YURIKA AYUKAWA
tel:+81-90-1760-5022, fax: +81-3-6804-4255 Email: ayurika@f04.itscom.net

Japanese Policy on Climate Change: Adaptation and its Complexity

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1. Background

1) Climate Change speeding up more than predicted

As seen in the Fourth Assessment Report of the International Panel on Climate Change (IPCC) released in 2007, global warming is real, as a result of human activities since 1750. The average temperature increase since the industrial revolution is 0.74 degree C, and is predicted to rise by 0.2 degree C per decade till 2030. This means that an increase of 1.14 degrees C is already in the pipeline. The indication from the Third Assessment Report of the IPCC in 2001 was that the temperature increase compared to pre-industrialized levels was 0.6 degree C, and regarding the impacts, it argued that staying below 2 degrees C would save us from the dangerous impacts of climate change. However, the Fourth Assessment Report has shown more urgency in calculating the speed of warming and argues that the safer line for avoiding the dangerous impacts of climate change seems below 1.5 degrees C. Since the Fourth Assessment Report by IPCC in 2007, many new documents have been published showing that the speed of climate change has accelerated even faster than predicted in that report. Considering that we are already committed to an increase of 1.14 degrees C by 2030, it will be very difficult to stay below 1.5 degrees C. Much more effort than predicted before to reduce the emissions of GHG globally to keep the CO2 atmospheric intensity level between 400-450 ppm is necessary. (Figure 1) [1]

[1] IPCC(2007) WGIII, Page 776
Gupta, S., D. A. Tirpak, N. Burger, J. Gupta, N. Höhne, A. I. Boncheva, G. M. Kanoan, C. Kolstad, J. A. Kruger, A. Michaelowa, S. Murase, J. Pershing, T. Saijo, A. Sari, 2007: Policies, Instruments and Co-operative Arrangements. In Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Box 13.7 The range of the difference between emissions in 1990 and emission allowances in 2020/2050 for various GHG concentration levels for Annex I and non-Annex I countries as a group[a]

Scenario category	Region	2020	2050
A-450 ppm CO_2-eq[b]	Annex I	–25% to –40%	–80% to –95%
	Non-Annex I	Substantial deviation from baseline in Latin America, Middle East, East Asia and Centrally-Planned Asia	Substantial deviation from baseline in all regions
B-550 ppm CO_2-eq	Annex I	-10% to -30%	-40% to -90%
	Non-Annex I	Deviation from baseline in Latin America and Middle East, East Asia	Deviation from baseline in most regions, especially in Latin America and Middle East
C-650 ppm CO_2-eq	Annex I	0% to -25%	-30% to -80%
	Non-Annex I	Baseline	Deviation from baseline in Latin America and MIddle East, East Asia

Notes:

[a] The aggregate range is based on multiple approaches to apportion emissions between regions (contraction and convergence, multistage, Triptych and intensity targets, among others). Each approach makes different assumptions about the pathway, specific national efforts and other variables. Additional extreme cases – in which Annex I undertakes all reductions, or non-Annex I undertakes all reductions – are not included. The ranges presented here do not imply political feasibility, nor do the results reflect cost variances.

[b] Only the studies aiming at stabilization at 450 ppm CO_2-eq assume a (temporary) overshoot of about 50 ppm (See Den Elzen and Meinshausen, 2006).

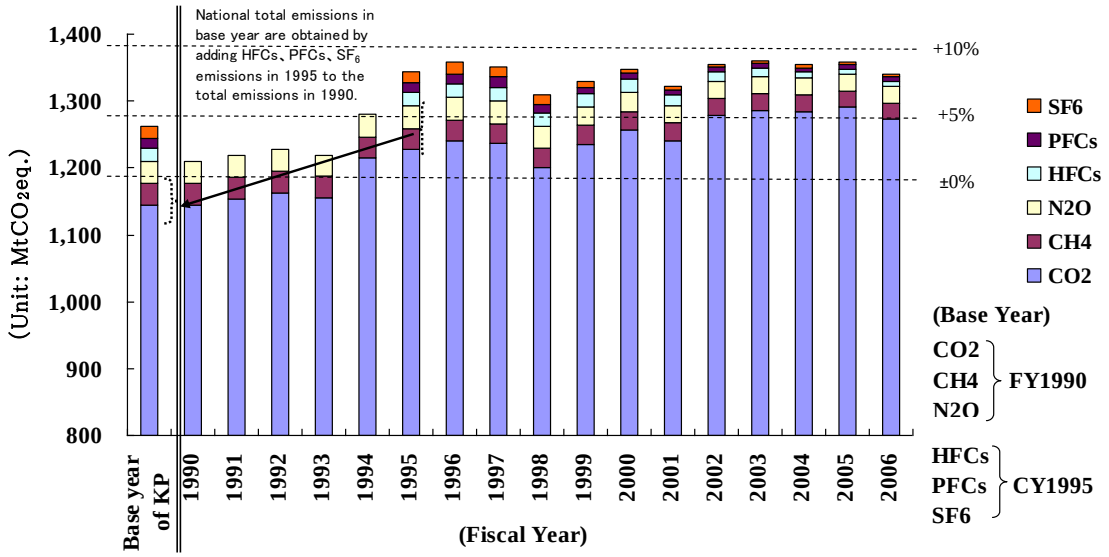
Source: See references listed in first paragraph of Section 13.3.3.3

The figures in this box have become the basis for the negotiations at the meetings of the United Nations Framework Convention on Climate Change (UNFCCC), and currently the mid-term target for 2020 is *the* issue to be agreed on at COP15/CMP5, to be held in Copenhagen in December 2009 for the post-2012 regime.

2) Japan's emission profile

Japan's GHG emissions have been increasing trend since 1990, even after the Kyoto Protocol was adopted in 1997, ratified in 2002, and went into force in 2005. The latest confirmed figure indicates a 6.2% increase from the base year for the year 2006. (Figure 1) [2]

[2] GHG Inventory Office of Japan (June, 2008)



The estimated emissions figure for 2007 announced last November was even higher, to the extent of 8.7% above 1990 levels. This is blamed on the shutdown of nuclear power plants in Niigata due to the big earthquake in 2007, which created some cracks in the power plants. The government is showing graphs that say "if nuclear plants were operated as planned…the emissions levels would have been…"

Around half of our emissions come from about 200 large emitting factories. Adding smaller facilities regulated by the Global Warming Prevention Law, the energy and industry sectors emit about 67% of the total Japanese emissions (Figure 2).[3]

[3] Kiko Network (May, 2008), "Greenhouse Gas Emissions in Japan"

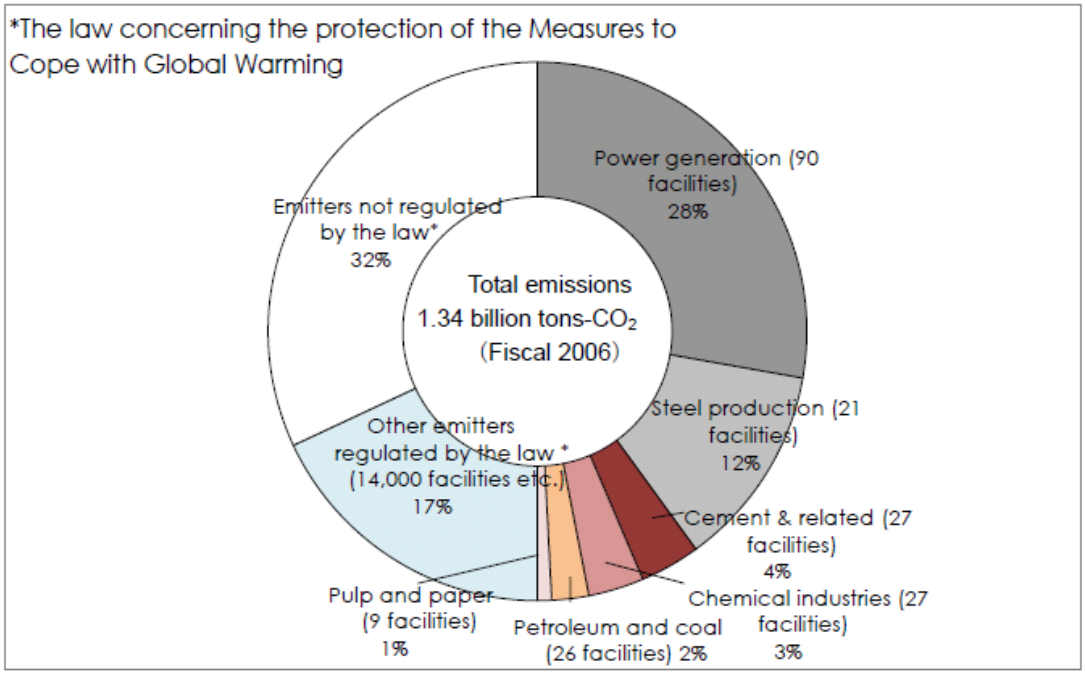
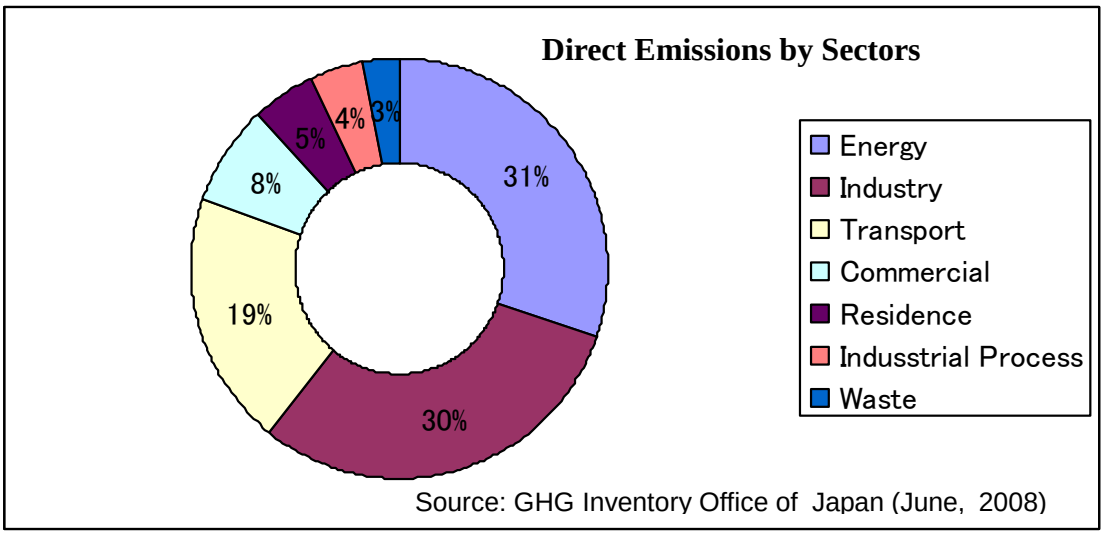


Figure 6. Ratio of emissions from Japan's big emitters (direct emissions)

Source: Estimated from GHG inventory and emission reports under the Global Warming Law.

Indirect emissions are growing in the commercial, residential and transport sectors, whereas the industry sector is at about the same level as in 1990. This is mainly due to the amount of activities that increased in these sectors from the 1990s until today. It shows a trend that the economic structure is shifting from manufacturing to service industries. However, the ratio of the direct emissions from these sectors is 8%, 5%, and 19% respectively. (Figure 3)



3) Japanese policy towards Climate Change, and its inefficiency

a. Japan commits to reduce 6% of its emissions from 1990 level. (Kyoto Protocol)

- Kyoto Target Achievement Plan (revised 2008)

This is the plan for how to meet the Kyoto Target, which was revised in March, 2008. However, this mainly consists of voluntary actions and intensive use of nuclear power. There is no mandatory economic measure such as a carbon tax or a cap & trade domestic emissions trading scheme, but there is a mandatory calculation, reporting and publicizing of the emission amounts of each company, in effect since 2006, stipulated in the Global Warming Prevention Law.

- Voluntary action is based on Nippon Keidanren's Voluntary Action Plan which is a "Pledge & Review" scheme, where industry federations make pledges to reduce their intensity targets or absolute targets as a group and each member company makes efforts on their own to meet the target. The Steel and Power sectors have no prospect of meeting their targets, but have the strongest power in Nippon Keidanren and force other member companies to oppose any mandatory policies.
- The weakness of the Voluntary Action Plan is that the industries pledge only what they can achieve. So some industries met their targets years ago, and when asked to raise their targets by the government in 2007, 11 out of 18 industries who raised their targets had already achieved the new targets in the year 2006.
- Despite these drawbacks, and the fact that emissions are still rising, the revised Kyoto Target Achievement Plan's main feature was to extend this voluntary action plan to all sectors that had not been included in Nippon Keidanren's scheme. So now, all sectors, including the commercial sector, transport, telecommunication, police agency, Ministry of Home Affairs, Ministry of Land Infrastructure, Transport, and Tourism, postal services, etc. have been made to set voluntary targets and achieve them.
- One big rationalization for the industries to reject any mandatory scheme was that the companies in the Nippon Keidanren are working on their Voluntary Action Plans. Now that all sectors are included in the Voluntary Action Plans, it has become even more difficult to introduce any mandatory scheme.

b. Japan declared it would reduce emissions 60-80% from 2005 by 2050, and work towards a Low Carbon Society. (Fukuda Vision, June, 2008 and "Action Plan Towards a Low Carbon Society, July 2008)

- In order to work towards a Low Carbon Society, the energy policy must be

changed. Japan's primary energy supply portfolio of 2006 is oil (47.9%), coal (20.6%), natural gas (15.4%), nuclear (11.4%), hydro & geothermal (3.6%), and new energy (including solar, wind and other renewables) (1.1%).[4] After the oil shock in the 1970s, Japan shifted its primary energy source from oil to coal and nuclear, and as a result, the use of coal has increased by 2.5 times compared to 1990. It will increase further in the future as a stable and cheap source of energy imported from politically stable countries such as Australia and Canada for energy security reasons. Even though we are facing an era where we have to phase out fossil fuels, and will increasingly become a carbon-constrained economy worldwide, Japan is still relying on mostly coal, and does not look towards renewable natural energy as essential for Japan both to meet the requirement from the earth and also to secure its energy needs.

- Japan is abundant with natural energy such as wind, wave, and tidal, as it is an island country 70% covered by forests, with rivers for small hydro, and has four seasons with lots of sunshine as well as snow. Japan is also a volcanic island, with huge potential for geothermal power. Such natural power is carbon free. Japan needs to tap all these potential domestic carbon-free energy sources and become energy independent from fossil fuel in order to construct a Low Carbon Economy.
- However, there is no effective policy in place to promote these natural energy sources. There has been a Renewable Portfolio Standard law since 2003, but the target is very low -- only 1.64% of electricity provided by 2014, meaning that each power company should provide 1.64% of their electricity supply from renewable sources other than large hydro.
- On February 24th, the Minister for Economics, Trade and Industry suddenly announced the introduction of a "Japan-type Feed-in-Tariff System" for solar power to be installed in residences for 10 years, with the price double the standard electricity fee that residents have to pay per kilowatt hour. The cost will be charged to all the electricity rate payers. This is a revolutionary step, as the utilities have strongly opposed this system.
- However, this is part of Prime Minister Aso's economic recovery plan, to be named the "Plan to Become the Number One Solar Power Nation in the World." The target is to increase solar power by 10 times by 2020, and by 40 times by 2030, in the Fukuda Vision, based on the Long-Term Demand and Supply Outlook made in March, 2008. But Aso went further and stated the target for 2020 to be 20 times more than now.

[4] Energy & Economic Statistics in Japan 2008 (Energy Data and Modeling Center)

- The drawback of this "Japan-type Feed –in-Law" is that this is only for solar power, and not for other renewable energy such as wind, small hydro, geothermal, woody biomass, and others. And the amount of power the utilities are to buy is limited to only those from households that are overproduced and not used, meaning the over production of power during the day when it generates a lot and the energy consumed is small. They will not buy all the power generated by solar. And this does not apply to huge solar power plants on a business scale or solar panels installed by companies for their own uses. This will continue for only about 10 years, or until the cost of solar panels per kW is halved from the current amount. So, there is no guarantee that this will continue for even 10 years, which will not be an incentive to make huge investments in the solar power technology to make it a great business opportunity.
- However, there will also be subsidies of 70,000 yen per KW installed. So together with the subsidy and the feed-in-tariff, the government projects about 8 million households to be equipped with solar panels. The objective of this project is to regain the World No.1 position in the global solar PV market which was taken over by Germany in 2005.
- Though this is only limited to solar, the introduction of a pseudo feed-in-tariff is a breakthrough in the renewable energy policy of Japan. It may expand to all renewable natural energy, specifically on woody biomass. Especially, the Minister Saito of the Environment actually mentioned extending the scheme to Wind Power at the Environment Ministers' Meeting of the G8 in Italy. The Prime Minister, in his speech made on 9th April[5], said that the percentage of renewable energy in the total energy consumption will be increased to 20% by 2020. This is a very ambitious target, as the current target in the RPS Law is only 1.64% of the total electricity provided, and in the Long-Term Energy Supply & Demand Outlook, the maximum introduction rate is 8.2% of the primary energy supply by 2020.

4) Japan's 2020 mid-term target discussion

A committee under the Prime Minister's Special Committee on Global Warming was set up in November 2008 to discuss the appropriate mid-term target for Japan, and to announce it by June 2009. In spite of the increasing impacts from rising temperatures and the damages brought by extreme weather events, global awareness of the necessity

[5] "Japan's Future Development Strategy and Growth Initiative towards Doubling the Size of Asia's Economy"
http://www.kantei.go.jp/foreign/asospeech/2009/04/09speech_e.html

to make huge reductions of GHG emissions, and the IPCC recommendation that stipulates developed countries to make reductions in the range of 25-40% from 1990 by 2020, the discussion in this committee is far from this range. Instead, committee members are discussing only how high the abatement cost in Japan is, and since Japan is already highly efficient, Japan does not need to reduce as much as other developed countries.

On 17th April, the committee officially announced 6 scenarios from +4% to -25% from the 1990 level at the Cabinet's Special Committee[6], and now under public hearings and public comments. The options were made only in the context of a "fare" abatement cost among the developed countries. Since Japan is unhappy with the way the Kyoto Protocol was decided in the end, it is trying to say that such an efficient country like Japan does not need to make so many reductions. So, the options do not include the cost of impacts from climate change, nor the positive effects of creating new businesses and employments, which may even make the GDP grow and make Japan the top runner in the global market.

The reduction figures are for all GHGs and only from domestic actions without including any sinks, or flexible mechanisms bought from abroad. Even so, it is unacceptable that they have put on the table scenario options to go even higher than the 1990 level, when science requires huge reductions in the post-2012 regime in order to stay below 2 degrees C above the pre-industrialized level. These scenarios, seen in the IPCC 4AR context, show that they are all in Scenario C in the famous Box 13.7 of the WGIII on page 776, which allows CO2e concentrations to go to 650 ppm, meaning the temperature increase will be in the range of 4.0 to 4.9 above pre-industrial levels, as shown in the Table SPM5 of the WGIII. Japan is proposing a world in which some catastrophic climate change effects may happen.

The first public hearing on the proposal took place in Tokyo on 20th April 2009. More than 500 people applied, but only 200 were allowed to attend. Two people from industries and one from an environmental NGO made a five minute speech, and afterwards, the discussion was opened to the floor. However, only about 15 people were able to speak, and the chair picked those he did not know. Those young people happened to be all sent from Keidanren or their company to say "Option One" was what they preferred. Only a few environmental NGOs were able to speak, as the chair was a friendly official of the Ministry of Environment. Out of about 13 people, 7 selected option 1 (+4%) and 6 selected option 6 (-25% or more). At Nagoya, the rate was 9:1, and in Osaka it was 8:2. All of those from the industry were sent from their companies

[6] See Annex A

under instructions from Nippon Keidanren to speak out for Option 1. They all talked about the old rhetoric of the Kyoto Protocol being unfair to Japan, as it did not reflect the early action taken by Japan in the 70s and 80s, and that the post-2012 regime has to include all countries, specifically China and India, and so Option 1 is the best.

2. Urban Insecurity in Japan

The average temperature rise in cities is higher than in other, smaller towns by 1 to 2 degrees C in the past 100 years. In Tokyo, the increase is 3 degrees C.[7] This is due not only to global warming but also to the heat island phenomenon caused by high skyscraper buildings, which block the wind from Tokyo Bay from coming inland to cool the central part of the city; heat emissions from air conditioning from all the buildings; and heavy car traffic emitting hot exhaust. This will worsen, if no policy is taken. During the summertime, the amount of monsoon rainfall increased (2008), with sudden heavy rainfall of 100mm per hour (2005) causing floods along the rivers and underground paths. In 2007, more than 5000 heat stressed people were sent to hospitals by ambulances in 17 major cities, and the number of patients increased exponentially as the temperature got higher. Tokyo, Osaka, and Nagoya, the three main cities, are predicted to lose around US$10 billion per year from heavy torrential rainfall and sea level rise.

3. Nuclear proliferation

Nuclear power is one of Japan's two climate policies along with industries' voluntary action plans. However, nuclear power has not helped Japan reduce its emissions to date. Many of the Japanese nuclear power plants had to be shut down due to troubles, data frauds, and most importantly, earthquakes. Whenever nuclear power plants are shut down, fossil fuels are burned to generate electricity, thus increasing CO2 emissions. So, nuclear energy is a huge uncertainty in making real reductions. In spite of these facts, nuclear is still the main pillar of Japan's climate policy, and the government intends to extend development through to a full-fledged nuclear cycle. For the moment, the power companies are setting a target of increasing the operational rate of nuclear power plants up to nearly 90%, though the current rate is as low as around 60%.

Furthermore, Japan is looking towards overseas markets to export nuclear power, since its domestic market is shrinking due to the lack of public acceptance. Japan wants to

[7] Extreme Weather Report 2005（Japan Meteorological Agency, 2005）

include nuclear power in the Clean Development Mechanism (CDM), one of the flexible mechanisms of the Kyoto Protocol, in the post-2012 regime. Japan is also looking towards exporting nuclear power as a means to reduce emissions in developing countries such as Indonesia, the Philippines, China and India. Japan may start stating that support for nuclear power in the developing countries be counted as developed countries' measurable, reportable, and verifiable (MRV) support to developing countries stipulated in the Bali Action Plan[8], which would likely create a huge nuclear proliferation threat in the East-Asia region in the post-2012 climate regime.

4. Energy Security

Japan's nuclear policy is not only aimed at climate change, but more importantly at energy security. As Japan has to import most of its fossil fuel from abroad, nuclear was regarded as a "dream come true" fuel since the 1950s, and Japan made the utmost efforts, spending trillions of yen to close the nuclear fuel cycle. As a result, most of the R&D budget on energy is spent on the backend cycle of nuclear power. This makes it impossible to secure enough R&D budget for promoting renewable energy technology. Consequently, it is difficult for other environmentally benign low carbon technologies to be seriously considered or looked into as an option to make huge emission reductions in the energy sector, and this is why Japan is far behind in taking these renewable energy technologies onto a level playing field to enable them to be used commercially.

As noted above, Japan is an island country surrounded by sea, windy, with two-thirds of its land surface covered with forests, very mountainous with many rivers for small hydro plants, volcanic with geothermal potential, and enjoys lots of sunshine under mild weather conditions. If all of these energy sources are tapped to a full extent, it will contribute greatly to Japan's energy security. With the right policy to promote it, it would be more reliable and certain in making real emission reductions as well.

5. Impacts of Climate Change in Japan

Although Japan is in a mild climate zone, Japan's weather patterns are changing. The average temperature rose by 1.06 degrees C in the 100 years till 1989. The maximum daily temperature has risen 0.71 degrees C, and the minimum temperature of the day is 1.42 degree C.[9] Hence we are having hotter summers and warmer winters

[8] UNFCCC(2007), FCCC/CP/2007/L.7 Draft Decision-/CP13

[9] Extreme Weather Report 2005（Japan Meteorological Agency, 2005）

than before.

One very visible change is that the blooming of cherry blossoms is happening earlier. In the past 50 years, it has become 4.2 days earlier on average.[10] The blooming of cherry blossoms used to be in the first week of April, when most of the schools, from kindergartens to universities, begin their fiscal year and it was the symbol for new entrance ceremonies at schools. Now, the blooming period has become a few weeks earlier in the latter half of March, when the graduation ceremony takes place. As a result, cherry blossoms have become a symbol for graduation ceremony.

The coloring and the falling of the leaves of maple trees and gingko trees are happening later than before. As a result of a survey conducted at all the meteorological centers nationwide, earlier blooming of cherry blossoms was seen in more than 65% of the observed centers, and 70% saw later coloring of gingko tree leaves, and more than 80% for the maple tree leaves.[11]

Other Significant Observed Impacts:

- Abnormal weather, such as strong typhoons, sudden rain showers, extremely high summer temperatures, and warm winters with less snow are happening nationwide. In terms of rainfall, there has been an increase in the range of fluctuation in annual precipitation. While the overall trend is towards less rainfall, the frequency of extreme rainfall has been increasing. For example, the number of hourly rainfall of more than 50 mm is in an increasing trend from an average of 206 times/year in the 1980s to 318 times/yr in the last 10 years.[12]

- On the other hand, the year 1994 was dry, and due to this drought, groundwater use increased in the Nagoya area, resulting in incidences of land subsidence.[13]

- 2002 was also dry, and due to this drought, 55% of the water supply was restricted in Fukuoka area.[14]

- In 2003, the summer was extraordinarily cool, and due to low temperatures,

[10] Extreme Weather Report 2005（Japan Meteorological Agency, 2005）
[11] "Wise Adaptation to Climate Change" (Ministry of Environment, June, 2008)
[12] "Wise Adaptation to Climate Change" (Ministry of Environment, June, 2008)
[13] Same as above
[14] Same as above

there was a loss of US$2.5 billion worth of agricultural products.[15] In 2004, Japan was struck by a record high of 10 typhoons in the summer, causing huge damages from flooding, landslides, storm surges and high tides. Three hundred people died or were lost, and more than 170,000 houses were flooded. This also caused agricultural damage which was as high as US$2.5 billion in 2003.

- In 2005, fierce rainfall at more than 100 mm/hour caused flooding in Tokyo.

- In the winter of 2005-2006, heavy snowfall was seen in the western side of Japan's Honshu island, which caused 152 deaths and missing, and 4713 houses damaged.[16]

- But the winter of 2006-2007 was abnormally warm with less snow.[17]

- The summer of 2007 was especially hot, where temperatures in Kumagaya and Tajimi city had record highs of 40.9 degrees C .[18]

- In 2007, more than 5000 people were sent to hospitals by ambulances in 17 cities including Tokyo, which was a record high. Sixty-six peopled died of heat stress nationwide.

Recent reports on future impacts from climate change in Japan[19] predict that even with stabilization at the lowest level of GHG concentration, which is 450ppm, there still would be some damage in Japan.

The report is based on 3 scenarios: 450ppm, 550ppm, and Business as Usual. For example, the beech trees will be lost by 35%, 50%, and 70% at the most by the end of this century. The sea level rise will not stabilize even under the 450ppm scenario, and the loss of sandy beaches will be up to 50% compared to 1990, without any adaptation measures. The risk of floods will still be high even under the 450ppm scenario, and

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15 Extreme Weather Report 2005（Japan Meteorological Agency, 2005）

16 Climate Change Monitoring Report 2006（Japan Meteorological Agency, November, 2007）
http://ds.data.jma.go.jp/tcc/tcc/products/gwp/CCMR2006.pdf

17 Climate Change Monitoring Report 2007（Japan Meteorological Agency, November, 2008）
http://ds.data.jma.go.jp/tcc/tcc/products/gwp/CCMR2007.pdf

18 Climate Change Monitoring Report 2007（Japan Meteorological Agency, November, 2008）
http://ds.data.jma.go.jp/tcc/tcc/products/gwp/CCMR2007.pdf

19 "Cost of Risks from Climate Change if global mitigation efforts are not made", AIM Team of National Institute of Environment Studies, (Material 4, Mid-term Target Committee of 14th April, 2009)

the cost of lost assets is estimated to be 6.4 trillion yen/year, 7.6 trillion yen/yr, and 8.7 trillion yen/yr by 2090, respectively, for each scenario. The risk of people dying from heat stress will be 2.1 times more, 2.8 times more, and 3.7 times more compared to 2020 by 2090 respectively, for each scenario.

6. Adaptation Policy in Japan

The Japanese policy towards climate change is focused on how to meet the Kyoto target. Mitigation is the priority issue rather than adaptation, and hence there is no policy on adaptation adopted in Japanese climate policy yet. However, awareness towards the impacts of climate change and recognition of the importance of adaptation policy has just taken off in Japan. Investigation on impacts of climate change in Japan have been made by the Ministry of Environment and the Meteorological Agency. But studies on how to adapt to the foreseeable impacts in Japan are based on existing studies, for example, on the improvement of species for agricultural products, or harbor and land use planning for disaster prevention.

The cost analysis of risks from climate change is an area yet untouched by scientists on impacts of climate change. This should be done by economists. But the difficulty of making such an analysis is that most impacts of climate change cannot be quantitatively assessed in terms of costs. Some risks, such as damage from typhoons or floods, could be estimated from market values. But impacts such as loss of biodiversity are difficult to put a market value on. At the moment, the cost analysis is limited to that for which market value data is available. Consequently, an overall policy for adaptation and cost analysis of risks from climate change is only at a preliminary stage.

- **Existing Studies**

The Japanese Meteorological Agency has published an annual "Climate Change Monitoring Report," since 2004, and the "Extreme Weather Report" every five years since 1974.[20] In both reports, disasters caused by extreme weather are evaluated quantitatively, and figures provided on how many people have died or gone missing, how many houses were destroyed, how much loss to agriculture, fishery, and forestry, and total cost of loss.

"Wise Adaptation to Climate Change", a Report by the Committee on Climate Change Impacts and Adaptation Research, under the Ministry of Environment, was published

[20] http://www.data.kishou.go.jp/climate/index.html

last June for the first time. It looks into "observed impacts from climate change", and provides "projected impacts" in the future and recommends types of adaptation to avoid the risks. It looks into the areas of food, water, natural ecosystems, disaster prevention and large coastal cities, health, citizens' life and urban life, developing countries, and others. This report evaluates the impacts in a qualitative way.

The report "Global Warming, and its Impacts on Japan", published by the Ministry of Environment in May 2008 and revised in August 2008, is the most comprehensive report on analysis of the impacts in qualitative as well as quantitative ways, and clearly indicates how many assets Japan would lose from global warming in amount of costs. The report looks into the areas of water resources, forestry, agriculture, coastal areas, health, and the overall risks from global warming. Then it clarifies and recommends what adaptation measures are needed to lessen the economic loss as well as livelihoods of Japan.

For example, the report estimates the amount of assets to be lost from floods due to climate change around Osaka Bay and Nagoya's Ise Bay to be around US$400 million, US$1 billion around Tokyo Bay, and US$200 million in other areas. In total, Japan would lose around US$10 billion per year, if a heavy torrential rainfall happens once in 50 years, where it was originally predicted to happen only once in 100 years.

Another example in the report describes the impacts of sea level rise and the loss of sandy beaches. It puts recreational value to sand beaches at US$120 per square kilometer. Using the social discount rate of 4% annually, the annual asset of sandy beaches are about US$922, which would total to US$23 billion in 2100. With a sea level rise of 30 cm, 56.6% of Japan's sandy beaches would be lost, which would be equal to a loss of US$13 billion. With a 65cm rise, 81% would be lost, equivalent to US$18.8 billion, and with a 100 cm rise, 90.3% would be lost, equivalent to US$ 21.1 billion.

This report and the "Wise Adaptation" report give an overall recommendation of an adaptation menu.

The following reports by related ministries give more concrete examples as necessary for adaptation, and ways to avoid disastrous impacts within each ministry's responsible areas.

The Ministry of Land Infrastructure, Transport, and Tourism has just drafted a report on "How the Climate Change Adaptation Policy on Harbor Facilities Should Be" this January, and opened it to public comments until February 14th.[21] In this report, it raises concerns and sends warning messages on how vulnerable the Japanese harbors and surrounding reclaimed land areas are. It gives examples showing that if the sea level rise is about 60 cm and a super typhoon reaches Tokyo Bay or Osaka Bay, as much as several hundred billion dollars of assets would be lost.

Due to the slow progress in making the necessary real reductions in the real world, the MLITT is pessimistic that global warming will not be mitigated rapidly, and states the necessity to be prepared to adapt to the impacts of climate change. For example, the length of sea shores necessary to be protected is 14,000 km long, but less than 10,000 km is protected by dikes, and 60% of these were made more than 40 years ago, and are now aging and lacking in earthquake protection standards. These must be reconstructed together with evacuation plans, as a part of an overall adaptation plan in climate policy.

The Ministry of Agriculture, Fishery and Forestry also published a report, "Climate Change Impacts on Agriculture, Fishery and Forestry and Adaptation" in 2007[22], but this is only on projected impacts, and the adaptation measures are mainly on developing climate change resilience and adaptive seeds for agricultural products, and changing methods of production.

7. Adaptation in Developing Countries

"Adaptation," in general, is regarded as support for developing countries that are already at risk from impacts of climate change, and something foreign to the Japanese. The following are some examples from Japan in trying to find a solution to the issue, but this is in the context of the developing countries as a whole and not in a regional aspect, such as Japan being a part of East Asia interdependently.

"The Wise Adaptation to Climate Change" report includes one chapter on the "Developing Countries Area", most of which are excerpts from IPCC AR4, UNFCCC, and other existing studies, and putting them in order to see what really needs to be done

[21] http://www.mlit.go.jp/appli/pubcom/port07_pc_000005.html
[22] http://www.s.affrc.go.jp/docs/press/2007/071221.htm

in terms of adaptation in developing countries and what Japan could/should do. As it also indicates, there have been many projects which have taken place with ODA loans, which could contribute to adaptation as well. These have been done by the Foreign Ministry and Japan International Cooperation Agency (JICA), which implements projects with ODA.

The Ministry of Foreign Affairs published an expert panel recommendation paper called the "Basic Policy on Development Cooperation in the Field of Climate Change"[23] in March 2008. The focus of this report is on implementing "Cool Earth 50," proposed by then- Prime Minister Abe in May 2007, and "Cool Earth Promotion Program" proposed by then- Prime Minister Fukuda at the Davos Conference in January 2008. Consequently, the report is comprised of two parts: mitigation and adaptation. At the Davos Conference, a new financial mechanism named "Cool Earth Partnership" was announced at the scale of US$10 billion. US$2 billion will be provided as a grant towards adaptation, and the rest, US$8 billion will be in the form of an ODA loan for mitigation. But this report does not indicate how this total US$10 billion will be divided and used.

JICA published a report titled, "JICA's Cooperation towards Adaptation to Climate Change"[24] in July, 2007. Here, it discusses issues of climate change impacts and adaptation in developing countries as a whole, and not specifically in Asia or East Asia. JICA has worked on projects which could contribute to adaptation in the Asian region, such as investigations on overall agricultural development in Cambodia, to prevent floods, secure water supply, and increase agricultural products. In China, capacity building projects took place, such as forest restoration, development of insect-resistant species, and improvement in technology to store genes. In Bangladesh, a cyclone shelter house was constructed to secure 37,000 evacuees in the Bengal Bay area. They also provided support for constructing strong bridges in small communities where most of the road infrastructure does not exist, as simple bridges are always torn down in the case of cyclones and torrential rainfalls and floods.

Most of the projects are feasibility-level studies to see where JICA could contribute, and JICA has made a list of projects that could contribute to adaptation. It could be said that "Implementing Adaptation" is not yet realized to the extent needed.

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[23] http://www.mofa.go.jp/policy/environment/warm/cop/policy0803.pdf
[24] http://www.jica.go.jp/jica-ri/publication/archives/jica/field/200707_env.html

8. Adaptation in the East Asian Region and Japan

As mentioned above, there is not yet a regional aspect or an approach on interdependency of the East Asia region in terms of adaptation in Japan.

However, one forum, the Asia-Europe Meeting, (ASEM) may become a place to discuss the issue. This forum includes countries such as Japan, China, Korea, Mongolia, India, Thailand, Vietnam, Singapore, the Philippines, Malaysia and EU countries. Tokyo co-hosted a Seminar on Adaptation to Climate Change last October with the European Commission, co-sponsored by the Netherlands, UK, Vietnam and South Korea. They exchanged views and experiences regarding adaptation. "The Seminar highlighted the serious necessity for the international community to attach as much importance to the adaptation issues as it does to the mitigation issues."[25]

9. Japanese contribution to Adaptation Fund under UNFCCC

There are two Funds under the UNFCCC and one under the Kyoto Protocol for adaptation. Those under the UNFCCC are the Special Climate Change Fund (SCCF) and the Least Developed Country Fund (LDCF), both of which are basically donation-type funds, managed by the Global Environmental Facility (GEF). Countries make a pledge or contribute to the Fund, and as of October, 2008, the total amount of pledges and contributions are as follows in Tables 1 and 2.[26]

(Table 1) Special Climate Change Fund (Status of Pledges & Contribution as of October, 2008)

COUNTRY	AMOUNT (US$)	COUNTRY	AMOUNT (US$)
Canada	12,894,703	Norway	16,439,893
Denmark	9,041,885	Portugal	1,299,099
Finland	3,422,945	Spain	6,861,900
Germany	14,173,388	Sweden	6,120,153
Ireland	1,600,000	Switzerland	2,986,893
Italy	10,000,000	United Kingdom	18,603,167
Netherlands	3,128,880	**TOTAL**	**106,572,906**

[25] http://www.mofa.go.jp/policy/economy/asem/seminar/summary0810.pdf
[26] GEF(2008) "Status Report on the Climate Change Funds, October 2008" GEF/LDCF.SCCF.5/Inf.2

(Table 2) Least Developed Countries Fund (Status of Pledges & Contributions as of October, 2008)

COUNTRY	AMOUNT (US$)	COUNTRY	AMOUNT (US$)
Australia	6,600,750	Luxemburg	5,702,900
Austria	580,400	Netherlands	16,342,578
Canada	6,518,366	New Zealand	3,868,560
Denmark	15,967,606	Norway	6,675,406
Finland	6,101,150	Portugal	64,065
France	15,280,918	Spain	987,178
Germany	56,123,301	Sweden	886,747
Ireland	7,749,794	Switzerland	2,366,860
Italy	1,000,000	United Kingdom	19,371,151
Japan	250,000	**TOTAL**	**172,437,729**

From both of the tables, we can see that Japan has not made any pledges or contributions to the SCCF, and only a very tiny amount, about 0.1% of the total pledged, to the LDCF. As the second largest economy in the world, this does not reflect its responsibility in a moral sense to help people who are already threatened by climate change.

One Fund under the Kyoto Protocol is called the Adaptation Fund, where the source of funding comes from a share of proceeds of 2% from the Clean Development Mechanism (CDM). This fund will function under the guidance of, and be accountable to, the Conference of the Parties serving as the Meeting of Parties. At the Bali COP13/CMP3, it was decided that an Adaptation Fund Board shall work as the operating entity of the Fund serviced by a secretariat and a trustee, and invited the Global Environment Facility (GEF) to provide secretariat services, and the World Bank to serve as the trustee of the Adaptation Fund Board on an interim basis.[27]

Developing countries were concerned that the ownership of the Fund was taken away from them to developed countries, and insisted on making the Board a legal entity at Poznan COP14/CMP4 in December, 2008. After long talks, it was decided to make the Board a legal entity, and developing countries were happy to be able to have direct access to the fund.

However, a bigger problem is that the amount of funding from just 2% levy from

[27] UNFCCC(2007), Decision 1/CMP3 (FCCC/KP/CMP/2007/9/Add.1)

CDM projects is not enough to meet the needs of adaptation. The UNFCCC secretariat made an estimation in 2007 about how much would be needed (Table 3) and how much could come from CDM proceeds.[28]

(Table 3)

Table 5. Estimated additional investment and financial flows needed for adaptation in the year 2030 (billions of United States dollars)

Sector	Global	Non-Annex I Parties
Agriculture, forestry and fisheries	14	7
Water supply	11	9
Human health	5	5
Coastal zones	11	5
Infrastructure	8–130	2–41

Abbreviations: Non-Annex I Parties = Parties not included in Annex I to the Convention

This estimation shows the total amount necessary in addition would be from US$49-171 billion by 2030, but the income from CDM levy would be US$80 million to 300 million annually and would be less than 1% of what is needed. So, the developing countries wanted to expand the 2% levy to all the Kyoto Mechanisms, such as Joint Implementation and International Emission Trading. After long discussions at Poznan, the parties could not come to a conclusion, and the COP14/CMP ended with no decision or any document on this.

The developing countries were extremely disappointed at this outcome. Though the Environmental NGOs did share the necessity of extending the 2% levy to all other Kyoto mechanisms, they believed it would still not be enough, and this problem should be discussed in the bigger context of creating a new financial mechanism for the post-2012 framework, and at the same time, asked developed countries to make more pledges or contributions to the other funds for adaptation under the Convention.

What the Japanese government should do now is make real pledges and contributions to the LDC Fund and the SCCF, and at the same time, make a concrete proposal in their submissions as to how they plan to contribute to fundraising for adaptation, not in a bilateral way like the Cool Earth Partnership, but in the context of contributing to the discussion on global financial mechanisms to raise the enormous amount of money that is essential to adapt to the impacts of climate change.

10. Conclusion:

[28] UNFCCC(2007), *Report on the Analysis of Existing and potential investment and financial flows relevant to the development of an effective and appropriate international response to climate change,* Dialogue Working Paper 8, Fourth Workshop, Vienna, 27-31 August, 2007

As indicated in the Fourth Assessment Report of the IPCC, "Warming of the climate system is unequivocal," and "with current climate change mitigation policies and related sustainable development practices, global GHG emissions will continue to grow over the next few decades … additional adaptation measures will be required at regional and local levels to reduce the adverse impacts of projected climate change and variability, regardless of the scale of mitigation undertaken over the next two to three decades." As seen in chapter 5 and 6, the effects of climate change are emerging at huge costs even in societies with high adaptive capacities such as Japan. Considering that the "impacts of climate change are very likely to impose net annual costs, which will increase over time as global temperatures increase," it is essential for Japan to consider the impacts of and adaptation to climate change when designing the overall climate policy of Japan. "Adaptation is necessary both in the short term and longer term to address impacts resulting from the warming that would occur even for the lowest stabilization scenarios assessed." [29]

As written in chapter 1-(4), the Mid-Term Target Committee discussed the 2020 target for Japan, without any consideration to costs of impacts from climate change and the essential adaptation measures accordingly. The mission of this Committee was only to evaluate the Marginal Abatement Cost and compare it with other developed countries to come up with a "fair" burden sharing for Japan, and its effects on the Japanese economy. This approach is not a comprehensive way to decide how we should invest our money to change our society towards a Low Carbon Society.

Now that we understand that mitigation and adaptation are both sides of a coin, Japan should start considering adaptation together with mitigation in the regional context. That Japan is not by itself but is a large part of the East Asia region, and is interconnected not only by business and politics but by the impacts we all get from climate change and the fact that we are all the cause of climate change. It is a huge global challenge to all human beings. We are all responsible. Japan should start to seriously think about interdependency among the East Asian countries.

[29] Quotation all from "Climate Change 2007: Synthesis Report" by IPPC (November, 2007)