

### **S-3 Low-Carbon Society Scenario toward 2050: Scenario Development and its Implication for Policy Measures**

#### **2. Multi criteria on evaluating long-term scenario and policy on climate change (Abstract of the Final Report)**

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#### I. Overview

This research project addresses issues on medium to long term target-setting on climate change policy. In order to mitigate climate change, it is important to clarify a goal of mitigation activities. We have found that negotiators of the time expected the Article 2 of UNFCCC to be a kind of indication of collective will of countries for which climate change is a serious global problem. In order for international society to reach the ultimate goal, it is necessary to agree on a short-term emission reduction agreement that is in line with the global trajectory. As for Japan's long-term target, it became clear that 60-90% reduction of GHG emissions in 2050 from 1990 level is necessary in order to avoid a dangerous level of climate change. The calculation is made taking account of three scientific uncertainties in the first place, namely the level of temperature increase, climate sensitivity in the model, and global differentiation scheme. In order to achieve such level of GHG reduction, both civil society participation and technology development are needed, whereas policies supporting the former seem to be lacking now. Creation of diffused energy use structure is in need.

In 2007 and 2008, G8 summit mentioned a possibility of setting a global GHG reduction target as 50% reduction in 2050. We also tried to identify the level and emission paths that can be implied by this target. We also draw implications of such level of target for Japan. We found that all cases showed that there is no room to increase GHG emissions after 2010, and that emission path leading to 2050 changes the level of temperature increase in 2100. Even in the case of halving global emissions in 2050, additional 1.5 °C temperature increase is unavoidable. Therefore, adaptation is equally important as mitigation. In our cases of global differentiation, Japan needs to reduce emissions in 2050 by 72-92% from 1990 level in order to halve emissions in 2050.

## II. Scientific Outcome

### Introduction

The objective of the project team is to work on issues related to setting the GHG stabilization level and the emissions reduction target in 2050 for Japan, as well as to identifying the criteria for evaluating long-term scenarios. This includes 1) Japan's reduction targets for 2050 and their rationale (working on the global differentiation scheme), 2) target-setting process (working on ways to set socially acceptable target-setting process), and 3) Impact-Target Relations (providing robustness for the target in terms of impact of climate change, political feasibility and so on). 4) Other issues related to targets and criteria on mid- to long-term GHG reduction.

#### 1. Methodology and the Results

The research is multi-disciplinary in nature, borrowing knowledge mainly from the study of impact of climate change, socio-economic modeling for GHG stabilization and international relations. We have conducted literature surveys and interviews with key policy-makers and experts.

In order to mitigate climate change, it is important to clarify a goal of mitigation activities. Article 2 of the UN Framework Convention on Climate Change (UNFCCC) sets the ultimate objective as; “stabilization of greenhouse gas concentrations in the atmosphere that at a level that would prevent dangerous anthropogenic interference with the climate system”. In the past two years of the project duration, we had investigated some of key impacts of climate change according to level of global warming temperature, and had calculated global emission trajectory that would keep the global temperature within the threshold under the “dangerous level”. In this fiscal year, three studies were conducted from perspective of political science and international law on this issue. First, negotiating process on Article 2 of UNFCCC was reviewed<sup>1)</sup>. It was found that negotiators of the time expected the article to be a kind of indication of collective will of countries for which climate change is a serious global problem. Second, a comparative study was made among various global environmental agreements specifically on articles on “objective”. It was found that Article 2 of UNFCCC is unique in terms of its goal-oriented feature, and its mentioning of a concrete target for the commitments underlined in the convention. Objectives in other conventions are more or less expressing philosophy, purpose, or means to tackle specific issues. Third, in order for international society to reach the ultimate goal, it is necessary to agree on a short-term emission reduction agreement that is in line with the global trajectory. An investigation was made to where and how such discussion on long-term goals should be discussed.

As for Japan's long-term target, it became clear that 60-90% reduction of GHG emissions in 2050 from 1990 level is necessary in order to avoid a dangerous level of climate change. The calculation is made taking into account three scientific uncertainties, namely the level of temperature increase, climate sensitivity in the model, and global differentiation scheme. In establishing future targets for global-mean surface temperature, rises in sea level, and atmospheric GHG concentrations, AIM/Impact[Policy] (1) projects the optimal GHG emissions path and GHG

reduction by region and (2) shows the scale of the warming impact by country and region under the optimal GHG emissions path, providing data for investigating whether or not established future targets are sufficient to avoid "dangerous impacts" (validity of future targets). It is an energy economic model estimating the optimal emissions path for greenhouse gases. Global emission paths for halving emissions are calculated as the following figure.

Figure 1. Japan’s required GHG reduction in 2050: A range of possible target for Japan to achieve 2C target

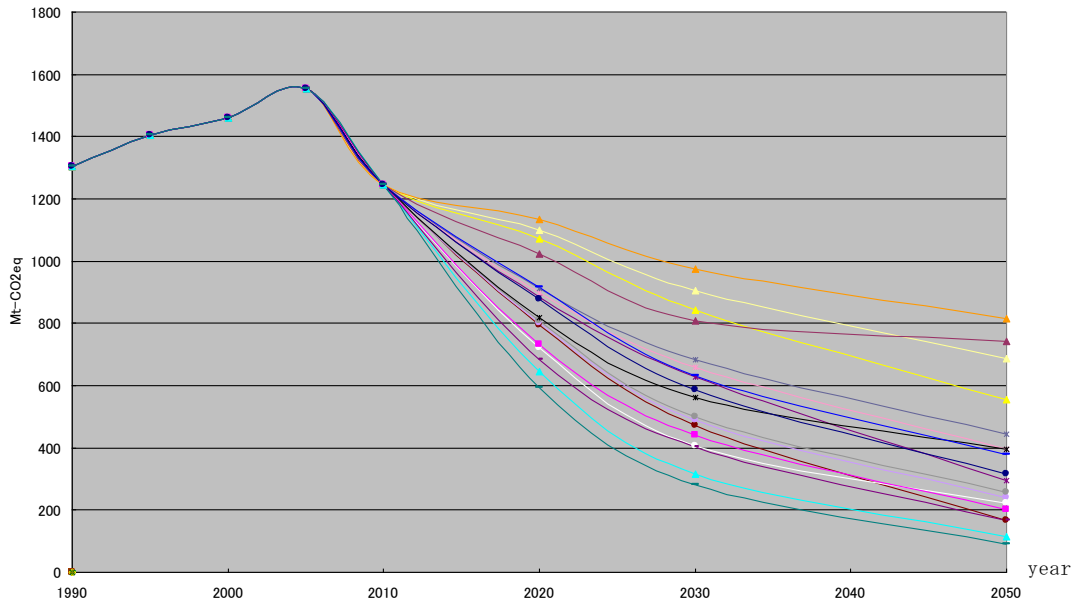
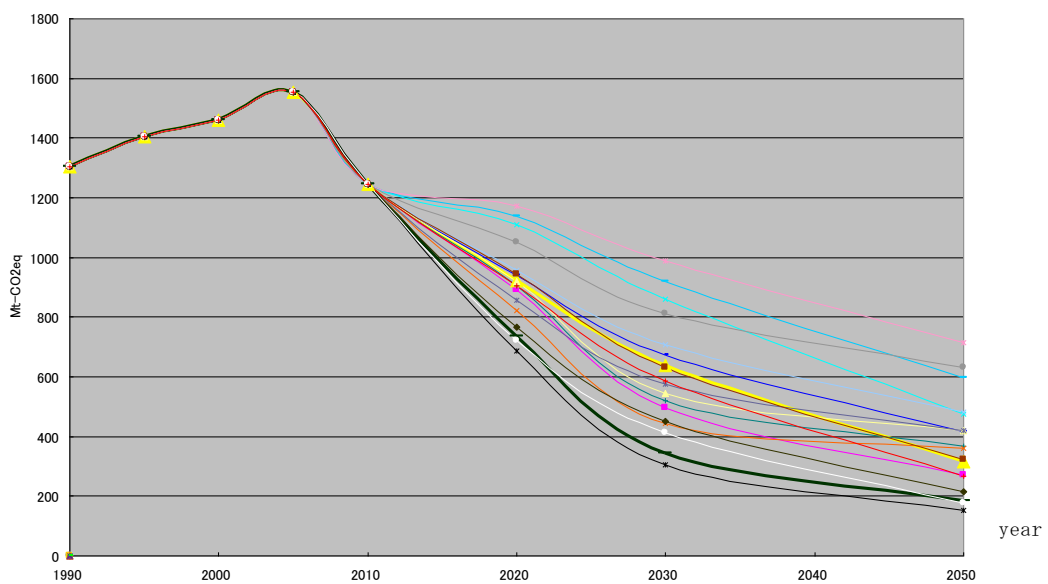
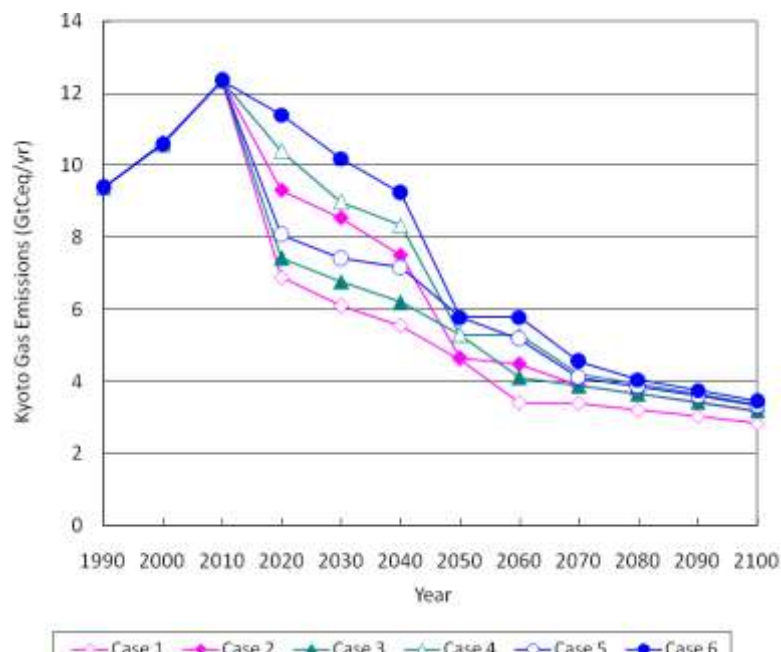


Figure 2. Japan’s required GHG reduction in 2050: A range of possible target for Japan to stabilize at 475, 500, 550ppm with climate sensitivity 2.6C



G8 indicated its global target of reducing GHG emissions by 50% by 2050. We further made calculation on implication of such statement onto Japan, using the same methodology as described above.

Figure 3. GHG emission path for 50% reduction by 2050



Parameters for this calculation are shown in Table 1.

Table 1. Parameters for calculation of Figure 3.

Case	BaseYear	Discout R.	GHG conc. level	Temp. incleas (2100)
Case1	1990	4%	465ppm-CO <sub>2</sub> eq	2.2°C
Case2	1990	5%	488ppm-CO <sub>2</sub> eq	2.4°C
Case3	2000	4%	476ppm-CO <sub>2</sub> eq	2.3°C
Case4	2000	5%	499ppm-CO <sub>2</sub> eq	2.5°C
Case5	2004	4%	488ppm-CO <sub>2</sub> eq	2.4°C
Case6	2004	5%	499ppm-CO <sub>2</sub> eq	2.6°C

We also calculated implications of such emission reduction to Japan. The result is as follows.

Table 2. Japan's required emission reduction in 2050 (Equal per capita in 2050)

	2050		2030	
	1990 level	2000level	1990 level	2000 level
Case1 (2.2°C)	85.2%	85.9%	65.4%	67.2%
Case2 (2.4°C)	85.0%	85.7%	51.6%	54.1%
Case3 (2.3°C)	82.9%	83.8%	61.9%	63.9%
Case4 (2.5°C)	82.9%	83.8%	49.5%	52.1%
Case5 (2.4°C)	81.4%	82.3%	58.6%	60.7%
Case6 (2.6°C)	81.4%	82.3%	43.1%	46.0%

Table 3. Japan's required emission reduction in 2050(Equal per capita in 2100)

	2050		2030	
	1990 level	2000 level	1990 level	2000 level
Case1 (2.2°C)	78.2%	79.3%	63.2%	65.1%
Case2 (2.3°C)	78.0%	79.1%	48.6%	51.2%
Case3 (2.2°C)	75.0%	76.3%	59.2%	61.3%
Case4 (2.4°C)	75.1%	76.3%	46.0%	48.8%
Case5 (2.3°C)	72.8%	74.2%	55.5%	57.7%
Case6 (2.6°C)	72.8%	74.2%	38.8%	41.9%

Table 4. Japan's required emission reduction in 2050(Equal emission per GDP improvement rate)

	2050		2030	
	1990 level	2000 level	1990 level	2000 level
Case1 (2.2°C)	92.0%	92.4%	79.4%	78.3%
Case2 (2.3°C)	91.9%	92.3%	71.2%	69.6%
Case3 (2.2°C)	90.8%	91.3%	77.1%	75.9%
Case4 (2.4°C)	90.8%	91.3%	69.7%	68.1%
Case5 (2.3°C)	90.0%	90.5%	75.0%	73.7%
Case6 (2.6°C)	90.0%	90.5%	65.6%	63.8%

In order to set such level of target in a sustainable manner, stakeholder participation in the decision making process is necessary. We also work on designing of stakeholder dialogue in Japan for obtaining consensus among stakeholders on long-term climate change policy goals to reduce greenhouse gas emissions. The problem is that there is no standard guideline or methodology to follow in the facilitation of stakeholder dialogue. Under the circumstances, it becomes important to research on available methodologies, examine how they are useful for the case of the dialogue in Japan, and design the dialogue based on the selected and agreed methodologies for application. It appears in the last year's progress of the project that the methodologies for facilitating stakeholder dialogue are investigated in two separate areas of academic study. The first area is so called "transition management" and "system innovation theory" being developed in the Netherlands. In the Netherlands, there was a stakeholder facilitation project (Cool project: Climate Options for the Long term project) to investigate options for a long-term climate change policy. The project was designed partly based on the methodologies proposed in the area of transition management. The second area is the area of international public policy handling development issues as well as conflict resolution issues in the developing countries.

On more macro understandings of climate policy, there is an emerging concept of climate security. The concepts of climate security and human security are not necessarily useful as a clear guideline for policy because of the ambiguity of the concept of security in general and the

inclusiveness of the notion of climate security and human security in particular. However, the concepts of climate security and human security have a heuristic value that has spawned all sorts of security studies relating to the state, the community, and to people as well as to military and non-military issues. Above all, the concepts of climate security and human security have great potential to raise the priority of policies that address threats to people, their communities and built- and natural environment by identifying the issues of daily life and environmental degradation as issues of “security.” In fact, one of the findings of this study is that there is a clear convergence on policy requirements between climate security and human security. The policy linkages of these security concerns are the policies for adaptation to climate change and those for ensuring human security. If these policies were fully implemented, they could lay the foundation for building sustainable society and, at the same time, help eradicate the root cause of social disorder and armed conflicts in many less/least developing countries.

Therefore, the consequences of climate change can reasonably be considered as “the matter of security” that in turn requires a comprehensive approach to deal with this problem domestically and internationally. Nonetheless, the Japanese climate change policy has not yet directed a course toward a radical change in socio-economic and industrial structure. A series of studies on low carbon society have been conducted under the auspices of the Minister of the Environment and policy proposals based on the studies about low carbon society have been presented in various occasions and various policy circles. However, it is short of implementing a nation-wide emission trading system and a comprehensive and extensive policy to promote the utilization of renewable resources. On the contrary, the new U.S. administration has advocated the policy called “Green New Deals.” While suggesting the introduction of an emission trading system during the presidential election campaign, the new Obama administration clearly depicts the direction of economic recovery driven by energy conserving and environment-friendly industries. While the new administration envisions the transformation of domestic economic and industrial structures into low carbon structures, the Congress has regarded the problems of climate change as the matter of national security.

### III. Contribution to policy of global environmental issues for decision makers

The result of the research contributed in the process to establish Japan’s proposal for long-term target, including its contribution to a briefing document on target-setting to the minister for the environment. The project members commented on climate policy and diplomacy based on the research result in various mass media including television and news papers.

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