

S-3 Low-Carbon Society Scenario toward 2050: Scenario Development and its Implication for Policy Measures (Abstract of the Interim Report)

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1. Introduction

To avoid serious climate change impact, there is discussion to limit the global mean temperature increase at 2 from pre-industrial level. Then the global GHG reduction target required in 2050 will be 50% of 1990 emission level, which could imply that reduction rate for Japan will be around 60-80%. We need Japan's low-carbon society scenarios to achieve such ambitious target. A large part of social infrastructure is likely to be replaced by 2050; therefore, it would be possible to propose concrete policy packages including institutional change, technology development, and lifestyle change towards meeting the target of a low carbon society in 2050.

2. Research Objectives

This project (S-3) focuses on the following issues:

- 1) Long-term scenario development study to integrate environmental options consistently using simulation models (S-3-1),
- 2) Long-term GHG reduction target setting considering effectiveness and validity (S-3-2), and
- 3) Assessment of environmental options considering future socio-economic conditions in
 - a) Urban system (S-3-3),
 - b) Information technology (IT) society (S-3-4) and
 - c) Transportation system (S-3-5).

We have the above 5 sub projects consisting of research experts in those areas. We have developed socially and technically consistent middle and long-term global warming policy (Fig.1).

The figure shows probable paths towards a low carbon society in Japan which are compatible with economic development and would enhance public interest leading to social and lifestyle changes.

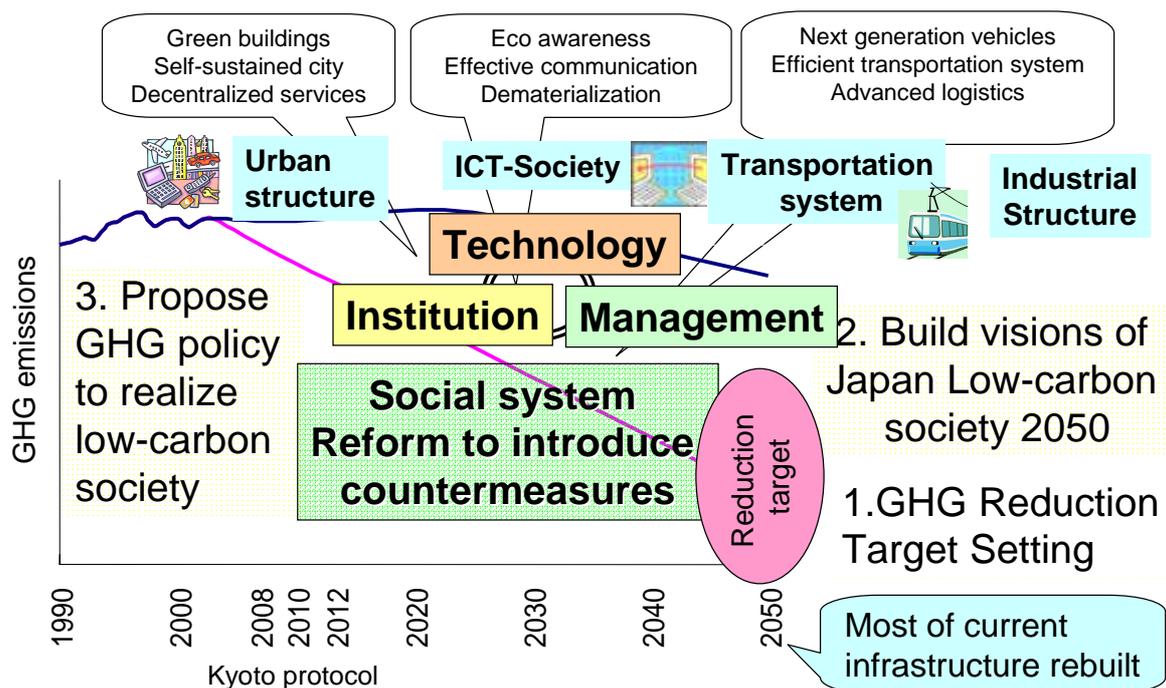


Fig.1 Research Framework of “Japan Low-Carbon Society (LCS) Scenarios toward 2050”

3. Research Method and Results

Our research outcomes for the FY2006 are given below. These findings are in the context of our ultimate goal to develop Japan low-carbon society scenarios toward 2050;

- 1) We examine the “backcasting” method, which first develops an emission target representing favorable LCS visions and then explores the methods in order to achieve such target.
- 2) We have developed the narrative storylines, their quantitative scenarios, and trend-breaking countermeasures in residential sector, service sector, transportation sector, industrial sector, energy supply sector, and others.
- 3) Technological and economic countermeasures for each sector, such as urban, IT society and transportation were analyzed. These became input for model simulation.
- 4) We have decided to facilitate Japan – UK Joint Research Project “Developing visions for a Low Carbon Society through sustainable development”. We will promote studies toward achieving a Low Carbon Society (LCS) by 2050 through collaboration, encouraging other countries to engage in LCS studies, and holding joint series of international workshops. The first workshop will be held in 2006 in Tokyo.

Outcomes from each sub-project are briefly summarized below.

3-1 Long-term Scenario Development Study to Integrate Environmental Option using Simulation Models (S-3-1)

Fig. 2 shows the methodology for developing LCS scenarios. We have developed the narrative storylines, their quantitative scenarios, and trend-breaking countermeasures in

residential sector, service sector, transportation sector, industrial sector, energy supply sector. The desired Japan 2050 future images with 60-80% GHG reduction will be set and the path considering economic impact, technological possibility, institutional, and lifestyle changes will be simulated objectively and consistently using several numerical model analyses.

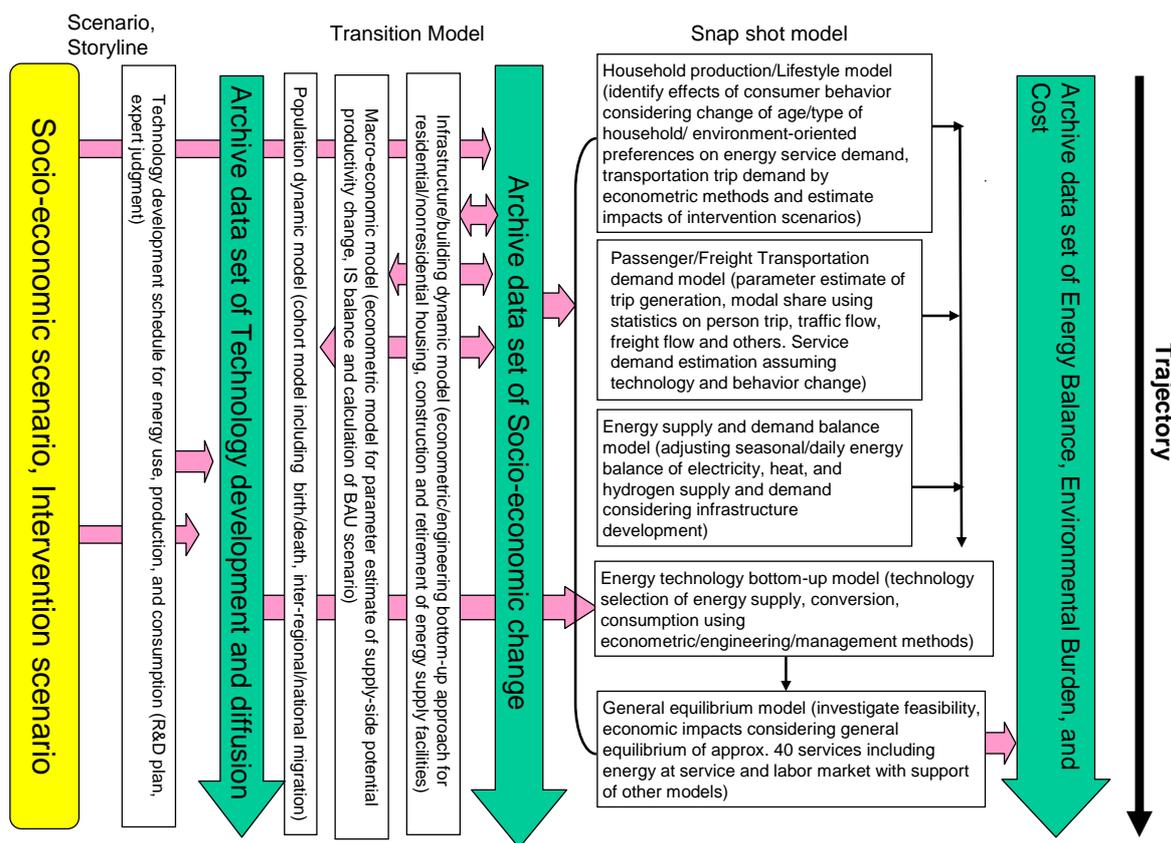


Fig. 2 Research framework of LCS scenarios development

We examined 70% CO₂ reduction by 2050 as compared to 1990 level. Following is a summary of the findings. (a) There are possibilities to reduce CO₂ emissions by 70% in 2050 with several energy demand countermeasures (such as insulation, transport modal shift, high efficiency vehicles, and clean product technologies) and drastic change in energy supply side. CO₂ free energy should be delivered for meeting spatially dispersed small-scale demands because it is almost impossible to undertake capture and storage of CO₂ from them; (b) in the residential sector there are many feasible countermeasures for drastic reduction of CO₂ emissions. However, along with technology development, rapid diffusion is also important for achieving such reduction in the residential sector; (c) Renewable energies may have a significant role to realize a low carbon society. It is important to design feasible roadmap to expand their share and use with long term perspectives.

3-2 Multi criteria evaluation of long-term scenario and policy on climate change (S-3-2)

This research project addresses issues on medium to long term objective-setting on climate change policy. It includes looking into ongoing international debate on mid- to long-term objective setting and criteria for evaluating long-term scenarios. Our research also includes various ideas for differentiation scheme, and draw implications for Japanese target. It turns out that from last year's research that, according to the existing research and by our calculations, Japan's GHG reduction in 2050 needs to be at least 70-80% from 1990 level in order not to exceed 2 °C global mean temperature increase from pre-industrial level, regardless of what the international relations would look like. Deciding the target for climate protection is, of course, a matter of value judgment, and more comprehensive analysis on how to bring the judgment to decision-making, such as the development of Participatory Integrated Assessment (PIA) is needed. However, taking into account the recent development on the study of the impact of climate change, "2 °C" target should be a feasible point of departure on the ultimate goal of the debate on climate change.

3-3 Effects of introducing countermeasures for carbon dioxide emission reduction in urban area (S-3-3)

The research objectives are to develop the method of evaluation of potential carbon dioxide emission reduction in urban area, and to apply the developed method to cities with various sizes and in various climate conditions in Japan in 2020 and 2050. The unique method of this research is to evaluate the effect of implementing integrated technological options into actual cities for reduction in carbon dioxide emission. Prediction of cities in the future target years is also included.

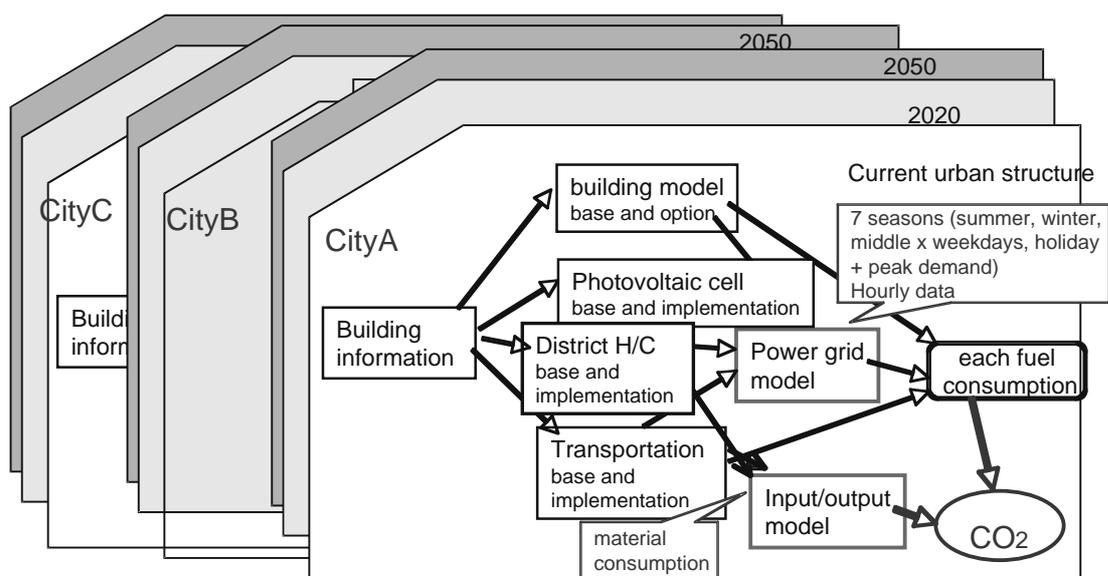


Fig. 3 Flow diagram of evaluation of carbon dioxide emission in urban area

3-4 Integrated Measures of Technologies and Lifestyles against Global Warming

- Eco-design of ICT (Information Communication Technology) Society - (S-3-4)

In this research the influence of ICT diffusion on environmental problems were described. There is no doubt that ICT can make a large contribution to the solution of environmental problems. In particular, we take notice of their two contributions. Firstly, ICT enables people to get a concrete image about environmental problems from various points of view. This would lead people to lead an environmentally conscious life. Secondly, ICT removes the restriction about "distance". This would cause large changes in an urban structure. It may be possible to create a new society that minimizes movement of goods, resources and people.

A future-desired IT society social image was drawn with text and illustration focusing on the lifestyle in 2050 using a brainstorming method. It was shown that the CO₂ emissions of the household origin in the future-desired IT society can be reduced by 40 percent of Japan's total emissions in the year 2000. These results suggest that it would be suitable for drastic greenhouse gas reduction and at the same time a comfortable life.

3-5 Long-term CO₂ reduction strategy of transport sector in view of technological innovation and travel demand change (S-3-5)

It can be said that hybrid vehicles would be the most feasible and promising technology to mitigate CO₂ emissions toward 2020. Construction of alternative fuel station is thought to be one of the key issues to prevail fuel cell vehicles. To reduce CO₂ emissions in 2020 under 1990's level, EST 2020 [HV+DM] scenario is developed by adding demand management (DM) to prevailing hybrid vehicles (HV) scenario. It requires making the production capacity double every year from 2005 to 2010 until it reaches 4 million hybrid cars per year, covering most of Japanese domestic passenger car demand.

In order to develop 2050 scenarios, group interviews have been held to obtain a rough outline of situations surrounding society, economy, urban form, transport, energy system and environment in 2050. There are various visions on the probabilities of the depletion of oil, dissemination of fuel cell vehicles and possibility of natural/simple lifestyles and so on. As for travel demand change, feasibilities of such kind of countermeasures were examined in case studies. On the other hand, automobile CO₂ emissions and the populations of all local governments were compiled and classified by the belonging metropolitan area, province level and population size. Using this framework, the national 60% reduction in 2050 was examined with the combination of applicable countermeasures to each regional category.

4. Discussions

In FY 2005, we have investigated Japan 2050 future images with 60-80% GHG reduction for 2050 with backcasting method. In FY 2006, we need to develop a pathway that considers economic impact, technological possibility, institutional and lifestyle change using simulation models. Thus, we have a challenging and fruitful research task for the next step.