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Please refer to the LCS-RNet website at: http://lcs-rnet.org/meetings/2012/09/lcs_rnet_oxford_meeting.html

Preface

The International Research Network for Low Carbon Societies (LCS-RNet) was established in 2009 on the initiative of the G8 Environmental Ministers Meeting (G8 EMM). At their 2008 meeting in Kobe, G8 Environment Ministers recognised the need for each country to develop its own vision of a low-carbon society (LCS); what it would look like; and how the transition might be achieved. This would contribute to the goal of cutting global emissions of greenhouse gases by half or more by 2050, to keep the rise of global average temperature below 2 degrees, a level that is believed would prevent dangerous impacts on the majority of the earth's eco-systems. Given this, the G8 Environment Ministers in Kobe strongly supported the establishment of the 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, finance and technologies, gathered in Bologna, Italy, for the Inaugural Meeting of the LCS-RNet. Participants at that meeting discussed research needs for 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 and third annual meetings were held in Berlin, Germany in September 2010 and Paris, France in October 2011. These meetings noted the need for science to explicitly aid the process of transition towards a LCS. The importance of linkages between the research community and governments as well as links with a wider range of stakeholders was emphasised. The Paris meeting addressed the many facets of the "paradigm shift" in climate policies demanded by the 2010 Cancun agreement. The meeting noted that this "paradigm shift" offered substantial opportunities to reconcile long-term challenges with shorter-term economic priorities.

The 4th Annual Meeting of the LCS-RNet was held on 17-18 September, in Oxford, United Kingdom (UK), co-hosted by the UK Energy Research Centre (UKERC) and the UK Department of Energy and Climate Change (DECC). The meeting took place at a challenging time for low-carbon transitions, with continuing macroeconomic challenges, technological challenges, changing policy priorities and a resurgence of the fossil fuel economy. At the same time, climate change research evidence has only reinforced the urgency of decarbonising 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 creation 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.

This Synthesis Report has been drafted by the LCS-RNet Steering Group plus colleagues from Japan and the UK. We would like to express our sincere thanks to Ms. Karyn MacBride, Dr. Lenka McAlinden, Ms. Sarah Gardner, Ms. Lucy Mahoney and Mr. Timothy Churchouse of the UKERC Meeting Place, Shuzo Nishioka, Takako Wakiyama and Tomoko Ishikawa from the LCS-RNet Secretariat as well as Ms. Kyoko Miwa and Dr. Rahul Pandey.

We would also like to express our special appreciation to the UK Department of Energy and Climate Change (DECC), for their generous support for LCS-RNet activities during 2012. We also would like to express our appreciation to governments and LCS-RNet contact points for their support and advice. Particular thanks are due to Dr. David Warrilow of DECC, Professor Jim Skea of Imperial College London and Dr. Mark Winskel of UKERC and Edinburgh University for their strong leadership in planning the meeting and for their hospitality in Oxford, UK.

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Key Findings

The 4th Annual Meeting of the International Research Network for Low Carbon Societies (LCS-RNet) took place against the background of continuing difficult macroeconomic conditions as well as emerging responses to the Fukushima accident in Japan and elsewhere. The key challenge that defined discussions at the meeting was how to maintain momentum towards a low-carbon society (LCS) while taking full account of the current social and economic background. At the most general level, the recommended responses involve devising strategies for LCS that go with the grain of current policy concerns and developing synergies between LCS policies and those in other domains. The key findings from the meeting reflect this broad underlying response. These findings lie in five areas: technological and behavioural responses; finance and green growth; valuing carbon and the co-ordination of polices at multiple levels of governance; developing scientific evidence and the science-policy interface; and enhancing international collaboration.

Technology development and behaviour change

> The potential of technology options for an energy transition, such as carbon capture and storage (CCS), nuclear and renewables including bioenergy, wind and solar, has been examined in many countries. A key finding is that accelerated innovation, cost reduction, appropriate arrangements for risk-sharing and the enhancement of local benefits will be key factors in public acceptance and successful deployment.

> Decarbonising energy supply is not sufficient in itself if ambitious climate targets are to be met. A transformation of the energy system is needed which must include effective strategies to promote energy efficiency and savings, as well as innovative approaches that integrate energy supply and demand.

> Conventional energy policies have promoted energy security by focusing on sources of supply. More attention is now being paid to energy demand reduction through energy saving and energy efficiency. Progress is beginning to be made in areas such as policy design, lifestyle change and accelerated technology development.

> Recent behavioural research provides some evidence that people are willing and able to change the way they consume energy. The Fukushima accident has triggered both behaviour change and discussions on energy sector reform in Japan. Increased social awareness and corresponding political pressure could be a trigger for similar developments in other countries.

Climate finance and green growth

> Confronted with current financial constraints, OECD countries can facilitate economic recovery through green growth policies that will also foster LCS. Green growth policies in developing countries can be used to enhance the low-carbon investments that will support economic activity associated with the growth of domestic demand.

A key challenge is to mobilise private capital to meet the up-front costs associated with capital intensive energy system transformation technologies. Policies that de-risk investment in low-carbon technologies could help to draw in funds from new sources, including from pension funds which necessarily take a long-term view. New forms of "citizens financing" (cooperatives, local banks and municipally owned utilities) can help to drive the process bottom up.

Coordinating national and sub-national policies and the value of carbon

Establishing a value for carbon through innovative financial mechanisms such as the development of carbon budgeting systems or setting a "social value for carbon" could promote investment in low-carbon projects at both the national and local levels. Finance mobilised through specific climate-related international mechanisms such as the Global Climate Fund can also be used to support the transition toward low-carbon development pathways.

In the ideal world, there would be a global price for carbon. However, many political obstacles stand in the way. The obstacles include different perspectives on equity between north and south and competitiveness questions affecting countries in the north. New regional emissions markets could start to address the problem of carbon leakage associated with unilateral policies.

In developing and expanding cities, lessons can be learned from past mistakes. Boundaries between jurisdictions are multiple and complex and there is a need for strong networks for exchanging resources and transferring knowledge and technologies. The integration of cities within regional markets is important for the development of new business opportunities.

Science-policy interaction for the low-carbon transition

Scientific evidence has contributed to the policy-making process and underpinned LCS policies in a number of countries. By exchanging knowledge and science-into-policy success stories, lessons can be learned which take account of national specificities in terms of norms, perceptions, history, and institutional arrangements.

The Fukushima accident highlights the importance of reviewing technology costs and rigorously identifying and managing risks. The promotion of evidence-based understanding will clarify the way in which risks can be managed and mitigated.

International collaboration to enhance low-carbon activities

Many developing countries are making progress through the initiation of planning, implementation and assessment mechanisms for climate and energy policy-making, urban planning processes and the establishment of policies and systems for managing forests.

More effective cooperation between developed and developing countries can be promoted through knowledge-based networks. Partnerships between funding agencies, the research community, businesses and governments, coupled with a global dialogue amongst relevant stakeholders, can help to narrow knowledge gaps and stimulate green growth.

Synthesis Report

This Synthesis Report must be seen in the context of difficult macroeconomic conditions as well as emerging responses in Japan and elsewhere to the Fukushima accident. Maintaining momentum towards a low-carbon society (LCS), while taking full account of the current social and economic background, is a key challenge. Strategies for developing LCS need to go with the grain of current policy concerns and exploit synergies between LCS policies and those in other domains. The key findings in this report reflect this broad approach. These findings lie in five areas: technological and behavioural responses; finance and green growth; valuing carbon and the co-ordination of polices at multiple levels of governance; developing scientific evidence and the science-policy interface; and enhancing international collaboration.

Technology development and behaviour change

The potential of technology options for an energy transition, such as carbon capture and storage (CCS), nuclear and renewables including bioenergy, wind and solar, has been examined in many countries. A key finding is that accelerated innovation, cost reduction, appropriate arrangements for risk-sharing and the enhancement of local benefits will be key factors in public acceptance and successful deployment.

The Fukushima accident has demonstrated the great vulnerability of energy systems to extreme natural events and has highlighted the need to protect energy systems from the impact of extreme events whose frequency may increase as a result of climate change. The deep transformation in the way that electricity and heat will be generated as the result of the transition to a low-carbon society will also help to build a more resilient energy system. The transition will require the following elements: a diverse and decentralised energy supply including the development of more flexible, locally-sited renewables; the avoidance of high levels of dependence on specific types of power generation; the demonstration and deployment of carbon capture and storage (CCS) which will allow the low-carbon use of fossil fuels; the development of smart grids; and greater regional interconnections. The latter will facilitate the better integration and more efficient use of intermittent low-carbon electricity and allow the export of low-carbon energy, especially to countries with higher shares of electricity in final demand.

However, renewables and CCS are less mature technologies and there are controversies and high levels of uncertainty associated with social acceptance, cost effectiveness and environmental impact. These uncertainties relate to the sourcing and availability of new materials needed for components, currency exchange fluctuations, geopolitical factors and supply chain constraints. Further research, development and demonstration is needed. The regular and timely provision of scientific evidence is needed to support pilot plants and demonstration schemes. For instance, recent research on offshore wind suggests that significant capital cost reductions can be expected by the mid-2020s.

Decarbonising energy supply is not sufficient in itself if ambitious climate targets are to be met. A transformation of the energy system is needed which must include effective strategies to promote energy efficiency and savings, as well as innovative approaches that integrate energy supply and demand.

Well-designed legislation can create a coherent framework for policy implementation comprising identification of technology options and emission reduction potential, target setting, independent review and systems of monitoring and evaluation. In the UK, for example, a carbon budget system has been developed to allow a longer-term perspective while maintaining flexibility in policy-making and implementation. Evidence-based advisory groups, drawing on government, industry, NGOs and academic researchers, can also systematically assess uncertainties and disagreements in energy policy. In the UK, if climate targets are to be met, policies will need to be tightened, for example by reviewing the 'Green Deal' financial mechanism and reforming electricity markets.

Conventional energy policies have promoted energy security by focusing on sources of supply. More attention is now being paid to energy demand reduction through energy saving and energy efficiency. Progress is beginning to be made in areas such as policy design, lifestyle change and accelerated technology development.

Energy efficiency improvement contributes to the achievement of climate targets as well as energy security. Common patterns are emerging in decarbonisation policies across a number of different countries. Fundamental system change is being sought through large improvements in energy efficiency and high shares of low-carbon (particularly renewable) energy. The decarbonisation of supply chains and changes in industrial structure are also making key contributions. However, further efforts are needed in energy efficiency and supply chain management. Energy efficiency in the built environment has improved, but there is unrealised potential for energy efficiency in transport and infrastructure. Lock-in effects represent a challenge to realising the potential in these sectors. The overall solution consists of greater energy efficiency, growth in renewables, CCS and supply chain/system change.

While acknowledging barriers to energy efficiency improvement, many countries have promoted energy demand reduction and developed energy efficiency strategies with the aim of smoothing the deployment of more efficient technologies. Government intervention is needed to lower barriers associated with, for example, transaction costs and high up-front expenditure. Innovative, 'win-win' policies can help people pay for improvements such as insulation through savings on their energy bills. Market-based policies (e.g. white certificates in Italy) have been shown to be effective, while regulatory policy measures (e.g. performance standards) have also played an important role. The co-benefits of investment in low-carbon technologies such as employment creation, economic growth and cost reduction need to be emphasised. The magnitude of possible rebound effects, whereby people increase their demand for energy services as energy efficiency increases, can be estimated. These effects appear to be limited and can be mitigated by careful policy design.

The strengths of current energy efficiency policies include the provision of information to consumers through, for example, appliance labels, and the regular updating of building regulations with comparatively strict requirements. The weaknesses of policy include a lack of coordination and vision among different governmental bodies, a strong incumbent industrial lobby and insufficient visibility of labels for buildings and cars.

Recent behavioural research provides some evidence that people are willing and able to change the way they consume energy. The Fukushima accident has triggered both behaviour change and discussions on energy sector reform in Japan. Increased social awareness and corresponding political pressure could be a trigger for similar developments in other countries.

Technology and economic barriers are not insurmountable, and the biggest barriers to transition perhaps lie in the social and political domains. The complexity of climate science communication and campaigns by vested interests are major obstacles. However, substantial changes can be triggered by crisis situations. After the Fukushima accident, the Japanese government launched an extensive power-saving campaign in the summer of 2011 and imposed a cap on power use for large industrial consumers. As a result, electricity consumption by large and small consumers in the period July to September 2011 was 15% lower than for the comparable period in the previous year. Small consumers and households reduced energy demand voluntarily without being legally required to. These demand reductions persisted in 2012. Although such actions were originally triggered by an emergency, raising awareness and confronting the need for change can lead to more permanent changes in lifestyle.

To avoid any return to former patterns of behaviour, new lifestyles need to be promoted and socially embedded. Empowerment through information, sustained campaigns and collaboration between diverse actors is key. The Japanese experience post-Fukushima indicates that behaviour changes can be achieved voluntarily when people act with a sense of purpose. Lifestyle changes which lower electricity consumption can indeed turn out to be positive in their own right.

Climate finance and green growth

Confronted with current financial constraints, OECD countries can facilitate economic recovery through green growth policies that will also foster LCS. Green growth policies in developing countries can be used to enhance the low-carbon investments that will support economic activity associated with the growth of domestic demand.

A clear articulation of green growth and the directions it might take can help to reconcile the aspiration for a low-carbon society with the means to tackle financial constraints. Green growth is economic growth that is environmentally sustainable. Rather than constituting a new paradigm, it represents a means to operationalise sustainable development.

Green growth will enable developing countries to achieve robust growth without locking themselves into unsustainable patterns. Green growth policies need to focus on what is required in the next 5-10 years in order to avoid locking-in investments that will lead to irreversible environmental damage. Triggering a wave of low-carbon infrastructure investment in least-developed countries will avoid their being directed into energy intensive pathways. Financial and technical support for specific technologies and new sunrise industries will be needed to develop low-carbon industries and markets. The analysis and investigation of potential areas for support will help to ensure effective implementation and the efficient use of resources.

The concept of green growth is equally applicable in developed countries. Green growth perspectives can be integrated into national and sub-national policy-making to align revenue-raising sources with low-carbon goals and tap new sources of investment finance. Green growth concepts can address environmental protection and the efficient use of natural resources, recognising that the source of many problems is embedded in current societal arrangements. Environmental policy with a green growth perspective can promote green jobs and the production of sustainable goods and services. Although it is too much to expect green growth policies to trigger a miracle in terms of employment, environmental policies can promote innovation and cost reduction through productivity gains and the sustainable and efficient use of energy and resources. In this sense, green growth can meet basic service needs and create new markets.

A key challenge is to mobilise private capital to meet the up-front costs associated with capital intensive energy system transformation technologies. Policies that de-risk investment in low-carbon technologies could help to draw in funds from new sources, including from pension funds which necessarily take a long-term view. New forms of "citizens financing" (cooperatives, local banks and municipally owned utilities) can help to drive the process bottom up.

The engagement of the private sector is important because it will enhance access to information about low-carbon products. This will further support innovation through research and development activities. Improving the investment climate for the private sector requires, among other things: political support; a stable legal environment; transparent, fair and effective regulation; mechanisms to promote specific business models such as public private partnerships (PPPs); the availability of concessional funding; and grants for project preparation and seed capital.

It is estimated that 0.5% of the total sum of private capital assets would be enough to finance the up-front costs of a global energy systems transition. Top-down mechanisms (e.g. the Tobin Tax) have the potential to redirect finance into tangible low-carbon investments (e.g. renewable energy/ efficiency). Other top-down mechanisms include phasing out fossil fuel subsidies and directing public budget savings to incentives for energy system transformation. Bottom-up initiatives based on "citizens financing" through mechanisms such as cooperatives, local banks and municipally owned utilities could also have a significant role to play in many countries and would help to engage citizens in the low-carbon transition.

Coordinating national and sub-national policies and the value of carbon

Establishing a value for carbon through innovative financial mechanisms such as the development of carbon budgeting systems or setting a "social value for carbon" could promote investment in low-carbon projects at both the national and local levels. Finance mobilised through specific climate-related international mechanisms such as the Global Climate Fund can also be used to support the transition toward low-carbon development pathways.

A climate-friendly financial architecture could reduce uncertainties, enhance investor confidence in low-carbon projects and erode the attractiveness of speculative investments. Public guarantees will lower the risks of low-carbon investment and redirect savings arising from low-carbon projects on to the balance-sheet. Financial institutions are not currently persuaded of the potential opportunities provided by low-carbon projects. Political signals/financial instruments are consequently needed to bridge the gap. Policy uncertainty due to fragmentation across different layers of government undermines the stable investment environment needed for low-carbon technologies and businesses.

The social cost of carbon should be reflected in a price signal established in a way that has broad political acceptability. For instance, the creation of new markets and the issuing of publicly guaranteed carbon certificates by governments will increase understanding of the social cost of carbon. The concept of carbon value also needs to be promoted through policy and education. Revenue from carbon taxes can be recycled to finance other social benefits. In an environment where the private sector is reluctant to invest, the public sector needs to take a leading role. However, it should be noted that, while the public sector is important for paving the way towards a greener economy through improved policies, regulations and institutions, it does not by itself have the financial means or the entrepreneurial ability to intervene directly in the economy as a producer or trader.

In the ideal world, there would be a global price for carbon. However, many political obstacles stand in the way. The obstacles include different perspectives on equity between north and south and competitiveness questions affecting countries in the north. New regional emissions markets could start to address the problem of carbon leakage associated with unilateral policies.

In order to address competitiveness issues, the significant share of production costs associated with raw materials and the risk of carbon leakage need to be considered. Making low-carbon projects more competitive can be seen as an opportunity for the host country, as associated risks will be lowered by sharing costs through international trade. Carbon trading entails regulatory risk, but it also establishes carbon assets which are managed by a group of countries. The Eurozone economies, for instance, could improve private companies' confidence in low-carbon policies by addressing regulatory risk.

The principles underpinning north-north and north-south trade need to be redefined. The political ambition should be to create a level playing field by tackling carbon leakage through new markets and regional emissions trading.

In developing and expanding cities, lessons can be learned from past mistakes. Boundaries between jurisdictions are multiple and complex and there is a need for strong networks for exchanging resources and transferring knowledge and technologies. The integration of cities within regional markets is important for the development of new business opportunities.

Lessons can be learned from the past, both when expanding existing cities and developing new ones. There is a need to build strong networks right from the start. This does not apply only to the transportation of goods and resources, but also to the transfer of knowledge and technology and the transmission of information through investment. Networks and interactions at the sub-national level, coupled with measures to influence demand side activities, can lead to the transformation of urban infrastructure and the efficient use of energy and resources. Ensuring high quality urban development and reorienting investment in green urban infrastructure will have a major impact on residential energy use and emissions and will avoid locking in to the 'wrong path' in terms of urban form and design. At the same time, measures to enhance the efficiency of existing cities should be applied.

New urban planning concepts can enhance the transition of urban infrastructure. Compact city concepts, for instance, could result in both environmental and economic benefits as it has been shown that decreasing population density leads to increased emissions. Synergies between urban planning policies, low-carbon society policies and financial mechanisms can result in more efficient use of energy and resources and hence reduced energy demand. In considering the sustainability of cities, economic linkages and interconnections with rural areas also have to be factored in.

Science-policy interaction for the low-carbon transition

Scientific evidence has contributed to the policy-making process and underpinned LCS policies in a number of countries. By exchanging knowledge and science-into-policy success stories, lessons can be learned which take account of national specificities in terms of norms, perceptions, history, and institutional arrangements.

Policy confusion following the Fukushima accident, coupled with industry lobbying, showed that nominally science-based policy-making had not succeeded in minimising risks. As a result, Japanese people felt misled and trust in science fell. It is evident therefore that public dialogue and participation must be an important part of the decision-making process if there is to be transparency, information sharing and mutual understanding.

The perception of scientific integrity needs to be re-established. The scientific community should be more active in informing decision-makers about underlying evidence and the expected impacts on society. The regular and timely provision of scientific evidence is important. Uncertainty about climate change creates huge problems for decision-makers. Knowledge institutions and their linkages with the policy-making process are critical. Scientific understanding of climate change damage and the extent to which different levels of damage are acceptable will be important evidence in developing national policy frameworks.

The Fukushima accident highlights the importance of reviewing technology costs and rigorously identifying and managing risks. The promotion of evidence-based understanding will clarify the way in which risks can be managed and mitigated.

A more robust evidence base and transparency of policy-making process is necessary to enhance the credibility of policy decisions. The Fukushima accident led Japan to review the methods used to estimate costs, assess social and environmental impacts and re-examine the political and technical options associated with energy policy. Following Fukushima, Germany decided to speed up the phase-out of nuclear power and shift from fossil fuels to renewables. The Fukushima accident triggered an improvement in the understanding of costs and risks accompanied by a shifting away from short-term priorities towards longer term perspectives.

International collaboration to enhance low-carbon activities

Many developing countries are making progress through the initiation of planning, implementation and assessment mechanisms for climate and energy policy-making, urban planning processes and the establishment of policies and systems for managing forests.

Developing and developed countries share common challenges in implementing climate policy. Four key issues to be considered in promoting low-carbon societies in developing countries are: 1) an adequate regulatory and policy framework; 2) the engagement of private sector; 3) strengthening research and development capacity; and 4) predictable access to adequate financing.

Developing countries and emerging economies need to adopt pragmatic strategies by aligning climate mitigation activities with the realisation of local co-benefits. For instance, measures affecting land use, land use change and forestry can be given high priority. Knowledge networks engaging policy-makers and low-carbon research teams can help to design and implement LCS measures at the city level using integrated assessment models for example. Modelling the socioeconomic implications of climate change and sustainable development in developing countries faces a number of challenges including: lack of historic data of GHG emissions; lack of capacity for managing emission inventories; and inconsistencies in macroeconomic modelling

Therefore, institutional mechanisms for channelling international support for research, technology and finance will play a crucial role in facilitating domestic action in developing countries. Collaborative networks between researchers, national policy-makers, local policy-makers and communities are necessary to enhance the acceptability and smooth the implementation of local actions. Such a network in Asia has already promoted the design and implementation of LCS measures.

More effective cooperation between developed and developing countries can be promoted through knowledge-based networks. Partnerships between funding agencies, the research community, businesses and governments, coupled with a global dialogue amongst relevant stakeholders, can help to narrow knowledge gaps and stimulate green growth.

Knowledge-sharing, dialogue and consensus building aimed at enhancing the transparency of data collection and decision-making and examining best practice can help to stimulate innovation and trade. Countries are approaching the same problem in different ways. A research network such as LCS-RNet, which focuses on the specific topic of low-carbon societies, can play a unique role in bringing together people from different countries and backgrounds to discuss their findings frankly round the same table. Such a network should be a platform for enhancing interaction among policy-makers, researchers, business, citizens and other stakeholders. This will raise the public profile of LCS issues, bring together the different groups that make up society and result in a sharing of objectives and goals. However, further participation from policy-makers and researchers is needed.

LCS-RNet, through day-to-day interaction amongst researchers in developed countries and dialogues between policy-makers and the research community, has provided guidance on how to mobilise the scientific findings and evidence required to make the transition to a low-carbon society. Looking to the future, the network needs to extend knowledge-sharing activities to emerging economies and other developing countries, as well as deepening opportunities for the exchange of knowledge on low-carbon society and green growth. At the same time, LCS-RNet invites policy-makers to recognise the importance of enhancing scientific support for climate policy design and implementation and encouraging collaborative research and information dissemination.

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P2-1	*Technology and policy assessment (TPA)* Phil Heptonstall (Imperial College)
P2-2	*Science and policy interface: Global perspective and local practice, based on a study, "Economic analysis of climate change in Korea"* Hoesung Lee (Korean University)
P2-3	*Changes in science-policy relation after Fukushima: Impact on low-carbon Japan* Shuzo Nishioka (IGES)
P2-4	*The German "Energiewende": Nuclear phase out, climate protection and the interaction between science and politics* Peter Hennicke (Wuppertal Institute)
Discussion	
Future of LCS-RNet Chair : Jim Skea (Imperial College)	
D-1	Hiroshi Tsujihara (Ministry of the Environment, Japan)
D-2	Shuzo Nishioka (LCS-RNet Secretariat/ IGES)

Day 2	
Keynote address	
Chair : Jean-Charles Hourcade (CIRED)	
K-1	*Inclusive green growth: The pathway to sustainable development* Stéfan Hallegatte (World Bank)
Plenary Session 3: International co-operation and finance	
Chair : Sergio La Motta (ENEA)	
P3-1	*Are climate policies conditional upon reforms of the financial systems?* Jean-Charles Hourcade (CIRED)
P3-2	*Mitigation and trade in energy-intensive commodities* Michael Grubb (University of Cambridge)
P3-3	*Climate change and development in Africa* Tomonori Sudo (JICA)
P3-4	*Climate negotiations: The symbiotic relationship between the FCCC and the outside world* Joyeeta Gupta (Amsterdam Global Change Institute)
Parallel sessions 2	
Regional co-operation: Asian case study **Chair : Mikiko Kainuma (NIES)**	
PS2.1-1	*Regional co-operation to realise low-carbon development in Malaysia:* Ho Chin Siong (Universiti Teknologi Malaysia)
PS2.1-2	*Development of Thailand's NAMAs for low-carbon green growth* Bundit Limmeechokchai (Thammasat University)
PS2.1-3	*Designing low-carbon development in Indonesia:* Rizaldi Boer (Bogor Agriculture University)
Global approaches **Chair : Jean-Charles Hourcade (CIRED)**	
PS2.2-1	*Delivering climate compatible development* Sam Bickerseth (CDKN)
PS2.2-2	*Dropping climate policy: Does it really increase wellbeing? A CGE perspective on sustainability* Fabio Eboli (CMCC/FEEM)
PS2.2-3	*Cities & green growth* Joaquim Oliveira Martins (OECD)
Plenary session 4: Low-carbon transitions as lever for sustainable development	
Chair : Peter Hennicke (Wuppertal Institute)	
P4-1	*Land versus energy: The new gordian knot of low-carbon strategies* Thierry Brunelle (LSCE/CIRED)
P4-2	*Urbanization, urban infrastructure and low-carbon cities* Shobhakar Dhakal (AIT)
P4-3	*Post carbon pathways: Towards a just and sustainable post carbon future* John Wiseman (University of Melbourne)
P4-4	*UK 2050 pathways calculator* Matt Webb (DECC)
Final debate: Will we navigate recovery from the financial crisis to a sustainable future?	
Chair : Mark Winskel (UKERC, Edinburgh University)	
F-1	*Meeting carbon budgets – 2012 progress report* Adrian Gault (CCC)
F-2	Jean-Charles Hourcade (CIRED)

Acknowledgement

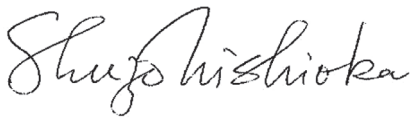
This Synthesis Report was developed with the aim of highlighting cross-cutting conclusions from panel discussions held during the 4th Annual Meeting of LCS-RNet, held in Oxford, United Kingdom on 17-18 September 2012.

Four years have passed since LCS-RNet was proposed at the G8 Environment Ministers' Meeting in Kobe. During these three 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 policy-makers gathered in Oxford fully aware of the needs to transform its social structures into a society with technologies having low dependence on energy, and promote green growth. This report summarises key findings of the discussions in Oxford and anticipates the future development of the LCS agenda. I believe that the report will be useful and of interest to those who carry out LCS research as well as to policy-makers and other stakeholders.

I would like to take the opportunity to introduce the initiation of "Low Carbon Asia Research Network (LoCARNet)", which is a network for researchers who are deeply involved in low-carbon development policy processes in Asia. This Asian version low-carbon network will share the similar objectives and goal with that of LCS-RNet. We sincerely hope that LCS-RNet will work together with the Asian network sometime in the near future.

Finally, I would like to express my gratitude to all of the chairs at the Oxford 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 Oxford for their contributions. I hope that we can meet again at the 5th LCS-RNet Annual Meeting.



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Secretary General
LCS-RNet Secretariat

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