LCS·R Net

Accelerating the transition to low carbon societies

-From theory to reality-

Synthesis Report of
Fifth Annual Meeting
International Research Network for Low Carbon Societies

22-23 July 2013
Yokohama, Japan

Host
National Institute for Environmental Studies (NIES)
Institute for Global Environmental Strategies (IGES)
Ministry of the Environment, Japan (MOEJ)

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Please refer to the LCS-RNet website at: http://lcs-rnet.org/lcsrnet_meetings/2013/07/529

Preface

The International Research Network for Low Carbon Societies (LCS-RNet) was established in 2009 on the initiative of the G8 Environment Ministers' Meeting (G8 EMM). At their 2008 meeting in Kobe, the Environment Ministers of the G8 recognized the need for each country to develop its own vision of a low carbon society (LCS), and how the transition might be achieved. This would contribute to the goal of cutting global greenhouse gas emissions by half or more by 2050 in an effort to keep the rise of global average temperature below 2 degrees Celsius, a level that is believed would mitigate dangerous impacts on the majority of the earth's eco-systems. Given this, the G8 Environment Ministers in Kobe strongly supported the establishment of a research network to help develop those visions and pathways towards LCS.

In October 2009, under the auspices of the Italian G8 Presidency, world-leading researchers engaged in work on various aspects of LCS, including scenarios, financing and technologies gathered in Bologna, Italy, for the inaugural meeting of the LCS-RNet. Participants at that meeting discussed research needs for reaching mid- and long-term targets, LCS scenarios, economic and technology policies, green growth, individual lifestyle changes and a range of cross-cutting issues. The second, third and fourth Annual Meetings were held in Berlin, Germany in September 2010, Paris, France in October 2011 and Oxford, United Kingdom in September 2012. These meetings noted the need for science to explicitly aid the process of transition towards LCS. The Oxford meeting addressed the position that recent climate change research evidence has only reinforced the urgency of decarbonizing economies. These diverse pressures are being played out in different ways in different nations and global regions, and networks such as LCS-RNet provide invaluable opportunities for comparing political, strategic and research responses. Although the world has changed considerably since the foundation of LCS-RNet, the network's basic mission to identify and share experiences and solutions on the low carbon societal challenge remains of paramount importance.

The Fifth Annual Meeting of LCS-RNet was held on 22-23 July 2013 in Yokohama, Japan, co-hosted by the National Institute for Environmental Studies (NIES), the Institute for Global Environmental Strategies (IGES) and the Ministry of the Environment of Japan. The meeting addressed the importance of de-carbonization in material flows under the expectation that changes in energy systems and technological innovation alone will fail to reduce global carbon dioxide emissions sufficiently. It also focused on transitions to low carbon societies that can be implemented through various activities such as financing, social and regime changes and knowledge sharing activities through networks such as LCS-RNet and through knowledge sharing platforms. In the last session, global challenges faced in creating LCS and future expectations towards LCS-RNet were discussed.

This Synthesis Report was drafted by the session chairs of the Annual Meeting together with the LCS-RNet Steering Group. We would like to express our sincere thanks to the contributions and supports to the meeting of Prof. Jim Skea of Imperial College London and Mr. David Warrilow of the UK Department of Energy and Climate Change (DECC) as well as Dr. Shuzo Nishioka, Ms. Tomoko Ishikawa and Ms. Takako Wakiyama of the LCS-RNet Secretariat.

We would also like to express our special appreciation to the Ministry of the Environment of Japan for its generous support for LCS-RNet activities. We also would like to express our appreciation to governments and to the LCS-RNet contact points for their support and recommendations. Particular thanks are due to Dr. Shuzo Nishioka and the Secretariat's strong leadership in planning the meeting and for their hospitality in Yokohama.

LCS-RNet Steering Group

LCS-RNet Steering Group Members

Mikiko Kainuma
National Institute for Environmental Studies (NIES)
/ (独) 国立環境研究所, Japan

Jim Watson
UK Energy Research Centre (UKERC), and University of Sussex

Stefan Lechtenböhmer
Wuppertal Institute for Climate, Environment and Energy
/ Wuppertal Institut für Klima, Umwelt, Energie GmbH, Germany

Sergio La Motta
National Agency for New Technologies Energy and the Environment,
/ Ente per Nuove Tecnologie, I'Energia e I'Ambiente (ENEA), Italy

Jean-Charles Hourcade
International Research Center on Environment and Development (CIRED)
/ Centre International de Recherche sur l'Environnement et le Développement, France

Authors of the Synthesis Report

Shobhakar Dhakal (AIT), Mikiko Kainuma (NIES), Stefan Lechtenböhmer (WI), Derk Loorbach (Drift), Yuichi Moriguchi (University of Tokyo), Sergio La Motta (ENEA), P.R. Shukla (IIMA), Jim Skea (Imperial College London), Tomonori Sudo (JICA), and Takako Wakiyama (IGES) with the help of Minal Pathak, Awassada Phongphiphat, Kristine Garcia, Eliyan Chea, Xiao Hu, Gito Immanuel, Bor Tsong Teh, and Vu Duc Canh

Edited by Mikiko Kainuma (NIES), Shuzo Nishioka (IGES), and Takako Wakiyama (IGES) with the help of Jean-Charles Hourcade (CIRED), Stefan Lechtenböhmer (WI), Jim Skea (Imperial College London), Sergio La Motta (ENEA), Tomoko Ishikawa (IGES) and Tara Cannon

Key Findings

The Fifth LCS-RNet Annual Meeting considered how a low carbon society could be achieved against a complex social and economic background. The aftermath of the economic recession, instability in employment, political instability in the Middle East and a widening gap between the rich and the poor pose many challenges. These uncertainties combine with the availability of new sources of energy, such as shale gas, and the impacts of the nuclear accident at Fukushima. At the same time, measures to address climate change have become increasingly urgent as a result of intensifying concerns about extreme weather events and the medium- to long-term impacts of climate change. Discussions at the meeting addressed the lessons learned from past transitions within a wider global context, how to secure adequate investment finance, and how to stimulate structural changes that could precipitate more fundamental social change. The key findings are summarized below.

Towards transitioning to a low carbon society

> Fundamental changes in the way of producing and consuming a large variety of goods are needed to address the global challenge of climate change. Delays in the transition will result in less optimal alternatives becoming locked in, resulting in a society that emits an unnecessarily large amount of carbon.

> Measures to lower carbon emissions levels need to be explored more comprehensively. Such measures include demand management, reduction of resource use, re-use of resources and extending the lifetimes of products and buildings. Improvements in energy supply technologies and a shift to a low carbon energy mix are important, as is a reduction in energy demand. Transitioning to a low carbon society can stimulate the economy and create new industries.
>
> In order for GHG emissions to decrease significantly, the global consumption of materials must be reduced. Dematerialization (the improvement of resource efficiency) will play a major role in reducing demand, as will improving and disseminating technologies to end-users.

Towards mainstreaming climate policies

> The relevance of the peak oil debate to climate change is now called into question due to the emergence of new sources of hydrocarbons such as shale oil and shale gas. The displacement of coal by shale gas may lead to a reduction in emissions in countries that are affected directly, but there is a high risk of carbon leakage. While shifting from coal to shale gas may bring short- to medium-term benefits, such a shift cannot be a long-term solution to climate change. New energy options such as shale gas could result in falling energy prices and discourage reductions in energy demand. Energy issues need to be considered within the context of climate change. Policies that can engage both developed and developing counties are needed. Energy policy needs to be steered at the political level if the climate is to be stabilized and the use of fossil fuels mitigated at the global level.

> Cooperation is essential if social and environmental goals are to be achieved, while competition will help to achieve goals in an economically efficient manner. The choice of policy instruments that bridge the competition and cooperation in the energy market is key to the green growth transformation and delivering economic and environmental benefits. The reform of energy markets for low carbon green growth has to go side by side with policies and programs favoring sustainable development. The development of sustainable infrastructure is needed to avoid lock-in. Given the close linkage between GHG mitigation and energy policy, effective international climate policies and carbon markets are necessary if low carbon green growth is to be promoted through reforming markets. There is a need to identify: a) policies that will promote low carbon energy resources and technologies; and b) international mechanisms that promote the effective and affordable transfer of technologies and the development of regional clean energy markets.

Up-scaling investments to realize low carbon societies

> The level of investment needed to achieve low carbon societies has become increasingly clear. Investment from both the public and private sectors will be needed. However, the current economic climate has inhibited investment from the private sector, while public financing will be insufficient by itself. Globally, private investment flows accounted for 74% of total climate finance in 2010-2011. Multilateral banks such as ADB have implemented several pump-priming programmes to attract and scale up private investment. Microfinance has a potentially important role to play in developing countries.

> A vision and an appropriate set of policies and measures are necessary to direct investment towards low carbon projects/programmes at the global level. The long-term benefits need to be considered when resources are invested. Meeting the challenges will require innovation in terms of both structuring and sourcing finance and technology. The policy environment should be re-designed so that climate change becomes a mainstream consideration in investment decisions.

Integrating local LCS actions into global challenges

> While international negotiations and climate change measures have progressed only slowly in most countries, low carbon plans and initiatives at the city level have moved forward significantly. This suggests that a bottom-up approach can accelerate the transition to low carbon societies at a global scale.

> Low carbon processes at the city level can lead to a self-organizing process in which a spectrum of new activities emerge and contribute to sustainability transitions. The actors involved can translate their ideas into concrete form within their own networks and organizations. Bottom-up approaches can empower a range of social actors to contribute to common goals, with a common language, outlook and agenda serving as the coordinating mechanism.

Accelerating the transition to low carbon societies

> The transition to a low carbon society will imply fundamental changes in the underlying culture, structure and behaviour of societies. The pursuit of the low carbon agenda continues to be a challenge. In order to make a successful transition, it is essential to have a vision and an appropriate toolbox of mitigation policies whose efficacy and efficiency have been assessed.

> Knowledge and innovation are critical when sharing best practices and scaling up successful projects in complex areas such as low carbon societies. As well as helping to realize the transition, knowledge and innovation can develop and create new ideas and practices and also extend to different sectors through their application and utilization in daily life.

Synthesis of Sessions

Plenary Session 1: Transition to Low Carbon Societies

[Chair] Sergio La Motta, ENEA, Italy

Speakers:

Jim Skea, Imperial College London, UK
Derk Loorbach, Drift, the Netherlands
Andrea Bigano, FEEM / CMCC, Italy

Why is transition to an LCS difficult and how can key climate policies contribute to it?

The low carbon agenda that each country is supposed to develop in response to the 2010 Cancun Agreement, which calls for a "paradigm shift towards a low carbon society that offers substantial opportunities and ensures continued high growth and sustainable development," needs to take into account the challenging context that includes the current economic recession, the reaction within several countries to the Fukushima nuclear accident and the relatively abundant fossil fuels due to the entrance into the market of an enormous quantity of shale gas, whose extraction could also lead to a carbon leakage effect where coal is displaced.

Economic recession in particular has resulted in pressure on public sector budgets within many countries, reduced the private sector's propensity for risk and increased political debate concerning the "affordability" of low carbon options, even though such options may lead simultaneously to a temporary boost for energy-related infrastructure and R&D expenditures in some countries and, remarkably, R&D spending for no long-term greenhouse gas (GHG) abatement technologies. Low carbon policies should be designated to promote economic recovery within ecological boundaries.

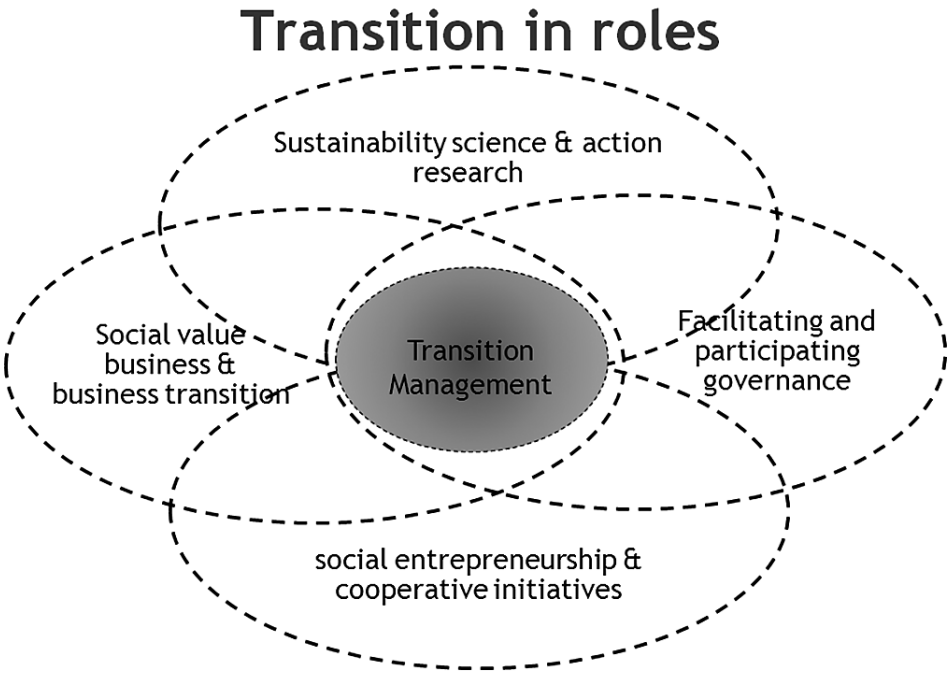
Maintaining a low carbon agenda therefore continues to be a challenge. In order to transition successfully to a low carbon society, it is essential to have a vision and an appropriate toolbox of mitigation policies whose efficacy and efficiency are duly assessed. Preliminary studies indicate that mandatory standards and information policies achieve a higher degree of success than subsidies, for which free riding may reduce the cost–effectiveness of policy actions.

To decide upon a vision it is essential to be aware that a transition will imply a fundamental change in the culture, structure and behaviour characterizing a societal system, where "culture" is the collective set of values, norms and perspectives; "structure" is the physical and economic infrastructures, institutions, rules, regulations and collective routines; and "behaviour" is the practices and operational mode of the societal system.

The assessment of policies should be conducted using an appropriate set of tools to facilitate evaluating the actual level of effectiveness of the policies.

Challenges and opportunities

- A low carbon agenda needs to take account of the challenging context including the current economic recession, the reaction within several countries to the Fukushima nuclear accident and the relative abundance of fossil fuels entering the market.
- A vision and an appropriate set of policies and measures are necessary to make a shift from savings increasingly to low carbon investments at the global level.
- Tools must be developed to assess policies' efficiency and efficacy. Datasets able to capture individuals' reactions to policies are expected to be particularly useful in this regard.
- It is essential to be aware that transitioning to a low carbon society implies a fundamental change in the culture, structure and behaviour characterizing a societal system.



Source: Derk Loorbach, 2013

Plenary Session 2: How to Achieve Low Carbon Development

[Chair] Shobhakar Dhakal, AIT

Speakers:

Yuzuru Matsuoka, Kyoto University, Japan
Rizaldi Boar, Bogor Agricultural University, Indonesia

What is the role of research and research networks to help achieve Low Carbon Development?

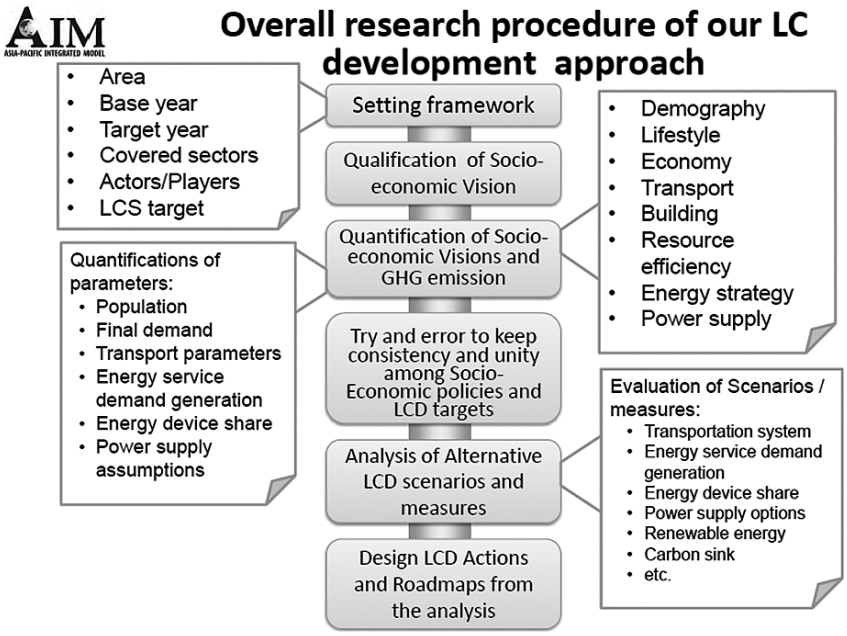
Climate change is a problem requiring new and transformative solutions. In order to achieve low carbon development, the role of research is, therefore, paramount from three fronts: first, acquiring knowledge on potential short- and long-term development pathways that are consistent with mitigation goals and their feasibility and costs; second, communicating evidence-based knowledge to decision makers and to society in general in order to create necessary conditions for a range of actions necessary to achieve low carbon development; and third, developing a network of interdisciplinary research to assist researchers and research institutions in the developing world to formulate visions and develop roadmaps consistent with leap-frogging, thus reducing the carbon intensiveness of growth.

It will be essential to develop research tools and methods, as they will prove necessary when incorporating socio-economic and development issues in new and innovative ways. These tools and methods must deal with setting framework/visions, analyzing and quantifying alternate visions for the low carbon society, and testing their feasibility. Communication with decision-makers is a prerequisite in these endeavors from the very outset in order to ensure that the full range of benefits ensues. The research policy dialogue and communicating with the greater society are essential because low carbon development requires technology and lifestyle changes. Thus, policy-makers need both roadmaps and confidence to achieve the low carbon visions.

Interdisciplinarity and cooperation are two aspects of research that will be critical in order for research to support low carbon development to the greatest possible extent. Insofar as multiple disciplines are involved in research for low carbon development, developing a new strain of research methodologies going beyond a particular discipline will be necessary. In light of the current state of research and capacity in many developing countries, which often prioritize other developmental issues over low carbon development, low carbon development will best be furthered by bringing disciplinary researchers together in the form of a research network for low carbon research, with research collaboration and support from an established global and regional center of excellence and ample expansion of local capacity for research and evidence-based planning. In such a context, the efforts underway through Japan's Asian Pacific Integrated Model (AIM) consortium to assist eight country-level and 14 regional-level (provinces and cities) analyses in Asia and related capacity building are encouraging.

Challenges and opportunities

- Successful policies for low carbon society development must be comprehensive with multiple objectives that complement and are harmonious with other areas (e.g., economy, security, living standards). They require a clear vision of the low carbon society future.
- The feasibility and effectiveness of low carbon society development is influenced by technology, the economy and finance, institutions and the linkage of low carbon policy to other policy areas.
- Collective actions are necessary. One example of this would incorporate spatial development, sectorial development, local green businesses and local community participation.
- A research network for a low carbon society is important to provide a common platform for better linkages between national and international research communities in order to accelerate knowledge sharing regarding tools, policies and good practices.



Source: Yuzuru Matsuoka, 2013

Parallel Session 1-1: Resource Management for Low Carbon Transition

[Chair] Yuichi Moriguchi, University of Tokyo, Japan

Speakers:

Seiji Hashimoto, Ritsumeikan University, Japan
Julia Nordmann, WI, Germany
Magnus Bengtsson, IGES, Japan

How can material use and efficient product design contribute to realization of a low carbon society?

The development of infrastructure, the increase in the diffusion of consumer durables, and higher level of use of consumer goods associated with economic development are expected to require the use of greater amounts of steel, cement, paper, and many other materials. Such an increase in the use of materials leads to the growth of the GHG emissions associated with those materials. The ratio of GHG emissions caused by material use relative to total GHG emissions is very high. Substantial reductions in the amounts of materials used will therefore contribute greatly to a decrease in total GHG emissions.

As for management of carbon intensive materials, it will be impossible to reduce GHG amounts to a significant degree without lowering the levels of global material consumption. Identifying reasons for differences in current material consumption in different countries is an important first step for exploring less resource consuming development. At the same time, measures such as demand management, weight reduction, substitution, and lifetime extension need to be explored in more detail.

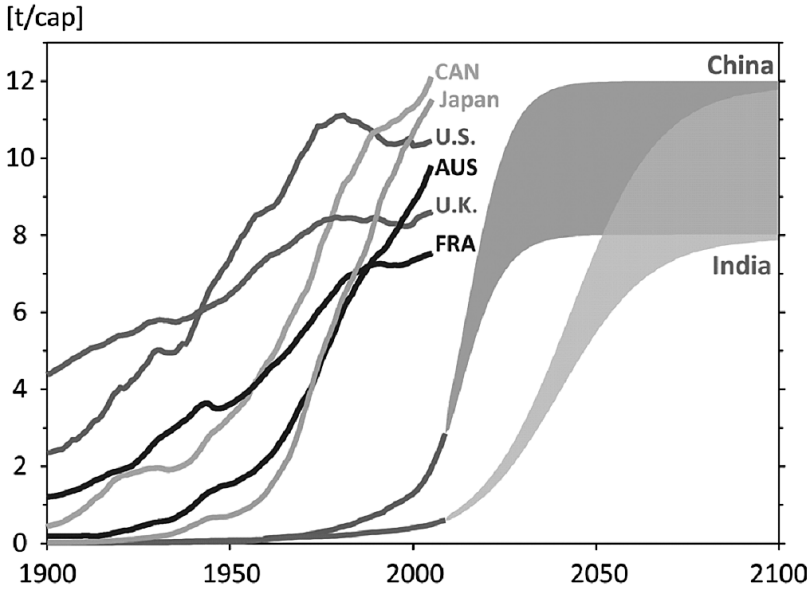
Taking the transition to low carbon and low resources in information and communication technology (ICT) as an example, individuals play an important role in reducing material use. However, there is only limited recycling of used mobile phones because of several reasons, including a lack of economic incentives, lack of knowledge about recycling options, non-transparent recycling structures and users' strong emotional attachment to the mobile phones themselves. Education and information provision as well as economic incentives for recycling seem to be promising approaches.

Recycling plays an important role, but is far from sufficient for achieving sustainable resource use. There is limited availability of scrap while stocks-in-use are growing. Moreover, there are material losses at different life-cycle stages, as well as lower quality resources derived through recycling, causing difficulties in replacing primary resources in many applications and so on. Many challenges need to be tackled, such as a radical change in innovation, which would shift from a "labour-saving" focus to the reduction of materials and energy consumption; the replacing of physical products with services; the intensive use of products; radical design changes and strategic research that "put the pieces together" into compelling narratives that underscore the necessity of fundamental societal change.

Challenges and opportunities

- While recycling is a good entry for education and awareness raising, it is insufficient for mitigating GHG emissions. More drastic socio-technical transitions through system innovations are needed. These range from labour-saving aspects to reduction of materials and energy consumption.
- It is necessary to look carefully at side effects of changes, e.g., the rebound effect of efficiency gains on the absolute level of consumption, the "leakage" of burdens to international trade partners, the problem simply shifting from one material to another, etc. Developing suitable business models to support sustainable behaviour is a challenge.
- Emerging economies, where the material requirement and the associated carbon dioxide emissions will increase significantly in coming decades, are important. Opportunities to mitigate material use may be found by analyzing factors behind the differences in per capita material stock and the flow of developments in the past.

Per capita stock of iron and steel



Source: Mûller and Wang, 2009

Parallel Session 1-2: Re-Designing Energy Markets for Green Growth and a Low Carbon Future

[Chair] Priyadarshi R. Shukla, IIMA, India

Speakers:
Yuji Matsuo, IEEJ, Japan
Ram Shrestha, AIT
Ruud Kempener, IRENA

How can the competition and co-operation of the energy market be bridged to meet the 2 degrees Celsius target?

The transformation of energy markets is a key to meeting the 2 degrees Celsius target. Energy markets are beset by multiple dichotomies. These dichotomies include: (i) *competition versus co-operation*, in which competition is vital for economic efficiency, while cooperation is essential for achieving social and environmental goals; (ii) *dynamics versus inertia*, e.g., *rapidly altering dynamics of energy resources and technology markets* (e.g., shale gas and nuclear energy in the post-Fukushima era) versus the *inertia of energy assets* (e.g., the long life spans of power plants, refineries, pipelines and electricity T&D, which cause long-term lock-ins), and (iii) global versus local, i.e., varied global endowments of energy supply versus local specificities of energy demand.

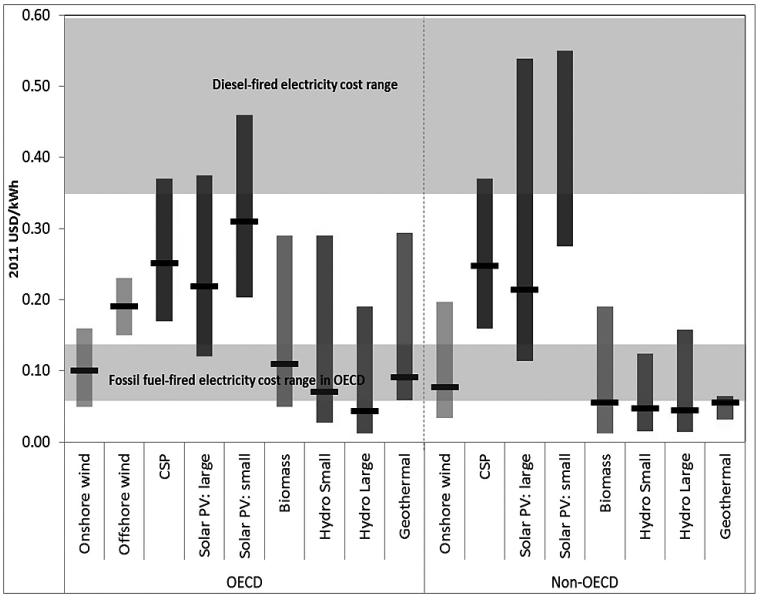
The optimal transformation of the energy market needs to balance these multiple contradictions so as to gain co-benefits and reduce risks. The *'green growth'* paradigm aims at optimal transformation that aligns economic growth and environmental goals such as reducing pollution and conserving energy. The keys to green growth transformation are the choice policy instruments that bridge the competition and cooperation in the energy market and thereby deliver economic and environmental benefits.

Renewable energy technologies (RETs) have emerged as key options that deliver sustainable, economic and reliable energy. The electricity generation costs of RETs such as wind, geo-thermal and hydro are already competitive vis-à-vis conventional energy options at numerous locations. Solar technology is competitive at places with high solar potential, and the rapidly declining costs of solar technologies are creating fresh opportunities for their penetration. Aided by innovations like smart grids, the RETs have the potential to leapfrog conventional energy competition and become a bridge between competition and cooperation.

Challenges and opportunities

- Competition in energy markets, while vital for achieving economic efficiency, is often an impediment to the vital transformation of energy systems needed to achieve the 2 degrees Celsius target. This is mainly due to the market advantages that fossil resources have enjoyed such as subsidies and oligopolies.
- Achieving the 2 degrees Celsius target simultaneously with attaining 'green growth' objectives, would require both *competition and cooperation* in energy markets. Cooperation is vital for all stages of technology R&D for both the demand and supply sides of the energy market.
- RETs are key options that are becoming increasing competitive and can deliver sustainable, economic and reliable energy. Due to the high inertia of energy system investments, the fraction of conventional fossil fuels is likely to remain high in the overall energy system. The RETs are likely to be leapfrog options which can become *bridges* between *competition and cooperation* in the transformation of future energy markets.
- The energy market transformation to achieve the 2 degrees Celsius target should: (i) use economically efficient and socially acceptable policy instruments that hedge the risks from low or zero carbon technologies like carbon dioxide capture and storage (CCS) and nuclear energy, and (ii) ensure that the future energy system enhances the economic, social, and environmental security of the planet.

Renewable Electricity Generation Cost



Source: International Renewable Energy Agency (IRENA), 2013

Parallel Session 2-1: Financing for Low Carbon Societies

[Chair] Tomonori Sudo, JICA, Japan

Speakers:

Bindu N. Lohani, ADB
Marinella Davide, CMCC, Italy
Baptiste Perissin Faber, CIRED, France

How can we find, track and scale-up the flow of finance in climate change actions?

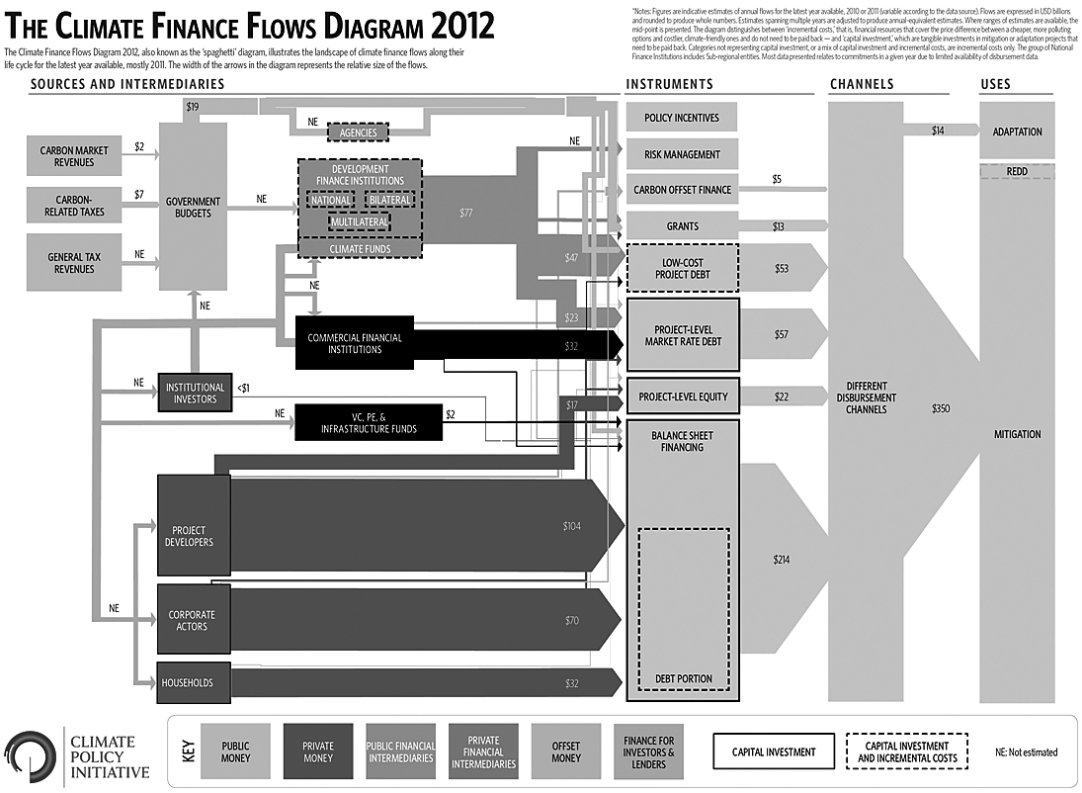
Debates on climate change finance including the Green Climate Fund remain ongoing at the UNFCCC and other fora. Recently, a comprehensive landscape on the flow of finance called a "spaghetti diagram" was developed. This covers a wide range of climate change-related finance flows. However, the lack of an agreed definition on "climate finance" causes confusion in identifying flows, and this in turn negatively impacts negotiations on climate change finance.

While public finance is considered one of main sources of climate change finance, public finance remains insufficient. At the same time, the amount to be financed via climate change finance is still unclear. The role of development financial institutions (DFIs), which comprise a large international public finance source, is to maximize development impact despite limited resources. DFIs are working to leverage other finance resources such as government investment, private sector finance and investment and capital markets. DFIs work to pilot and scale up projects using several risk sharing schemes, including first loss portfolio guarantees and partial credit guarantees, and share knowledge on their successful cases.

Furthermore, the experiences of recent unconventional monetary policies are also useful to learn from. "Carbon based monetary policy" is a proposal applying monetary control policy within climate change finance. The proposed "carbon based monetary policy" will use carbon as a tool of market operation by the central bank, allowing it to increase the monetary supply to invest in low carbon development projects and programmes. While potential negative impacts of such a policy, such as the possibility of inflation, require further consideration, it is worth considering the role of the central bank applying monetary policy to scale up finance volume to promote a low carbon society.

Challenges and opportunities

- There is a need to develop an agreed definition of climate change finance so as to be able to track such finance more accurately and to pinpoint the focus of negotiations regarding climate change finance.
- DFIs should work as catalysts to leverage climate change finance and as developers of risk sharing schemes and knowledge sharing platforms in order to scale up climate change finance.
- Traditional financial tools are not necessarily addressing funding needs toward low carbon societies. It is necessary to develop new instruments to increase finance in actions that contribute to creating low carbon societies.



Source: Climate Policy Initiative (CPI), 2012

Parallel Session 2-2: Low Carbon Future Cities

[Chair] Derk Loorbach, Drift, the Netherlands

Speakers:

Roberto Del Ciello, ENEA, Italy
Tsuyoshi Fujita, NIES, Japan
Chun Xia, WI, Germany
Niels Schulz, UNIDO consultant

How can a bottom-up approach stimulate a global transition to LCS?

It is cities that accommodate the largest resource and energy users as well as carbon dioxide emitters. They are also the places most vulnerable to climate change effects and external shocks. On the other hand, they are also places of innovation giving rise to many alternatives that, because of cities' scale, could have a global impact.

The fragmented and complex nature of cities creates a paradox, insofar as they could be places where the needed systemic changes or transitions have the potential actually to take place relatively rapidly, yet are also the hardest to address because of their fragmented nature and relatively low governance capacity and capital.

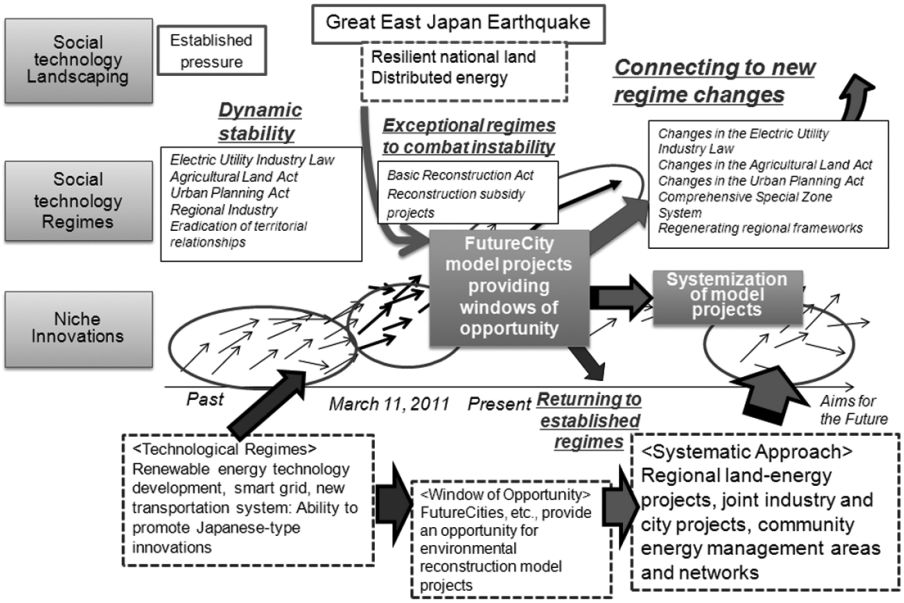
There is mounting evidence that low carbon development is feasible. Multiple initiatives are emerging around the globe as part of the autonomous dynamics of change in cities, guided and directed by new tools, models, concepts and initiatives. There is a demand though for more process-oriented strategies and better insight into the actual impact of these initiatives.

Cities can lead. Small initiatives and changes often add up to a whole that is greater than the sum of the parts and there seems to be a global movement with increasing global impact which needs to become one of the core focal points for climate change strategies. Whereas nation states cannot reach agreement for a variety of reasons, cities are feeling the consequences and taking action. This calls for reorienting research, policy, finance and strategy towards the level of cities.

Challenges and opportunities

- Population density and high per capita consumption in cities does not always coincide spatially. There needs to be a better understanding about regional variations in elasticity of energy demand, given urbanization and development trends and the need to make these sustainable.
- While achieving low carbon and resource-circulating societies is the long-term goal, it also needs to be the short-term focus in order to gradually internalize external (environmental and social) costs.
- Climate change is only one of the multitude of problems that cities face. Equity, justice, democracy and competitiveness are equally important and need to be combined in any urban sustainability strategy. In addition to the attention given to sustainable urban growth, there is also a strong need to develop integrated strategies for cities that are shrinking or in decline. Environmental innovation is a key factor in achieving urban sustainability, as part of broader socio-economic strategies that also need to include new forms of (participatory) governance and the empowerment of social innovation. Japan's eco-model cities and future cities initiatives provide excellent and very innovative testing grounds for such new approaches.

Analyzing Reconstruction-based Town Planning with Social Innovation



Source: Tsuyoshi Fujita, 2013

Plenary Session 3: Renovation of Industry for Green Growth

[Chair] Stefan Lechtenböhmer, WI, Germany

Speakers:

Noriko Fujiwara, CEPS, Belgium
Joyashree Roy, Jadavpur University, India
Teruyoshi Omura, Panasonic Corporation, Japan

How can the manufacturing industry become low carbon and thereby contribute to green growth?

The manufacturing industry is important as it is one of the largest energy and resource consumers and GHG emitters globally. Despite improvements in energy efficiency, absolute resource use and emissions have both increased in recent years, with increased activity in response to rising demand for and trade in industrial products.

Given the high energy and resource use of the manufacturing industry and particularly such energy-intensive products as steel cement, ammonia and aluminium, revamping the manufacturing industry involves huge challenges. Low carbon roadmaps developed by several European energy intensive industries have made it clear that energy and material efficiency only offer limited potential and further substantial emission reductions would mainly have to rely on breakthrough technologies including industrial CCS, many of which are not available yet. That said, there is still scope for efficiency improvements in the practices followed in many countries.

To globally achieve sufficient GHG reductions, mitigation strategies for the manufacturing industry have to go beyond technical solutions within the sectoral boundaries and take new patterns of demand for industrial products into consideration. Industry could then respond to these via changes in product design, increasing the service life of products, and so on.

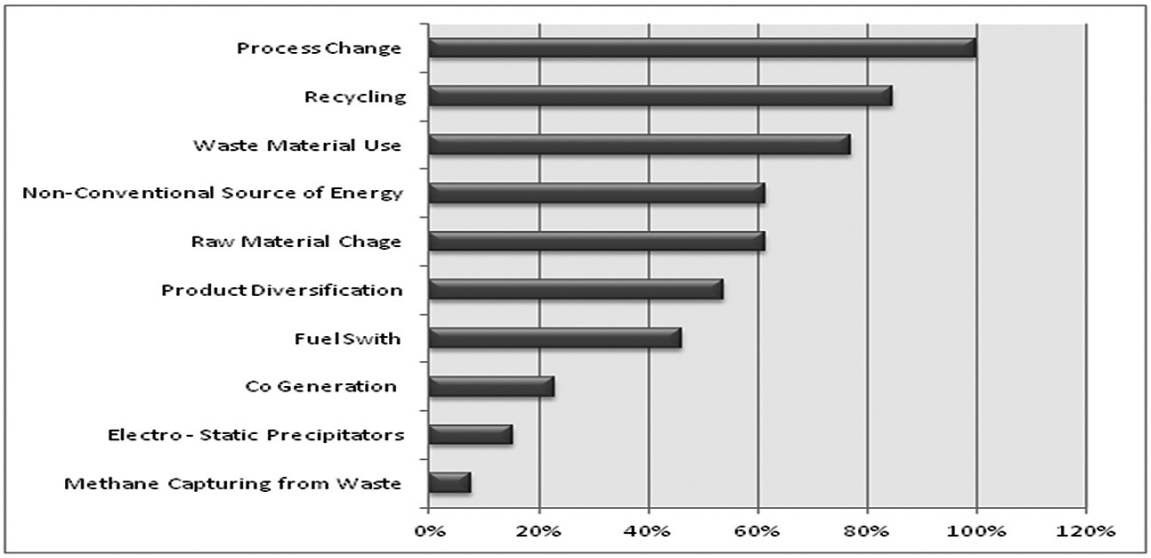
This requires multiple national and industrial strategies, which have to be oriented towards both the short term and long term and targeted at specific industries or even technologies, while also targeting the economy as a whole. Ideally all strategies would be embedded into a global emission trading system in order to avoid potential leakage problems due to international competition for customers and investment. Successive international sectoral agreements and other instruments could be an alternative. There exist, however, extremely diverse opinions on how these should be designed.

The largest momentum for climate change may come from industry itself as green solutions, which may be new eco-efficient products, services or technologies, are increasingly recognised as likely to lead future markets. It is therefore a promising field of policy to create enabling conditions and policy frameworks which both incentivise developing these markets and facilitate the efforts of "responsible" companies who are willing and often already on the way to develop low carbon products and technologies as future businesses.

Challenges and opportunities

- Solutions to reduce GHG emissions from the manufacturing industry must cover the whole range of technologies and solutions for energy efficiency improvement as well as material use efficiency, fuel and feedstock switching, waste recycling, and energy recovery, including the development of new breakthrough technologies.
- However, solutions have to go beyond sectoral boundaries and address the development of new patterns of demand for industrial products. Industry can then respond to this through changes in product design, increased service life of products, and so on.
- A transition achieved through innovation and investment in clean technologies and low-/zero-carbon energy can create sustainable markets of the future and contribute to increasing employment and alleviating poverty and social exclusion.
- The development of smart city infrastructure as an integrated package by the private sector has tremendous potential for reducing the environmental burden, increasing the quality of life, enhancing vitalization of the economy and creating new business opportunities.

Steps to Reduction GHG and other environmental emissions



Source: Chakraborty, D., 2012

Debate 1: Global Challenges to Low Carbon Societies

[Chair] Hideyuki Mori, IGES, Japan

Speakers:

Hiroshi Tsujihara, Ministry of the Environment, Japan
David Warrilow, DECC, UK
Stefan Lechtenboehmer, WI, Germany
P. R. Shukla, IIMA, India
Benoît Leguet, CDC Climat, France

How do their governments address the global challenge of transitioning to a low carbon society?

A major reduction of emissions will be key in order to realize the goal of keeping global temperature rises below 2 degrees Celsius. However, fundamental changes in all sectors and at all levels of society will be essential to address the global challenge of the changing climate. Policymakers in many countries shared similar perceptions about the need for action and the challenges involved in tackling climate change issues.

The UK has embarked on an ambitious programme to reduce GHG emissions by 80% by 2050. Their emission reduction targets are set in the form of carbon budgets. Fulfilling this target warrants high-level change, ambition and identification of no-regret trade-offs between sectors. The use of effective communication tools will be vital in selling to the public, policy-makers, and other stakeholders the benefits of transitioning to low carbon options. Though the reality of achieving a low carbon society remains a challenge, the UK government now has the practical experiences to make the theory a reality. In a report developed by the Scientific Council of Global Environment, the Council highlighted the importance of such society contract and the urgency of addressing the energy question of utilization and demand.

At the same time, the role of science in Germany is apparent in several activities of scientific organizations that are becoming more science-oriented and transformative. The establishment of science policy institutions in some non-government organizations and a strong civil society voice demonstrate the growing role of science in Germany. The Scientific Council of Global Environment emphasized that successful great transformation requires public design and global cooperation.

On the other hand, the Japanese government believes that climate change is an increasingly urgent issue and there is a need to speed up work on consolidating and organizing knowledge. It has also recognized the importance of more and closer collaboration among developing countries as being central to achieving the transition to LCS in terms of risk management and integrated discussions on mitigation and adaptation.

What are the major impediments in achieving this global challenge?

There has been an urgent call for aligning development, climate change policies and actions at international, national, and sub-national levels with a consideration of the diversity across and between different nations. There is also increasing knowledge and a growing recognition of the need to encompass different approaches to science. The transition science allows for an understanding of how such transitions can be achieved. Also, transformative science generates innovation. Pooling the results of academic and applied research on the economics of climate change will be useful, as it can make the research more comprehensive and usable by public and private decision makers.

How does a network like LCS-RNet contribute to addressing the challenge? What should the key roles of a network like LCS-RNet be in order to help the low carbon transition process?

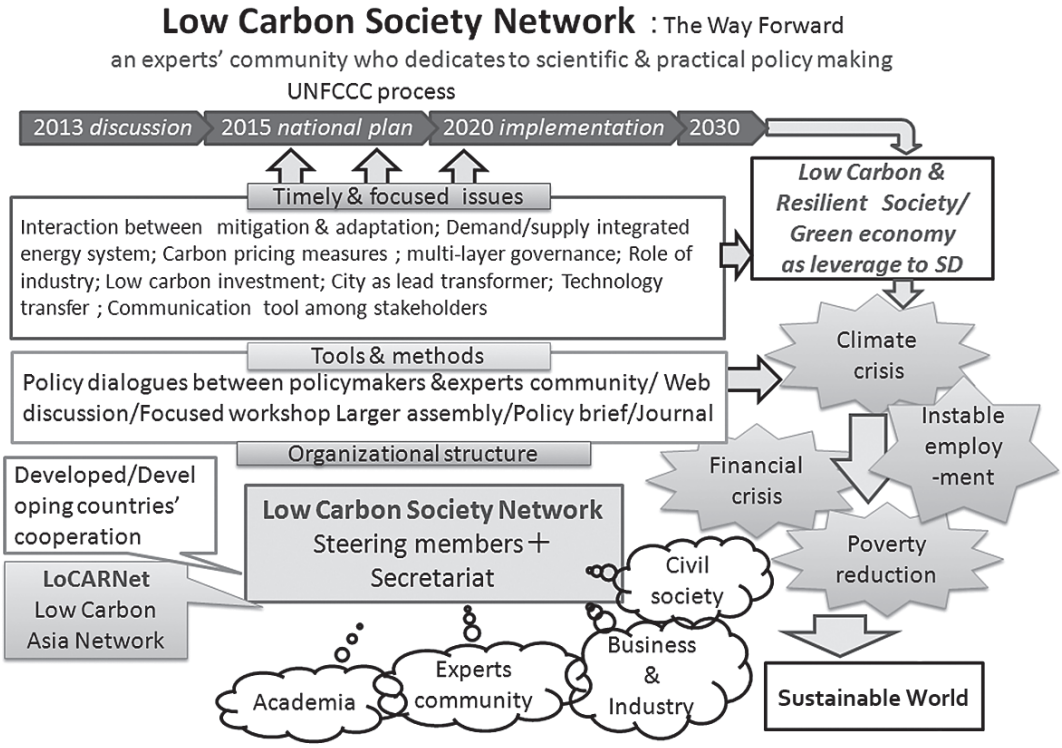
Integrating climate science, mitigation and adaption with socio-economic policies is the basic foundation of LCS-RNet. It is important that researchers and policy makers gather and tackle the issue of climate change, such as at the LCS-RNet fora. Because of the different situation each country is facing to achieve

low carbon development, the value of LCS-RNet is rising as a means of finding common pathways and strategies for transition. The network also serves as a form of communication tool between developing and developed countries to share lessons and experiences in very different political and social settings.

The Japanese government through IGES will continue to fully and strongly support the activities of LCS-RNet and LoCARNet in the process of the low carbon society transition. The Japanese government proposed to proactively widen the scope of LCS-RNet activities and establish a forum for policymakers, experts and researchers that would allow the network to address climate in a more comprehensive manner; consider both mitigation and adaptation and their trade-offs in identifying appropriate global policies; consolidate and organize knowledge and information; encourage support from developed countries to developing countries to enable transition to low carbon societies; and facilitate the transition to low carbon.

Challenges and opportunities

- The key challenge is to make our responses to climate change as instruments for global cooperation. Using the LCS-RNet platform can take this message forward.
- While several recommendations emerged from the debate such as the use of energy efficient technologies and the development of low carbon and balanced energy mixes, these still need to be passed into legislation to be put into practice.
- To address low carbon society transition, particularly regarding reducing GHG emissions, climate change should not be used as the selling point as it is not an effective means of engaging the attention of policy-makers. It is better to use the competitiveness of low carbon transition options against each other (i.e., choices among various types of renewable energy).



Debate 2: Global Challenges to Low Carbon Societies

[Chair] Jim Skea, Imperial College London, UK

Speakers:

Tae Yong Jung, KDI School, Republic of Korea
Derk Loorbach, Drift, the Netherlands
Abdul Hamid Zakri, Science Advisor to the Prime Minister of Malaysia. IPBES

How can the LCS community address transformational change and link the LCS agenda to wider economic and environmental concerns?

Speakers in the final panel session challenged the LCS community to move beyond its "comfort zone," developing and adopting tools and methods that could grapple with more transformational change and establish stronger links to development issues and to wider environmental challenges associated with biodiversity, land use and the provision of ecosystem services.

While the papers at the workshop acknowledged a sense of urgency about the LCS agenda, the solutions and analysis did not appear to match this urgency. A more holistic and integrated approach was required.

Some argued that a degree of patience was required, as significant and unexpected changes did take place over time, such as the adoption of carbon taxes in China and Japan which had not been anticipated 20 years ago.

The meeting discussed the need to develop methods that could deal with transformational change and would facilitate researchers engaging with policymakers concerning unpredictability and disruption, given that the political system preferred the rhetoric of predictability and management control. There was debate, but no uniform view on the need for target-setting or whether targets needed to be uniform or differentiated.

It was argued that closer public involvement in policy making processes was needed and that this might be characterized as "policy engagement" rather than "public engagement."

There was a strong assertion that policies need to be based on sound science, but that a "policy relevant" rather than "policy prescriptive" approach to advice was more likely to engage the attention of policymakers.

Challenges and opportunities

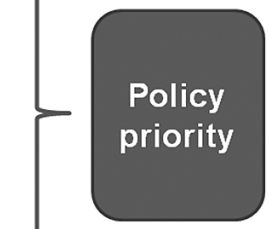
- There is a need to move the LCS agenda forward to encompass change that is more transformational than the incremental steps that have been envisaged to date.
- It is essential that the LCS agenda be linked to adaptation and the wider development agenda in respect of developing countries.
- The world does not develop smoothly but is subject to abrupt changes triggered by emerging developments. The set of LCS tools and methods needs to be expanded, for example through agent-based modeling, to better understand such developments.
- Much of green growth rhetoric is premised on incremental changes to the status quo which may be advanced by institutions embedded in an older, unstable regime.
- The LCS agenda should be opened up and a more holistic, integrated approach adopted than is linked to wider sustainability issues, notably biodiversity, water availability, food and poverty.
- Goods and services linked to the built environment and transport need to be designed to protect land and biodiversity while minimizing energy use and emissions of toxic materials.

KDI 국제정책대학원
KDI School of Public Policy and Management

Global Challenges to LCS

Issues

- Typical global public good issues
- Private vs. Public sector
- Developed vs. Developing countries
- Global vs. National/Local agenda
- Economic Development vs. Environment
- Mitigation vs. Adaptation priority
- Short-run vs. Long-run perspectives
- Bilateral vs. Multilateral arrangements
- Government-driven vs. NGOs & Civil society driven



Source: Tae Yong Jung, 2013

Participants List

Asayama, Yumiko
NIES, Japan

Ashina, Shuichi
NIES, Japan

Bengtsson, Magnus
IGES, Japan

Benioff, Ron
LEDS-GP, USA

Bigano, Andrea
FEEM/CMCC, Italy

Boer, Rizaldi
Bogor Agriculture University, Indonesia

Chea, Eliyan
Royal University of Phnom Penh, Cambodia

Ciello, Roverto Del
ENEA, Italy

Davide, Marinella,
CMCC, Italy

Dewi, Retno Gumilang
Institut Teknologi Bandung, Indonesia

Dhakal, Shobhakar
AIT

Faber, Baptiste Perissin
CIRED, France

Fujino, Junichi
NIES, Japan

Fujita, Tsuyoshi
NIES, Japan

Fujiwara, Noriko
CEPS, Belgium

Garcia, Kristine Bernardino
World Agroforestry Centre-Philippines, the Philippines

Garivait, Savitri
JGSEE-KMUTT, Thailand

Hak, Mao
Kyoto University, Japan

Hamanaka, Hironori
IGES, Japan

Hashimoto, Seiji
Ritsumei University, Japan

Hayashi, Yuri
Ministry of the Environment, Japan

Ho, Chin Siong
UTM, Malaysia

Hoshino, Yuko
Ministry of the Environment, Japan

Hu, Xiao
Fudan University, China

Immanuel, Gito Sugih
Bogor Agricultural University, Indonesia

Ishikawa, Tomoko
IGES, Japan

Jung, Tae-yong
KDI School, Republic of Korea

Jupesta, Joni
UNU-IAS

Kainuma, Mikiko
NIES, Japan

Kamal, Uy
Ministry of Environment, Cambodia

Kananurak, Jakkanit
TGO, Thailand

Kang, Mihee
Seoul National University, Republic of Korea

Kapshe, Mamohan
School of Planning and Architecture Bhopal, India

Kawamura, Mihoko
JICA, Japan

Kean, Fong Wee
WRI, USA/China

Kempener, Ruud
IRENA, Germany

Kobayashi, Hikaru
Keio University, Japan

La Motta, Sergio
ENEA, Italy

Lâm, Nguyn Tùng
ISPONRE, Vietnam

Lechtenboehmer, Stefan
WI, Germany

Leguet, Benoît
CDC climat, France

Limmeechokchai, Bundit
Thammasat University, Thailand

Lohani, Bindu N.
ADB

Loorbach, Derk
Drift, the Netherlands

Macandog, Damasa
University of the Philippines Los Baños, the Philippines

Masui, Toshihiko
NIES, Japan

Matsuo, Yuji
IEEJ, Japan

Matsuoka, Yuzuru
Kyoto University, Japan

Mori, Hideyuki
IGES, Japan

Mori, Mihoko
JICA, Japan

Moriguchi, Yuichi
University of Tokyo, Japan

Nakayama, Motoko
Ministry of Foreign Affairs, Japan

Nishioka, Shuzo
IGES, Japan

Nordmann, Julia
WI, Germany

Omura, Teruyoshi
Panasonic Corporation, Japan

Pachauri, Rajendra K
TERI, India

Pathak, Minal
CEPT University, India

Phongphiphat, Awassada
JGSEE, Thailand

Pulhin, Florencia
International Rice Research Institute (IRRI)

Roy, Joyashree
Jadavpur University, India

Sahara, Junichiro
JICA, Japan

Sang-Arun, Janya
IGES, Japan

Schulz, Niels
UNIDO Consultant

Sen, Le Thi Hoa
Hue University of Agriculture and Forestry, Vietnam

Sengchandala, Syamphone
Ministry of Natural Resources and Environment, Lao PDR

Sethi, Girish
TERI, India

Setioko, Bambang
Diponegoro University, Indonesia

Shrestha, Ram
AIT

Shukla, Priyadarshi R.
IIMA, India

Skea, Jim
Imperial College London, UK

Sudo, Tomonori
JICA, Japan

Sumi, Akimasa
NIES, Japan

Takemoto, Akio
APN

Tamura, Masami
Ministry of Foreign Affairs, Japan

Tanaka, Satoshi
Ministry of the Environment, Japan

Towprayoon, Sirintornthep
JGSEE, Thailand

Tsong, Teh Bor
UTM, Malaysia

Tsujihara, Hiroshi
Ministry of the Environment, Japan

Wakiyama, Takako
IGES, Japan

Wanadjaja, Timotheus Lesmana
International Society of Sustainability Professionals Indonesia (ISSP), Indonesia

Warrilow, David
UK-DECC, UK

Wells, John Bruce
Asia LEDS Partnership

Xia, Chun
WI, Germany

Zakri, Abdul Hamid
Science Adviser to the Prime Minister of Malaysia. IPBES

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	Abdul Hamid Zakri, Science Advisor to the Prime Minister of Malaysia. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)
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Acknowledgements

This Synthesis Report was developed with the aim of highlighting cross-cutting conclusions that emerged through the panel discussions held during the Fifth Annual Meeting of LCS-RNet, held in Yokohama, Japan on 22-23 July 2013.

Five years have passed since LCS-RNet was proposed at the G8 Environment Ministers' Meeting in Kobe. This year is the last year of the first phase of LCS-RNet's activities. During these five years, thanks to the dedicated efforts of scientists, policy-makers and other stakeholders from many developed and developing countries, low carbon society (LCS) research has made significant progress, and our meetings have increasingly identified and focused on key issues.

This year, scientists and policymakers gathered in Yokohama fully aware of the need both to transform social structures into those that utilize technologies having low dependence on energy and the need to promote green growth. This report summarizes the key findings of the discussions in Yokohama and looks ahead to the future development of the LCS agenda. I believe that this report will be useful and of interest to those who carry out LCS research, as well as to policymakers and other stakeholders.

This year, three meetings were held concurrently in Yokohama. In addition to the LCS-RNet Annual Meeting, there was a meeting of the International Forum for Sustainable Asia and the Pacific (ISAP) that was organized by IGES. One of the sessions of LCS-RNet was conducted as a joint session with ISAP in discussing "Knowledge Sharing Networks towards Realising Low Carbon Societies." The third meeting was that of the Low Carbon Asia Research Network (LoCARNet), in which researchers from Asian countries experiencing remarkable growth come together to consider paths leading to low carbon development. LoCARNet shares objectives and goals similar to those of LCS-RNet. We sincerely hope that LCS-RNet enhances its collaboration with LoCARNet in the near future.

Finally, I would like to express my gratitude to all of the chairs at the Yokohama meeting, as well as to those who have contributed to this report. I would also like to thank all of the participants at the meeting in Yokohama for their contributions.

Shuzo Nishioka

Secretary General
LCS-RNet Secretariat

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LCS-RNet Secretariat

c/o Institute for Global Environmental Strategies (IGES)
2108-11, Kamiyamaguchi, Hayama, Kanagawa, Japan, 240-0115
Website: http://lcs-rnet.org
Email: lcs-rnet@iges.or.jp

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