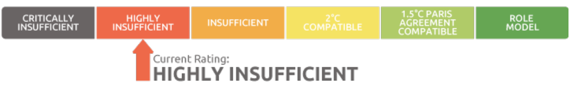
CLIMATE ACTION TRACKER

History: 2017 2016 2015 2014 2013 2011

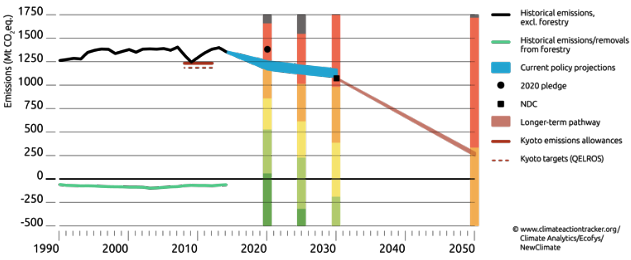
Japan

Page last updated: 6th November 2017

Rating



Basic Intermediate



Assessment

Japan's future emissions are challenging to predict, owing to uncertainty around the future role of nuclear, coal and renewable energy. While a large amount of coal-fired generating capacity is still under construction and in planning, the recent cancellation of plans for a coal plant is a possible indication of the potential impact of efficiency improvements and the government foreseeing larger renewable energy deployment toward 2030 than planned under the NDC. If this happens with other planned coal power plants, emissions projections may shift downwards and bring the NDC target - of 26% below 2013 emission levels including LULUCF (18% below 1990 levels) by 2030 - within reach.

Japan's proposed Kyoto Protocol-like accounting of sinks (land use change and forestry) reduces its effective emissions reduction target by about 3% below 1990 levels, resulting in a target of 15% below 1990, excl. LULUCF. We rate the target "Highly insufficient," meaning that if all countries were to adopt this level of ambition, global warming would likely exceed 3–4°C in the 21st century. This is in stark contrast to Japan's claim that its NDC is in line with a 2°C pathway.

Japan ratified the Paris Agreement on 8 November 2016, turning its Intended Nationally Determined Contribution (INDC) into its Nationally Determined Contribution (NDC), without further changes to the text. The NDC includes an emissions reduction target of 26% below 2013 levels by 2030, equivalent to 18% below 1990 levels by 2030 (Government of Japan 2015a).

Japan's NDC is based on a problematic accounting method that excludes land use, land use change and forestry (LULUCF) from the base year emissions, but includes it in the target year emissions. This type of asymmetric emissions accounting needs to be scrutinised under the Paris Agreement. When accounting for LULUCF credits in the base year, this target is reduced to 23% below 2013 (15% below 1990) levels. The Japanese Government also proposes using the Joint Crediting Mechanism (JCM), which could potentially further reduce the level of domestic reductions, depending on how Japan intends to account for the cumulative credits in the post-2020 period.

Under our CAT analysis a "Insufficient" rating would require an emissions level of 980 $MtCO_2e$ in 2030 or 20% below 1990 levels, a "2°C compatible" rating would require an emissions level of 293 $MtCO_2e$ in 2030 or 76% below 1990 levels. This stands in stark contrast to Japan's claim that the NDC is in line with a 2°C target.

The energy strategy that was developed in conjunction with the target is not in line with what is needed to transform Japan's energy sector to a low carbon economy. Indeed, the contrary is the case, as coal-fired power plants are set to play an increasingly important role in Japan. The share of low carbon options in the energy supply sector will increase only slightly from 37.5% before the Fukushima crisis (2009; (IEA 2015a)) to approximately 44% in 2030, if the Government's stated aim of a 20–22% share of nuclear electricity is reached, or less if this is not the case.

The share of renewable energy in total electricity generation has increased considerably - from 9.7% in 2010 (pre-Fukushima) to 14.6% in FY2015 (Renewable Energy Institute 2016) partly due to the generous feed-in tariff scheme introduced in 2012. While the Government has recently amended the scheme to avoid the "solar bubble" observed in the last few years due to high tariff rates and flaws in policy design, it is crucial that the Government will also maintain the momentum toward large-scale deployment of renewables.

Currently implemented policies will lead to emissions levels of 8–14% below 1990 levels in 2030, excluding LULUCF. The results indicate that under current policies, Japan will overachieve its 2020 pledge regardless of the future role of nuclear power, but might fall short of achieving its 2030 target in the NDC unless additional measures are implemented. The lower end of the range for current policy projections misses the NDC target by 1%point.

Pledges and targets

NDC

Japan's NDC includes an emissions reduction target of 26% below 2013 levels in 2030, which translates to a 18% reduction from 1990 levels, excluding LULUCF, but including LULUCF credits in the target year. The target contains 37 $MtCO_2e$ of credits from LULUCF in 2030. A large share will come from forest management, as was the case for Japan's pre-2020 targets. This reduces the effectiveness of the target. The Japanese Government also intends to allow the use of carbon credits from the JCM. In total the NDC foresees the potential use of credits equalling between 50–100 $MtCO_2e$ during the period up to 2030.

LULUCF is an issue in the NDC, given that Japan intends to use credits obtained through LULUCF accounting to meet its 2030 target. According to the NDC, the Japanese government intends to use accounting rules "in line with approaches equivalent to those under the Kyoto Protocol." This means that the activities of forest, cropland/grazing land managements and re-vegetation are projected to generate a credit of roughly 2.6% of total GHG emissions excluding LULUCF in 2013. This reduces the effectiveness of the 2030 goal from an 18% reduction below 1990 levels to about 15%, which is reflected in our quantification of the NDC. In this context, it should be noted that the Paris Agreement requires the negotiation and adoption of a common approach to methodologies for accounting, and it cannot be assumed that the Kyoto Protocol accounting system will be adopted.

Another uncertainty with the NDC relates to Japan's proposed overseas crediting system (JCM). According to the NDC, while no crediting from the JCM system was assumed in calculating the target bottom up, "accumulated emission reductions or removals by Fiscal Year (FY) 2030 through governmental JCM programs to be undertaken within the government's annual budget are estimated to be ranging from 50 to 100 million t-CO_2" (Government of Japan, 2015a). While there is room for interpretation, assuming that Japan achieves a cumulative JCM credit acquisition of 50–100 $MtCO_2$ by linearly increasing the annual credit acquisition between 2014 and 2030, the credits acquired in 2030 would amount up to 6–11 $MtCO_2$, which is roughly 0.5–0.9% of 1990 emissions. The potential impact of the JCM is not included in our assessment because it is not included in the bottom-up calculation of the NDC target level, and also because the future development of the scheme toward 2030 is uncertain.

Japan's NDC is enshrined in the Plan for Global Warming Countermeasures (MOEJ 2016), the establishment of which is obliged by the Global Warming Countermeasure Promotion Act and which was adopted by the Cabinet on 13 May, 2016. Japan has ratified the Paris Agreement on 8 November 2016.

Kyoto Protocol (KP)	
Member of KP CP1 (2008–2012)	Yes
Member of KP CP2 (2013–2020)	No
KP CP1 target (below base year)	6% below 1990
KP CP2 target (below base year)	N/A
Copenhagen pledge	
2020 target	3.8% below 2005 by 2020 [9% above 1990 by 2020 excl. LULUCF]
Conditions	LULUCF credits considered
Paris Agreement target	
Ratified	Yes
2030 target	26% below 2013 by 2030 [18% below 1990 by 2030]
Coverage	economy-wide, incl. LULUCF and overseas credits for 2030
LULUCF	LULUCF credits considered
Long term goal(s)	
Long-term goal(s)	80% by 2050 (base year not specified)

2020 Pledge

On 15 November 2013, Japan announced a new pledge to reduce emissions by 3.8% below 2005 levels by 2020. This pledge will result in an emissions level of 1,344 $MtCO_2e$ in 2020, equivalent to 6% above 1990 levels when calculated in terms of IPCC AR4 GWPs. For its original Copenhagen pledge, Japan communicated a target of a 25% emissions reduction below 1990 levels by 2020 (Government of Japan 2010). This target was conditional on the establishment of a fair and effective international framework, in which all major economies participate, and on agreement by those economies to ambitious targets.

The revised 2020 pledge assumes zero nuclear power in 2020. In addition, it has been estimated (Kuramochi, 2014a) that about 20 $MtCO_2e$ of overseas credits could be used, adding a further 1.6% to the allowed domestic emission. However, due to the current status of the Clean Development Mechanism (CDM) as well as the development status of the JCM, it is uncertain if such an amount of credits would realistically be acquired. We therefore did not consider the impact of overseas credits in the 2020 pledge quantification.

We estimate that LULUCF accounting in the form of forest management leads to a credit of 38 $MtCO_2e$ in 2020 (Government of Japan 2015a), equivalent to around 3% of 1990 industrial emissions. As proposed by the Government of Japan these credits will lead to an allowed emissions level under the revised pledge of 1,375 $MtCO_2e$ in 2020, or around 9% above 1990 levels. In addition, the use of overseas credits can further increase the total allowed domestic emission levels under the pledge. This pledge has not yet been enshrined in domestic legislation (Kuramochi 2014).

The revised 2020 pledge of November 2013 was a serious decrease in ambition compared to Japan's original Copenhagen pledge of 25% below 1990 levels. Revision of the original pledge raises the 2020 target by more than 350 $MtCO_2e$. While the Japanese government claims that this revision is mainly due to the future exclusion of nuclear energy from the energy mix (MOE, 2013), the basis of the 3.8% target is the pre-Copenhagen target (15% below 2005 levels) which was much less ambitious than the Copenhagen pledge.

Japan's Kyoto target (2008–2012) was at -6% relative to base year (1990) emission levels. Japan overachieved the target by reducing its emissions by 8.4% including LULUCF credits and the purchases of Kyoto units (MOEJ 2014).

Long term goal

The Plan for Global Warming Countermeasures (MOEJ 2016) enshrines a long-term target to reduce Japan's GHG emissions by 80% from current levels by 2050. The base year is not specified. Assuming that the base year is either 1990, 2005 or 2013, the target emission level for 2050 ranges at roughly 250–280 $MtCO_2e$.

Fair share

We rate the NDC 2030 reduction target of 26% (23% excluding LULUCF credits) below 2013 levels as "Highly Insufficient." Our assessment identifies a relatively large gap, [1] compared to the level at which we would rate Japan's contribution as "2°C compatible" let alone "1.5°C Paris Agreement compatible". Under our CAT analysis the "2°C compatible" rating would require a maximum emission level of 293 $MtCO_2e$ in 2030 or 76% below 1990 emission level. This stands in stark contrast to Japan's claim that the NDC is in line with a 2°C target.

The "Highly insufficient" rating indicates that Japan's climate commitment in 2030 is not consistent with holding warming to below 2°C, let alone limiting it to 1.5°C as required under the Paris Agreement, and is instead consistent with warming between 3°C and 4°C: if all countries were to follow Japan's approach, warming could reach over 3°C and up to 4°C. This means Japan's climate commitment is not in line with any interpretation of a "fair" approach to the former 2°C goal, let alone the Paris Agreement's 1.5°C limit. We also rate Japan's 2020 pledge "Highly insufficient". We would rate Japan's former target of a 25% emissions reduction below 1990 levels as "Insufficient". Commitments with this rating are in the least stringent part of their fair share range and not consistent with holding warming below 2°C let alone with the Paris Agreement's stronger 1.5°C limit. If all government targets were in this range, warming would reach over 2°C and up to 3°C.

If the CAT were to rate Japan's projected emissions levels in 2030 under current policies, Japan would also be rated "Highly insufficient."

For further information about the risks and impacts associated with the temperature levels of each of the categories click here.

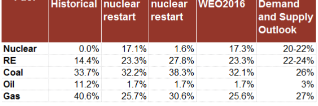
Footnotes

[1] We explicitly do not mention a number here, please see the methodology section for an explanation.

Current policy projections

Currently implemented policies will lead to emissions levels of between 1,165 and 1,247 $MtCO_2e$ (1–8% below 1990 levels) in 2020 and 1,081 and 1,158 $MtCO_2e$ (8–14% below 1990 levels) in 2030, excluding LULUCF. The results indicate that under current policies, Japan will overachieve its 2020 pledge regardless of the future role of nuclear power, but might fall short of achieving its 2030 target in the NDC unless additional measures are implemented. The lower end of the range for current policy projections misses the NDC target by just 20 $MtCO_2e$.

The range for each year depends partly on the future of nuclear power. The lower end projection is from a scenario in which all nuclear reactors that applied for restart as of April 2017 would be approved and the difference in nuclear power generation compared to the IEA WEO 2016 Current Policies Scenario (IEA 2016) is balanced by coal and gas power. The resulting electricity mix in 2030 is found to be similar to that in WEO 2016 Current Policies Scenario. The upper end projection, by contrast, is from a scenario in which there will be no nuclear power generation in 2020 and 2030, except for three reactors which are already in operation again, and the electricity supply gap is filled by renewables, coal and gas power, proportional to the technologies' shares in the WEO 2016. The table below illustrates the fuel mix in the power sector in 2014, and under different assumptions for our projections, in comparison to the WEO2016.



Shares of different fuels in electricity mix

Fuel	2014	2030			
	Historical	Full nuclear restart	Limited nuclear restart	WEO2016	Long-Term Energy Demand and Supply Outlook
Nuclear	0.0%	17.1%	1.6%	17.3%	20-22%
RE	14.4%	23.3%	27.8%	23.3%	22-24%
Coal	33.7%	32.2%	38.3%	32.1%	26%
Oil	11.2%	1.7%	1.7%	1.7%	3%
Gas	40.6%	25.7%	30.6%	25.6%	27%

After the 2011 earthquake, the Japanese Government decided to revise its energy policy and committed to reducing its reliance on nuclear energy. In 2011, all nuclear power plants stopped operating and were not allowed to restart until they complied with higher safety standards. In 2014, the Government announced the new Basic Energy Plan of 2014 (METI 2014) that calls for a reintroduction of nuclear energy, the target of which is quantified in the NDC. As of April 2017, 25 reactors in 15 nuclear power plants have applied for a restart (and one in construction applied for operation) under new, more stringent safety standards (JAIF 2017). As of March 2017, eight reactors with a total of 6.9 GW have passed the safety examination and have been approved for restart (under the condition that all required safety measures are properly installed), of which three are currently in operation (Ibid.).

In parallel to developing its GHG target under the NDC, Japan developed the 2015 Long-Term Energy Demand and Supply Outlook, an energy strategy that forms an integral part of achieving this target. This strategy, which is the basis for the calculation of the GHG targets, foresees that 20–22% of electricity will be supplied by nuclear energy, 22–24% by renewable energy and the remaining 56% by fossil fuel sources. This strategy stands in strong contrast to what would be compatible with a long-term, 2 °C-compatible strategy.

Two important aspects highlight why this is the case:

First, the energy strategy foresees a relatively large share of base load power plants (i.e. nuclear and coal fired power plants) of 46–48% in 2030 of total electricity production. Increasing the role of base load technologies in an energy system runs counter to what can be observed in most countries on a path to a low carbon society. Strategies in most countries foresee a significant increase of variable renewable energy resources. This requires a paradigm shift in how energy systems are structured and managed, and will increase their complexity. Such shifts take time and require the development and rollout of new technologies such as differently designed distribution networks (see e.g. (Bloomberg 2015)

Japan's proposed energy strategy will not only delay this necessary shift, but will also put Japanese industry at a competitive disadvantage with other countries that are currently undertaking these shifts.

Second, in the strategy, fossil fuel power plants would play an important role in Japan's energy mix in 2030 (56%), with 26% of total electricity generation expected to come from coal-fired power plants. This share could increase even further as the foreseen nuclear contribution is challenged by strong opposition to nuclear power in the wake of Fukushima.

As of November 2015 there are coal-fired power plant construction plans for a total of 18 GW, which would, together, emit more than 100 $MtCO_2e$ annually (Kuriyama & Kuramochi 2015). While several of these are replacements of existing plants, and it is unlikely that all of the planned 18 GW will be actually built, such a large-scale coal power installation plan poses a serious risk to Japan's future mitigation efforts. Early in 2017, the electricity utility cancelled its plans for a coal fired power plant in Hyogo, naming decreasing electricity demand as the reason (Buckley & Nicholas 2017). It is unclear to what extent this development will continue in the future, and whether the remaining plants in the pipeline will be constructed as planned.

The Basic Energy Plan of 2014 and its Long-Term Energy Demand and Supply Outlook lowered the ambition level for nuclear power compared to the pre-Fukushima 2010 Basic Energy Plan (from about 50% to 20–22% in 2030). The anticipated share of nuclear is still higher than what can be expected when looking at the capacity of those plants that have applied for a restart. In turn, the share of coal according to the NDC is lower than that in our estimates, and thus emissions of the CAT current policy projections are higher than what would result from the 2014 Basic Energy Plan.

The ambition level for renewables is only marginally raised in the Basic Energy Plan of 2014 in comparison to the Basic Energy Plan of 2010 (from about 20% to 22–24% in 2030). In 2012, the Renewable Energy Act was introduced to support these targets. It institutes a feed-in tariff (FIT) and general funding for distribution networks. As of December 2016 around 89 GW (91% of which is PV) have been approved for the FIT since its start in July 2012, but less than half of that – 34 GW – has begun operating (METI 2017). Nevertheless, the share of renewable energy in total electricity generation has increased considerably from 9.7% in FY2010 to 14.6% in FY2015 (Renewable Energy Institute 2016).

The future development of renewable energy in the electricity mix is highly uncertain. The feed-in-tariff (FIT) schemed introduced in 2012 provided very favourable rates, particularly for solar PV, which led to a large increase in PV installations, but no significant growth in other renewables. A large number of FIT-certified companies purposefully delayed installation until prices dropped. The Ministry of the Economy, Trade and Industry (METI) has revised the scheme with an intention of avoiding a "solar bubble" and achieving a more balanced growth of renewable energy (METI 2016). However, there are also concerns that the revision would both discourage investment in solar PV, and provide no further incentives to other renewables for balanced growth (Hirata 2016). The fifth Basic Energy Plan is expected to be formulated during FY2017.

Before the recently-initiated transformation of the electricity supply sector, Japan had already introduced effective policies for energy efficiency in transport, industry and buildings. These policies were recently complemented by additional policies in the building sector (top runner standard for building materials) and a Global Warming Tax. The latter is a low upstream environmental tax at a maximum price of JPY 289 (about USD 3) per tCO_2 in 2016. The GHG impact of this complex new policy is difficult to quantify without proper modelling tools, and we thus have not been able to include this in our scenario. The government quantifies the impact between 6-24 $MtCO_2$, on a baseline of 1,115 $MtCO_2$ for energy related emissions. The resulting emission levels are higher than our estimates for energy related emissions in the current policy projections. . We have therefore not attempted to quantify this policy for this update.

Assumptions

Historical data

For historical data, we use data submitted via the Common Reporting Format 2016 (UNFCCC 2016), converted to SAR GWP.

Pledge

Target emission level for 2020 were calculated from 2005 emission data according to Japan's Second Biennial Report to the UNFCCC (Government of Japan 2015a). We calculated Japan's LULUCF accounting quantities in 2020 for afforestation, reforestation and deforestation based on the accounting rule under the second commitment period of the Kyoto Protocol. Net removal by forests (38 $MtCO_2e$/yr) is taken into account for 2020.

Post 2020 target

The target for 2030 was calculated using Japan's NDC and the UNFCCC CRF data submitted in 2016 (UNFCCC 2016) converted to SAR GWP terms. Because of this, the NDC emission level quantified in this analysis (1073 MtCO2e) is different from the one in the NDC document, which is based on AR4 GWPs.

Current policy projections

Japan's Second Biennial Report (Government of Japan 2015a) only provides "With measures" emissions projection, which is identical to Japan's NDC. For the analysis of current policy projections, we used the WEO 2016 Current Policies Scenario (IEA 2016) which covers various climate related policies and their impact on energy-related CO_2 emissions as a basis. We apply the growth rate of that scenario to the last available year of inventory data for energy related CO_2. These datasets were combined with the projection for all GHGs other than energy-related CO_2 from the Central Environment Council, Ministry of the Environment (MOEJ 2012a); among various scenarios we took projections from "low mitigation effort scenario – moderate economic growth variant", the definitions of which - as well as the assumed future economic growth rate - are very similar to those for the IEA WEO Current Policies Scenario. This scenario provides values based on GWPs from SAR. Again, we applied the growth rate of this scenario to inventory data of the last historical year.The expected mitigation impact from the Act on Rational Use and Proper Management of Fluorocarbons (2013) was also considered. We assumed the additional mitigation impact in 2030 to be about 10 $MtCO_2e$/yr based on the comparison between the values mentioned in the policy document and our reference scenario for non-energy related emissions (MOEJ 2012b; MOEJ & METI 2014; Government of Japan 2015a). Thereby we assume a linear interpolation of the values between 2020 and 2030 for the reference scenario, and that the values in the policy scenario remain stable at 2025 values (last year provided in the documentation).

The WEO foresees a relatively large share of nuclear energy plants in electricity generation for 2030 (17%). While this is overachieved by the current assumptions of the government (Basic Energy Plan), it is not completely supported by the rate of restart of currently shut down nuclear power plants. We explored high nuclear" and limited nuclear scenarios. For the high nuclear scenario, it is assumed that all 26 nuclear reactors that applied for restart as of 15 September 2016 will be approved and complete their extended 60-year lifetime. The changes in nuclear power generation compared to the IEA WEO 2016's Current Policies Scenario is balanced by coal and gas power. The ratio of coal and gas power remain the same as in WEO 2016 and the average capacity factor of nuclear power plants was assumed to be 80%. For the limited nuclear scenario, it is assumed that only those reactors, which are in operation as of April 2017, will continue to generate electricity until they reach their 40-year lifetime, and that no further plants will be reconnected. The electricity supply gap is filled by renewables, coal and gas power and the ratio of three power sources remains the same as in IEA WEO 2016.

nario, it is assumed that all 26 nuclear reactors that applied for restart as of 15 September 2016 will be approved and complete their extended 60-year lifetime. The changes in nuclear power generation compared to the IEA WEO 2015's Current Policies Scenario is balanced by coal and gas power. The ratio of coal and gas power remain the same as in WEO 2015 and the average capacity factor of nuclear power plants was assumed to be 80%. For the zero nuclear scenario, it is assumed that there will be no nuclear power generation in 2020 and 2030, and the electricity supply gap is filled by renewables, coal and gas power and that the ratio of three power sources remains the same as in IEA WEO 2015.

The future development of renewable energy in the electricity mix is highly uncertain. The feed-in-tariff (FIT) schemed introduced in 2012 had provided very favourable rates particularly for solar PV, which lead to a large increase in PV installations but no significant growth for other renewables. A large number of FIT-certified companies purposefully delayed installation until prices dropped. The Ministry of the Economy, Trade and Industry (METI) has revised the scheme with an intention of avoiding a "solar bubble" and achieving a more balanced growth of renewable energy (METI 2016b). However, there are also concerns that the revision would both discourage investment on solar PV, and provide no further incentives to other renewables for balanced growth (Hirata 2016).

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