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CARISMA
Innovation for Climate Change Mitigation

CARISMA Climate Change Mitigation Monitor

ENHANCED GUIDANCE FOR PREPARING A TAP

At the recent Bonn Climate Change Conference, enhanced Guidance for Preparing a Technology Action Plan has been made available, in order to improve the development of prioritised technologies into projects that can be ultimately implemented.

The Technology Needs Assessment (TNA) process prioritises technology options for climate change mitigation and adaptation in light of a country's sustainable development priorities. The TNA process therefore not only maps out a country's long-term development priorities, but also identifies technologies to realise these with lower emissions and stronger climate resilience. As a next step, the TNA identifies and analyses barriers hindering deployment and diffusion of the prioritised technologies, as well as measures to overcome these. The final step in the TNA process is the preparation of Technology Action Plans (TAPs), which support the implementation of the prioritised technologies, at the desired scale, to achieve the climate and development benefits as identified earlier in the TNA.

Since the end of the 1990s, over 100 developing countries have conducted TNAs. In 2009, the TNA process was updated with improved guidance, which was applied by over 30 countries during the Global TNA Project of 2009-2013. Currently, a second phase of this project is ongoing with another 25 countries. Results from the Global TNA Project have been analysed by the UNFCCC secretariat in the Third TNA Synthesis Report and by the Technology Executive Committee in a paper on TNA Good Practice.

From these TNA review activities, it has become clear that while countries have been able to systematically prioritise technologies for climate and development, the TAPs often contain insufficient information for potential investors to consider technologies and enabling actions for funding. Therefore, COP20 (Lima, 2014) requested guidance on how the results of the TNAs, in particular the TAPs, can be developed into projects that can be ultimately implemented. COP21 (Paris, 2015) welcomed the work, after which the guidance was presented at a side-event during the Bonn Climate Change Conference on 18 May of this year.

Wytze van der Gaast
JIN Climate and Sustainability

"The Technology Action Plan forms the keystone in the technology transfer process"

While formulation of TAPs is the final stage of a TNA process, the guidance considers TAPs as a 'keystone' between 'TNA analysis' on the one hand and 'technology implementation' on the other: without a solid action plan, implementation of prioritised technologies will not work (see Figure 1). ►

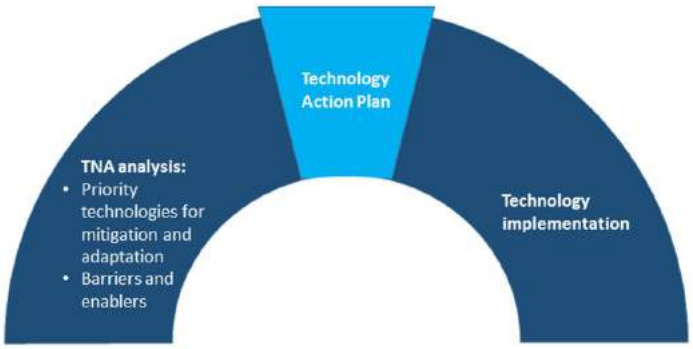

Figure 1. TAP as keystone in technology transfer process.

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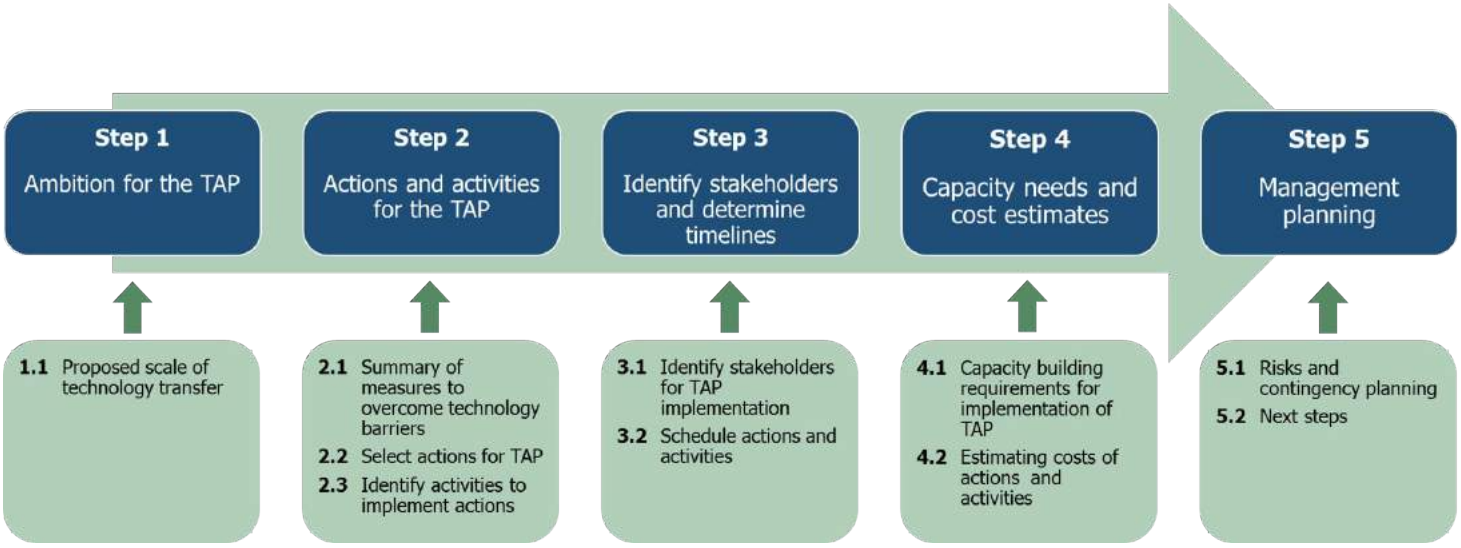

Figure 2. Overview of steps of a TAP preparation process. All five sequential steps for TAP formulation are part of a TNA process and supported, in terms of capacity and costs, by the Global TNA Project.

The guidance also acknowledges that actions in a TAP can take different forms, such as a technology demonstration project, or a programme to train local engineers in operating the technology. The goal of the guidance is to help ensure that each completed TAP contains:

- A set of concrete actions needed for successful technology implementation in the country; and
- An indicative investment proposal for each technology, which can be considered for funding by potential public and/or private funders.

TAP PREPARATION PROCESS

The target audience for a TAP are in-country public and private sector stakeholders that are likely to be involved in the implementation of the proposed actions detailed in the TAP. These stakeholders can be decision makers from governments, where actions involve, for instance, regulatory measures or incentives or infrastructural improvements, and private investors when actions concern concrete business proposals and/or investment opportunities.

1. Ambition: The first task is to describe the scale and context for technology deployment and diffusion in the country context (the 'ambition'). Usually, this information has been collected in earlier stage of a TNA but is revisited in light of latest developments in the country.

2. Selection of actions for inclusion in the TAP: Actions are selected to support technology implementation at the desired scale. Earlier in a TNA, barriers have been identified to deployment and diffusion for each priority technology, as well as possible measures for addressing these. For a TAP, the previously identified measures are turned into a list of actions. These actions are expanded into a set of specific activities, i.e. the specific things to be done to realise an action.

3. Responsibilities and time frame: Once the activities are defined, the relevant stakeholders, i.e. those who will be directly involved in the implementation of the TAP, should be identified. Here, it is also important to estimate a timeframe for each activity, including the sequence of actions and whether a technology is a turn-key option to be implemented in the short run or an option which still needs some further steps before it can be deployed in the market in the country.

4. Capacity and financial resource needs: For all Actions and activities identified for inclusion in the TAP, it is important to estimate the human and financial resources needed for each, including the type of financing required and potential sources of funding. The guidance acknowledges that detailed cost-estimates may not be feasible given the resources for a TNA. Instead, TNA teams are recommended to clearly identify what are the different cost items to be covered and to make basic calculations using as much as possible benchmark or other generally available cost information. With that, the TAPs produce cost figures that help potential funders assess which items they could cover and whether the action plan meets pre-feasibility checks. As a next step, and usually beyond the TNA project (resources), more detailed cost calculations can be made using the funder's own guidance and template.

5. Finally, the TAP should include a management plan for reporting, risk management, corrective measures, and contingency plans.

The five steps of the renewed TAP guidance are presented in Figure 2.

MORE INFORMATION

The report 'Guidance for Preparing a Technology Action Plan' can be viewed or downloaded from the website of the TNA project: www.tech-action.org. Here you may also find more information about the TNA project, other TNA guidance documents, and TNA reports on the process and results in participating countries.

INFORMATION OVERLOAD? REVIEW OF DATABASES ON CLIMATE CHANGE MITIGATION POLICY

Policy makers need a wide range of information in order to adopt the best possible policies to act on climate change. A variety of databases have emerged, compiling information on climate change mitigation policies in a variety of countries. An analysis of 24 such databases has been undertaken.

The analysis leads to a few preliminary findings. First, data on climate change mitigation policies is increasingly available. This is a positive development from the perspective of transparency of climate policy, and can potentially lead to more informed decision making.

Second, available information is concentrated largely on the energy sector, with an emphasis on energy efficiency. A more comprehensive coverage of climate policy databases, including more focus on e.g. agricultural policies, would be a welcome development.

Third, data availability is unevenly distributed. While the emissions-intensive countries in the global North are well represented, information on policies in developing countries is scarcer and less comprehensive. More information on developing countries' policies would not only be beneficial to track their efforts to achieve NDCs, but may also be useful for the countries themselves, with a view to sharing knowledge and best practices with each other, gaining access to climate finance, and learn about past successes and failures.

Harro van Asselt & Stefan Bößner, Stockholm Environment Institute

Within the CARISMA project, SEI leads the work on mapping and assessing climate climate mitigation policies.

Fourth, the data sources analysed are insufficiently linked to each other, thus forgoing potential synergies, and potentially leading to an excess of information.

Lastly, data sources generally eschew comparisons of policies and provide little information about the costs of, and actual emissions savings attributed to, specific policies. While it may be challenging to provide such information both ex ante and ex post, comparable estimates of costs and/or emissions savings will become increasingly important after Paris.

The CARISMA working document on the review of mitigation databases can be downloaded from the CARISMA website.

JUMP START THE EU HEATING & COOLING STRATEGY

The EU's Heating and Cooling Strategy provides a framework to better integrate efficient heating and colling into existing energy policies. The focus is on (1) minimising energy leakage from buildings, (2) maximising the efficiency and sustainabiltiy of heating and cooling systems, (3) supporting efficiency in industry, and (4) integrating heating and cooling in the electricity system.

The relevance of this strategy for the EU's energy system cannot be understated. Heating and cooling is the single largest energy sector in the EU, totalling 50% (550 Mtoe) of final energy consumption. Fossil fuels accounted for 75% of the primary energy supply for heating and cooling, while renewables accounted for 18%.

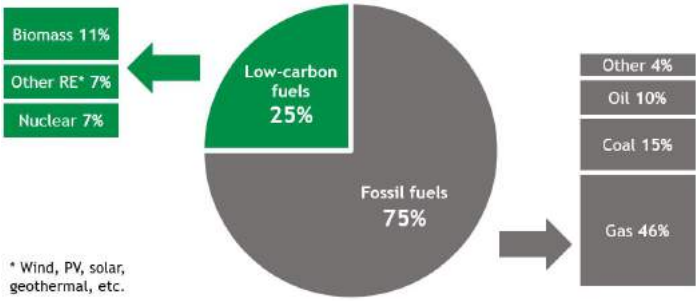

Figure 3. Primary energy for heating and cooling, 2012

In decarbonising urban environments, district heating holds a great potential to be a key strategic option, especially in combination with renewable energy (incl. biomass). However, there are significant challenges, such as lack of investments, unfavourable price developments, and a highly diverse regulatory framework for district heating across Europe.

During a discussion at the BIOTEAM conference in Brussels, the main lesson learnt was that, even if the competition with natural gas is tough, sustainable district heating is possible and desirable given the large volumes of heat being wasted.

The BIOTEAM project was a three-year project (2013-2016), co-funded by the EU's Intelligent Energy Europe programme. The project focused on optimising pathways and market systems for enhanced competitiveness of sustainable bio-energy. Upon the end of the project, the 'BIOTEAM Magazine' has been publised, providing an overview of the key results, including the work on district heating, the role of biogas in a circular agro-economy, and life cycle assessments of a number of bio-energy pathways in a range of European countries.

More information about the BIOTEAM project, along with its publications, is available at www.sustainable-biomass.eu.

ROADMAPS FOR LOW-CARBON ENERGY TECHNOLOGY

In order to address the challenge of climate change, it is necessary to accelerate the development of low-carbon (energy) technologies. The International Energy Agency (IEA) has prepared a set of 'roadmaps' to take on this challenge, along with issues of energy security and economic growth.

The IEA Technology Roadmaps are strategic plans describing steps needed to be taken to support the development of low-carbon technologies, outlining targets, pathways, priorities, and time frames for their RDD&D (research, development, demonstration and deployment). They include technical, policy, legal, financial, market, and organisational needs for technology development, based on stakeholder consultation.

The technology-specific roadmaps present international consensus on milestones for technology development, legal/regulatory needs, investment requirements, public engagement/outreach and international collaboration, based on the 2°C Scenario (laying out a pathway giving an 80% chance of keeping global temperature increase below 2 degrees). In addition to these international roadmaps, the IEA is working with several countries on country- and technology-specific roadmaps, such as a Wind Energy Development Roadmap for China.

The 21 technology-specific roadmaps include a range of renewable energy technologies, such as solar photovoltaics, bioenergy, geothermal heat and power, hydropower, nuclear energy, and wind energy. In addition, there are roadmaps focused on CCS, low-carbon technologies in the transport and industry sectors, and energy-efficient buildings.

Based on the experience with 'roadmapping', the IEA has prepared a 'how-to guide'. The guide includes detailed directions to countries and companies wishing to develop and implement effective low-carbon energy technology roadmaps relevant to their circumstances and objectives. It includes clear guidance on how to identify key stakeholders and develop a technology baseline, and indicators for progress tracking. According to the IEA, there are six vital aspects in the design of a roadmap process: stakeholder participation; resource constraints; critical inputs; roadmap design; buy-in and dissemination; and monitoring and tracking.

The Technology Roadmaps as well as the 'how-to guide' are available to download at www.iea.org/roadmaps.

THE COSTS OF CLIMATE CHANGE MITIGATION

Is it the social cost of carbon, the private costs, the carbon price or a reduction in the gross domestic product (GDP) we need to consider when talking about the costs of mitigation? The truth is: all of these terms are legitimate, but one must be aware of the definitions in order to use them in the right context.

Most analyses report mitigation costs in macroeconomic indicators, such as 'GDP losses'. In general, estimates are stated as deviations from a baseline scenario without mitigation policies: the measure expresses how much GDP is "lost" in percentage terms at a particular point in time compared to its expected value for this particular point in time by reducing emissions to a certain stabilisation scenario.

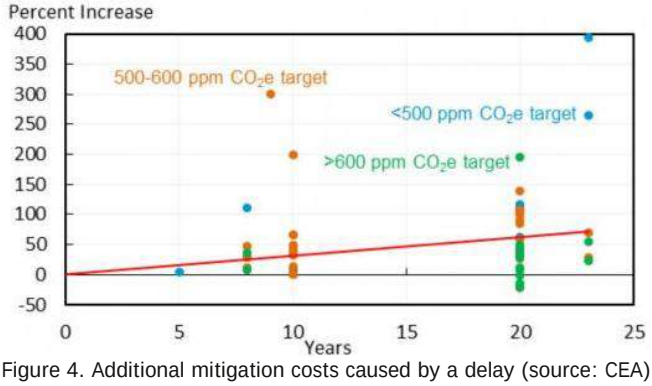

Figure 4. Additional mitigation costs caused by a delay (source: CEA)

Estimates of aggregate economic costs of mitigation are executed through integrated models based on a wide range of assumptions of e.g. behavioural change and technological switch. Therefore, estimates are highly variable. For example, the IPCC predicts global consumption loss of between 3 and 11% by 2100.

Several studies confirm that delaying mitigation actions is costly in multiple ways, as by the later starting point of the actions, GHG concentrations have already increased, andthere is less time remaining for policies to become effective. The figure below shows that delay results in higher costs, regardless of the CO_2 stabilisation target. On average, net mitigation costs increase by approximately 50% for each decade of delay. Therefore, it seems reasonable to invest in climate change mitigation right away.

CLIMATE POLICY INFO HUB

This note is a summary of the knowledge package 'The Costs of Mitigation: An Overview' on the Climate Policy Info Hub. This website offers science-based knowledge for climate decision-makers, on topics such as EU and international climate policy, the EU ETS, renewable energy, energy efficiency, and adaptation.

TECHNOLOGY TRANSFER IN THE PARIS AGREEMENT: IS EUROPE READY FOR ENLIGHTENED SELF-INTEREST?

On the 30th of June, the European Commission's DG for Climate Action, in collaboration with ICF International, hosted a workshop on the role of technology transfer in the Paris Agreement. The workshop's focus was on the private sector, and in particular on the opportunities the Paris Agreement creates for European businesses. This is telling; the focus of the European negotiators in the technology discussions under the UNFCCC has been narrowly self-interested. In the wake of the Paris Agreement, it is time that this self-interest becomes more enlightened.

The developed countries in the UNFCCC have consistently argued that the Technology Mechanism, which is the framework under which the climate negotiations have, for the past six years, tried to enhance technology transfer of climate-friendly technology to developing countries, ought to facilitate private sector activities. As most climate technology and business is currently still located in industrialised countries, it is firmly in Europe's interest that mechanisms under the UNFCCC create opportunities that will lead to added value, and jobs, in the old continent.

However, this also needs to be nuanced. The Technology Mechanism is the result of difficult negotiations towards the Paris Agreement and cannot be seen in isolation. In the Paris Agreement, developing countries accepted soft mitigation commitments in exchange for serious support to realise their targets laid down in their Nationally Determined Contributions. Pushing for European business opportunities may disturb this delicate balance.

It is too simple to regard the business opportunities under the Technology Mechanism as a win-win-win situation for the climate, developing countries, and European business. Unfortunately, the core interest of business is not environmental sustainability or climate-resilient development in developing countries. It is time that the Member States of the European Union not only talk about their own interests, but take responsibility for the success of the Technology Mechanism.

Heleen de Coninck
Radboud University

"The EU should look further than its narrow self-interest in business opportunities"

They can do so by arguing for and promoting active National Designated Entities for the Technology Mechanism in all Member States, providing generous non-earmarked funding for the Climate Technology Centre and Network (the implementation arm of the Technology Mechanism which connects developing countries' technology transfer needs with developed countries' technologies and expertise), and reporting on their climate technology transfer activities, thus allowing much-needed learning about good practices.

Indeed, if this would be done seriously, the business opportunities will come, also for Europe. The European Commission needs to acknowledge that to maintain developing countries motivated to achieve their NDCs, helping European business is a secondary objective, and the interests of developing countries should be at the core and centre in its discussions on technology transfer.

ACCELERATING PUBLIC UNDERSTANDING OF CCS

Carbon capture and storage (CCS) is one of the climate change mitigation technology options focused on by the CARISMA project. The Global CCS Institute has recently released two new reports to help accelerate public understanding of this technology.

The report 'Introduction to Industrial Carbon Capture and Storage' summarises 17 CCS projects across sectors including natural gas processing, fertiliser manufacturing and hydrogen production. The report highlights that one quarter of the world's CO_2 emissions, or 8.5 gigatonnes, result from these, and other industrial sectors such as iron and steel, cement production and petrochemicals refining. According to the Global CCS Institute, CCS is the only technology that can achieve deep reductions in CO_2 emissions from such high-emitting industries, and "failure to stimulate a future pipeline of CCS projects could see the cost fo climate mitigation more than double."

The second report, 'Understanding Industrial CCS Hubs and Clusters' explores the economic benefits of building shared infrastructure for multiple small industrial emitters to reduce emissions using CCS.

The highlights of both reports can be read on the 'Industrial CCS' page of the Global CCS Institute website. Here also PDF versions of both reports can be downloaded.

GLOBAL CCS INSTITUTE

PLEDGES OVERSHOOT PARIS TEMPERATURE LIMIT

Individual country pledges to reduce greenhouse gas emissions would need to be strengthened in order to limit future climate change to well below the 2°C limit included in the Paris climate agreement. This is the conclusion of a new assessment by a team of international research organisations from Europe, the US, Latin America, Africa, Asia, and Oceania, that has been published in Nature.

Pledges made for the Paris agreement on climate change last winter would lead to global temperature rise of 2.6 to 3.1 °C by the end of the century. In fact, the entire carbon budget for limiting warming to below 2 °C might have been emitted by 2030, according to the study.

The new study provides an in-depth analysis of the pledges which countries submitted at the Paris climate meeting in December, the Intended Nationally Determined Contributions (INDCs), showing that additional measures would be necessary to limit future temperature rise to 2 °C, or even 1.5 °C, by 2100. Substantial enhancement or over-delivery on current INDCs by additional national, sub-national and non-state actions is required to maintain a reasonable chance of meeting the target of keeping warming well below 2 degrees Celsius.

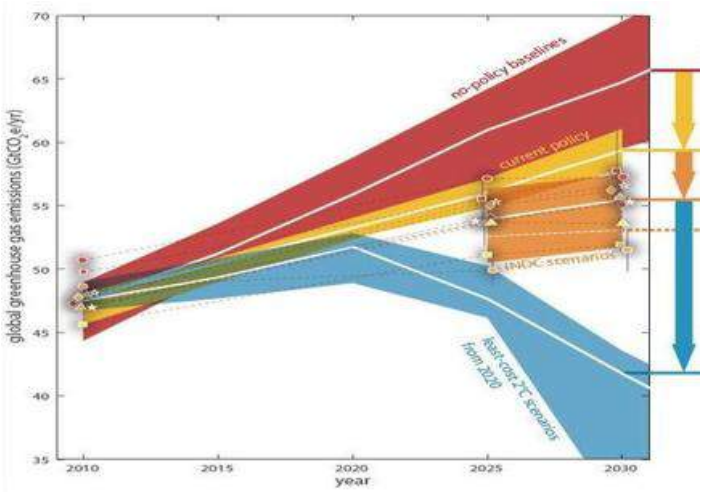

Figure 5. Global greenhouse gas emissions from 2010 to 2030, as implied by INDCs (orange), compared to no-policy baseline (red), currrent policies (yellow) and 2 °C scenarios (blue) (source: Rogelj et al., 2016).

Publication: Rogelj, J., Den Elzen, M., Höhne, N., Fransen, T., Fekete, H., Winkler, H., Schaeffer, R. Sha, F., Riahi, K. & Meinshausen, M. (2016), 'Paris Agreement climate proposals need a boost to keep warming well below 2 °C', Nature, vol. 534, pp. 631-639.

KEY RECENT PUBLICATIONS ON MITIGATION

The CARISMA team has selected key publications in fields relevant to climate change mitigation, including climate policy, climate law, and technology.

Bataille, C., Waisman, H., Colombier, M., Segafredo, L., Williams, J. & Jotzo, F. (2016), 'The need for national deep decarbonization pathways for effective climate policy', Climate Policy, vol. 16, suppl. 1 (Special Issue on Deep Carbonization Pathways Project), pp. S7-S26.

COP22 Presidency (25 May 2016), Open-ended informal consultations on the Marrakech Conference, Bonn Climate Change Conference. Speaking notes Mr. Aziz Mekouar on behalf of Morocco, incoming Presidency COP22/CMP12.

Geels, F.W., Berkhout, F. & Van Vuuren, D.P. (2016), 'Bridging analytical approaches for low-carbon transitions', Nature Climate Change, vol. 6, pp. 576-583.

Glachant, M., Ing, J. & Nicolai, J.P. (2016), The incentives to North-South transfer of climate-mitigation technologies with trade in polluting goods, Economics Working Paper 16/242, Zurich: CER-ETH.

Government of Pakistan (2016), Technology Needs Assessment Report: Climate Change Mitigation, Islamabad: Ministry of Climate Change.

Luderer, G., Bertram, C., Calvin, K., De Cian, E. & Kriegler, E. (2016), 'Implications of weak near-term climate policies on long-term mitigation pathways', Climatic Change, vol. 136, no. 1, pp. 127-140.

Mace, M.J. (2016), 'Mitigation Commitments Under the Paris Agreement and the Way Forward', Climate Law, vol. 6, no. 1-2 (Special Issue on Paris Agreement), pp. 21-39.

Peeters, M. (2016), 'An EU Law Perspective on the Paris Agreement: Will the EU Consider Strengthening its Mitigation Effort?', Climate Law, vol. 6, no. 1-2 (Special Issue on Paris Agreement), pp. 182-195.

UNFCCC (2016), Technology and the UNFCCC: Building the foundation for sustainable development, Bonn: United Nations Framework Convention on Climate Change.

Van Asselt, H. (2016), 'The Role of Non-State Actors in Reviewing Ambition, Implementation, and Compliance under the Paris Agreement', Climate Law, vol. 6, no. 1-2 (Special Issue on Paris Agreement), pp. 91-108.

Wong-Parodi, G., Krishnamurti, T., Davis, A., Schwartz, D. & Fischhoff, B. (2016), 'A decision science approach for integrating social science in climate and energy solutions', Nature Climate Change, vol. 6, pp. 563-569.

CARISMA PROJECT UPDATES

Communication and consultation. The CARISMA team has carried out an initial stakeholder consultation with climate change mitigation stakeholders across Europe. Key outcomes include the need for embedding climate change mitigation options in their socio-economic context, the importance of considering policy interactions, en the need to enhance learning from EU projects and experiences. CARISMA aims to meet this need by setting up an online portal (see below).

Research and innovation. A complete list of mitigation options has been prepared, as well as an inventory of what research and innovation (R&I) initiatives are going on in Europe, Next steps include the creation of a validated list of priorities for R&I, and an assessment of priority issues for innovation towards market implementation. Meetings with innovation decision-makers will be organised at EU and Member State levels to present and discuss the key findings.

Online mitigation portal

The CARISMA project aims, together with other EU-funded projects, to launch an online climate change mitigation portal, enabling exchange of information on mitigation research and innovation. The collaborating projects will post highlights of their work so that information from different EU-funding projects on climate change mitigation can be found in one place, supporting the dissemination of climate change mitigation knowledge.

CARISMA collaborates with the following projects on the structure and design of the platform:

- ADVANCE: Advanced model development and validation for improved analysis of mitigation policies
- TRANSrisk: Transition pathways and risk analysis for climate change mitigation and adaptation strategies/policies
- PATHWAYS: Exploring the possibilities for transitions to a low-carbon, sustainable Europe
- CD-LINKS: Linking climate and development policies - leveraging networks and knowlegde sharing
- GREEN-WIN: Solution-oriented approach for green growth and win-win strategies for sustainable climate action

Assessment of technologies for mitigation. A range of methodologies are being used for the assessment of climate change mitigation technologies. The assessments focus on costs and benefits, environmental aspects, and social aspects including public acceptance. Technologies assessed include bio-CCS, solar PV, smart grids, wind energy, and artificial trees.

Mapping and assessing mitigation policies. Databases of climate change mitigation policies have been analysed, resulting in a working document (see page 3 for more information). In addition, a set of case studies are carried out focussing on interaction among policies, for example between the EU's emissions trading scheme and renewable energy policies.

Policy implementation and context factors. Different approaches to governance and their main features are being analysed, focusing amongst others on the degree of climate mainstreaming, participatory configurations, and public-private partnerships. In addition, a list of contextual factors that could influence climate change policy formulation and implementation is being prepared. Such contextual factors include institutional, political, economic, and social aspects.

International collaboration on research, innovation, and technology transfer. Research and innovation (R&I) initiatives for climate change mitigation at various levels are mapped and analysed. In addition, CARISMA focuses at a firm-level assessment of the functioning of global innovation networks. In this framework, CARISMA organised a workshop on R&I offshoring, in March of this year in Copenhagen.

THE CARISMA PROJECT TEAM

The CARISMA project is carried out by a team of researchers from 10 European research institutes and universities, led by Radboud University in the Netherlands.

Figure 6. Group photo of the CARISMA team during the project meeting in Prague in February 2016.

This project has received funding from the European Union's Horizon 2020 Programme of the EU under Grant Agreement No. 642442.