>The Climate Change Adaptation Act, passed in 2018, prescribes that the government shall amend the Plan once every five years.</td>
</tr>
</tbody>
</table>

Nationally Determined Contribution (NDC): Adaptation

<table>
<thead>
<tr>
<th>TARGETS</th>
<th>ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not mentioned</td>
<td>Not mentioned</td>
</tr>
</tbody>
</table>
EMISSIONS OVERVIEW

Japan’s GHG emissions, excluding LULUCF, have dropped by only 2.4% (1990-2018), and the government’s newly-announced climate targets for 2030 (46% below 2013 levels) and 2050 (carbon neutrality) are not in line with a 1.5°C pathway.

In 2030, global CO₂ emissions need to be 45% below 2010 levels and reach net zero by 2050. Global energy-related CO₂ emissions must be cut by 40% below 2010 levels by 2030 and reach net zero by 2060.

Rogelj et al., 2018

GHG emissions across sectors and CAT 1.5°C ‘fair-share’ range (MtCO₂e/year)⁵

Japan’s emissions (excl. land use) decreased by 2.4% between 1990 and 2018 to 1,240 MtCO₂e. In those years, emissions from the energy sector have consistently accounted for around 87% of the total. Most sectors have seen emissions fall since total emissions peaked in 2013.

Japan’s 2030 target is not 1.5°C ‘fair-share’ compatible. To be 1.5°C ‘fair-share’ compatible, Japan would need to strengthen its domestic emissions target and increase its international financial support.

Gütschow et al., 2021; Climate Action Tracker, 2020a, 2021

Energy-related CO₂ emissions by sector

In Japan, the largest driver of overall GHG emissions are CO₂ emissions from fuel combustion. These emissions have been decreasing since 2013. Emissions from the power sector are, with a 43% share, the largest contributor, followed by those from industry and transport with 23% and 19%, respectively.

Enerdata, 2021

Due to rounding, some graphs may sum to slightly above or below 100%.

*Other energy-related sectors’ covers energy-related CO₂ emissions from extracting and processing fossil fuels.
Energy Overview

Fossil fuels make up 87% of Japan’s energy mix, a share which remains greater than it was before 2011. The carbon intensity of energy supply observed over the past decade has been around 15% greater than that observed in the decade prior. Renewable energy supply, however, particularly solar and biomass, is increasing.

1.5°C Compatibility

The share of fossil fuels globally needs to fall to 67% of global total primary energy by 2030 and to 33% by 2050, and to substantially lower levels without carbon capture and storage (CCS).

Rogelj et al., 2018

Energy mix

Total primary energy supply (TPES) (PJ)

This graph shows the fuel mix for all energy supply, including energy used not only for electricity generation, heating, and cooking, but also for transport fuels. Fossil fuels (oil, coal and gas) make up 87% of the Japan energy mix, which is slightly above the G20 average of 81%. However, since 2017, annual energy supplied from coal, oil, and gas has fallen consistently (at an average of -3%, -5%, and -3% per annum, respectively) while that from renewables has increased at an average of 5% per annum.

Enerdata, 2021 Due to rounding, some graphs may sum to slightly above or below 100%

Solar, wind, geothermal, and biomass development

TPES from solar, wind, geothermal and biomass (PJ)

Solar, wind, geothermal and biomass account for 7% of Japan’s energy supply – the G20 average is 7.1%. The share in total energy supply has increased by around 59% in the last five years (2015-2020). Bioenergy (for electricity and heat) makes up the largest share. However, solar has seen the largest increase in recent years, with average year-on-year growth of 39% between 2012 and 2020.

Enerdata, 2021 Due to rounding, some graphs may sum to slightly above or below 100%

Note: Large hydropower and solid fuel biomass in residential use are not reflected due to their negative environmental and social impacts.

Decarbonisation rating: renewable energy share of TPES compared to other G20 countries

Current year (2020):

5-year trend (2015-2020):

Medium
Carbon intensity of the energy sector
Tonnes of CO₂ per unit of TPES (tCO₂/TJ)

Carbon intensity is a measure of how much CO₂ is emitted per unit of energy supply. Due to structural changes in Japan’s energy mix following the 2011 Fukushima nuclear accident, carbon intensity in the last decade has been around 15% greater than what was observed the decade prior. While increases in the share of renewables in the energy mix may have helped to reduce carbon intensity in the last five years, the use of natural gas is likely a larger driver of changes in this metric. Japan’s carbon intensity is greater than the G20 average and is declining at a slower rate.

Enerdata, 2021

Energy supply per capita
TPES per capita (GJ/capita) in 2020

The level of energy use per capita is closely related to economic development, climatic conditions and the price of energy. Energy use per capita in Japan is, with 127.88 GJ/capita in 2020, well above the G20 average, but is decreasing faster at -8.3% between 2015 and 2020 in contrast to the decreasing G20 average of -0.12% over the same period.

Enerdata 2021, United Nations, 2019

Energy intensity of the economy
(TJ/million US$2015 GDP) in 2019

This indicator quantifies how much energy is used for each unit of GDP. This is closely related to the level of industrialisation, efficiency achievements, climatic conditions or geography. Japan’s energy intensity is lower than the G20 average and has been decreasing at a slightly lower rate of -9.26% (2014-2019) as compared to the G20.

Enerdata, 2021, World Bank, 2021
In 2020, Japan produced 32% of its electricity from coal, and another 36% from natural gas. While the country is planning to phase out old, inefficient coal-fired power plants by 2030, it also plans to build at least 10 GW of new coal-fired generation capacity, equal to about 22% of existing capacity, in the coming years. There will still be 50 units with a total capacity of 33 GW in 2030.

Japan generated 72% of its electricity from fossil fuels in 2020. The share of renewable energy (including biomass and hydro) in Japan’s power sector has been increasing, particularly since 2013, and accounted for approximately 23% of the power mix in 2020. Note that an increase in the share from fossil fuels immediately followed the 2011 Fukushima accident. While the decrease in oil’s share observed prior to the accident has recommenced, that of coal and natural gas are still above what they were before 2011.

Rogelj et al., 2018; Climate Action Tracker, 2020b

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**Electricity generation mix**

Gross power generation (TWh)

<table>
<thead>
<tr>
<th>Year</th>
<th>Coal and Lignite</th>
<th>Oil</th>
<th>Natural gas</th>
<th>Nuclear</th>
<th>Renewables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
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<tr>
<td>2000</td>
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<td>2005</td>
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<td>2010</td>
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<tr>
<td>2015</td>
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<td></td>
</tr>
<tr>
<td>2020</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Japan generated 72% of its electricity from fossil fuels in 2020. The share of renewable energy (including biomass and hydro) in Japan’s power sector has been increasing, particularly since 2013, and accounted for approximately 23% of the power mix in 2020. Note that an increase in the share from fossil fuels immediately followed the 2011 Fukushima accident. While the decrease in oil’s share observed prior to the accident has recommenced, that of coal and natural gas are still above what they were before 2011.

Enerdata, 2021 Due to rounding, some graphs may sum to slightly above or below 100%

---

**Share of renewables in power generation**

(incl. large hydro) in 2020

<table>
<thead>
<tr>
<th>Country</th>
<th>Share of renewables</th>
<th>Decarbonisation rating: share of renewables compared to other G20 countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>22.6%</td>
<td>Current year (2020): low</td>
</tr>
<tr>
<td>G20 average</td>
<td>28.7%</td>
<td>5-year trend (2015-2020): Medium</td>
</tr>
</tbody>
</table>

Enerdata, 2021
Emissions intensity of the power sector

For each kilowatt hour of electricity, 465.8 g of CO₂ are emitted in Japan. Emissions intensity has decreased over the last five years as the share of renewable energy in power has risen, that of oil has decreased, and some nuclear reactors have been brought back online. It should be noted, however, that prior to the decreasing trend observed over the last five years, emissions intensity increased by 31% between 2010 and 2013.

Enerdata, 2021

POLICY ASSESSMENT

Renewable energy in the power sector

Japan has identified offshore wind as a key area of focus under its Green Growth Strategy. As such, the government has set capacity targets for this electricity source of 10 GW by 2030 and up to 45 GW by 2040. The strategy also seeks to increase the use of home solar panels and battery storage. Moreover, a recently released draft Strategic Energy Plan forecasts a 2030 share of renewables in power generation of 36-38%, up from the 22-24% estimate given in the country’s current NDC.

Shimizu et al., 2021; The Government of Japan, 2020b

Coal phase-out in the power sector

In July of 2020, Japan announced it would phase out inefficient coal-fired power plants by 2030. Details are still forthcoming, but the announcement will likely not affect the 10 GW of coal-fired generation planned or currently under construction. It remains to be seen how this aligns with the government’s recently-released draft energy plan that forecasts a 19% share of coal in the 2030 power mix (down from the 26% in Japan’s current NDC).

Climate Action Tracker, 2020; IEA, 2021a; Shimizu et al., 2021

CORONAVIRUS RESPONSE AND RECOVERY

The Japanese government’s first two stimulus packages allocated some small amounts towards climate change mitigation-related activities, such as solar power generation equipment and storage batteries for domestic businesses. The third stimulus, announced in December 2020, had a much larger mitigation focus and allocated JPY 2tn towards a Green Innovation Fund, details of which are outlined in the government’s Green Growth Strategy. The Fund opened for applications in April 2021.

Transport emissions have steadily decreased since a 2001 peak. In 2018, passengers travelled twice as much by road than by rail, and 11 times more freight was shipped by road than rail. Transport energy use is dominated by fossil fuels. The EV share in new car sales, which has been decreasing since 2017, is only 0.6%.

**Share of transport in energy-related CO₂ emissions**

Transport energy use is dominated by fossil fuels. The EV share in new car sales, which has been decreasing since 2017, is only 0.6%.

**1.5°C COMPATIBILITY**

The share of low-carbon fuels in the transport fuel mix globally must increase to between 40% and 60% by 2040 and 70% to 95% by 2050.

Rogelj et al., 2018; Climate Action Tracker, 2020b

**Transport energy mix**

Final energy consumption of transport by source (PJ/year)

Electricity and biofuels make up only 3% of the energy mix in transport.

Enerdata, 2021. Due to rounding, some graphs may sum to slightly above or below 100%.

**Transport emissions per capita**

excl. aviation (tCO₂/capita) in 2020


Aviation emissions per capita\(^6\)
(tCO₂/capita) in 2018

<table>
<thead>
<tr>
<th></th>
<th>Japan</th>
<th>G20 average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions</td>
<td>0.3</td>
<td>0.2</td>
</tr>
</tbody>
</table>

| Decarbonisation rating: aviation emissions compared to other G20 countries |
|-----------------------------------------------|------------------|
| Current year (2018):                         |                   |
| 5-year trend (2013-2018):                    |                   |
| Japan                                         | +7.53\%          |
| G20 average                                   | +21.25\%         |


Motorisation rate

**VEHICLES**

489 per 1,000 inhabitants in 2019 in Japan*

<table>
<thead>
<tr>
<th></th>
<th>Japan</th>
<th>G20 average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of EV sales in 2020 was</td>
<td>0.6%</td>
<td></td>
</tr>
</tbody>
</table>

Note that while the motorisation rate has increased only slightly since 2015, this has occurred while the country’s overall population has decreased.

Motorisation rate

<table>
<thead>
<tr>
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<th>G20 average</th>
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<tbody>
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Market share of electric vehicles in new car sales (%)

<table>
<thead>
<tr>
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<th>G20 average</th>
</tr>
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<tbody>
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Passenger transport

(modal split in % of passenger-km) in 2018*

<table>
<thead>
<tr>
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<th>Japan</th>
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<td></td>
</tr>
</tbody>
</table>

Note that while the motorisation rate has increased only slightly since 2015, this has occurred while the country’s overall population has decreased.

Freight transport

(modal split in % of tonne-km) in 2018*

<table>
<thead>
<tr>
<th></th>
<th>Japan</th>
<th>G20 average</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0.6%</td>
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</tbody>
</table>

Note that while the motorisation rate has increased only slightly since 2015, this has occurred while the country’s overall population has decreased.

Freight transport

(modal split in % of tonne-km) in 2018*

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<td></td>
</tr>
</tbody>
</table>

Note that while the motorisation rate has increased only slightly since 2015, this has occurred while the country’s overall population has decreased.

POLICY ASSESSMENT

Phase out fossil fuel cars

The Japanese government aims to have EVs (including non-plug-in hybrids) make up 100% of new car sales by 2035. This target, announced in December 2020, is backed up by an action plan, detailed in the government’s Green Growth Strategy, to reduce the costs of automotive battery packs. Japan could achieve 1.5°C compatibility in this benchmark by excluding non-plug-in hybrids from their 2035 sales. However, the idea of a fully electric vehicle fleet is highly contentious in Japan, given the automotive industry’s significance to Japan’s economy.

Dooley and Ueno, 2021; Kuramochi et al., 2017; Suga, 2021; The Government of Japan, 2020

Phase out fossil fuel heavy-duty vehicles

The Japanese government last updated its efficiency standards for heavy-duty vehicles in 2019. Currently, standards require manufacturers to improve fuel efficiency of trucks and buses by 13.4% and 14.3%, respectively, from 2015 levels by 2030. While the government is making efforts to decarbonise maritime shipping through the use of hydrogen fuel, it does not have a long-term strategy in place for the phase-out of fossil fuel heavy-duty road vehicles.

METI, 2019; The Government of Japan, 2020

Modal shift in (ground) transport

The Green Growth Strategy includes an action plan for the promotion of a modal shift in logistics. This includes a shift from truck transportation to other means with “smaller specific CO₂ emissions” as well as efficiency improvements along the supply chain, such as improved traffic flow measurement. While the share of rail in transport has increased over the last decade, this has been largely due to passenger transport. Previous government efforts to increase freight transport by rail have had mixed results.

IEA and UIC, 2017; Mizutani and Fukuda, 2020; The Government of Japan, 2020

*Owing to the variety of sources and data years available, these data are not comparable across G20 countries.

Dooley and Ueno, 2021; Kuramochi et al., 2017; Suga, 2021; The Government of Japan, 2020

Dooley and Ueno, 2021; Kuramochi et al., 2017; Suga, 2021; The Government of Japan, 2020

Dooley and Ueno, 2021; Kuramochi et al., 2017; Suga, 2021; The Government of Japan, 2020

Dooley and Ueno, 2021; Kuramochi et al., 2017; Suga, 2021; The Government of Japan, 2020
### Building Sector

Emissions from energy used to build, heat and cool buildings

Direct emissions and indirect emissions from the building sector in Japan account for 9.14% and 23.92% of total energy-related CO₂ emissions, respectively. Direct emissions steadily decreased over the past two decades, while indirect emissions generally increased and have only begun to decline in the last five years. Currently, per capita emissions from the building sector are almost twice the G20 average.

**Share of buildings in energy-related CO₂ emissions.** Building emissions occur directly (burning fuels for heating, cooking, etc) and indirectly (grid-electricity for air conditioning, appliances, etc.)

By 2040, global emissions from buildings need to be reduced by 90% from 2015 levels, and be 95-100% below 2015 levels by 2050, mostly through increased efficiency, reduced energy demand, and electrification in conjunction with complete decarbonisation of the power sector.

Rogelj et al., 2018; Climate Action Tracker, 2020b

### Building Emissions per Capita (incl. indirect emissions) (tCO₂/capita) in 2020

- **Japan:** 2.8 tCO₂/capita
- **G20 average:** 1.4 tCO₂/capita

Building-related emissions per capita are nearly twice that of the G20 average as of 2020. This reflects the high fossil fuel share in the country’s electricity mix. However, compared to the G20 average, Japan has managed to decrease per capita building emissions faster, with an almost 12% reduction between 2015 and 2020 (about four times the G20 average).

Enerdata, 2021; United Nations, 2019

### Policy Assessment

**Near zero energy new buildings**

Zero energy buildings and houses feature as key efficiency strategies in Japan’s recent Basic Energy Plans. The 2014 plan set a goal to reduce the average net primary energy consumption of newly constructed buildings and houses to zero by 2030, and thereby achieve average zero emissions in newly constructed houses by 2030. These goals were reiterated in the 2018 plan.

Climate Action Tracker, 2020; METI, 2018

**Renovation of existing buildings**

Japan’s Long-term Strategy includes, as part of its vision for carbon-neutral living, provisions for retrofitting existing buildings to increase energy efficiency. The Green Growth Strategy goes further and includes an “action plan” for retrofitting buildings. The retrofitting is part of the larger move towards zero energy buildings and houses and includes the installation of rooftop solar and battery systems, energy efficient renovation with high-performance heat insulating materials, and energy management using optimal control systems.

The Government of Japan, 2019b, 2020b
**Industry Sector**

**Emissions from energy use in industry**

Direct emissions and indirect emissions from Japan’s industry make up 23.0% and 15.2% of energy-related CO₂ emissions, respectively. In absolute terms, **direct emissions from industry have decreased by 29%** from the relatively stable historical average observed between 1990 and 2015, while indirect emissions have decreased only slightly, by 2.5%, from its historical average.

**Share of industry in energy-related CO₂ emissions.**

**Industrial emissions need to be reduced by 65-90% from 2010 levels by 2050.**

Rogelj et al., 2018

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**Industry emissions intensity**

ICO₂e/USD2015 GVA in 2017

- **Japan:** 0.3
- **G20 average:** 0.7

**Industry emissions intensity:**

Industry emissions intensity: 5-year trend (2012-2017)

- **Japan:** -24.06%
- **G20 average:** -16.45%

Decarbonisation rating: industry emissions intensity compared to other G20 countries

- **Current year (2017):** Very high
- **5-year trend (2012-2017):** High

Enerdata, 2021; World Bank, 2021

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**Carbon intensity of steel production**

kgCO₂/tonne product in 2016

- **Japan:** 1,784.5
- **World average:** 1,900

Steel production and steelmaking are significant GHG emissions sources, and challenging to decarbonise.

World Steel Association, 2018; Climate Action Tracker, 2020c

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**Policy Assessment**

**Energy efficiency**

Japan first established its Act on the Rational Use of Energy in 1979 and has regularly revised this law since then, most recently in 2020. The law covers around 90% of the industrial sector, as well as buildings and transportation. Factories and workplaces covered under the law are required to submit regular reports to the Ministry of Economy, Trade and Industry and reduce energy consumption by 1%, on average, each annual reporting period.

Japan has focussed on improving energy efficiency rather than decarbonising energy supply.

Grantham Research Institute on Climate Change and the Environment, 2021; IEA, 2021; Nagata, 2013; Kuriyama, A. et al., 2019
LAND USE SECTOR

Emissions from changes in the use of the land

To stay within the 1.5°C limit, Japan would need to ensure the land use and forest sector remains a net emissions sink. Annual LULUCF removals have decreased steadily, at an average rate of about -3.5% per annum, since peaking at around -100 MtCO₂ in 2003. While Japan’s NDC assumes 37 MtCO₂ annual removal from the LULUCF sector in 2030 (including 27.8 MtCO₂ from forest management), the draft new NDC assumes 48 MtCO₂ annual removal from the LULUCF sector in 2030.

Global deforestation needs to be halted and changed to net CO₂ removals by around 2030.

Rogelj et al., 2018

POLICY ASSESSMENT

Target for net zero deforestation

Japan, as part of its efforts towards the UN’s strategic plan for forests, implemented a Basic Plan for Forest and Forestry in 2016. The plan calls for the country to maintain a forest area of 25 Mha (covering about 70% of the country) and increase forest stock. More recently, it has introduced a Forest Management Act and established a Forest Environment Tax. While Japan has made efforts to reverse loss of forest cover domestically, it remains one of the largest importers of logs from tropical rainforests, thus exacerbating the global issues of deforestation.

Forestry Agency of Japan, 2019; Japan Forest Information Review, 2020; Sekiguchi and Ochi, 2021

AGRICULTURE SECTOR

Emissions from agriculture

Japan’s agricultural emissions are mainly from rice cultivation, digestive processes of livestock (mainly cattle), and manure management. A 1.5°C compatible pathway requires behavioural and dietary shifts and less fertiliser use.

Methane emissions (mainly enteric fermentation) need to decline by 10% by 2030 and by 35% by 2050 (from 2010 levels). Nitrous oxide emissions (mainly from fertilisers and manure) need to be reduced by 10% by 2030 and by 20% by 2050 (from 2010 levels).

Rogelj et al., 2018

Emissions from agriculture (excluding energy)

In Japan, the largest sources of GHG emissions in the agriculture sector are rice cultivation (33%), manure management (25%), and enteric fermentation (23%). While emissions from agriculture showed a decreasing trend of around -8% between 2010 and 2018, there has been little change to the sector’s emissions breakdown during this time. Dietary changes and efficient use of fertilisers as well as reductions in food waste could help reduce emissions from this sector.

FAQ, 2021

Due to rounding, some graphs may sum to slightly above or below 100%
Japan bases its NDC calculation on planned actions to be undertaken in the industrial, building, transport, energy, and LULUCF sectors.

The combined mitigation effect of Nationally Determined Contributions (NDCs) assessed by April 2021 is not sufficient and will lead to a warming of 2.4°C by the end of the century. This highlights the urgent need for all countries to submit more ambitious targets by COP26, as they agreed to do in 2015, and to urgently strengthen their climate action to align to the Paris Agreement’s temperature goal.

Climate Analytics, 2021a

**Nationally Determined Contribution (NDC): Mitigation**

**Targets**

The draft of Japan’s new NDC set a target of 46% emissions reduction below 2013 by 2030.

**Actions**

Japan bases its NDC calculation on planned actions to be undertaken in the industrial, building, transport, energy, and LULUCF sectors.

**Climate Action Tracker (CAT) evaluation of targets and actions**

This CAT evaluation is a new, overall rating, that combines the several, separately rated elements, of policies and actions, domestic and internationally supported targets, ‘fair-share target’ and the country’s contribution to climate finance. The “Insufficient” rating indicates that Japan’s climate policies and commitments need substantial improvements to be consistent with the Paris Agreement’s 1.5°C temperature limit.

We rate Japan’s recently proposed 2030 domestic emissions reduction target as “Almost sufficient”, and inconsistent with 2°C of warming when compared to modelled domestic emissions pathways. Although the proposed target represents a significant improvement on its first NDC, Japan’s new target is not stringent enough to limit warming to 1.5°C. We rate Japan’s overall ‘fair-share’ contribution as “Insufficient” as its domestic target is not 1.5°C compatible and its contribution to mitigation abroad through climate finance is highly insufficient. Japan should both increase its emissions reduction targets and provide additional, predictable finance to others to meet its ‘fair-share’ contribution. For the full assessment of the country’s target and actions, and the explication of the methodology see [www.climateactiontracker.org](http://www.climateactiontracker.org)

Climate Analytics, 2021

**Transparency: Facilitating Ambition**

Countries are expected to communicate their NDCs in a clear and transparent manner in order to ensure accountability and comparability. The NDC Transparency Check has been developed in response to Paris Agreement decision 1/CP.21 and the Annex to decision 4/CMA.1, which sets out the “information to facilitate clarity, transparency and understanding” as crucial elements of NDCs.

**NDC Transparency Check recommendations**

Japan’s INDC was submitted to the UNFCCC on 6 November 2016 and its first NDC on 30 December 2020. To ensure clarity, transparency, and understanding, it is recommended that Japan provides additional detailed information in its next NDC or NDC update, including:

- Provide information on the circumstances under which Japan may update the values of the reference indicators, their sources, and how they were constructed.
- Detail the planning process, including domestic institutional arrangements, public participation, stakeholder engagement, and gender responsiveness.
- Explicitly state the assumptions and methodological approaches for accounting for the land-use sector and non-GHG gas components.
- Provide information on considerations of fairness and ambition of the NDC and grounds to substantiate Japan’s NDC target as more stringent than its previous target.

For more visit [www.climate-transparency.org/ndc-transparency-check](http://www.climate-transparency.org/ndc-transparency-check)

**Ambition: Long-term strategies**

The Paris Agreement invites countries to communicate mid-century, long-term, and low-GHG emissions development strategies by 2020. Long-term strategies are an essential component of the transition toward net zero emissions and climate-resilient economies.

<table>
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<tbody>
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<tr>
<td>Sectoral steps</td>
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<tr>
<td>Net zero target</td>
<td>Aim to decarbonise society “as soon as possible in the second half of this century” 80% reduction, base year not specified</td>
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</table>

For more visit [www.climate-transparency.org/ndc-transparency-check](http://www.climate-transparency.org/ndc-transparency-check)
FINANCE | MAKING FINANCE FLOWS CONSISTENT WITH CLIMATE GOALS

In 2019, Japan spent almost USD 2bn on fossil fuel subsidies, including around USD 10bn of public financing for the oil and gas sectors. As such, Japan is the G20’s largest provider of public funding for fossil fuels, funding that surpassed the USD 8bn in revenue generated from Japan’s carbon tax in 2019.

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FISCAL POLICY LEVERS

Fiscal policy levers raise public revenues and direct public resources. Critically, they can shift investment decisions and consumer behaviour towards low-carbon, climate-resilient activities by reflecting externalities in the price.

Fossil fuel subsidies

USD billions

<table>
<thead>
<tr>
<th>Year</th>
<th>Natural gas</th>
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<td>2019</td>
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</table>

OECD-IEA Fossil Fuel Support database, 2020

Fossil fuel subsidies by fuel type

USD in 2019

- Natural gas: 1.941bn
- Petroleum: 76%
- Coal: 1%
- Natural gas: 23%

Over the past decade (2010-2019), Japan’s fossil fuel subsidies have oscillated considerably, reaching a value of USD 1.9bn in 2019. Over this period, most of the subsidies were directed to support the production and consumption of petroleum and natural gas.

Comparable data is not yet available for 2020. However, according to the Energy Policy Tracker data, during 2020 Japan has pledged at least USD 1.6bn to fossil fuel energy as part of its energy-related funding commitments and COVID-19 economic response. The recorded government support has been pledged in the form of loan guarantees issued by the Japan Bank for International Cooperation (JBIC) in favour of the two national airlines, All Nippon Airways (ANA) and Japan Airlines (JAL), to purchase new aircrafts.

Energy Policy Tracker, 2021; OECD-IEA Fossil Fuel Support database, 2020

Due to rounding, some graphs may sum to slightly above or below 100%

CORONAVIRUS RESPONSE AND RECOVERY

Japan’s first two stimulus packages, passed in April and May of 2020, provided a total of JPY 234tn but focused little on green measures. In December 2020, Japan announced a new economic stimulus package of around JPY 74tn for post-COVID recovery. Included in the package is a JPY 2tn Green Innovation Fund, the details of which are outlined in the government’s Green Growth Strategy. More recently, the Bank of Japan announced that it will provide low-cost loans to financial institutions with a view to combating climate change.

Governments steer investments through their public finance institutions, including via development banks both at home and overseas, and green investment banks. Developed G20 countries also have an obligation to provide finance to developing countries, and public sources are a key aspect of these obligations under the UNFCCC.

Japan’s 2012 national carbon tax covers 68% of domestic emissions and generated USD 6.2bn in 2020. Emissions cover all fossil fuels but were priced at a very low nominal price for 2020 (USD 2.65/tCO₂e). Moreover, subnational emissions trading schemes have been in place since 2010 and 2011 for the Tokyo and Saitama Prefectures, respectively. Under these schemes, 18-20% of total emissions are covered and priced at around USD 5/tCO₂e. No consistent revenue estimates are available for the subnational schemes.

Oil Change International, 2020

Due to rounding, some graphs may sum to slightly above or below 100%.
Financial policy and regulation

Through policy and regulation, governments can overcome challenges to mobilising green finance, including real and perceived risks, insufficient returns on investment, capacity and information gaps.

Japan has taken some commendable steps to green its financial system. In April 2021, the Bank of Japan introduced a measure to provide funds to financial institutions for investment or loans aimed at addressing climate change issues.

The Bank of Japan also launched a new scheme to provide no-interest loans to financial institutions that are undertaking disclosure initiatives, for example, under the Task Force on Climate-Related Financial Disclosures, as well as to purchase green bonds in foreign currencies.

In December 2020, the Japanese Financial Services Agency (FSA) established the Expert Panel on Sustainable Finance, which is comprised of businesses, financial and academic experts, and observers from various ministries. The panel will focus on developing policy approaches for driving sustainable finance by financial institutions, providing investment opportunities for investors through financial and capital markets, and promoting disclosures of climate related information by private companies.

In December 2020, the FSA, along with Ministry of Economy, Trade and Industry (METI) and Ministry of Environment (MOE), also announced the Task Force for Preparation of Environment for Transition Finance. The task force published the final Basic Guidelines on Climate Transition Finance in May 2021. The guidelines will strengthen Japan’s capacity for financing transitions, especially in hard-to-abate sectors, and introduce more funds towards achieving the 2050 carbon-neutral goals and the Paris Agreement.

In December 2020, the METI formulated a “Green Growth Strategy towards 2050 Carbon Neutrality”, including policy tools such as a scheme for long-term funds with an interest subsidy to attract global ESG investment.


<table>
<thead>
<tr>
<th>Nationally Determined Contribution (NDC): Finance</th>
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<tbody>
<tr>
<td>Conditionality</td>
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<tr>
<td>Investment needs</td>
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<tr>
<td>Actions</td>
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<tr>
<td>International market mechanisms</td>
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</tbody>
</table>
ENDNOTES
Where referenced, “Enerdata, 2021” refers to data provided in July 2021. For more detail on the sources and methodologies behind the calculation of the indicators displayed, please download the Technical Note at: www.climate-transparency.org/g20-climate-performance/g20report2021

1 The ‘1.5°C compatible pathway’ is derived from global cost effective pathways assessed by the IPCC's SR15, selected based on sustainability criteria and defined by the 5th-50th percentiles of the distributions of such pathways, achieving the long-term temperature goal of the Paris Agreement. Negative emissions from the land sector and novel negative emissions technologies are not included in the assessed models, which consider one primary negative emission technology (BECCS). In addition to domestic 1.5°C compatible emissions pathways, the ‘fair-share’ emissions reduction range would almost always require a developed country to provide enough support through climate finance, or other means of implementation, to bring the total emissions reduction contribution of that country down to the required ‘fair-share’ level.

2 ‘Land use’ emissions is used here to refer to land use, land use change and forestry (LULUCF). The Climate Action Tracker (CAT) derives historical LULUCF emissions from the UNFCCC Common Reporting Format (CRF) reporting tables data converted to the categories from the IPCC 1996 guidelines, in particular separating Agriculture from LULUCF, which under the new IPCC 2006 Guidelines is integrated into Agriculture, Forestry, and Other Land Use (AFOLU).

3 The Decarbonisation Ratings assess the current year and average of the most recent five years (where available) to take account of the different starting points of different G20 countries.

4 The selection of policies rated and the assessment of 1.5°C compatibility are primarily informed by the Paris Agreement and the IPCC’s 2018 SR15. The table below displays the criteria used to assess a country’s policy performance.

5 The 1.5°C ‘fair-share’ ranges for 2030 are drawn from the CAT, which compiles a wide range of perspectives on what is considered fair, including considerations such as responsibility, capability, and equality. Countries with 1.5°C ‘fair-share’ ranges reaching below zero, are expected to achieve such strong reductions by domestic emissions reductions, supplemented by contributions to global emissions reduction efforts via, for example, international finance. On a global scale, negative emissions technologies are expected to play a role from the 2030s onwards, compensating for remaining positive emissions. In order to maintain comparability across all countries, this report harmonises all data with PRIMAP 2021 dataset to 2018. However, note that Common Reporting Format (CRF) data is available for countries which have recently updated GHG inventories. Where countries submitted updated NDC targets before August 2021, these have been analysed and included.

6 This indicator adds up emissions from domestic aviation and international aviation bikers in the respective country. In this Country Profile, however, only a radiative forcing factor of 1 is assumed.

7 This indicator includes only direct energy related emissions and process emissions (Scope 1) but not indirect emissions from electricity.

8 This indicator includes emissions from electricity (Scope 2) as well as direct energy-related emissions and process emissions (Scope 1).

On endnote 4.

Low Medium High Frontrunner

Renewable energy in power sector
No policies to increase the share of renewables Some policies Policies and longer-term strategy/ target to significantly increase the share of renewables Short-term policies + long-term strategy for 100% renewables in the power sector by 2050 in place

Coal phase-out in power sector
No targets and policies in place for reducing coal Some policies Policies + coal phase-out decided Policies + coal phase-out date before 2030 (OECD and EU28) or 2040 (rest of the world)

Phase out fossil fuel cars
No policies for reducing emissions from light-duty vehicles Some policies (e.g. energy/emissions performance standards or bonus/ malus support) Policies + national target to phase out fossil fuel light-duty vehicles Policies + ban on new fossil fuel-based light-duty vehicles by 2035 worldwide

Phase out fossil fuel heavy-duty vehicles
No policies Some policies (e.g. energy/emissions performance standards or support) Policies + strategy to reduce absolute emissions from freight transport Policies + innovation strategy to phase out emissions from freight transport by 2050

Modal shift in (ground) transport
No policies Some policies (e.g. support programmes to shift to rail or non-motorised transport) Policies + longer-term strategy Policies + longer-term strategy consistent with 1.5°C pathway

Near zero energy new buildings
No policies Some policies (e.g. building codes, standards or fiscal/financial incentives for low-emissions options) Policies + national strategy for near-zero new energy buildings Policies + national strategy for all new buildings to be near zero energy by 2050 (OECD countries) or 2025 (non-OECD countries)

Energy efficiency in industry
No policies Mandatory energy efficiency policies cover more than 26-50% of industrial energy use Mandatory energy efficiency policies cover 51-100% of industrial energy use Policies + strategy to reduce industrial emissions by 75-90% from 2010 levels by 2050

Retrofitting existing buildings
No policies Some policies (e.g. building codes, standards or fiscal/financial incentives for low-emissions options) Policies + retrofitting strategy Policies + strategy to achieve deep renovation rates of 5% annually (OECD) or 3% (non-OECD) by 2020

Net zero deforestation
No policies or incentives to reduce deforestation in place Some policies (e.g. incentives to reduce deforestation or support schemes for afforestation/ reforestation in place) Policies + national target for reaching near net deforestation Policies + national target for reaching zero deforestation by 2020s or for increasing forest coverage

BIBLIOGRAPHY