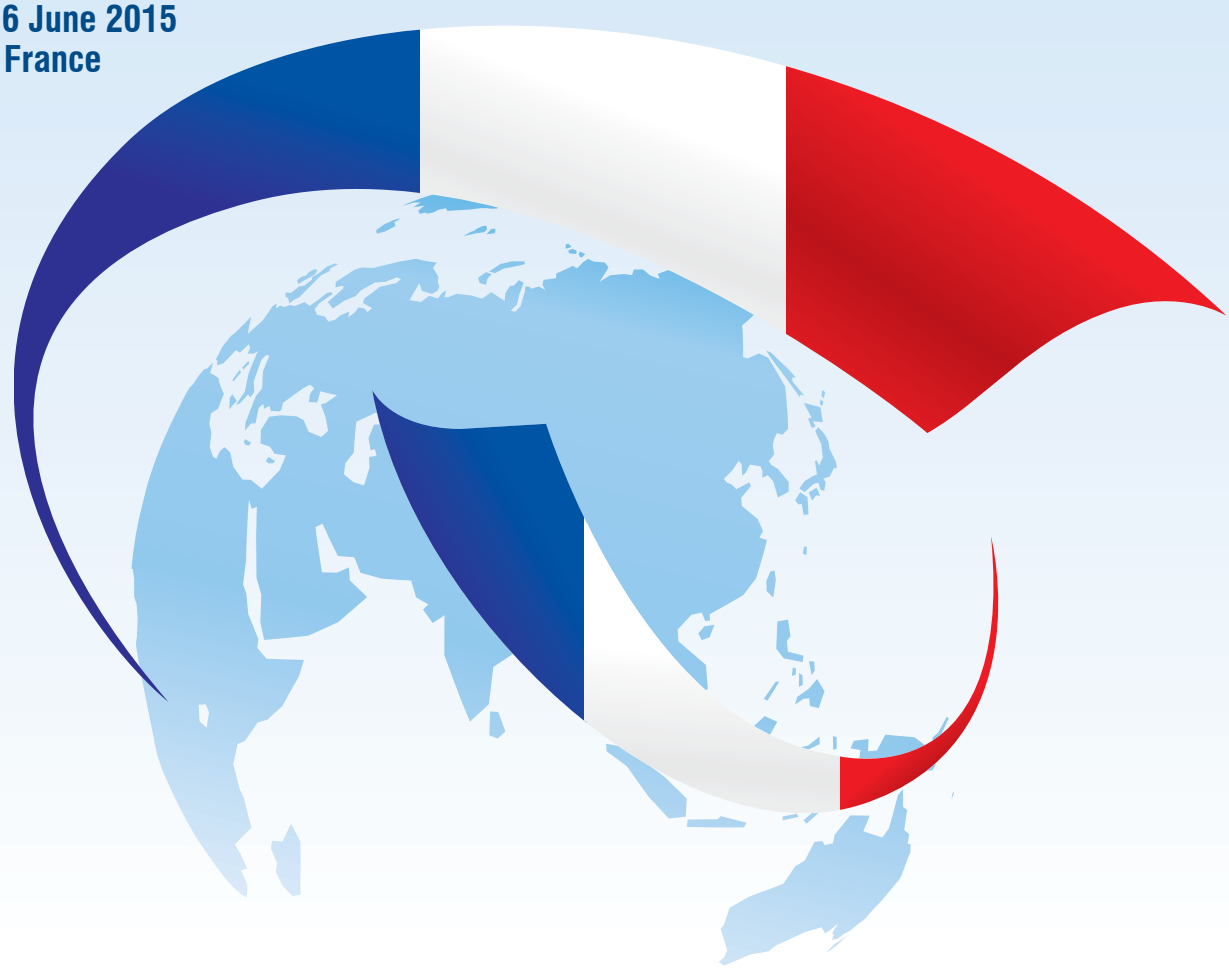
LCS·R Net

Towards an equitable low carbon development

A science-policy dialogue for COP21

Synthesis Report of Seventh Annual Meeting
International Research Network for Low Carbon Societies
15 – 16 June 2015
Paris, France



Host:
The International Research Center on Environment and Development (CIRED)
The French Ministry of Ecology, Sustainable Development, and Energy (MEDDE)

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Please refer to the LCS-RNet website at: http://lcs-rnet.org/7th_annual_meeting_presentations/

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 G8 Environment Ministers recognised the need for each country to develop its own vision of a low carbon society (LCS) and how such transition might be achieved. This vision would aim to cut global greenhouse gas emissions by more than 50 per cent by 2050, in order to prevent average global temperatures rising above 2 degrees Celsius and avoid dangerous impacts on Earth's major eco-systems. The G8 Ministers initiated LCS-RNet as a strong endorsement of this pathway towards LCS.

The seventh Annual Meeting of LCS-RNet was held over 15th to 16th June, 2015 in Paris, France, and was co-hosted by the French International Research Center on Environment and Development (CIRED) and the French Ministry of Ecology, Sustainable Development, and Energy (MEDDE).

The meeting addressed visions of the transformation of energy systems; urban dynamics, rural development and decarbonisation; common but differentiated responsibilities; and triggering the transformation in a challenging financial context.

It also considered a statement from LCS-RNet, which will be disseminated in the process towards the 21st Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change (UNFCCC) in Paris. The authors hope that an international agreement on climate change will be agreed in 2015; national policy frameworks will then be developed over the next five years and implemented from 2020; and the statement from LCS-RNet can provide good proposals for resolving issues on climate change.

This Synthesis Report was drafted by the session chairs and rapporteurs of the Annual Meeting together with the LCS-RNet Steering Group. Sincere thanks go to the contributions and support provided by Mr. Richard Lavergne of MEDDE, Dr. Christophe Cassen and Ms. Arancha Sánchez of CIRED as well as Dr. Shuzo Nishioka, Dr. Mikiko Kainuma, Ms. Tomoko Ishikawa, Ms. Michiko Inoue and Ms. Takako Ono of the LCS-RNet Secretariat.

We would also like to express our special appreciation to the MEDDE, the French Environment and Energy Management Agency (ADEME), the Chair <Long term modeling and sustainable development> (ENPC - Mines Paristech) and the Ministry of the Environment of Japan (MOEJ) for their generous support of this year's LCS-RNet activities. We greatly value the support and recommendations provided by governments and LCS-RNet contact points. Particular thanks are due to CIRED – for their strong leadership in planning the meeting and for their hospitality in Paris.

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Key Findings

Climate change mitigation can no longer be seen as an isolated problem. A low carbon society requires multi-objective, long-term, sequential policy strategies for reaching broad societal goals including the transformation of energy systems, decarbonisation of cities and rural areas, picking the benefits of cooperation, and appropriate financing. The 7th LCS-RNet Annual Meeting focused on these four themes and discussed how the Intended Nationally Determined Contributions (INDCs) and Sustainable Development Goals (SDGs) can lead to funding challenges and benefits of the cooperation as well as the implications for COP21.

Visions of the transformation of energy systems

- **Sustainable energy systems are crucial to all dimensions of sustainable development.**
  - Sustainable energy systems create significant opportunities for green economic development, as they need a substantial shift of investment from the fossil, energy supply side, oriented towards energy efficiency and low carbon supply systems.
  - For this transition to happen, we need future visions, scenarios and roadmaps as well as policies and governance for implementing sustainability transitions and strategies.
- **A common goal with different national contexts needs to be considered.**
  - There are many feasible transition pathways for energy systems that are compatible with climate policy objectives. Preferred pathways may vary significantly between countries and regions. Local specificities and social acceptance (including the availability of adequate human resources) also need to be taken into account.
  - There will be controversies about the performance, economic viability, environmental performance and social acceptability of some of the technical options that are being deployed. It is, therefore, crucial that governments engage their citizens and take their views into account.
- **Investment patterns are decisive.**
  - Energy systems involve expensive and long-lived infrastructures in production, transport (e.g. power grids) and end-uses (e.g. buildings). These characteristics create path dependencies that can be barriers to change towards increasing sustainability. Existing structures create technology lock-ins and involve vested interests.
  - The next decades will need high investment into most components of the energy demand and supply systems worldwide. Industrialised countries have to reinvest, while developing countries are building up stocks of buildings and infrastructure.
  - Decisions taken now determine if these investments will continue to lock in unsustainable patterns of an inefficient use of high carbon energies, or will be directed into more sustainable solutions (e.g. efficiency and renewable supply), which, from a socio-economic perspective are often much more attractive.

Urban dynamics, rural development and decarbonisation

- **A large mitigation and adaptation potential lies in urban and rural contexts.**
  - Urban and rural flows, as well as interconnection in between, are significant with potential strong conflicts between urban and rural development. Urban areas strongly depend on rural integrity to ensure the availability of water as well as food and resources. Therefore, these issues must be treated with a holistic approach, in a sustained and equitable economic development perspective.
  - Governance needs to unleash the large mitigation and adaptation potential in the urban and rural contexts. National and regional/local governments can participate in incentivising mitigation and adaptation actions taken at the city and rural levels.
- **Cities will play a major role in shaping the transition to a low carbon society.**
  - Cities are crucial actors since they can directly influence the planning of key issues such as traffic, urban land use, buildings, and waste management.
  - The role of cities needs to be mainstreamed in national and international climate policies.
  - As mobility depends not only on the price of fuels but also on indirect factors such as housing costs, (for example, the "gentrification" of downtown areas indirectly creates energy poverty traps for commuters in the suburbs) and infrastructure, (for example, access to transport services or interconnection between road and rail), policies should be specifically designed to tackle these issues.
- **Climate actions in rural areas differ by spatial dynamics and development patterns.**
  - Rural systems vary from country to country: as an example, the role of the forests and the role of the agricultural areas, especially those close to the urban areas, are both crucial in each policy intended to reduce GHG emissions, and therefore in a LCS perspective.
  - Rural agro and forestry areas provide wide ecosystemic services that are under threats by climate changes and adaptation strategies are needed to ensure the flow of resources from rural areas to urban ones in a long-term perspective. Moreover, rural areas contribute strongly to the GHG global balance by acting as an emission source as well as a sink. Some of the above listed elements are driven by the urban and population growth, while others are more finite inside the rural agro-ecosystem.

The CBDR principle revisited: From burden sharing to picking the benefits of cooperation

- **A paradigm shift, seeing the fight against climate change as an economic opportunity instead of as a burden to be transferred to others, is necessary.**
  - While there are several principles under discussion, we should explore win-win solutions in accordance with every country's national circumstance. From this perspective, concepts of nationally appropriate mitigation actions (NAMAs) and intended nationally determined contributions (INDCs) become important. Under these concepts, we can consider solutions on climate change issues not under a simple bipolar relationship between developed and developing countries, but under various situations depending on every country's national circumstances.
  - Commitment under the CBDR principle should be geared towards maximising development opportunities and obligations of cooperative conduct rather than burden sharing. The responsibility of developed

countries is to propose a framework for helping developing countries to implement and reinforce their INDCs through universal access to:

- Climate finance, starting from the upgrading of the Green Climate Fund
- Knowledge networks and communication tools to share lessons and experiences
- High-level academic education, international scientific programmes and R&D cooperation

- **Technological innovation is a path-dependent process in which history and expectations matter greatly.**
  - Path dependence and system inertia imply that delaying policies that redirect innovation towards clean technologies significantly increases costs in the future.
  - Implementation of low carbon policies will require substantial financing and transformational changes in the energy supply. However, combining climate and sustainable development policies could lower the costs.

<Implications for COP21>

Triggering the transformation in a challenging financial context

- **Accelerating the transformation toward low carbon futures despite the current pressures on public budgets is ambitious but possible.**
  - One 'fault line' of the world economy is rather long-term investment shortfalls and the preference of financial intermediaries for liquid assets. A massive redirection of savings towards investment in low carbon infrastructure and production entails inevitable trade offs, but will reduce this fault line and unleash the strong positive ripple effect across multiple sectors.
- **Innovative financial mechanisms can be set up urgently.**
  - They can: a) reduce the risks attached to low carbon projects that are close to the break even point but blocked by high upfront costs; and b) attract private savings and institutional investors by valuing low carbon assets. Although the required evolutions (Basel III regulations, refinancing criteria, public guarantees on credit lines) are out of the scope of the UNFCCC, COP21 can incite step changes in financial intermediation.
- **Climate finance will enhance the efficacy of non price policies (emission standards, norms, and public works).**
  - Climate finance will enhance the efficacy by securing its consistency with the agreed social value of carbon reduction and strengthen the confidence of investors. It will also facilitate the deployment of carbon pricing mechanisms by lowering the investment risks.

What agreement for what benefits of a large climate alliance?

- **Climate policy tools must be aligned with policies adopted for objectives other than climate mitigation.**
  - Reforms of building policies, policies targeted at low carbon energy supply, smart urban planning, reforms of real estate markets, and industrial policies aiming material efficiency to reduce waste generation, need to be pursued.

- Regulation to build electricity grids supporting a higher level of intermittent renewable energy will be set up in view of more decentralised electricity production.
- The conservation of ecosystem services threatened by climate changes contributes to hedging against rural drift.

- **CBDR cannot be applied in the same way as the Kyoto Protocol.**
  - Enforcing the CBDR principle is pointless in an adversarial exercise about the sharing of the remains of a carbon emissions budget. It demands a cooperative exercise between countries with different historical responsibilities in the climate affair and in terms of technology, capability, soft power and finance.
- **Financing the cooperation between developed and developing countries is a key challenge.**
  - The USD 100 billion per year promised by developed countries to fund the Green Climate Fund (GCF) is not enough but will be a significant leverage.
  - A long-term signal is needed to attract private funding beyond public funding.

INDCs and SDGs: Funding challenges and benefits of cooperation.

- **The French process set up a framework for dialogue on energy vision and scenarios, to which the ADEME contributed with its visions and which will likely continue.**
  - The ADEME's visions for 2030 and 2050 are consistent with current legislative objectives, which are being translated into the next planning of investment in the energy sector.
  - For 2050, the objective of dividing greenhouse emissions by four implies that more than a division by four is required for CO_2 emission, because reducing emissions of other greenhouse gases is much more difficult.
  - There is a significant potential for emission reduction through retrofitting in the building sector, and through the transformation of mobility in cities.
- **There is a need for an institutional framework that is flexible and allows for fast-track action and efficient decision-making.**
  - A problem with the current international climate regime is that everyone is expected to move at the same speed, which is not possible.
  - Since the UN regime is good at giving meaning, this aspect should be improved, which is what the move towards INDC (i.e. multidimensional commitments instead of a pure target-based approach) seems to indicate.
- **The rationale behind the INDCs and SDGs discussion is consistent with the "financing sustainable development."**
  - ODA is a catalyst for the mobilisation of other resources (private, domestic), to bridge the gap with the USD trillion dollars estimated for SDGs.
  - Planning and long-term objectives identified in the long term transformation pathways are necessary aspirational objectives for investors.

Visions of the transformation of energy system

Session Abstract

The challenge of making energy systems more sustainable goes beyond technologies and energy sources. It is mainly about changing the current direction of development and a societal transformation where the sustainability of energy systems is increased and clean energy for sustainable development is provided. There could be different feasible transition pathways for energy systems that are compatible with climate policy objectives. Preferred pathways may vary significantly between countries and regions. Local specificities and social acceptance (including the availability of adequate human resources) also need be taken into account.

Energy systems involve expensive and long lived infrastructure in production, transport and end-uses. These characteristics create path dependencies that can be or become barriers to change towards increasing sustainability. Existing structures create technology lock-ins and involve vested interests.

Early support for low-carbon options is needed. This support needs to pay due attention to the timing of interventions from R&D through to market deployment, and recognise that innovation occurs in systems in which there are multiple actors and feedback loops between stages. Innovation is rarely a linear process. This means attentions to monitoring, evaluation and learning by governments and their agencies – as well as a willingness to take risks.

Session Reports

Plenary 1: **Energy security and affordability**

Chair: Stefan Lechtenböhmer, WI
Rapporteur: Katharina Hillebrandt, WI

Keynote Speakers:
Bert Metz, European Climate Foundation
Brent Wanner, IEA

As energy production and use account for two-thirds of global GHG emissions, transforming the energy system is an inevitable pillar on the way to a low carbon society. Although recent research indicates that the challenge is even larger than indicated by the latest IPCC report (AR5) (due to the time already spent compared to the research condensed there), the first good news regarding this topic came last year, when energy-related CO_2 emissions stalled for the first time, despite global economic growth of 3%.

According to the recent IEA analysis on "Energy and Climate Change," a further stabilisation of globally emitted GHGs could be obtained if national INDCs (Intended Nationally Determined Contributions) to be submitted before the COP21 were actually implemented (see "INDC Scenario" in Figure 1). Realising the INDCs would include tripling improvements in energy intensity compared to the past decade, increasing shares of renewable electricity generation and halting the expansion of oil and coal use. While the declaration of intended contributions to climate change mitigation by different countries constitutes an important step, it is, however, still a long way to their implementation.

Furthermore, in order to start decreasing worldwide GHG emissions even stronger efforts are required. In the short term, this could be realised by means of proven best practise technologies (such as energy efficiency, renewables investment, upstream methane reductions, fossil-fuel subsidy reform, phasing out of inefficient coal-fired power plants and minimising new investment into it). This means that investment patterns have to be changed to overcome past and avoid future lock-ins into (inefficient) fossil energies.

A positive aspect is that not only specific climate policies but also best practise policies fostering economic growth and development often have a positive impact on climate change mitigation. Thus, it is often possible to pursue the simultaneous realisation of different targets by deliberate policy design. The scientific community could further engage in informing stakeholders such as policy makers and companies about this, e.g. by conducting multiple benefit analyses which not only consider the cost of climate policies but also the benefits of avoided climate change.

Key findings of the session

The INDCs received so far are clearly not sufficient to reach the 2°C target or reach a peak in emissions. However, if fully implemented they would enable a levelling off of energy-related GHG emissions, triple improvements in energy intensity compared to the past decade, lead to increasing shares of renewable electricity generation, and halt the expansion of oil and coal use.

Several analyses show that there are a number of good policies available that would potentially enable a GHG emissions peak in the near future and also reaching the two degree corridor. Policies are, e.g. increased energy efficiency, further expansion of renewable energies, but also a gradual phase-out of coal.

Significant transformations in the energy systems of most countries worldwide need, on the one hand, to tackle existing vested interests, e.g. by industries linked to fossil fuels, which could hinder following more rational and climate-friendly patterns. On the other hand, there is a need to renew energy systems and infrastructures in parts of the world and to build new ones in others. These investments have to be as sustainable as possible in order to avoid future lock-ins in conventional infrastructure, and to lock-in sustainable development patterns instead.

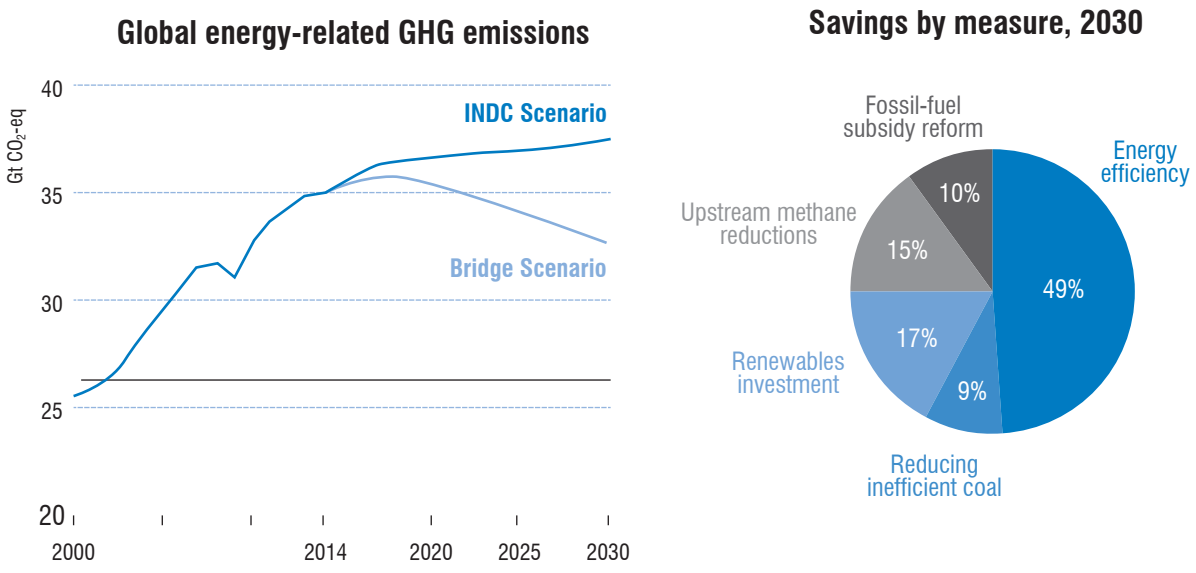
Concrete/practical steps for transformation

In order to safeguard the INDCs' implementation and enable further steps, a regime regularly monitoring progress and suggesting revisions is crucial.

In order to reach decreasing global GHG emissions, the implementation of proven best practise technologies has to be fostered (e.g. energy efficiency, renewables investment, upstream methane reductions, fossil-fuel subsidy reform, phasing out of inefficient coal-fired power plants and minimising new investment into it).

Science has an important role (e.g. by energy system modelling) in providing national discussions with the information needed that help politicians and stakeholders to fully appreciate the advantages of good energy policy in their respective contexts. These (energy security, access to clean energy, reduction of pollution, etc.) are often so significant that GHG mitigation can be seen rather as a co-benefit of rational energy policy than the other way around.

Figure 1: Historical and possible future development of global energy-related GHG emissions



Five measures - shown in a "Bridge Scenario" - achieve a peak in emissions around 2020, using only proven technologies & without harming economic growth

Source: Presentation by Brent Wanner, IEA

Parallel 1.1: **A common goal, different national contexts**

Chair: Nadia Maizi, CMA/Chaire MPDD
Rapporteur: Marcello Peronaci, ENEA

Speakers:
Maria Rosa Virdis, ENEA
Stefan Lechtenböhmer, WI
Yu Wang, Tsinghua University
Marcelo Poppe, CGEE

The first presentation was given by Mrs. Maria Rosa Virdis and dealt with the impacts of different deep decarbonisation pathways to 2050 on Italian energy intensive industries, with a focus on the role that CCS and, respectively, energy efficiency can play in substantial CO_2 emission reductions. The response strategies by the system were analysed under different technological hypotheses. A third case considered the option of output reduction as a response strategy in a scenario where industrial CCS has very limited deployment. As a conclusion, it was shown that CCS, renewables and energy efficiency are key elements of Italian decarbonisation scenarios; should CCS not be a viable option and other renewable and enabling technologies be unable to reduce significantly energy demand and CO_2 emissions, the result could be delocalisation and further downsizing.

The second presentation was given by Mr. Stefan Lechtenböhmer and Mrs. Katharina Hillebrand, dealing with the transformation of the German energy system: in 2010 the German government decided to shift to a highly efficient and mainly renewables-based energy system by 2050 as a means to reduce GHG emissions by 80 to 95% vs. 1990 levels. Also, the decision was made to phase out nuclear energy by 2022. The ongoing change of the current energy system is linked to a number of technical, economical, institutional as well as stakeholder related and political challenges which determine current energy political debate.

From the technical point of view, while technical and infrastructure related issues in the electricity system seem solvable, challenges remain with regards to the expansion of electricity into other sectors such as transport and particularly energy intensive industries.

From the economical point of view, the overall costs of converting the energy system have been moderate so far, and investments are expected to pay off on the future. Further, accelerated technology development as well as increased investment have created significant economic co-benefits such as jobs and growth. In specific sectors and for particular consumer groups, however, additional costs became significant and have created resistance from consumer associations.

The third presentation was given by Mr. Yu Wang. He presented China's low carbon development roadmap of the power sector. China pledged in 2009 to reduce CO_2 emissions per unit of GDP by 40-45% on 2005 levels by 2020, and a share of non-fossil energy of 15% and announced in 2014 that it would peak CO_2 emissions by 2030, and increase the share of non-fossil energy carriers of the total primary energy supply to at least 20% by then. The power sector's low carbon development roadmap is essential to the whole low carbon development of China. Scenario analysis was used to simulate the roadmap and the co-benefits of alternative coal technologies. Low carbon electricity technologies could result in CO_2, SO_2, PM2.5, and NOx mitigation. In the policy scenario, the emission of CO_2, SO_2, PM2.5, and NOx in 2050 could fall back

to the level of 2010, which means 39~54% lower than the level of BAU scenario.

The last presentation was given by Mr. Marcelo Poppe and dealt with the mitigation and adaptation plans in Brazil and the pathways to a deep decarbonisation. Its main pillars are: fuel switching, efficiency gains and a zero net deforestation, the reforestation and the forest restoration.

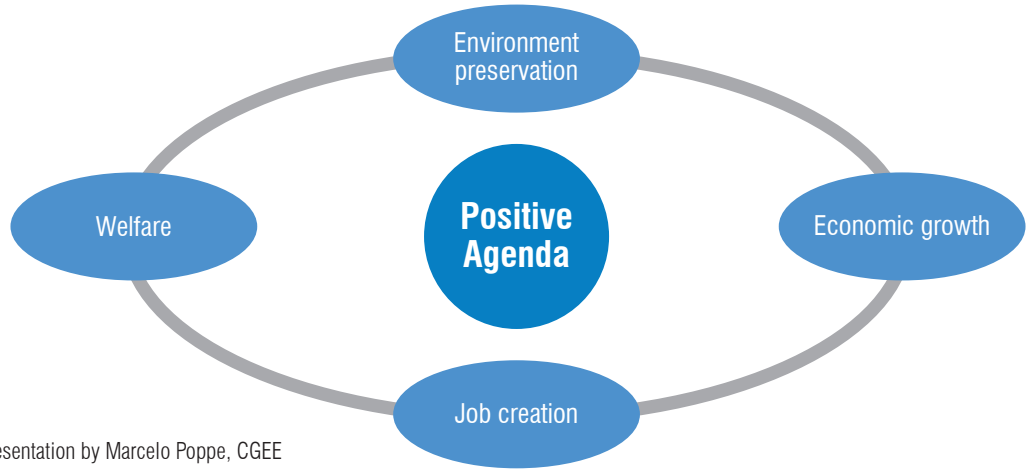
Key findings of the session

- Consider that the risks associated with severe climate change impacts outweigh the risks associated with the implementation of mitigation actions and that the relative costs to additional mitigation tend to get higher in the long term.
- The multilateral recognition of the social and economic value of mitigation activities could create positive incentives for accelerating the implementation of enhanced climate action.
- Differences in the strategies/actions undertaken by several countries worldwide must be considered.

Concrete/practical steps for transformation

- The transformations so far achieved and those expected make it necessary to amend current regulations, particularly for the electricity market, as the current energy's only market is no longer sufficient without further instruments safeguarding sufficient renewable as well as backup capacities.
- As the ongoing transformations affect many interests, including those of powerful players, plus the need for broad participation, the transformation of the energy system also touches on important questions of how to engage all the stakeholders, to balance interests and to provide opportunities for the "losers" of the transformation,
- A strong coordinated commitment by the politicians is needed worldwide, as a transition to an LCS depends particularly on the economical/societal/occupational aspects instead of the technical ones.

Figure 2: The low carbon transition



Source: Presentation by Marcelo Poppe, CGEE

Parallel 1.2: **Institutions and regulations: Securing innovation and investment decisions**

Chair: Christian Egenhofer, CEPS
Rapporteur: Ioanna Ketsopoulou, UKERC

Speakers:
Jim Watson, UKERC
Lars Nilsson, LUND University
Jesse Scott, IEA

This session addressed the issue of innovation in low carbon pathways, particularly through the lens of governance, institutional arrangements, and the challenges in securing finance. The first presentation by Prof. Jim Watson of the UK Energy Research Centre set out the case of the UK as a successful example of a country that has made some progress in energy system transformation. Despite a contentious political climate, the UK's commitment towards climate change mitigation remains stable. This has been underpinned by a strong policy framework; primarily the Climate Change Act of 2008 that set out the UK's ambitious emissions targets and led to the creation of the Committee on Climate Change and the setting up of successive 5-yearly Carbon Budgets, as well as the Electricity Market Reform and ongoing support for efficiency and RD&D, not only in supply side technologies, but also networks, heat and transport. UKERC research on finance availability for power generation concluded that investment needs are likely to increase in the future; therefore, a clear framework is needed to direct investment to low carbon generation and attract innovative finance sources. The need to move away from a traditional linear innovation model was underlined in the presentation, as there is no clear distinction between innovation and investment. Finally, the need to act now in order to continue to meet the requirements of future Carbon Budgets was highlighted, especially in areas where there is still time for experimentation, such as heat.

The second presentation by Prof. Lars Nilsson from LUND University drew on the example of Scandinavian countries, and Sweden in particular, as other successful case studies of countries on a low carbon pathway. As such, they currently face a different set of challenges; namely bioenergy and land use, the role of the power sector, transport and energy intensive basic materials. The role of incumbents versus new actors in effecting transitions was addressed. Successful transition examples, such as the development of heat pumps in Sweden, highlighted that contrary to popular belief winners can be picked. The importance of strong central decision making was underlined through the example of the resolution of the California electricity crisis in the early 2000s. While the complexity of different technologies and systems is recognised, there is need for a coherent and integrated innovation framework across policy domains, focusing both on push and pull mechanisms. There is potential for governments to set up multi-objective policies and develop methodologies to comprehensively evaluate transitions. The state should be able to lead towards a clear and stable direction, providing strong signals for the investment community.

The third presentation by Jesse Scott from the IEA aimed to identify the strengths and weaknesses of policy signals at the EU level in the context of the proposed 2030 Framework for Climate and Energy. Significant tension was identified between policy signals at the EU and the national level; emissions policy is mainly set at the EU level, which is generally preferred by investors, while efficiency and renewable energy policies are mainly determined at the national level. The resulting fragmentation creates confusion for investors and poses a challenge for the formation of a common EU energy market. A layer of uncertainty is added

by the lack of clarity in institutional structures, particularly at the EU level, and the timeline associated with the 2030 Framework, the details of which will not be clear until the late 2010s. The increasing level of uncertainty can lead investors to inaction. Further complexity is added by the different time horizons under which EU policy, national policy, and investors operate.

Key findings of the session

For the UK decarbonisation will become more challenging in the future, as the obvious easy wins have already been achieved.

The effect of governance and institutional complexity on the achievement of decarbonisation targets should not be underestimated. To counteract that an option would be to be overambitious in terms of policy targets.

The climate issue has developed from being seen mainly as an isolated pollution problem to a broader question about how society can develop, for example towards sustainable cities and a circular economy. This perspective is better aligned with the multiple societal objectives of governments and recognises that mitigation measures often have multiple co-benefits.

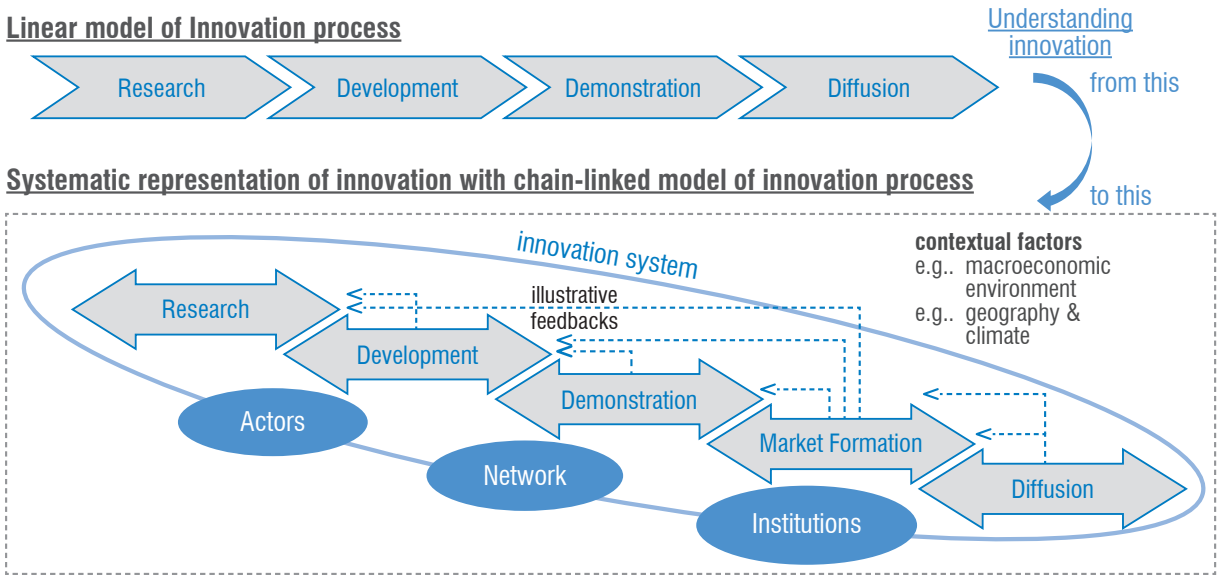
Concrete/practical steps for transformation

Crisis can mobilise action but the resulting motivation can be short-lived. For long-term transitions, we need to develop positive visions and narratives of future low carbon societies through scenarios, pathways, and roadmaps at various geographical levels and for different sectors.

A greater focus should be placed on energy efficiency. Targeted support is needed for increased uptake.

There is need to simplify the EU policy context to attract investment in low carbon generation. Otherwise there is a risk that traditional investors, like utilities, will shift their focus to other sectors or other geographical markets.

Figure 3: Contrasting innovation models



Source: Global Energy Assessment

Urban dynamics, rural development and decarbonisation

Session Abstract

Significant mitigation and adaptation potential lies in the urban and rural contexts; to unleash this potential is essential to achieve a transition towards low carbon societies.

Cities will play a major role in shaping the transition to a low carbon society. Cities are crucial actors since they can directly influence the planning of key issues such as traffic, urban land-use, buildings, and waste management. The role of cities needs to be mainstreamed in national and international climate policies.

Rural systems vary from country to country: the role of the forests and the role of the agricultural areas, especially those close to the urban areas, are both crucial in policies intended to reduce GHG emissions, and therefore in a LCS perspective.

Rural agro and forestry areas provide wide ecosystemic services that are under threats by climate changes and adaptation strategies are needed to ensure the flow of resources from the rural areas towards the urban ones in a long-term perspective. Moreover, rural areas contribute strongly to the GHG global balance by acting as an emission source as well as a sink.

Urban and rural flows, as well as interconnection in between, are significant with potential strong conflicts between urban and rural development. Urban areas strongly depend on rural integrity to ensure the availability of water, as well as food and resources. Therefore, these issues must be treated with a holistic approach, in a sustained and equitable economic development perspective.

Session Reports

Plenary 2: **Spatial dynamics and decarbonisation: A question of development patterns**

Chair: Sergio La Motta, ENEA
Rapporteur: Antoine Rivière, MEDDE

Speakers:
Tomonori Sudo, JICA
Jan Corfee-Morlot, OECD

Urban areas play an important role when it comes to the transition to low carbon societies. One main reason lies in their demographic and economic weights. As an illustration, over 40% of the GDP in the Asian-Pacific region is realised in urban areas. More generally, the case of cities in emerging countries is a fascinating topic of research due to their pace of change, which is incredibly high. They thus help to better understand how to guide cities' development patterns towards their effective decarbonisation.

Current development pattern in emerging cities is not sustainable

The economic value generated by cities relies on the resource supply from rural areas, such as food and water. This rural economy, which generates resource supply, relies on the exploitation of natural capital and thus causes its degradation over time. The major issue is that the value created in urban areas does not flow back to the rural economy (i.e. resource supply) and natural capital. As a consequence, the challenge is to transform this one-way cascade flow into a two-way interaction.

Cities represent a great opportunity for fostering change

Generally speaking, it is crucial to enable cities to "go green" since they are at the heart of systemic changes. For instance, succeeding in greening the power sector could lead to the promotion of electric vehicles and the use of greener transportation. This would also decrease the demand for coal, which would thus alleviate both transport capacity and port capacity for coal (see Fig. 1). This kind of systemic change is also true for other urban systems, such as water supply, and can have a great impact at the city scale. Nevertheless, cities cannot achieve such ambitious shifts on their own, and need a two-way relation with national governments.

The case of Bangkok, Thailand

What does "going green" mean for such a city? In the Bangkok Metropolitan Region (BMR), the challenge is to govern across levels of government? To overcome obstacles such as urban sprawl, reliance on fossil fuels, high flood risks, untreated wastewater or landfills. Some of the policy options are obviously sectoral (e.g. improving public transportation, fostering energy efficiency and renewable energy use in buildings) while others have a specific focus on strategic implementation levers. The latter may include the implementation of metropolitan commissions, community-based actions, and attracting private investors while diversifying sources of revenue at the same time.

Issue #1. Governance matters

Governance is at the heart of the transition of cities. Here, the main challenge is to ensure a better coordination across the various levels of governments, from local ones (urban and rural), to national policies and international commitments. The partners of cities (e.g. businesses, civil society, etc.) must also be integrated in this governance since they also have a role to play in the GHG emission mitigation.

Issue #2. Investment and redistribution are also key

In order to "go green," cities need to make green investments, which can be enabled thanks to four criteria: (1) leadership, to offer a strategic view; (2) alignment across levels of regulations; (3) market-based instruments to reach markets; (4) green financial regulations.

Beyond the green investments themselves, it is also important to work on a better resource allocation system. The purpose is to alleviate inequities among local governments in terms of resource availability while providing coordination and information-sharing between local authorities and the national government. Last but not least, a specific care shall be given to the diversification of finance sources, with the explicit goal of not relying only on international public funding.

Issue #3. Better tools are needed

Measurement, reporting, and verification of GHG emissions of cities is a third challenge. To this effect, there is a clear need for standardised GHG inventories, such as GPC 2.0 which was currently developed. Better tools are also required to strengthen the capacity of science policy assessments in an integrated way.

Moving forward: cities in COP21 and beyond

The UNFCCC could play a role in providing these standardised tools. It also has a role to play by using it to call for collective action working through nation states.

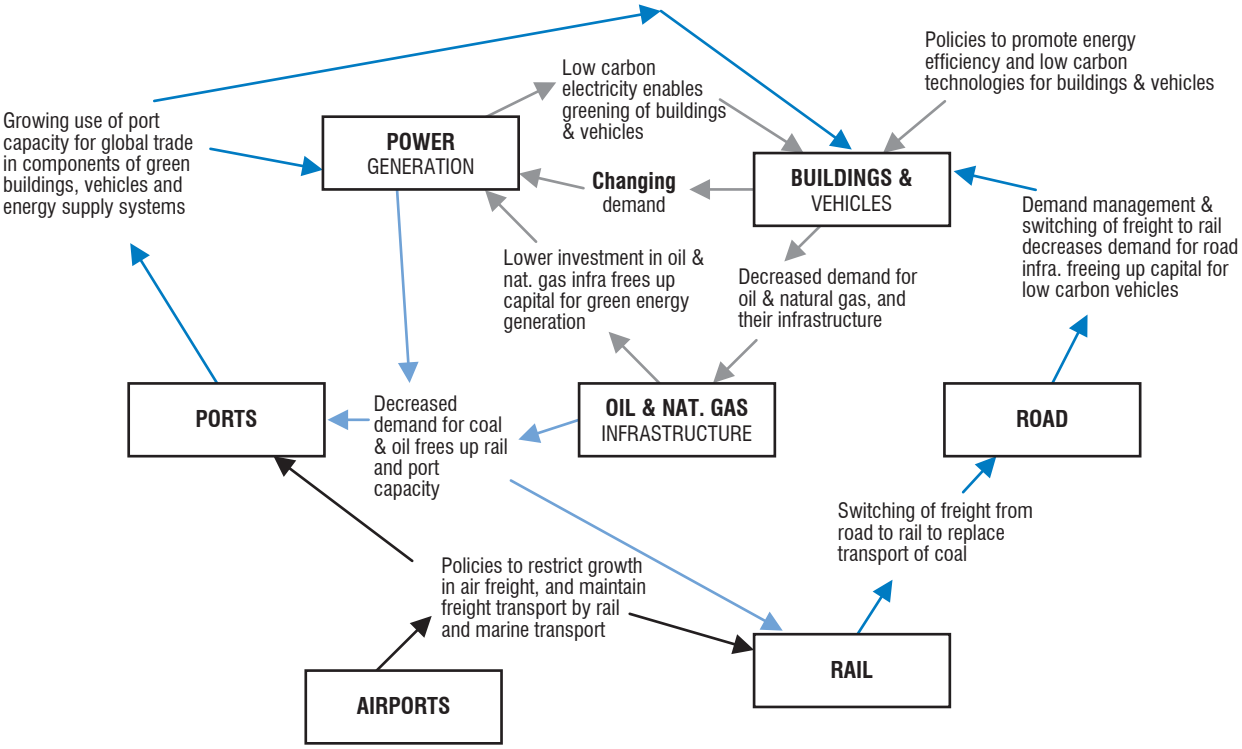
Key findings of the session

- A better coordination than now across the various levels of governments, from local ones (urban and rural), to national policies and international commitments is necessary for mitigating GHG emissions.
- In order to "go green," cities need to make green investments, develop a better resource allocation system and ensure diversification of finance sources.
- Measurement, reporting, and verification of GHG emissions of cities are important for realising and monitoring actual GHG emission reduction.

Concrete/practical steps for transformation

- Developing standardised tools for GHG emission inventories
- Enabling green investments (while diversifying the financial sources) and making sure their economic benefits are equitably redistributed.
- Ensuring consistency across spatial policies (through a participatory approach) and across levels of governance.

Figure 4: Interdependence of infrastructure systems in virtuous cycles of low carbon growth



Source: Kennedy, C., Corfee-Morlot, J. (2013). Past performance and future needs for low carbon climate resilient infrastructure – An investment perspective, *Energy Policy, 59, 773-783.*

Parallel 2.1: **Urbanisation and climate actions in cities**

Chair: Claire Roumet, Energy cities
Rapporteur: Laurent Faucheux, CIRED

Speakers:
Matthias Wanner, WI
Ho Chin Siong, UTM
Nicola Tollin, University of Bradford

There is a consensus about environmental leeway stemming from lower scales of analysis, i.e. at the urban scale, where economic activities and energy/transport consumptions mainly arise. Heterogeneous in space, the urban question is only partially transposable between the north and the south e.g. *(i)* an upwards levelled worldwide infrastructure per capita would represent a third of the 2°C emission budget; *(ii)* mitigation co-benefits are generally inversely proportional to GDP per capita, if thought as coupled with economic development; *(iii)* spatial reorganisation in the north versus spatial organisation in the south, i.e. roughly 3 billion more urban dwellers in 2050, both implying more than just higher densities or accessibilities, but structural changes, e.g. infra-urban connectivity.

Invariably, local spaces have to be better known; as in Ruhr *(i)* numerically, via geo-referenced data collection methods, so as to overcome uncertainties at aggregate levels with regard to what can be significantly expected where it is expected; *(ii)* societally and demographically, implying to know who the urban tissue stakeholders are, as well as their weight in the behaviour modification potential; *(iii)* experimentally, within a learning network of cities, i.e. from cities originalities emerge specific problems/solutions, experimentation is the only way figure them out in a fully multidimensional manner and; *(iv)* theoretically, i.e. gaps of knowledge are numerous in spatial economics. Another gap is about solving the governance paradox: which level/scale of intervention is the most relevant in a national area to synthesise effective and efficient pro-climate shifts at the urban scale?

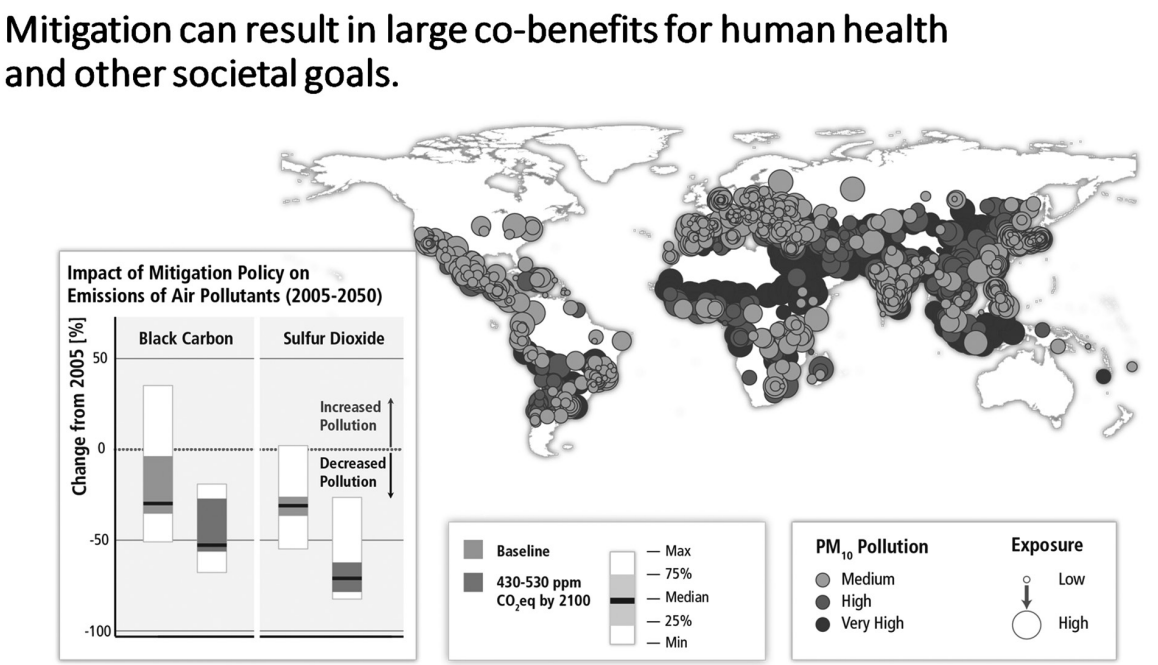
Key findings of the session

- Necessity of initiating peer to peer exchanges, i.e. direct dialogues between few cities so that they can start a learning process.
- The more economic development is desirable, the higher co-benefits tend to be.
- Need for a new role for national institutions (states or public banks) in assisting local government in resources allocation/sharing, for a territorial solidarity on energy.

Concrete/practical steps for transformation

- More geo-referenced and open-sourced data about housing (as least as much as for transport).
- More transdisciplinarity among social sciences to capture all urban dimensions, e.g. the case of Ruhr.

Figure 5: Contrasting innovation models



Source: Global Energy Assessment

Parallel 2.2: **Climate land-uses and rural development**

Chair: Stéphane de Cara, INRA
Rapporteur: William Dang, CIRED

Speakers:
Bruno Dorin, CSH Delhi
Michael Obersteiner, IIASA
Donatella Spano, CMCC

Accounting for almost half of the world population and up to 70 % in developing countries, rural areas, despite their importance, have no unequivocal definition. They can be defined alone as open country and small settlements (IPCC, WGII AR5) or compared to the urban areas as its residual (Lerner and Eakin, 2010). Through their usages such as supplying food, supplying energy through bioenergy and supplying ecosystemic services, rural areas are of a certain interest. Allocating the different usages on a finite space and under environmental constraints through the impacts of the human activities facing climate change, apparent trade-offs are at play.

These trade-offs can be seen via the links with the urban areas. Historically characterised by the convergence of income of urban and rural areas and by the decline of the share of agriculture in GDP and employment, OECD countries' development paths seem hard to follow by developing countries. This appears particularly true when facing the apparent opposite ecological aspect and the developmental aspect of modern agriculture. On the one hand, agriculture is jeopardising many ecological services through mono-cultures and few agro-industries, less resilient to climatic and economic shocks, and on the other hand, in the structural transformation paradigm, agriculture is an engine of growth. Studying the developed countries dynamics, reveals that developing countries are actually following a very different path where more and more people are stuck in rural areas while the income gap is widening and natural resources are depleting faster, increasing risks of severe social and political crisis. Therefore, this observation advocates the transition of the agricultural model towards an agro-ecological perspective reconciling these two objectives.

Unlike energy systems that can dive into resources and "unlimited" renewables giving more flexibility, land use, because of its limitlessness, asks for a fundamentally different management. Linking the impacts of the different activities in rural areas through the production systems and the Sustainable Development Goals (SDG) as objectives to define targets and narratives. Models tend to highlight the constraint aspect of the land sector. As time goes by, the system gets pressurised, further diverging from the set goals. However, solutions lie with the demand side, switching to a more thrifty diet, for example, leaves more space for trade-offs to happen contrary to increasing bio-energy demand. Overall, models help to robustly identify the superior policy portfolios with co-benefits or disruptive technologies. This could help the discussion by avoiding the negotiation on single policies and the ranking problem.

If the impacts of climate change can be assessed, adaptation and mitigation action plans need to be implemented on the field in order to manage disaster risks and increase resilience. Such options have been identified at the European level but need to be integrated at national and regional level, taking into account heterogeneity between and within regions. The crux lies in the identification of the challenges and priorities, the assessment of risks of the different sectors and the coordination and implementation at the local level. In order to be successful, such strategies need cooperation between regions and involvement of citizens at the local scale.

Key findings of the session

Historical modern agriculture model will not be enough to tackle the challenges ahead. Empirical data shows that developing countries do not and will not follow the path of the OECD countries.

Diet policies are efficient. As they have strong co-benefits, these policies release the pressure on the system improving the range of outcomes.

Governance needs vertical and horizontal integration. European level plans need to be transcribed from the national to the local scale, taking into account the heterogeneity of challenges and priorities and involving the stakeholders.

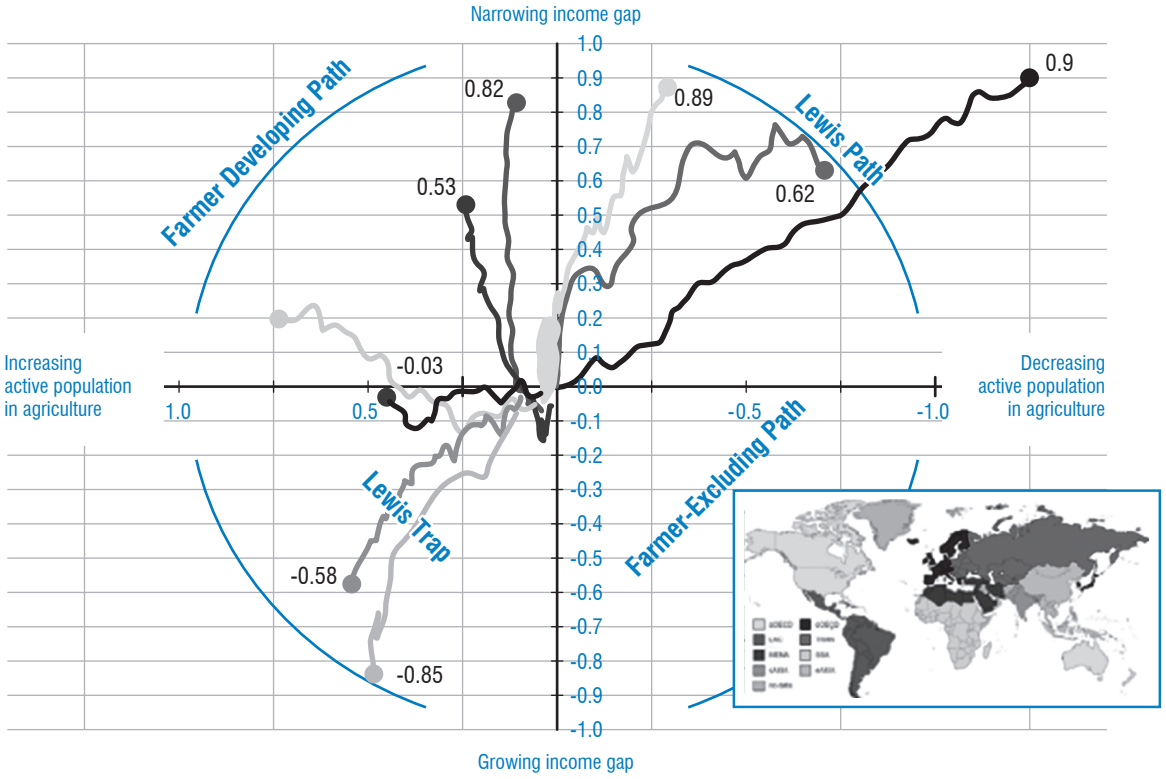
Concrete/practical steps for transformation

Labour and land market needs to be further studied.

Even though the supply side has been appropriately modelled, the demand side is still lacking.

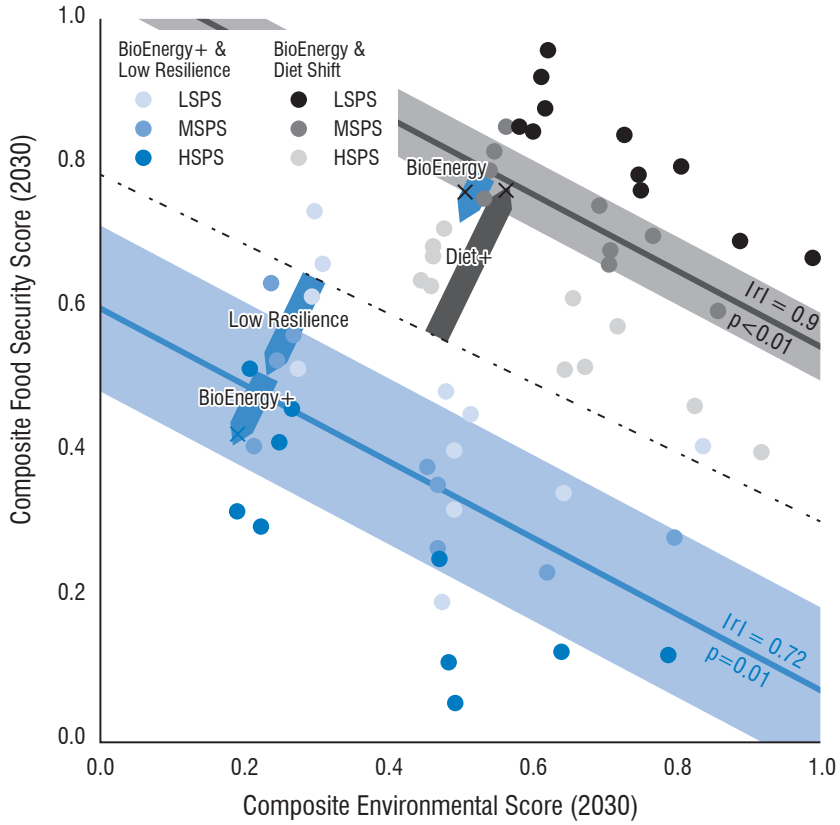
Mitigation strategy needs to be designed at a high (national and regional) level, throughout the different sectors and an adaptation strategy needs to be designed at the local level.

Figure 6: Worldwide dynamics on cumulated annual growth rates on agriculture



Source: Presentation by Buruno Dorin, CSH Delhi

Figure 7: Depressurising strategies on composite food securety score and composite environmental score



Source: Presentation by Michael Obersteiner, IIASA

The CBDR principle revisited: From burden sharing to picking the benefits of cooperation

Session Abstract

Climate change is the common issue among the countries in the world, but the responses to it are different among them. Implementing the CBDR (Common but differentiated responsibilities) principle has proven challenging in tough negotiations on dividing the remaining global carbon emissions budget. Instead the CBDR principle is needed to guide a cooperative process between countries with different historical responsibility for climate change, and in terms of responsibility to facilitate technology transfer, capacity development and finance to enable developing countries to transition to a low-carbon development pathway. As a result, all countries can receive the benefits to avoid the climate change.

Commitment under the CBDR principle should be geared towards maximizing development opportunities and obligations of cooperative conduct rather than burden sharing. Toward the COP21 to be held in Paris in 2015, all countries are expected to commit their INDCs (intended nationally determined contributions) in order to represent the low carbon society. In order to realise the low carbon society, analyses in various scales and aspects are needed, for examples, theoretical framework in common, national and sub-national analyses taking into account their own circumstances, and practical countermeasures related to specific sectors. And mutual assistance among all countries are also needed to implement and reinforce INDCs. After integration of these all elements, we can obtain the various pathways to achieve the low carbon society, and we can implement the most effective option.

Path dependence and system inertial imply that delaying policies that redirect innovation towards clean technologies significantly increases costs in the future. Implementation of low carbon policies will require substantial financing and transformational changes in energy supply and demand in all sectors. However combining climate and sustainable development policies could lower the costs.

Session Reports

Plenary 3: **From CBDR to RDBC (risk, distribution, beyond the country logic)**

Chair: John Barrett, UKERC
Rapporteur: Takako Ono, IGES

Keynote Speakers:
Marc Fleurbaey (Princeton University)

Discussants:
Jean-Charles Hourcade, CIRED
Subash Dhar, Technical University of Denmark

Common but Differentiated Responsibilities (CBDR) was a common principle under the UNFCCC. However, we seem to be confronted with a bifurcation point for reconsidering the concept of this principle. Specifically, implementing the CBDR principle should not cause an adversarial exercise about the sharing of the remains of a carbon emissions budget.

The CBDR can be considered as a deontological approach, which consists of obligation not to harm and compensatory justice, such as the polluter-pay principle. This approach is a backward-looking narrative that states that developed countries have colonised poor countries, seized fossil fuels and pre-empted the atmosphere by emitting GHG emissions; hence, the developed countries have stronger responsibilities than developing countries on climate change issues.

On the other hand, a consequentialist approach that focuses on the ultimate consequences on well-being, is a forward-looking narrative that the best policy targets inequalities of living standards across individuals over the world; convergence between countries, inequalities between social groups.

New approaches are also emerging, such as international and intergenerational paretianism. The international paretianism approach states that all negotiating parties must benefit from the agreement, compared to a business as usual scenario (BAU). The intergenerational paretianism states that all generations must benefit from the agreement compared to BAU.

While there are several principles under discussion, we should explore win-win solutions in accordance with every country's national circumstance. From this perspective, concepts of nationally appropriate mitigation actions (NAMAs) and intended nationally determined contributions (INDCs) come to be important. Under these concepts, we can consider solutions on climate change issues not under a simple bipolar relationship between developed and developing countries, but under various situations depending on every country's national circumstances. In fact, developing countries also have started coping with climate change actively. For example, India set an ambitious goal on reducing its emission intensity of its GDP by 20 – 25% by 2020 compared to 2005. India established its national electric plan and has increased the share of renewable energy sources in its total electricity sources.

In addition, the CBDR principle seems to have shifted to financial and technological contribution from developed countries to developing countries. Both developed and developing countries are enhancing the implementation of mitigation measures. However, they bear different responsibilities in terms of technology capability, soft power, and finance. Developed countries have also to propose a framework where the primary gain of cooperation for developing countries is to make easier the bifurcation towards a low carbon development.

Key findings of the session

The CBDR can be considered as a deontological approach, which consists of an obligation not to harm and compensatory justice, such as the polluter-pay principle.

On the other hand, there is another approach: the consequentialist approach that considers the ultimate consequences on well-being.

While there are several principles under discussion, we should explore win-win solutions in accordance with every country's national circumstance. From this perspective, concepts of NAMAs and INDCs become important.

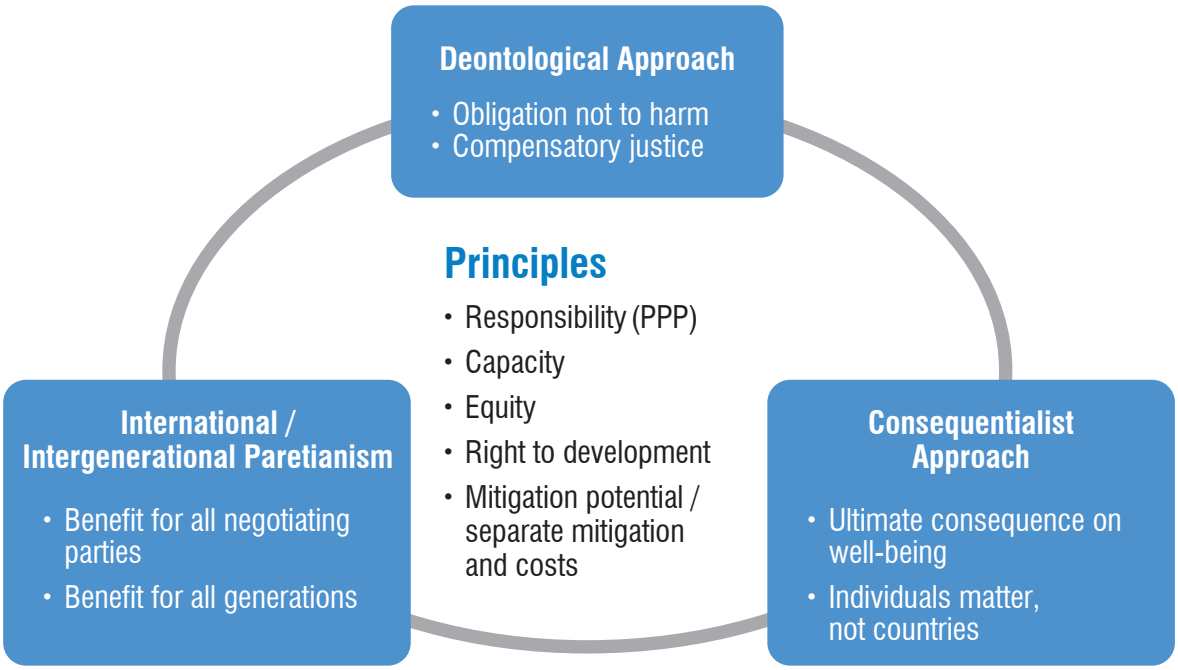
Concrete/practical steps for transformation

Implementing the CBDR principle should not be an adversarial exercise about the sharing of the remains of a carbon emissions budget.

Under the concepts of NAMAs and INDCs, we can consider solutions on climate change issues not under a simple bipolar relationship between developed and developing countries, but under various situations depending on every country's national circumstances.

The concept of INDCs helps understanding that desirability of feasible transition pathways vary significantly between countries given local specificities, social acceptance, and the availability of adequate human resources.

Figure 8: Approaches and principles of negotiation for climate stabilisation



Source: Drawn from the presentation by Marc Fleurbaey, Princeton University

Plenary 3.1: **Bifurcations in development pathways**

Chair: Toshihiko Masui, NIES
Rapporteur: Florian Leblanc, CIRED

Speakers:
Franck Lecocq, CIRED
Subash Dhar, Technical University of Denmark
Andreas Schäfer, UCL

Early actions to shift development pathways towards low carbon societies are motivated by structural energy lock-ins within economies. Understanding the challenges faced by climate change mitigation requires understanding how technical path dependency leads to bifurcation. Bifurcations occur when the number of choices to be made is limited compared to the possible options of the future potentials. Considering a continuous set of decisions, deviations from long-run trajectories is possible along with generated path-dependency, while path-dependency will ultimately end-up with a bifurcation towards one of the ex-ante available options. The main characteristics of path dependency are: (i) past decisions affecting future ones, therefore, there is multiple equilibrium but without sub-optimality, (ii) chosen paths proven to be inferior only ex-post, and (iii) chosen paths possibly demonstrated to be inferior and avoidable ex-ante. Externalities generated by path dependency requires public intervention and will fail to be internalised if: (i) there are uncertainties on cumulative mechanisms, (ii) there is asymmetry of information across agents, and (iii) multi-scale benefits are not taken into account as a whole in an optimisation process.

Comparing different futures regarding climate change mitigation scenarios is a key to analyse bifurcations processes. Two DDPP (deep decarbonisation pathways) scenarios for India assess the co-benefits of sustainability behaviours comparing to a conventional pathway of development and climate change mitigation. With climate change mitigation, both pathways impact positively SDG's, particularly in the sustainable pathway. Renewables appear to be a major part of electricity cleaning in both pathways, with less dependency on coal and other fossil fuels in the sustainable pathway mainly due to lower demand. Both climate change mitigation pathways will require substantial financing and transformational changes in energy supply, especially in renewables. Finally, the social value of carbon is significantly lower in the sustainable pathway, compared to a global carbon price.

There is a need to understand cumulative mechanisms such as in the passenger transportation systems. Previous data show that the average daily travelled time is similar across countries regardless of the income, but still rising income turns into rising travel demand in terms of distance. This directly implies a shift towards faster transportation modes as people get richer. Taking for granted these long-term dynamics of people behaviours, is there room for energy and carbon policies in the transportation sector? Simulations with a simple model show that it is possible to shift the development pathway of transportation only with drastic policies, as high raises for instance. Taking into account spatial and social heterogeneity may lead to different conclusions. Technological change, however, seems to remain the key opportunity for climate change mitigation, with potential in fuel savings in air transport. However, technological change should go along with behavioural change to work.

Key findings of the session

Understanding cumulative mechanisms can lead to structural policies that matter for climate change mitigation early actions.

Sustainable patterns shift development trajectories towards easier climate change mitigation pathways.

The passenger transportation sector has a very stable, long-term dynamics that challenges the idea of technological change being sufficient to mitigate greenhouse gases.

Concrete/practical steps for transformation

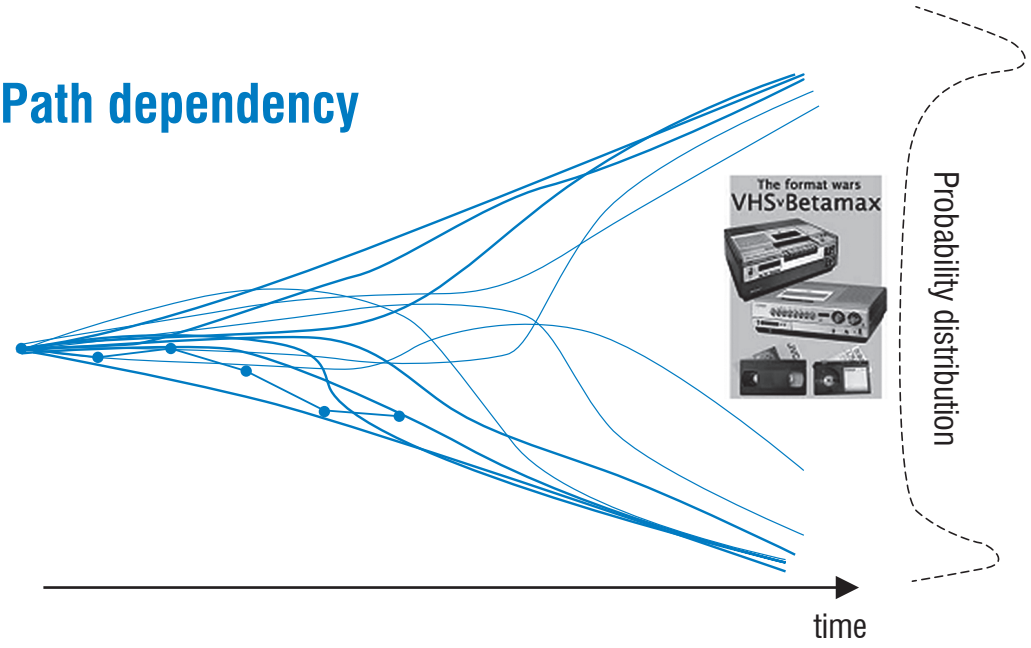
Condition abatement costs down the road with structural policies.

Encourage a research agenda on path-dependency mechanisms related to climate change mitigation: documenting past bifurcations and cumulative mechanisms is crucial to capture key features in numerical exercises where welfare comparison of scenarios are not 'at the margin' of each other problematically.

Implementing climate policies requires substantial financing and transformational changes in energy supply, especially in renewables: as a side effect, sustainable pathways have co-benefits to shift towards a low carbon society, driving energy demand to a lower level, and improving energy security.

Behavioural changes could help technological progress to become a relevant levy of climate change mitigation passenger transportation: observed fundamental behaviours across regions require radical policies if one wants to impact long-term dynamics of transports.

Figure 9: Path-dependencies leading to bifurcations



Source: Presentation by Franck Lecocq, CIRED

Implications for COP21

Session Abstract

This session addresses the main challenges of climate negotiations at COP21 and explores the conditions to reach an agreement.

The CBDR principle remains at the core of all tentative agreements between developing and developed countries. But enforcing the CBDR principle demands a cooperative exercise rather than a burden sharing approach between countries with different historical responsibility in the climate affair and in terms of technology capability, soft power, and finance. A future agreement should propose a framework that helps developing countries to implement and reinforce their INDCs.

One of the main issues at stake is providing the funds pledged by developed countries of up to USD 100 billion per year by 2020 so that developing countries can achieve their own targets. More broadly, a massive redirection of savings towards investment in low carbon infrastructure and production will be necessary in the coming decades. Climate finance can play a significant role in the low carbon transition, albeit in a context of pressures on public budget.

Against this background and pursuing the objective to provide equitable access to development, it is hence necessary to envisage complementary financial systems to redirect investments towards the low carbon transition.

COP21 can provide some hooks for inciting changes in financial intermediation, but this will demand initiatives beyond the UNFCCC to reform other domains of the world governance (finance, trade) and to launch climate clubs of 'pioneers' committed to low carbon transformations (countries, regions or cities).

Session Reports

Plenary 4.1: **Triggering the finance in an adverse context**

Chair: Alfredo Sirkis, Centro Brasil no Clima
Rapporteur: Christophe Cassen, Aurélie Méjean, CIRED

Keynote Speakers:
Jean-Charles Hourcade, CIRED
Nick Robins, UNEP

Discussants:
Hikaru Kobayashi, Keio University/IGES
Alfredo Sirkis, Centro Brasil no Clima

This session focused on the challenges and the features of a two-degree financial system. Mobilising financial resources to trigger low carbon investments is indeed a key challenge. A large amount of savings are trapped in the financial system and generate speculative bubbles. These savings should be redirected in a productive manner towards low carbon infrastructures (transport, buildings, etc.). The financial system can play an active role for that purpose by addressing systemic environmental risks such as climate change. However, the financial system is confronted with a triple challenge: its own fragmentation, market failures and growing strategic but constrained public finance. Against this background, countries like the UK, China, and Brazil have started to implement policy options to align their financial systems with climate security. These options should indeed be pursued in addition to resource pricing, environmental regulation, and public finance.

More broadly, the adoption of a carbon value as a notional price, though at a first stage through a voluntary agreement by clubs of governments, could help trigger a wave of low carbon investments and redirect parts of global savings towards low carbon investments, thus providing a lever for the equitable access to development. In this context, the role of central banks is key to ease the transition by refinancing green assets, thereby lowering the cost of capital. Central banks could then implement a monetary policy by injecting liquidity on the condition it is redirected towards green investments. Ultimately, the funding of the Green Climate Fund (GCF) will be the focus of COP21, but the evolution of climate finance will be tackled beyond the UNFCCC process in various fora (G20, BIS, International Association of Insurance Supervisors [IAIS], International Organisation of Pension Supervisors [IOPS]).

Key findings of the session

It is possible to trigger a low carbon transition now despite the pressures on public budgets. One 'fault line' of the world economy is not the lack of savings but the long-term investment shortfalls and the preference of financial intermediaries for liquid assets.

Innovative financial devices have to be set up urgently to: a) reduce the risks attached to low carbon projects close to the breakeven point but blocked by high upfront costs b) attract private savings and institutional investors by valuing low carbon assets.

Climate finance will **enhance the efficacy of non-price policies** (emission standards, norms, etc.) by securing their consistency with the agreed social value of carbon reduction and strengthen the confidence of investors. **It will also facilitate the deployment of carbon pricing mechanisms.**

The required evolutions (Basel III regulations, refinancing criteria, public guarantees on credit lines) are out of the scope of the UNFCCC, but **COP21 can incite step changes** in financial intermediation.

Concrete/practical steps for transformation

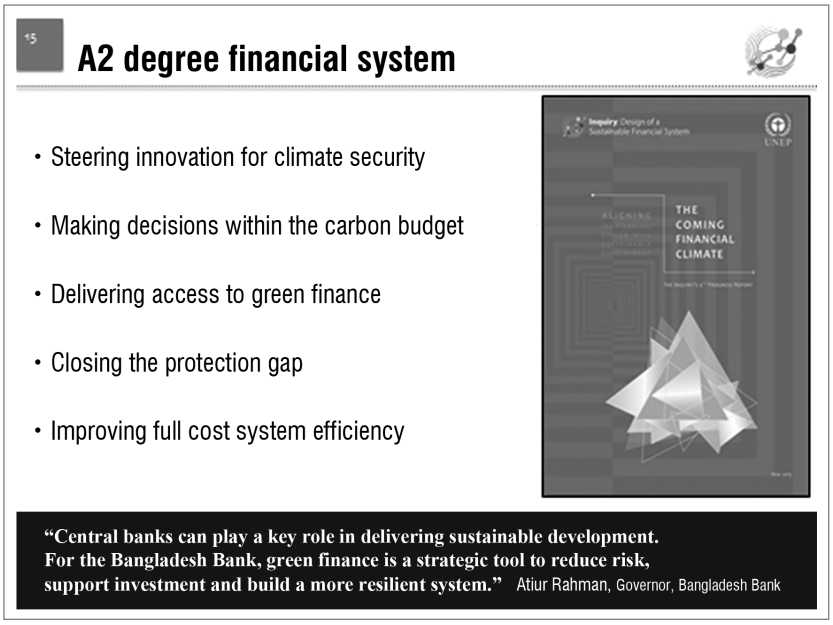
COP21 can provide four hooks for inciting to step changes in financial intermediation:

- **an agreed social value of carbon reduction** to be incorporated in the various low carbon financial initiatives so as to hedge against their fragmentation and maximise their overall efficiency;
- a strong **MRV (Measuring Reporting Verifying) process** monitored under the authority of the UNFCCC to follow the efficiency of the support to INDCs, and guarantee the environmental credibility of the investments;
- a framework securing **the transparency of voluntary commitments** of countries, **clubs of countries** and non-central state actors to support low carbon initiatives; and
- **modalities linking these initiatives and the contributions to the GCF** in order to secure multilateral assistance and the funding of adaptation policies.

Reforms of the financial system provide new avenues for international cooperation regarding:

- the stability of the financial system;
- the financing of green infrastructures;
- banking system reforms (Incorporating sustainability factors into the Basel Accords), insurance (Developing guidance on how to apply Insurance Core Principles to the challenge of climate change (IAIS)); and
- pensions (sharing best practice on the links between climate change and investor governance (IOPS)).

Figure 10: A2 degree financial system



Source: Presentation by Nick Robins, UNEP

Plenary 4.2: **What agreement for what benefits of a large climate alliance?**

Chair: Klaus Topfer, IASS
Rapporteur: Christophe Cassen, Aurélie Méjean, CIRED

Introductory talks:
Pascal Canfin, WRI

Roundtable Discussants:
Paul Watkinson, MEDDE
Hermann Ott, WI

This session addressed the main challenges of climate negotiations at COP21. The expected outcome raised by Paul Watkinson of the conference is, in particular, to set a 'Paris alliance' based around 4 pillars. First, a legal instrument, be it a protocol or an agreement, that would be a legally binding instrument applicable at the international level. It must also be a dynamic instrument that will evolve with time and will include rules on transparency and accountability. Second, the Alliance will rely on national "contributions" or "commitments," the so-called Intended Nationally Determined Contribution (INDCs). Third, regarding finance and investment, at Copenhagen (COP15) and Cancún (COP16), developed countries agreed to mobilise USD 100 billion per year from private and public funds by 2020 so that developing countries can achieve their own targets. A first priority will, therefore, be to ensure that this commitment is respected. There needs, in particular, to be a signal to go beyond public funding for the long term. Fourth, the challenge of cooperation consists in ensuring that all of companies, municipalities and sub-national bodies, as well as at the national level are involved in the process.

Three main points have then been discussed in the round table regarding the perspectives of COP21. Discussions that followed Paul Watkinson's presentation highlighted that the Common but Differentiated Responsibilities (CBDR) cannot be applied the same way as in the Kyoto Protocol. Emerging countries, like Brazil, are conscious that every country has now to reduce carbon emissions, but they insist on the fact that the CBDR principle has to be applied to climate finance and technology transfers. Furthermore, the future agreement in Paris will not solve all the issues. There will remain a gap in terms of climate objectives or financial contribution that will be filled by bilateral agreements between countries, be it under the form of clubs or in other fora like the G7 (e.g. to make progress on setting a climate insurance system). At least, achieving a future agreement in Paris will require finding a common understanding among countries. In particular, Brazil has put forward in the last COP in Lima the idea of a social value of carbon, although the idea has to get more legitimacy with most countries.

Key findings of the session

Climate policy tools must be aligned with policies adopted for objectives other than climate mitigation.

Enforcing the CBDR principle is hopeless in an adversarial exercise about the sharing of the remains of a carbon emissions budget. It demands a cooperative exercise between countries with different historical responsibility in the climate affair and in terms of technology capability, soft power, and finance.

Financing the cooperation between developed and developing countries is a key challenge. The USD 100 billion per year promised by developed countries to fund the Green Climate Fund (GCF) is not enough but will be a significant leverage. A long-term signal is needed to attract private funding beyond public funding.

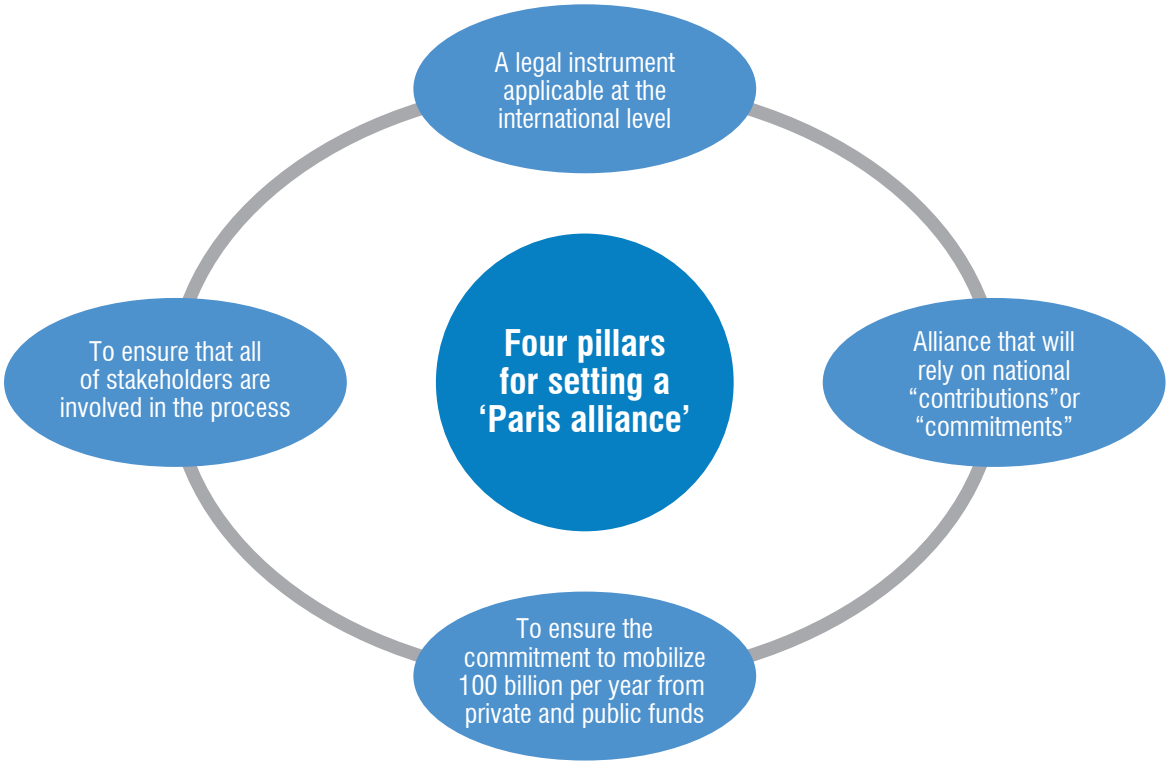
Concrete/practical steps for transformation

It is necessary to set an efficient review process regarding the compliance of commitments at the Paris conference.

Further progress is needed to attract public and private funds and create a trust relationship with developing countries, in particular through the implementation of a long-term signal like a social value of carbon.

Part of this progress will be tackled beyond the UNFCCC in key international fora or clubs of countries.

Figure 11: Challenges of climate negations at COP21



Source: Drawn from the presentation by Paul Watkinson, MEDDE

Reports on the sessions for moving forward: INDCs and SDGs: Funding challenges and benefits of the cooperation

1st session: **Visions of the transformation of energy system**

Keynote speaker: Francois Moisan, ADEME
Rapporteur: Beatrice Cointe, CIRED

This session consisted in the keynote address by François Moisan (ADEME), who was briefly introduced by Jean-Charles Hourcade, and was followed by questions from the audience and discussions. The presentation was entitled "Energy transition and green growth in France." It was comprised of three parts: one on the upcoming bill on energy transition and green growth, one on the ADEME's vision to 2030 and 2050, and one on the role of the ADEME.

The first part described the objectives of the French bill for energy transition and green growth, which is currently under discussion in the parliament and should be voted on in the summer. These include a decrease in greenhouse gas emissions by 40% by 2030, a reduction of energy demand by 50% by 2050, an increase of the share of renewable energy in final energy consumption to 32% by 2030, a reduction of the share of nuclear energy and of fossil energy in the electricity mix, i.e. a diversification of electricity generation.

For 2050, the overarching objective is that of the "Facteur 4", i.e. dividing greenhouse gas emissions by 4. This bill was prepared after a large debate that was held in 2013 to discuss energy transition visions, scenarios, and objectives. The speaker stressed that the minister for ecology, sustainable development and energy is currently working on a planning of investments in the energy sector (PPI) that would be consistent with the upcoming bill.

The second part presented the "energy visions" for 2030 and 2050 that were elaborated by the ADEME in 2012. These "visions" were based on techno-economic scenarios to 2030 and 2050, and on macroeconomic evaluation using the model "ThreeME," and on a sociological assessment of the evolutions of the lifestyle of French households. These different visions are presented in terms of electricity balance in 2010, 2030 and 2050; they involve a decrease in energy demand through energy efficiency. The vision for 2050 has to comply with the "Facteur 4" objective, which implies more reductions for CO_2 since other greenhouse gases are much more difficult to reduce. The ADEME's vision looks at sectoral reduction potential and impact on the energy mix on the supply side. The macroeconomic impact of this vision (e.g. on GDP, employment, international trade…) was assessed using the "ThreeMe" model and comparing to a reference scenarios. The assessment suggests that the energy transition has a positive, though small, macroeconomic impact: two years of economic growth could be gained because there is a need for innovation to ensure that companies are positioned on future markets stemming from the energy transition.

In the last part, the speaker gave more details about the role, status, and specificities of the ADEME as an operator of the energy transition in France. The ADEME is a public agency that depends on the ministry for ecology, sustainable development and energy for research. It supports research, development, and innovation in the energy sector, for instance in the sectors of transportation and of renewable energy.

The discussion mainly focused on the links between modelling exercises and policy-making: was the use of simulation accepted by everyone in the French context? How was the process of discussing and establishing scenarios organised?

The speaker replied that the work on the ADEME's visions started in 2010, before the election and the change of government; the debate that was then announced in 2012 and organised in 2013 lasted for nine months and involved different groups of the civil society (business, NGOs, workers unions, local governments…). It did not reach a consensus but fostered agreement on some basic points, leaving the political decisions for the government. He stressed that the committees established during the debate remain active to this day and will probably intervene in the assessments of results.

Key findings of the session

The session presented the current progress in energy transition legislation in France and the ambitious objectives for 2030 and 2050.

The establishment of visions and scenarios, and their macroeconomic assessment, shows where the potential lies to achieve these objectives and that they would have a positive macroeconomic impact.

The French process set up a framework for dialogue on energy vision and scenarios, to which the ADEME contributed with its visions, and which will likely continue.

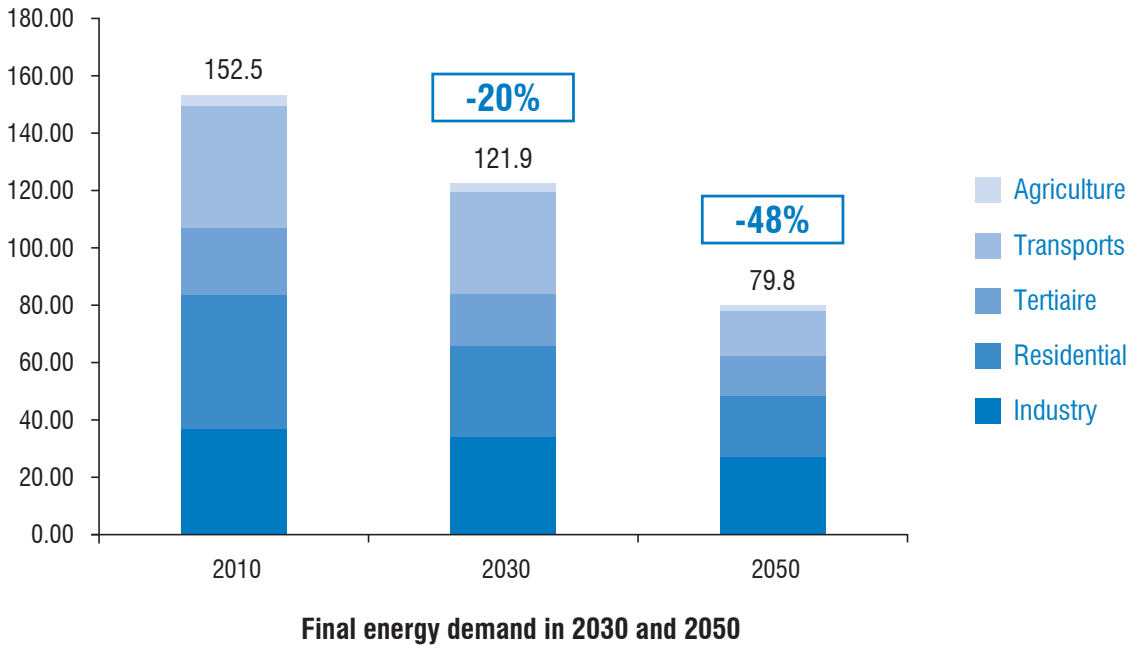
Concrete/practical steps for transformation

The ADEME's visions for 2030 and 2050 are consistent with current legislative objectives, which are being translated into the next planning of investment in the energy sector.

For 2050, the objective of dividing greenhouse emissions by four implies that more than a division by four is required for CO_2 emissions, because reducing emissions of other greenhouse gas is much more difficult.

There is significant potential for emission reduction through retrofitting in the building sector, and through the transformation of mobility in cities.

Figure 12: Energy transition scenarios to 2030-2050 elaborated by ADEME for National Debate (November 2012)



Source: Presentation by Francois Moisan, ADEME

2nd session:
Urban dynamics, rural development and decarbonisation

Keynote speaker: Hermann Ott, WI, and a roundtable with the chairs of the 1st session
Rapporteur: Beatrice Cointe, CIRED

This session consisted of the keynote address by Hermann Ott (Wupperthal Institute) followed by questions from the audience and a discussion. The presentation consisted of an assessment of the current status of global climate talks, a diagnosis of the institutional problems encountered within the UNFCCC, and a proposal for enabling swifter global progress.

It started by noting that the history of climate policy over the past 25 years has been a history of ups and downs, and that despite progress in renewable energy, the climate gap remains. What is negotiated right now is on the basis of INDCs, i.e. voluntary pledges by countries or group countries, on mitigation, adaptation or finance, and in all likelihood the outcome in Paris will not be sufficient to bring about the required decrease in emissions to stay below 2°C: the global climate negotiations system is developing into a system of "pledge and chat." The keynote address relies on "structuration theory" to explain why the UNFCCC regime is important, what it can do and cannot do, and how it can be complemented to allow for the kind of transformative change that is required to fight climate change.

Structuration theory argues that there is a duality between agency and structure; that you have to look at both and study how they interact. It stresses the distinction between rules and resources; rules are cognitive, interpretive frames and cultural norms, while resources are economic resources and authoritative/allocative power. The notion of "structuration cycle" posits that agents influence the structure, which in turns influences the agents' behaviour.

When we look at the climate regime from this frame, we see that it is doing OK in terms of providing significance and legitimation, but that has not been very successful when it comes to dealing with resources: despite multiple attempts to organise a reallocation of resources, the process seems somewhat stuck on this point, and there are institutional reasons for that. The Kyoto Protocol is very different from other environmental regimes, especially in two main aspects: it does not contain an "entry fee," i.e. obligations, and it does not allow for majority voting (all decisions under the UNFCCC have to be taken by consensus and it is the same for the Kyoto Protocol). This has led to a standstill or rather a backlash, and everything that is happening in climate policy is not reflected in the UNFCCC. It is highly unlikely that the transformational change and massive reallocation of resources required can be in any way achieved by consensus of 190+ diverse countries, so we need a different approach.

Two recommendations have been put forward to this end. First, since the UN regime is good at giving meaning, this aspect should be improved, which is what the move towards INDC (i.e. multidimensional commitments instead of a pure target-based approach) seems to indicate. Second, to foster progress, it would be good to enter into a second track in a "club" approach: there should be a pioneer club of more ambitious countries established outside the UNFCCC framework to establish a winning narrative for climate policy, facilitate leading by example, allow the setting of rules for increased flexibility and adaptability by majority voting, enjoy the benefits of closer

cooperation. There are many examples of clubs already, but no "fast-track" club. This club could be open to states and subnational entities; it should have an ambitious vision, clear and progressive criteria for membership, flexible decision-making procedures. Its objective would be to demonstrate that a fossil-free economy is working and so o subsequently increase ambition within the UN regime as well. It would not be a substitute but a supplement to the UNFCCC.

The questions and discussions mainly addressed practical aspects and issues with the proposal. How would the proposed system adjust with potential trade issues? Who would be willing to join such a club, and how would you attract developing countries that have always said the UN system is sacred? What would be the benefits of joining such a club? Should the quantity of mitigation be a criterion for this kind of club? A discussion followed the presentation. The speaker's answers were overall fairly optimistic about the possibilities to overcome potential difficulties. He stressed that though other, more specialised clubs (many of which already exist) are very important, there is a need for a climate club that would address the climate as a whole. About trade issues, he agreed that they should be looked into (at least for political reasons), but seemed confident that they would not be a problem. Regarding developing countries, though there is resistance about leaving the system, many are actually looking for a way out of the deadlock (submitting INDCs, contributing to the GCF…). Motivations to join in would first be the will to do something against climate change to be progressive, and the idea that fighting climate change can be good business, and there could be incentives, such as trade preferences (as in the Montreal Protocol), technology and financial exchanges, for other countries.

Key findings of the session

A problem with the current international climate regime is that everyone is expected to move at the same speed, which is not possible.

The UNFCCC should concentrate on providing meaning and legitimation to climate protection activities worldwide.

A second treaty should be added, initially outside the UN regime, to establish a "fast-track club" and provide a platform for ambitious countries for moving faster than the rest, in order to get more movement into the negotiations.

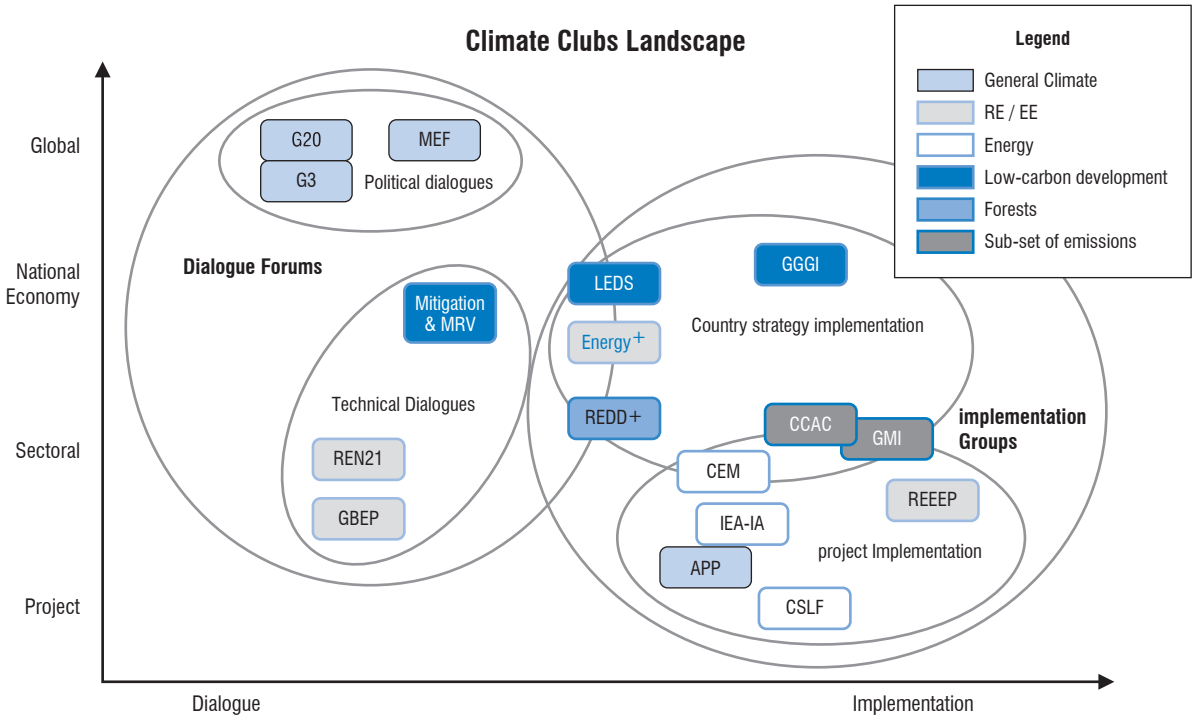
Concrete/practical steps for transformation

There is a need for an institutional framework that is flexible and allows for fast-track action and efficient decision-making so that "pioneer" countries can make progress on climate action and trigger movement at the global level.

Actual progress and action to fight climate change are not reflected within the UNFCCC.

For institutional reasons, the UNFCCC is not flexible enough to foster transformative change, a "fast-track" club could provide a structure for countries willing to do more to do so and show that fossil-free development is possible.

Figure 13: An overview of climate clubs and why they are different (thanks to Luts Weischer)



Source: Presentation by Hermann E. Ott, WI

3rd session: **The CBDR principle revisited: From burden sharing to picking the benefits of cooperation**

Keynote speaker: Sébastien Treyer, IDDRI
Rapporteur: Tomoko Ishikawa, IGES

One of the main outcomes of the United Nations Conference on Sustainable Development (UNCSD, Rio+20), held in June 2012 in Rio de Janeiro, Brazil, was the agreement by member states to launch a process to develop a set of sustainable development goals (SDGs), that will build upon the millennium development goals (MDGs) and converge with the post-2015 development agenda. Since March 2013, intergovernmental consultations were made at the Open Working Group (OWG) of the General Assembly on Sustainable Development Goals. The OWG proposed a set of SDGs: 17 goals and 169 targets, which are to be adopted at the UN General Assembly September 2015. According to "The future we want – Rio+20", "SDGs should be action-oriented, concise and easy to communicate, limited in number, aspirational, global in nature, and universally applicable to all countries."

What is/could be the difference between MDGs and SDGs? MDGs were designed on the initiative of donors, and their targets were mainly for developing countries. On the other hand, SDGs are required to respond not only to a dimension of development, but also to dimensions of the economy, society, and the environment. Therefore, these are not only for developing countries, but also developed countries. Also, MDGs have focused on funds transfer from developed countries to developing countries. It was pointed out that there was no regard for a perspective of the role of economic development, which enables developing and emerging countries to encourage problem-solving by themselves.

SDGs are to be voluntary targets, and not legally binding. Therefore, after the agreement, each country should identify priority issues to tackle in the light of circumstances of the country, reflect them with their national planning, and then build up an effective system for implementation. Also, it is necessary not only to incorporate the priorities into a national plan, but also to link them with relevant policies and plans of national and local governments. In addition, it is expected that the business sector and NGOs make proactive efforts to promote effective implementation. However, again, as the SDGs are to be voluntary targets, not all nations and actors will take such proactive actions.

In the meantime, countries are shifting gears towards setting up emissions reduction targets with a new tool - Intended Nationally Determined Contributions or INDCs - in time for COP21 in Paris. However, setting targets is not the end. What is important is to build a system to ensure the steady implementation and encourage continuous improvement. By doing so, the targets and their associated institutional arrangements in each country will determine whether the world can put development on the road to a low-carbon and climate-resilient future.

We should try to meet the climate change targets and SDGs as one overarching goal, as they are complimentary and one cannot do without the other – a failure to meet targets set by the climate change regime would also have an adverse effect on achieving the SDGs. Hence, to identify essential means of implementation, or MOI, is crucially important.

In NDCs, a full-fledged approach for the development of "science-based" policies, such as setting targets, ensuring their implementation, and supplementing in a quantitative manner, will be indispensable. As the major point of policies after the setting of quantitative GHG emissions

reduction targets, a credible measuring, reporting and verification, or MRV system, becomes increasingly important. Also, not only for targets for GHG emissions reduction, but also for targets for SDGs, it is of the utmost importance to take data in a comparable manner, with uniform indexes and hard measures. In this regard, to ensure transparency would be an issue in the future.

In addition, multi-stakeholder partnerships that go beyond levels and sectors are expected to play an increasingly important role in joining forces for effective implementation. To recognise multi-stakeholder partnerships as important vehicles for mobilising and sharing knowledge, expertise, technologies and financial resources in all countries will be a key in the post-2015 development era.

Key findings of the session

SDGs are required to respond not only to a dimension of development, but also to dimensions of the economy, society, and the environment. Therefore, these are not only for developing countries, but also for developed countries.

Not only for SDGs, but also for NDCs, setting targets are not the end. What is important is to build a system to ensure the steady implementation and encourage continuous improvement.

Recognising multi-stakeholder partnerships as important vehicles for mobilising and sharing knowledge, expertise, technologies, and financial resources in all countries, will be a key in the post-2015 development era.

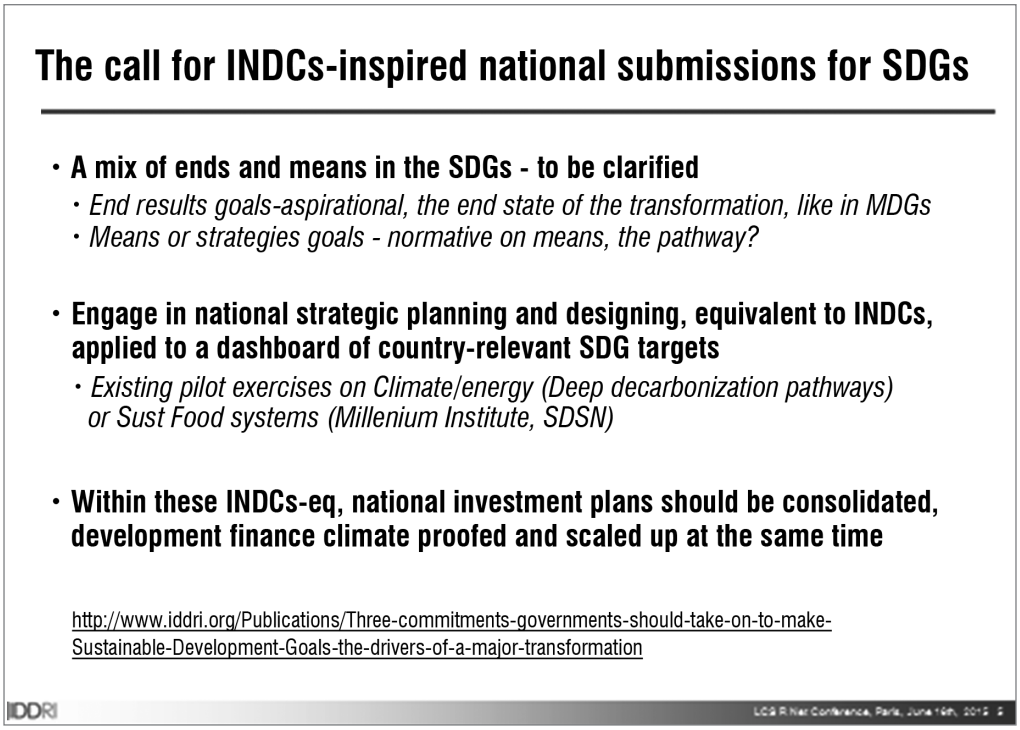
Concrete/practical steps for transformation

We should try to meet the climate change targets and SDGs as one overarching goal, as they are complementary and one cannot do without the other – a failure to meet targets set by the climate change regime would also have an adverse effect on achieving the SDGs.

Not only for targets for GHG emissions reduction, but also for targets for SDGs, it is of the utmost importance to take data in a comparable manner, with uniform indexes and hard measures.

In the post-2015 development era, multi-stakeholder partnerships are expected to play an increasingly important role in the implementation of sustainable development.

Figure 14: The call for INDCs-inspired national submission for SDGs



Source: Presentation by Sébastien Treyer, IDDRI

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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 seventh annual meeting of LCS-RNet, Paris, France, 15th to 16th June, 2015.

Seven years have passed since LCS-RNet was proposed at the G8 Environment Ministers' Meeting in Kobe. This year, scientists and policymakers gathered in Paris fully aware of the need to discuss issues such as energy security and affordability, resource efficiency improvement, CBDR and low carbon investment to pursue transformation to a low carbon society. This report summarises the key findings of the discussions in Paris and looks ahead to future development of the LCS agenda. I believe this report will aid in LCS research and assist policymakers and other stakeholders.

In the second phase our network is focusing on adaptation as well with the goal of making significant progress in low-carbon society research. As a further objective we intended to announce proposals from the scientific community ahead of COP21. The proposals were prepared as the statement from LCS-RNet with the intention of sending a strong signal to COP21 in Paris. The eighth meeting of LCS-RNet is planned to be held in Germany in 2016 with the intention of considering future issues after COP21.

Finally, I would like to express gratitude to all of the chairs at the Paris meeting, as well as to those who have contributed to this report. I would like to express my heartfelt thanks to the governments of steering member countries—France, Germany, Italy, UK and Japan—for their continued support of network activities. The steering members extended much effort in structuring the program, which has led us here to the current second phase of activities under the strong leadership of this meeting's co-chairs: Jean-Charles Hourcade of CIRED and Stefan Lechtenböhmer of Wuppertal Institute for Cliamte, Environment and Energy. I would also like to thank all of the participants at the meeting in Paris for their contributions.

Shuzo Nishioka

Secretary General
LCS-RNet Secretariat

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