



Information brief on strategies and research towards LSC  
in the network's member countries

# **A dozen challenges to be tackled by Low Carbon Society Research in Japan**

Japan's Country Brief to LCS-R Network Annual Meeting  
Berlin, 20-21 September 2010

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## **A dozen challenges to be tackled by LCS research in Japan**

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### **Executive Summary**

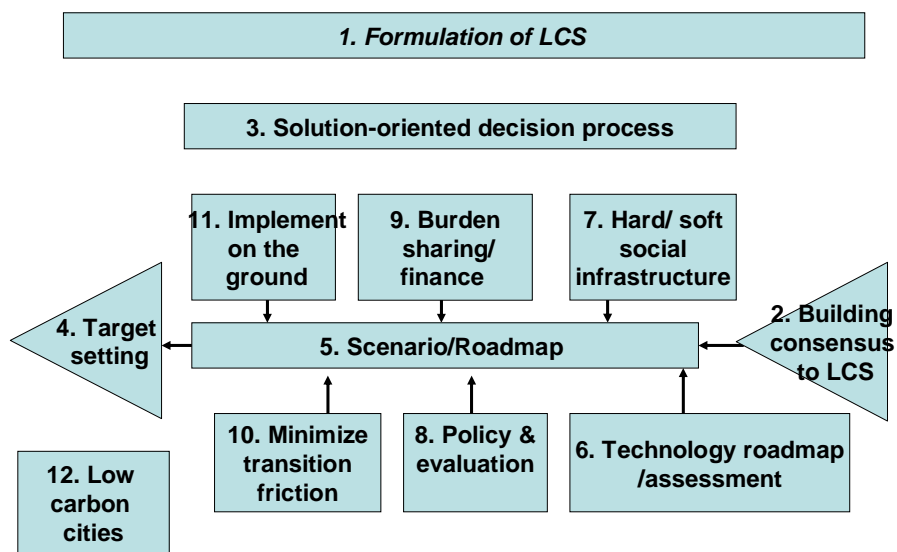
#### **Japan's progress in LCS Policy**

- Substantial long-term emissions-reduction policy started in Japan in 2007, later than that in the EU. Until then, Japan had been keen on implementation only to achieve the Kyoto target due to short-term vision.
- Long-term policy was addressed for the first time through the “Basic Law on Global Warming Countermeasures” under the Democratic Party administration in 2010. The draft law passed the House of Representatives but fell through due to the resignation of PM Hatoyama.
- Since 2004 research has focused on the low carbon society (LC) scenario for long-term reductions toward 2050, and debate on the establishment of LCS was initiated in 2008 in order to determine a basis for international negotiations at Copenhagen. Since then, research has been consolidated and plans discussed for policy related to long term reductions.

#### **The dozen challenges (see Figure below) to be tackled by LCS research in Japan are:**

1. Responding to a new paradigm shift: Formulation for a low carbon society
2. Is transition really necessary? Enhancing scientific communication
3. Speed-up to confront emerging risk: Change to a more solution-oriented decision system
4. Target setting: Compromising top down and bottom up
5. How to lay the railroad? From target-setting to policy deployment
6. Enough technology for LCS? Technology roadmap and evaluation of technological systems
7. How to change the social infrastructure? Hard infrastructure and social institutions
8. What does LCS policy mean to stakeholders? Policy implementation and its socio-economic impacts
9. Who pays first? Economic burden-sharing logic and financing for realizing a roadmap
10. How to minimize inevitable friction associated with the transition
11. Getting people involved: How to make a roadmap work on the ground
12. Low carbon cities: Comprehensive policies and measures at the regional level

In addition, worldwide cooperative research on low carbon development, and establishing a methodology to concentrate worldwide knowledge to avoid the human hazards of climate change should be expanded over G20 countries.



**A dozen challenges to be tackled by LCS research in Japan**



Information Brief from Japan to LCS-R network annual meeting, Berlin, 21 September 2010

## **A dozen challenges to be tackled by LCS research in Japan**

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### **Background**

Taking the path towards a low carbon society represents a big leap for the contemporary world; however, methodologies of such a transition remain unclear for all nations across the globe. Many nations, with a range of circumstances and problems—some unique and some shared—are struggling to establish policy-making processes, to plan civil infrastructures and to implement social systems. Such situation was addressed at the G8 Toyako summit in 2008, Japan, where the International Research Network for Low Carbon Societies (LCS-RNet) was established to serve as a platform to share information and to consolidate the global body of related knowledge.

This paper reports on the progress of Japan's policy process in overcoming the barriers against transition into a low carbon society to shed light on the need for research into the transition process. This report represents some of author's observations in engaging in the Japanese policy-making process, such as in The Consultation Committee for Mid-term Reduction Target for 2020, held in 2009, and The Sub-committee (Chair) under the Central Council for Environment to draw up a mid-to long-term roadmap towards reductions of 25% by 2020 and up to 80% by 2050, ongoing throughout 2010.

### **I. Progress of low carbon society policy making in Japanese**

#### **(1) Kyoto target only:<sup>1</sup>**

Until 2007, Japan's climate change policies had been designed without considering the long-term policy framework, with the main focus of discussion on how to clear the Japanese target of a 6% reduction from the 1990 level, i.e., the Kyoto plan did not include a plan for the long term. Although basic guidelines were set by the Cabinet, each Ministry independently made efforts in its own territory—with little in terms of actual results. The only notable measure taken was reinforcement of the energy saving law by applying the top-runner standard to energy-consuming appliances, which promoted product innovation. Despite discussions surrounding the introduction of core policy tools, such as carbon tax and emission trading, reluctance on the part of the government, together with

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<sup>1</sup> See Appendix 1

objections from industry, plus low awareness of the long-term implications of climate change, meant that such tools were never introduced. As a result, Japanese emissions, which at one point (2007) rose to 8% above the 1990 level, dropped down to almost the same level as 1990 in 2008 due to onset of the economic recession (which reduced production levels in energy-intensive industries).

## **(2) Issues raised regarding the Kyoto Protocol<sup>2</sup>**

The following issues were raised while checking the Kyoto performance of each sector. 1) Reliability of nuclear power: Conflict between safety considerations and maintaining a high load factor. Nuclear power accounts for one quarter of electrical power generation, and the load factor is expected to rise due to easing of regulations; 2) Energy security: Conflict between the improvement of energy security by increasing coal-fired power generation and GHG emission reductions; 3) Lack of reduction efforts in the residential sector; 4) Delay in taking proper action against increasing office-based energy consumption due to a structural shift from manufacturing industry to the service sector; 5) Critical lack of data on energy usage by the demand side; 6) Direct emission- vs. indirect emission-accounting system in the power sector: Registration system that does not properly reflect demand-side effort to blame. Statistically, demand-side effort is cancelled by worsening carbon intensity of the power sector; 7) Necessity to formulate policy mix: Including an introduction of carbon tax and cap-and-trade scheme; 8) Effectiveness of voluntary target-setting in industry; 9) Necessity of catch-up due to delay in introducing renewable energy (1.3% share of primary energy supply in 2006), mainly due to reluctance of the power sector.

## **(3) Start of debate on mid- and long-term reductions from 2007<sup>3</sup>**

The 2005 G8 Summit in the United Kingdom set the Glen Eagles Process into motion, which was aimed at a post-Kyoto scheme for the G8 Toyako summit in 2008. This also precipitated wrangling on the international stage over the successor to the Kyoto Protocol as well as over domestic policy in Japan.

In 2004, the Ministry of Environment (MOE) and National Institute for Environment Studies (NIES) initiated a strategic research project entitled Low Carbon Society Scenarios (70% reduction in 2050 from 1990 level) with 60 researchers from universities and research institutes, of which an interim report was opened in February 2007. This research focused on a collective societal shift in response to climate stabilisation. The concept of “Low Carbon Societies” has gradually taken root within climate policy in Japan. As a result of this research, the technical feasibility of a 70% reduction (based on the 1990 level) by 2050 was confirmed, a figure realised through applying various policy measures, and assuming a transformational shift of society, economy and social infrastructure, as well as technology. These research results appear to have led Japan’s long-term climate policy in the early 2000s. The project was promoted to a three year Japan-UK Joint Research

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<sup>2</sup> See Appendix 2

<sup>3</sup> See Appendix 3

Project in 2007 to exchange information between the two countries.

#### **(4) Catching up with the mid- to long-term climate policy<sup>4</sup>**

In May 2007, the long-term global emission reduction target of 50% reduction by 2050 was mentioned for first time by Prime Minister Shinzo Abe at the G8 Heiligendamm Summit. Prior to the summit, the MOE examined a long-term strategy based on the “70% Low Carbon Scenario” research above, while METI added “technology development map towards a long-term reduction target”. These studies were consolidated as the “Environmental Energy Innovation Plan” of May 2008, which stressed the need for technological developments as well as social innovation to enable penetration of such into society, at the Council for Science and Technology Policy (CSTP), chaired by the Prime Minister.

Prior to the Toyako summit in July 2008, then Prime Minister Yasuo Fukuda announced a 60%-80% reduction target for Japan by 2050 at the Diet. There were few notable proposals to endorse this target other than the 70% Scenario. This target-setting attracted heavy opposition from industry, which feared a decline in their international competitiveness.

At the G8 Environment Ministers Meeting held prior to the Toyako Summit, establishment of an international research network for low carbon societies (LCS-RNet) was proposed and then agreed on by the participants. The Fukuda government set the realization of a Low Carbon Society as his core policy and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and the Cabinet Office also initiated a promotion of low carbon cities. On 7 March 2008, an amendment to the “Law Concerning the Promotion of the Measures to Cope with Global Warming” was passed by a Cabinet meeting, which involved a review of the legal system on estimation, reporting and publication of greenhouse gas emissions, as well as strengthening of policy guidelines such as emission limitations.

Thereafter, the “Consultation meeting for setting mid-term target” was convened by the Cabinet Office under then Prime Minister Taro Aso at the end of 2008, prior to L’Aquila G8, to decide Japan’s stance on mid-term (by 2020) GHG reductions for negotiation at COP 15. Five research institutions (Table 1) participated in the review of the 2020 reduction target. The technical feasibility and the economic impact, under a fixed economic growth rate of 1.3% and fixed macro-frame such as production of steel and iron of 120 million tons and flat traffic volume, were examined in six stages of reduction targets, from +4% to -25%, compared to 1990. Based on such investigation, Prime Minister Aso set Japan’s mid-term target as an 8% reduction from the 1990 level (15% compared to 2005), which he then announced at L’Aquila G8.

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<sup>4</sup> See Appendix 4

Table 1. **Techno-economic models applied for target-setting analysis**

- International Comparability: MAC (marginal abatement cost) and Cost/GDP analysis models by:
  - National Institute for Environmental Studies (NIES)
  - Research Institute of Innovative Technology for the Earth (RITE)
- Domestic Reduction: Bottom-up technology-based analysis models by:
  - National Institute for Environmental Studies (NIES)
  - Institute of Energy Economics Japan (IEEJ)
- Economic Evaluation: General Equilibrium / Macro-economic models by:
  - Japan Center for Economic Research (JCER)
  - National Institute for Environmental Studies (NIES)
  - Keio University

#### **(5) Issues related to obstacles on the way towards a Low Carbon Japan<sup>5</sup>**

In the process of discussing a mid-term target, the following points were raised. 1) Necessity of a huge investment in the significant reductions; 2) Mass-media induced fear of severe economic burdens placed on households; 3) Weakening international competitiveness of Japanese industries: the majority of industry is opposed to a reduction target of more than -4%. 4) Technical feasibility. Some research institutions concluded that reductions of more than 20% are technically impossible; 5) No debate on policies: Economic model calculations tacitly include carbon price as its basis; nevertheless, no debate based on the introduction of carbon tax or other financial schemes such as cap and trade has taken place due to the taboo in putting such on the discussion table; 6) Fixed industrial structure: The premises of the review are based on a fixed industrial structure for the next decade. Production volumes of industrial goods, nuclear power generating capacities and traffic volumes, etc. were set higher to maintain consistency with government economic plans or by using the projections of industries as-is, which assume current industrial structures will continue for the next 10 years; 7) Marginal Abatement Cost (MAC) was strongly argued as an international equity criterion in allocating emissions; 8) Usage of tax revenue: Depending on how carbon tax incomes are used, huge differences in burden sharing affecting households were calculated.

#### **(6) Policy change under Democratic Party administration<sup>6</sup>**

In September 2009, Japan's political administration changed and the Democratic Party took power. The new Prime Minister, Yukio Hatoyama, addressed in his UN Speech in September 2009 an 80% reduction target compared to 1990 for the long term, and a 25% mid-term target by 2020 "with the condition that all the main emitter countries participate in the global CO<sub>2</sub> reductions". At the same

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<sup>5</sup> See Appendix 5

<sup>6</sup> See Appendix 6

time, a consultation meeting was convened again by the Minister of Environment with the same research institutions as the previous year. However, the outcomes were same as those of the previous consultation because the overall framework had not changed.

In March 2010, the draft “Basic Law on Global Warming Countermeasures” (Table 2) was approved by Cabinet meeting, and the bill was passed in the House of Representatives in June. However, the legislation was subsequently scrapped due to the resignation of Prime Minister Hatoyama at the beginning of June. As a result of the election of the House of Councilors in July the Democratic Party lost some ground; however, Hatoyama’s replacement, Kan, has placed a focus on the expansion of investment in the environment and energy sectors as one of his core economic growth strategies, and the draft bill is awaiting resubmission.

Table 2. Draft Basic Law on Global Warming Countermeasures

1. Mid- and Long-term Goals

- 25% reduction below 1990 level by 2020 \*premised on the establishment of a fair and effective international framework by all major economies and agreement on their ambitious targets
- 80% reduction below 1990 level by 2050 \*an appeal for all economies to share the vision-of achieving at least a 50% reduction in global emissions by 2050
- Renewable energy target: Raising the share of RE to 10% of the total primary energy supply by 2020

2. Basic Measures

- Emissions Trading System:  
Establishment of domestic emissions trading scheme  
Consider a formula of setting limits of emissions as absolute amount of GHG emissions
- Tax for measures against Global Warming:  
“Greening” of the tax system overall, including the consideration of a tax for measures against global warming to be implemented from fiscal year 2011
- Feed-in Tariff applying to all renewable energies

**(7) Issues raised by the Basic Law<sup>7</sup>**

The draft Basic Law showed for the first time the clear political will of the government toward LCS, and many issues have been raised so far: 1) Appropriateness of a 25% target in consideration of international equity and economic efficiency; 2) Validity of the conditional target setting written into the draft; 3) Domestic reduction amount out of a 25% reduction target. How much can be covered

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<sup>7</sup> See Appendix 4



by international credit? 4) Questioning the technological and social feasibility of a high reduction target; 5) No clear explanation of the financial resources to cover the cost of transition, of the national burdens or of the expected employment frictions in the transition period; 6) Necessity of consistency with Japan's mid-term energy plan approved by the Cabinet meeting in June; 7) A "fair" assessment of the reduction effects induced by Japan's high-tech industry as a whole all over the world is requested from the industrial sector, such as the electric device industry.

In this legislation process, business sectors centering on the Japan Federation of Economic Organizations strongly opposed significant emissions reductions, initiation of a cap-and-trade system and a global warming tax. The labor unions and the public were also opposed to additional burdens and frictions resulting from the transition.

#### **(8) Roadmap towards 2050<sup>8</sup>**

The development of a roadmap started in January 2010 to address the possibility of up to a 25% reduction by 2020 to reinforce the feasibility of the Basic Law. This has been operated by the subcommittee under the Central Council of Environment since April 2010. A team consisting of 60 researchers from universities and research institutions was established and the physical plan to 2050 was made in 3 areas including residential/office and transportation, land planning and industrial sectors.

#### **(9) Movements towards low carbon cities via local initiatives<sup>9</sup>**

The Tokyo metropolitan government set its 2020 reduction target as 25% compared to 2000 independently from the government and established the "10-Year Project for a Carbon Minus Tokyo". Under the project, a cap-and-trade regulation was set against the GHG emissions from large-scale business offices, which allowed emissions trading between medium-sized and small industries. By allowing businesses to purchase Tradable Green Certificates to offset the cap, automatic expansion of the emissions trading system outside of the Tokyo area is expected. Kanagawa and Saitama, which both border Tokyo, each have their own low carbonization plans. Other medium and large cities have set up their own low carbon city plans and are slowly moving towards a low carbon society.

#### **(10) Efforts to promote LCS Research<sup>10</sup>**

To date, the research that has been carried out towards forming low carbonization policy has been conducted by policymakers in various ministries as well as research institutes; for example, the Research Institute of Innovative Technology for the Earth (RITE), The Institute of Energy Economics, Japan (IEEJ), The Agency of Advanced Industrial Science and Technology (AIST); MOE: National Institute for Environmental Studies (NIES), Institute for Global Environmental Strategies (IGES). However, more cooperation with universities and research institutions is required

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<sup>8</sup> See Appendix 8

<sup>9</sup> See Appendix 9

<sup>10</sup> See Appendix 10

to enable the transition towards a low carbon society, since many subject fields are involved. Such cooperation would also need to involve institutions such as the National Institute for Agro-Environmental Sciences and the Building Research Institute. Universities, such as Hokkaido University, are starting to establish an LCS research network. Until recently, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) had kept its distance from policy making in climate change, but in 2009, in recognition of the importance of the climate change agenda within mainstream science and technology society, it established a body called the “Center for Low Carbon Society Strategy” with over 30 researchers under the Japan Science and Technology Agency (JST).

## **II. A dozen challenges to be tackled by LCS research in Japan**

The challenges facing low carbon research clarified through the policy discussions above are consolidated into 12 issues, given below.

### **(1) Responding to a new paradigm shift: Formulation for a low carbon society**

Methodologies for the formulation of a low carbon society, e.g., what should be done and in which kind of processes, have to be clarified. *Methodologies* here refers to the operational methods of consolidating the knowledge on how resources can be effectively and smoothly allocated towards formulating a low carbon society. Such methodologies need to address the overall challenges, such as research, development and deployment in tackling individual issues. In Japan, this thrust mainly results from international pressure, i.e., is formulated as a forced adaptive response to UNFCCC decisions rather than being through independent initiatives.

This “meta-study” to confront the huge transition to LCS has no precedence to refer to as guidance. Currently, it is at the stage of searching for the most appropriate ways to overcome the barriers in order to move ahead. By amassing the knowledge required to overcome barriers that will emerge in various steps towards LCS, such knowledge can be consolidated to form a set of methodologies that can be transferred to developing countries aiming at low carbon development.

### **(2) Is transition really necessary? Enhancing scientific communication**

Science-based communications should be strengthened to enable a solid consensus to be reached within society on LCS. Presently in Japan the need for such transition is not sufficiently understood within society, so such ideology needs to be instilled within society free of any form of skepticism. In other words, what is needed is for the climate change scientists to enhance dialogue with society via a dependable communication methodology.

### **(3) Speed-up to confront emerging risk: Change to a more solution-oriented decision system**

Under the new LCS regime, each stakeholder is urged to act on the ground. A new decision-making process, involving such stakeholders in the early stage of designing LCS, should be established in order to implement policy effectively. The vertically compartmentalised government administrative structure must be changed to a more solution-oriented one. For example, energy technology is within the realm of the Ministry of Economy, Trade and Industry (METI), which appears opposed to the promotion of renewable energy due to resistance stemming from certain industries, and is not so keen to formulate policies effective for reductions on the demand side. The Ministry of Environment (MOE) is in charge of the top-down type reduction target setting, which sometimes lacks feasibility endorsements. Deliberations are required with the Ministry of Land, Infrastructure, Transport and

Tourism (MLIT) for matters closer to peoples' homes and with the Department of the Treasury for public finance such as carbon tax. To organize Universities, the Ministry of Education, Culture, Sport, Science and Technology (MEXT) is essential, with the Council for Science and Technology Policy as the headquarters of matters related thereto. Presently, after intra-ministerial discussions, final adjustments to many contradictory policies are made at the end of the policy-making process, by the Cabinet, which results in a highly inefficient and duplicitous process. Further, even though part of the process is open to public debate, stakeholder opinions are not adequately represented within such process. An overall transformation in structure is therefore needed to enable swift decision making to take place—the environmental equivalent to a one-stop-shopping type system.

In the UK, the Department of Energy and Climate Change (DECC) was established to integrate energy and climate policy, and to establish a consolidated policy, the Climate Change Committee consisting of industry, government and researchers was formed. The Treasury reviews the validity of any policy related to the prevention of global warming via the Stern Review. Compared with the arrangement in the UK, the policy work carried out in Japan involves much duplication—especially in terms of overlap between environment policy (reduction targets), energy policy and land use policy—which thus needs to be eliminated.

Japan has not yet established an information exchange process as regards direct dialogue between stakeholders and consensus-formulation processes. Although these policy formulation processes differ according to country, national participation processes do exist, such as NEPP (Nature and Environmental Protection Plan) in the Netherlands, NRTEE (National Round Table for the Environment and the Economy) in Canada, as does a public participation process in some Scandinavian countries. In Japan there is no such citizen participation process, except for public hearings from stakeholders given by related Councils (of Environment/Energy) and the public comment submission process after draft planning, which results in little impact on the decision process.

The challenges identified are: Design of a solution-oriented integrated policy-making and administrative system to respond quickly and effectively to this pressing need for transformation, and consensus-building among stakeholders regarding LCS from the early stages of policy making.

In Japan, under the leadership of Professor Yagishita of Sophia University, a large-scale, real-time stakeholders' meeting is being undertaken as a social experiment. The process involves more than 30 substantively responsible managers from industry and service sectors, and local governments and NGOs, but without the national government and media, and over 30 meetings have taken place over the past 3 years since 2008. One question, from the perspective of research, is whether such frank dialogues can realise a practical and substantive forum, as well as discussion agenda, within actual policy making processes<sup>11</sup>.

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<sup>11</sup>[www.ristex.jp/examin/science/interaction/.../H21\\_yagishita\\_houkokusho.pdf](http://www.ristex.jp/examin/science/interaction/.../H21_yagishita_houkokusho.pdf)

#### **(4) Target setting: Compromising top down and bottom up**

As no consensus has been agreed upon amongst the ministries, it can be said that no firm national target has been set for Japan yet. One of the reasons for this is the immature policy-making process, which cannot deal with scientific knowledge and the notion of equitability in the international context. Another is the instability of the government itself. The Liberal Democratic Party regime has been pressured from industry and hesitated to set a bold target, while Hatoyama's top-down regime set a 25% reduction target without any strategies on the ground. Although the 25% remains a reduction target for 2020, it is not clear what proportion can be achieved via international credit and sinks and what proportion is to be met by domestic reduction efforts. The new Kan government plans to use Low Carbon investment as one of the key pillars for his economic growth policy. However, a strong signal from the government has yet to emerge. The bureaucracy, industry and the corporate world in general appear apprehensive to move ahead without a clear and consistent message from the government towards reductions.

Challenges to tackle: in 2009 before Copenhagen, under the Aso Cabinet, official evaluation of the socio-economic impact of reduction targets resulted in the determination of 6 levels, ranging from plus 4% from 1990 level to minus 25%. This evaluation process marked the first such attempt to involve academics and experts into the decision-making process of climate policy. The procedures of this discussion were, however, limited to domestic impact and strongly directed by the cabinet, which was reluctant to make any drastic changes under the current economic recession.

Mainstreaming the science-based policy-making and target-setting process and establishing economic evaluation of policies and political decision making processes to enable consensus-making amongst stakeholders are thus the challenges to overcome before LCS can push forward.

#### **(5) How to lay the railroad? From target-setting to policy deployment**

Within the sequential process of policy design, first of all targets need to be set, followed by drawing up roadmaps with the most appropriate technology options, developing a social system development that enables such technology deployment, evaluation of the feasibility of the roadmap, proposing policy for promoting a smooth transitional process, economic analysis of the proposed policies, and then penetration thereof into the public sphere towards its implementation.

Japan is currently striving to make steps in the above direction. Since April 2010, a mid- to long-term roadmap sub-committee within the Central Council of Environment has been drawing up the necessary technological and policy steps to 2020 and 2050, based on the assumption of a 15-25% reduction by 2020. The sub-committee has engaged over 60 experts from various sectors, who have been tasked with evaluating the socio-economic impacts of the various scenarios on the table before decisions are made. The technological feasibility has already tentatively been confirmed, and an

additional investment of about 1-2 % of GDP is estimated to attain the target range given above.

In short then, the challenges here are to come up with an effective road mapping process and then translate this into real actions.

#### **(6) Enough technology for LCS? Technology roadmap and evaluation of technological systems**

Technology plays an essential role as a main actor in realizing a low carbon society. All conventional technologies which aspire to improved, more convenient lifestyles are solely based on the abundant supply of energy. As a radical break from the past, it is now required to examine and answer the questions of whether sufficient technologies are available to implement a low carbon society, how energy efficiencies and low carbon technologies can be deployed in society, how the social system can be designed to make technology work and how the social system can be changed to accommodate such technologies.

Challenge: Requirement of scenario for technology (identifying targeted technology, measuring its attributions and potential for innovation), new technology (CCS, etc.), and to examine the longer term projections on innovative technology development, evaluation of the potential of new systems such as smart grids, how to formulate a significant transition for energy systems such as electrification and gasification, what criteria should be applied to select an energy system for the future, and the potential to introduce it to society.

In 2005, METI developed the Energy Technology Vision and Roadmap 2100, which is now being revised (Energy Technology Vision and Roadmap 2100), and in 2008, the Japan Council for Science and Technology Policy also provided a future low carbon technology roadmap. The question ‘the earlier, the better?’ needs some analysis as regards an endogenous innovation mechanism.

#### **(7) How to change the social infrastructure? Hard-infrastructure and social institutions**

To deploy low carbon technology within society, a social infrastructure is required. For example, in a bike society, bicycle lanes to be constructed, and traffic regulations and penalties where bikes have preferential treatment need to be introduced. Transitions of such social infrastructures—software (laws, social customs, etc.) and hardware (infrastructures)—have only just begun.

Challenge: Identification of targeted social infrastructures to invest in: consider city size for Light Rail Transit; study modal shift potentials for Japan’s cargo transportation system; assess the impact of abandoning the toll road system on CO2 reduction.

#### **(8) What does LCS policy mean to stakeholders? Policy implementation and its socio-economic impact**

Japan is considering a number of policy measures; which include a carbon tax and cap-and-trade

emissions trading scheme (including two options; absolute cap or carbon-intensity based method), consolidated regulations and standardizations, FIT (feed in tariff), tax reforms to allow subsidies and tax exemptions for promoting low carbonization and action planning of cities, industry, land use, and so on. Of these, Japan has only introduced FIT so far. The introduction of a tax and trade market has not yet been introduced, due to strong opposition from industry out of concern of loss of international competitiveness and the uncertainty of its effectiveness. The promotion and sharing of information about the technologies that make profit in short term, if relatively low barriers of cost can be cleared, may provide a good opportunity for business. Although subsidies (such as eco-points) to promote energy efficient devices and thermal insulation for housing have been introduced as a countermeasure against the economic recession, those subsidies are not financially sustainable in the long run.

In Japan, a policy mix of the above measures has not been developed yet, while in United Kingdom, a flexible policy mix including tax, emissions trading scheme, preferential tax treatment or exemption are in place. For a 15%-25% reduction by 2020, an additional investment estimated at 66 to 100 trillion yen is required, about 1-2% of GDP. Although many other estimates have been conducted, a correct message has not necessarily been given to policymakers because such estimates are calculated under varying assumptions. The media tends only to pick up on eye-catching figures without clarifying the assumptions and some stakeholders intentionally use such figures for their own reasoning.

Challenge: to design a comprehensive policy mix and economically evaluate such

#### **(9) Who pays first? Economic burden-sharing logic and financing for realizing a roadmap**

Debate has so far been insufficient as regards the equitability and effectiveness of sharing the financial burden, although the amount of required investment in a low carbonized society is huge. No agreement has even been reached to identify who takes what kind of financial liability. Further, a consensus has not been reached as to whether the cost should be borne by a public fund generated from carbon tax income, or by investment from emerging industry for business growth. Industry and some arms of the media are actually decelerating the introduction of active measures by highlighting the cost borne by households. It therefore needs to be recognized that this investment is not the sinking investment, but the investment for future green growth in new industry. However, the impact of such green investment on economic growth has not yet been examined in detail, thus no agreement has been reached by the government.

The introduction of renewable energies has met with obstacles in the present corporate climate of Japan, which operates on an extremely short-term (3 years) return period. Discussions concerning methods to generate investment funds (whether from a commercial bank, government-affiliated investment, or other) are under way.

Challenge: Development of economic evaluation models which connect growth strategies with low-carbon investment. In other words, it must be easy to understand for the general public what the implications of the burdens are for future households. The present macro-economic model is insufficient to analyze sector-wise frictions such as household behavior and labour power shift, thus a more micro-macro integrated model needs to be developed.

#### **(10) How to minimize inevitable friction associated with the transition**

A low carbon society requires a transition from the current regime—a structural change and associated needs for a smooth shift of the workforce (help the unemployed in obsolete industries move to new growth industries) and establishment of a safety net, and increased competitiveness in international trade.

Challenge: Recognizing frictions embedded in the transition, and proposing ways to lessen them. Balancing domestic policy with the international requirement to stabilize climate are factors decided by politics.

#### **(11) Getting people involved: How to make a roadmap work on the ground**

Methods of policy implementation and social involvement as well as the participation of individuals and groups have not fully been developed, despite the fact that a low carbon society cannot be realised without the active participation of citizens whose lifestyles could be dramatically changed. The main actors that will bring about a low carbon society through the designated system are actual individuals, households, industrial groups, community groups and NGOs. However, the question is whether change to individual lifestyle and standards of behavior will occur from outside-in, in line with the systems change, or from within the individuals and groups themselves. Thus a simplified flow of information from business enterprises to citizens is essential in allowing consumers to make the appropriate choice as regards energy utilization and technology. Cross-generation education, information moderation through scientists, and effective collaboration with expert groups, e.g., NGOs providing energy efficiency consultation are also important.

Challenges: Developing the methods to prompt various stakeholders.

#### **(12) Low carbon cities: Comprehensive policies and measures at the regional level**

If low carbonization at the nation scale is difficult to promote, low carbonization at the city-level is more achievable, and spillover effects of results to the national scale can be expected. Whatever the shape the process will take, low carbonization need to be implemented on the ground. Because a city accommodates smaller units of population, infrastructure and governance, it would be easier to promote a transition. In Japan, the Tokyo metropolitan government has set a 25% reduction target by 2020 and has initiated cap and trade-type emissions trading since April 2010 without waiting for a



decision by the national government. The pro-environment governor of Shiga Prefecture submitted a proposal to set a 50% reduction target by 2020 to the prefectural council. Other cities also have policies for low carbon cities. The more such low carbon initiatives take place at the regional level, the more recognition will spread, thus spillover effects to other cities could make a huge impact. Land use reform in rural areas should also be taken into account in terms of maintenance of carbon sinks, biomass production, distribution of agricultural products, etc. Low carbon model cities do already exist—in 2008 the government designated 13 such cities, the guidelines of which are published by MLIT.

Challenge: Promote cities as front-runners to LCS. Promote information exchange among low carbon cities.

### **III. Cooperative research into low carbon development with developing countries (extension to G20)**

LCS-RNet activities should be corresponded to the expansion of G8 to G20. If developing countries take a path towards traditional energy-intensive technology-led societies, low carbonization efforts by developed countries will be insufficient in realising a low carbon world. From now onwards research geared towards low carbon development in developing countries will be crucial, and will also be important in the context of developed countries. Therefore, an international framework to assist developing countries, especially in securing, and making effective use of funding as well as technology transfer, is important. In Japan, NIES and a team at Kyoto University are carrying out research to apply the methods which have been developed as a Japanese low carbon society scenario study to cities in the Asia Pacific region. MEXT is also supporting cooperative research with an international aid organization, JICA and universities.

Challenge: Identification of research needs via dialog between policymakers and researchers in developing countries and collaborative research of low carbon societies with researchers in developing countries.

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