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CARISMA
Innovation for Climate Change Mitigation

CARISMA Climate Change Mitigation Monitor

MANAGING CLIMATE AND ENERGY POLICY INTERACTIONS
A CHALLENGE TO THE LOW-CARBON TRANSITION

A few days before the opening of the UN climate change conference in Marrakesh (COP22), the question of designing a credible and coherent 2°C policy framework to reduce myopia and inertia of decision makers is a major issue for an effective decarbonisation of all countries.

Emilie Alberola & Benoît Leguet, I4CE – Institute for Climate Economics, Paris

I4CE carried out one of the CARISMA case studies on policy interactions.

The credibility of global decarbonisation pathways is growing. One year ago, in December 2015, who could have thought that an international and universal climate agreement involving all countries would enter into force in less than a year's time? It happened: the Paris Agreement comes into force on the 4th of November, 2016, ratified by 86 Parties, covering over 60% of global greenhouse gas (GHG) emissions.

After the diplomatic celebration of the Paris Agreement's entry into force, political climate action must kick in. The major challenge of the COP22 is to give credibility and coherence to this political aspiration, by maintaining the Paris agreement momentum through the UNFCCC process and the Global Climate Action Agenda. After its ratification, the first meeting of the Parties to the Paris Agreement (CMA1), taking place in Marrakesh in conjunction with COP22, should deal notably with the credibility of the commitments embedded in the Nationally Determined Contributions (NDCs) and the review of their ambition. These are critical issues because for the time being we are still far from the low-carbon path needed to limit global average temperature rise to 2°C as compared to pre-industrial levels, not to mention 1.5°C.

Among its objectives, the Paris agreement calls for aligning climate and energy policies and financial flows for supporting the transition towards a low-carbon, climate-resilient economy. Obviously, implementing the Paris Agreement's climate goals and NDCs requires strengthening climate and low-carbon energy policies such as carbon pricing measures, but also an enhanced policy mix coherence.

For improving the 'policy alignment', understanding policy interactions is paramount as these could have positive or negative impacts on the effectiveness of a low-carbon strategy, especially when overlaps occur between policies. In France, for example, interactions between climate and energy policies can occur between: its National Low-Carbon Strategy released in November 2015, which aims at reducing national GHG emissions by 75% in 2050 compared to 1990 levels; some EU energy and climate policies; and policies at the regional and local levels.

In a specific case study of the French electricity sector, we hint at the fact that French national-level policies implemented in the power sector are likely to have a minor impact on the European Union's Emissions Trading Scheme ▶

In this issue

(EU ETS) due to the relatively low GHG emissions of the French electricity companies covered by the EU ETS (see Figure 1). However, the EU ETS impacts energy efficiency improvements in France beyond the scope of the power sector through the use of auctioning revenues. This policy interaction can be relatively strong in France, as the French government uses 90% of ETS auction revenues to finance energy efficiency in the residential sector through the French National Housing Agency.

In addition, on renewable energy, the EU carbon price can be a complementary policy, but it is not enough for large deployment of renewable energy in France, as in all other EU Member States (see Figure 2). As a consequence, the French government invests in renewable energy technology deployment through a subsidy scheme amounting to €14 billion between 2005 and 2011 (likely to grow to €20 billion by 2020). As a result, solar and wind energy, as a share of the total energy production, has increased from 1% in 2008 to 5% in 2015. Since 2012, the EU carbon price has also been too low to give enough incentives for coal-to-gas fuel-switching. In this context, the French government announced in May 2016 it would introduce a carbon floor price on electricity generation. However, on the 21st of October, 2016, the proposal was removed as it could constitute illegal state aid under EU rules, and because the potential closure of the coal plants was causing social unrest due to possible job losses at the targeted power plants.

Managing interactions between energy and climate policies remains a key challenge for the EU and its Member States while the debate on the EU 2030 energy-climate package is ongoing. A number of recommendations can be set up as to avoid misalignments. A first recommendation would be to require enhanced ex ante impact assessments of policies addressing CO_2 emission reductions that overlap in the industry and energy sectors. These assessments could subsequently provide a basis for evaluation of the need to adjust the EU ETS accordingly, in light of other climate and energy policies.

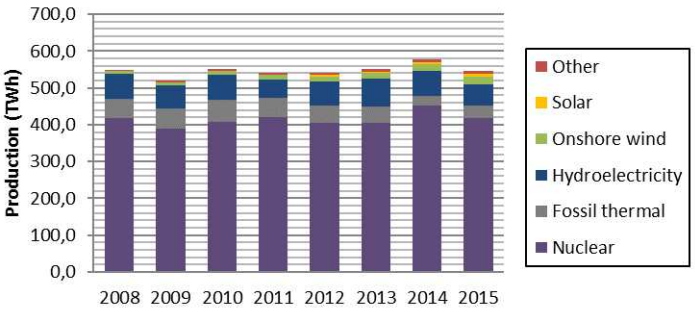


Figure 1. Electricity production in France. Only fossil is covered by the EU ETS. Source: I4CE, based on data from RTE France (2016).

A second recommendation would involve ensuring an up-to-date assessment process for the economic maturity of low-carbon technologies, as foreseen by the 'Energiewende' in Germany. It could, for example, seem helpful to establish or to provide indications regarding a timetable or the conditions required for gradually abandoning policies to support renewable energy, in order to limit their costs and to enable competition between decarbonisation technologies. Lastly, if the sole justification is the urgency to accelerate the decarbonisation of the EU's economy, a recommendation would be to expand the time horizon of such ambition, such as by formally adopting the EU 2050 low-carbon economy roadmap. To move forward, this long-term decarbonisation roadmap could establish a long-term carbon shadow price for definitely reducing the uncertainty for economic players.

READ MORE

The analysis of the impact of the implementation of renewable energy and energy efficiency policies in the electricity sector under the EU ETS is one of the four case studies analysed for the CARISMA working document on identifying and mapping climate change mitigation policy interactions, available on the CARISMA website. The other case studies cover energy efficiency policies in Austria and Greece, and the interaction between the EU ETS and the Renewable Energy Directive at EU-level.

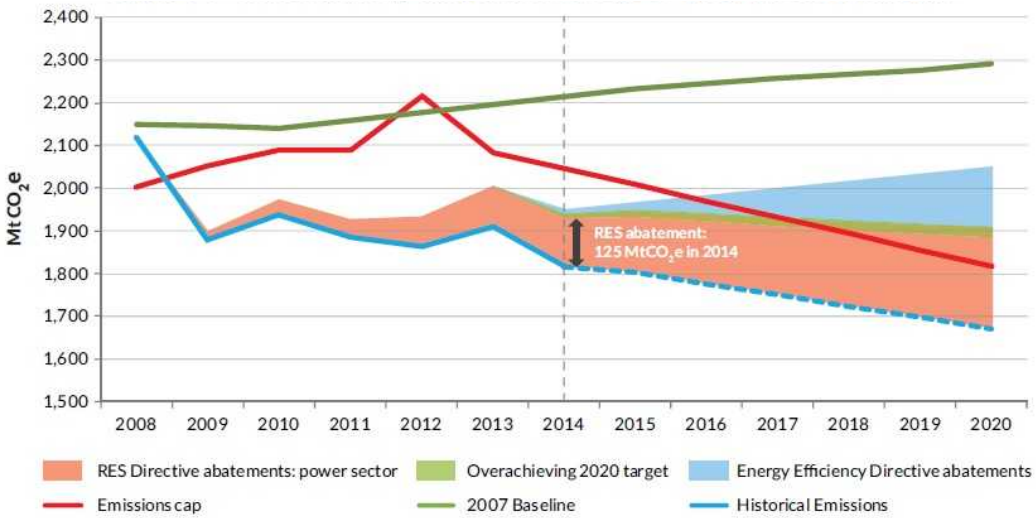


Figure 2. Baseline, cap, and emissions in EU ETS phases II and III.
In 2014, CO_2 emissions from industry and energy sectors covered by the EU ETS were already below its 2020 cap. Renewable energy deployment has had a strong impact on these emissions reductions but a low impact on the EUA surplus. Indeed, as presented in the figure, at least 125 $MtCO_2e$ was avoided in 2014 in the power sector due to the Renewable Energy Directive. However, these abatements were accounted for in the cap setting, and only the overachievement of the renewables target may contribute to the surplus.
Source: I4CE, estimations based on European Commission data 2015.

POLICY IMPLEMENTATION AND **CONTEXTUAL FACTORS**

To support climate change mitigation, the EU has developed and implemented a wide range of policies and instruments across sectors and countries. On the one hand, their success depends on design features and incentive structures. On the other hand, the result may be shaped and driven by the specific context in which they are expected to operate. A team within the CARISMA project focuses on the latter issue to address key contextual factors influencing formulation or adoption of mitigation options.

The study started with workstreams on governance and contextual factors. It is important to have a better understanding on climate change governance at international and European levels. The outcome of the Paris Agreement has been assessed with a focus on the increasing role of non-state actors and its implications for a shift to polycentric governance. The team also compares the Agreement and outcomes with developments in other climate-relevant regimes such as the Montreal Protocol and aviation (ICAO) and maritime (IMO) negotiations. Moreover, it is discussed what types of leadership in climate and energy policies the EU strives for internally, for instance through the Energy Union, and externally, including in the international climate talks.

Noriko Fujiwara,
Centre for European Policy Studies (CEPS)

Within the CARISMA project, CEPS leads the work on the roles of implementation and contextual factors in realising climate change mitigation.

At the same time, a step-wise approach has been adopted to key contextual factors in climate change mitigation. The first step is to identify broad categories of contexts – institutional, economic, and behavioural – and factors which constitute these contexts. One of the sources of this categorisation is the IPCC 5th Assessment Report. The team has been in consultation with other project partners and CARISMA Advisory Board members to select and describe key contextual factors for each category. Once they are short-listed, the team will examine the list and choose the most relevant ones for country case studies across EU Member States and Accession Countries.

Two publications on the respective themes are under preparation, and will be published on the CARISMA website once available. For the upcoming country case studies, active interaction between CARISMA researchers and experts through interviews and meetings is envisaged.

ROLE OF **WOODY BIOMASS** IN EU RENEWABLES TARGETS

The European Union has set ambitious targets of raising the share of EU energy consumption produced from renewable resources from 20% by 2020 to 27% by 2030. A research paper in the Biomass and Bioenergy journal assesses the role of woody biomass in reaching these targets. The paper identifies leading and lagging countries in biomass development by focusing on their current biomass use and forecasts future perspectives.

Biomass is a major source of renewable energy in the EU-28, accounting for more than 62% of all renewables. Wood accounts for approximately 80% of the biomass used for renewable energy. However, the specific role of woody biomass, including waste wood resources, remains relatively unknown. Recent projections for 2030 estimate that there is still a significant additional sustainable realisable potential of wood for energy from EU forests, provided intensive wood mobilisation efforts are applied.

The paper evaluates the specific contribution of woody biomass, based on future trends from the forest industries in the EU Member States. Some studies estimate that the EU's biomass primary demand can increase from 3.1 EJ in 2005 to 7.4 EJ in 2020, of which 5 EJ would be solid biomass.

Not all countries have strong support of bioenergy and all have different potentials of woody and other biomass. The feasibility of the targets is constrained by the situation in EU countries. Various measures can increase the likelihood of achieving bioenergy targets for the EU, including stable support policies for bioenergy markets and the reduction of fossil fuel subsidies. Based on the current policies, the authors estimate that a number of countries (including Belgium, France, the Netherlands and the UK) may not achieve their biomass targets. On the other hand, Estonia and Austria have already reached their biomass targets, and several other countries are near to their targets.

The study could serve as starting point for future work related to national renewable energy targets assessment, and for setting new targets. Further research should determine which sources have the highest priorities, when regarding bioenergy together with other renewable energy sources, such as wind, water and solar energy.

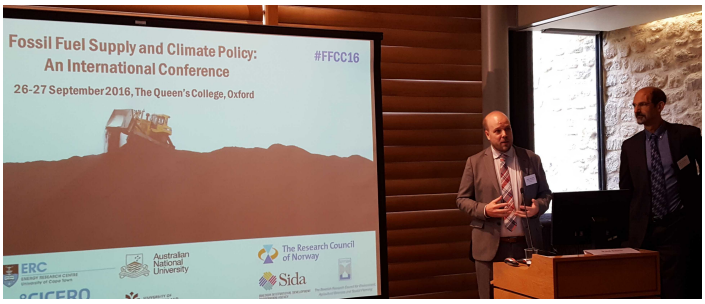
Proskurina, S., R. Sikkema, J. Heinimö, and E. Vakkilainen. (2016). Five years left – How are the EU member states contributing to the 20% target for EU's renewable energy consumption; the role of woody biomass. Biomass and Bioenergy, vol. 95, pp.64-77.

ADDRESSING THE **SUPPLY SIDE** OF **FOSSIL FUELS**

On 26-27 September, the Stockholm Environment Institute (SEI), together with several academic partners, organised the first International Conference on Fossil Fuel Supply and Climate Policy at Queen's College in Oxford. The conference was co-chaired by Harro van Asselt, coordinator of CARISMA's work on mapping and assessing mitigation policies.

The conference built on the growing interest in whether and how climate policy should seek to limit the supply of fossil fuels, in addition to reducing demand. Research suggests a large share of fossil fuel reserves will need to stay in the ground to keep warming below 2°C – but achieving this will be a daunting challenge. For many countries fossil fuel extraction and trade are central to energy security and economic development. And despite growing insights into environmental impacts of fossil fuel extraction and the financial risks of further investment in fossil fuel development, the options for supply-side climate policies and actions, their potential role and effectiveness all remain underexplored.

The conference brought together more than 100 practitioners and researchers to discuss the possibilities of, and challenges to, approaches addressing the supply-side of climate policy. Participants drew attention to the potential implications of new investments in fossil fuel extraction, including the risks of asset stranding. Supply-side policy approaches, such as moratoria on new coal mines, the phasing out of fossil fuel production subsidies, coal taxes, and funds to leave fossil fuels unexploited, were discussed in detail as to their potential and limitations. In addition, the conference explored the challenges of increased attention for developing countries, as well as for workers and communities that are dependent on fossil fuel extraction.



Harro van Asselt and his colleague Michael Lazarus open the International Conference on Fossil Fuel Supply and Climate Policy. Photo: Marion Davis.

More information, including the full programme, can be found at the conference website. Videos of the various sessions can be found here.

OFFSHORING OF **R&D** IN CLIMATE TECHNOLOGIES

Under the CARISMA project, researchers at the UNEP DTU Partnership in Denmark are carrying out case study research on the offshoring of R&D in climate technologies by multinational companies (MNCs) from Europe to emerging economies, such as China, India, and Brazil. The case studies enable a detailed understanding of how R&D offshoring proceeds, and how local R&D units in the emerging economies develop to take part in the global innovation activities undertaken by their parent MNCs in Europe.

From the research conducted, it seems clear that the emergence of R&D offshoring typically built upon previous stages of offshoring of production activities. Hence, the process of R&D offshoring often involves that parent companies over time place increasingly more complex and knowledge-intensive tasks in their local subsidiaries. This means that R&D offshoring can be considered part of a longer-term, parent-subsidiary relationship, which changes dynamically over time.

This upgrading of the local R&D units can take several decades but can also happen relatively swiftly within a decade. The ongoing research aims to understand more about the underlying conditions enabling the development of the local R&D units, especially (i) the role and deliberate resources devoted by the parent MNC to upgrade the skills and capabilities; (ii) the importance of in-house learning efforts undertaken by the local R&D; and (iii) the role of the surrounding innovation system.

For more information, a policy brief on the challenges and opportunities for Europe of R&D offshoring can be found on the CARISMA website: Outsourcing and Offshoring R&D in Green Technology to Emerging Economies: Opportunities and Challenges for Europe. More insights gained from the case study research will be incorporated into a larger report, which will be published at a later stage of the CARISMA project.

In addition, research published by the UNEP DTU Partnership has stressed some of the firm-specific issues involved in placing knowledge-intensive tasks in local subsidiaries:
Hansen, U.E., N. Fold, and T. Hansen (2016). Upgrading to lead firm position via international acquisition: learning from the global biomass power plant industry. Journal of Economic Geography, vol. 16, pp. 131–153.

SMART GRIDS ALLOW TO GO BEYOND MITIGATION

Smart grids, also known as intelligent energy networks or sometimes self-healing grids, are considered to be an enabler of mitigation. However, practical implementation has been slow internationally, limited to patches of isolated experiments and meeting public opposition. Research by Radboud University within the CARISMA project views smart grids from another angle – one which could boost the interest in smart grids and their public acceptance.

Traditionally, smart grids are considered to be means to enable renewable energy. However, results of a technology appraisal study at Radboud University show that opportunities and risks generated by the use of smart grids go beyond economy and technology. These additional opportunities (and risks) have been demonstrated in existing pilot projects and include empowerment of individuals to, for example, self-produce energy or start an innovative business. Smart grids can stimulate neighbours to work together in energy cooperatives or share practices in making use of new features provided by smart grids, such as selling energy to each other. For under-electrified sunny or windy regions smart grids are near to the only option to make efficient use of these renewable sources.

What are smart grids? The hyped term 'smart grids' usually means a two-way flow of energy and information, both of which are monitored in real time to allow automatic balancing of supply and demand at the device level and re-routing of energy in case of network disruptions.

Zahar Koretsky, Radboud University

Within the CARISMA project, 'smart grids' is one of the key mitigation technology options assessed, along with artificial trees and bio-energy with carbon capture and storage (BECCS).

However, before calling smart grids a panacea for all our energy problems, there are serious considerations to take into account. First, the opportunities are not equally distributed among actors in the energy system. For opportunities to one group of stakeholders there are related risks for another. For example, in some contexts smart grids reduce energy costs, but in others they raise them. Second, the enabling effects seen in pilot projects may not scale well to larger deployment. Pilots normally benefitted from careful selection, monitoring and tweaking. This may not be realistically expected in wider roll-outs. Finally, there are still massive improvements to be made in for instance smart grid cybersecurity, reliability, and quality of user interface.

Overall, smart grids have the potential to strengthen ties within communities, possibly at the cost of rigid privacy, security, and even health in the same communities, as well as of well-being outside them. The study of the CARISMA project on smart grids will be published in January 2017 as part of the technology assessment report on mitigation technology options.

CLIMATE CHANGE MITIGATION IS **"BIG BUSINESS"**

On 26 October, the Dutch government for the first time organised a National Climate Summit. The motto of the conference, held in Rotterdam, was "Bring Paris home", signifying the need for concrete actions based on the goals of the 2015 Paris Agreement. With more than 1,700 participants, it is clear that climate change is no longer a topic just for the 'green movement', but also an issue with huge business opportunities.

Prime Minister Mark Rutte in his opening speech: "At the time of the 1997 Kyoto agreement, the business community aimed to slow things down. Now, businesses are a driving force." Indeed, a group of 39 large Dutch companies launched a 'transition coalition', requesting a Climate Act, a Climate Minister, a climate investment bank, and consistent long-term climate policy. Also the largest employers' federation stated that, provided there are clear climate goals and regulations, "the transition is a golden opportunity for businesses."

At the Dutch National Climate Summit: Joris Thijssen (Greenpeace), Prime Minister Mark Rutte, and Marjan van Loon (Shell).

In the environmental momement, there is still scepticism towards the attitude of business and government, especially since just last year three new coal-fired power plants were opened. However, it is clear that the threat of climate change is nowadays also seen as a business opportunity.

MITIGATION TECHNOLOGY **COST AND BENEFIT** ANALYSIS

A goal of the CARISMA project is to understand costs and benefits as well as economy-wide implications of the introduction or expansion of climate change mitigation technologies (CCMT) in the European Union. The analysed CCMTs so far include wind power, bio-energy with carbon capture and storage (BECCS), and electricity from photovoltaics (PV).

So far we collected a large range of data on investment costs and current cost of capital for wind and PV, and discussed these with stakeholders. For BECCS, data collection and model calibration is under way. For the quantitative analysis of economy-wide effects a global multi-regional multi-sectoral computable general equilibrium (CGE) model is used. The model is calibrated to the base year 2011 and regional as well as sectoral aggregates have been constructed. The aim is to reveal economy-wide feedback effects which are not visible in technology-specific bottom-up analyses.

Targets for the CCMTs' shares of regional electricity generation are based on scenarios from the literature. The macroeconomic effects are explored for each CCMT separately to reveal the separated effect for each technology. In the first stage of the analyses we deploy a portfolio approach, meaning that certain target shares for the penetration of the technologies are assumed to be implemented; if necessary using subsidies. In a second modelling stage we aim to use the instrument of a CO_2 emission permit trading scheme (the EU ETS).

Andreas Türk, University of Graz

Within the CARISMA project, costs and benefits are analysed of a number of climate change mitigation technologies, including wind power, bio-energy with carbon capture and storage (BECCS), and solar PV.

For wind power, early results show that its implementation leads to positive welfare and GDP effects across all regions. However, in some cases subsidies are still necessary to be competitive. Results also indicate that distributional effects must not be ignored: we see effects on wages and capital income, with the former tending to decline and the latter to increase, since on average electricity generation becomes more capital intensive with a higher share of wind power. Further runs on de-risking investment will be carried out.

The results of the analysis will be published in February 2017 on the CARISMA website, in a report on costs and benefits of deploying low carbon technologies.

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.

Bonen, A., et al. (August 2016), **Investing to Mitigate and Adapt to Climate Change: A Framework Model**, IMF Working Paper WP/16/164

Healy, S., et al. (October 2016), **Instruments to increase climate policy ambition before 2020 - economic and political implications in selected industry and emerging countries**, Dessau-Roßlau: German Environment Agency.

Singh, N., J. Finnegan & K. Levin (August 2016), **MRV 101: Understanding Measurement, Reporting, and Verification of Climate Change Mitigation**, Working Paper, Washington: World Resources Institute.

Stavins, R.N. & R.C. Stowe [Eds.] (October 2016), **The Paris Agreement and Beyond: International Climate Change Policy Post-2020**, Cambridge, Massachusetts: Harvard Project on Climate Agreements.

UNFCCC secretariat (August 2016), **Linkages between the technology needs assessment process and the nationally determined contribution process**, draft paper for the Technology Executive Committee, 13th session.

UNFCCC secretariat (October 2016), **Mapping climate technology development and transfer activities and initiatives under and outside the Convention relevant to the implementation of the Paris Agreement**, document for the Subsidiary Body for Scientific and Technological Advice, 45th session.

Van der Gaast, W. (2017*), **International Climate Negotiation Factors: Design, Process, Tactics**, Springer International Publishing. *available 25 October 2016

CARISMA's sister project TRANSrisk organises a side-event at the UN climate change conference in Marrakesh (COP22). The event **"Assessing mitigation pathway risk and uncertainty: case studies in the Netherlands, Kenya and Chile"** will take place on Friday the 18th of November from 17:30 in the EU Pavilion.

CARISMA PROJECT UPDATES

Stakeholder feedback. In the first year of the project, the CARISMA team carried out an initial stakeholder consultation with mitigation stakeholders across Europe. Key outcomes included the need for embedding mitigation options in their socio-economic contexts, the importance of considering policy interactions, the role of governments to enhance climate urgency, and the need to enhance learning from EU projects and experiences. By early-2017, a second round of consultations will be undertaken, communicating intermediate results and requesting feedback in light of earlier outcomes.

Working document on ETS-RED policy interaction. In October 2016, CARISMA published a working document on policy interaction between the EU Emissions Trading Scheme (ETS) and Renewable Energy Directive (RED). The document states that it is important to understand how the RED affects the ETS, identify the conditions under which the directive will undermine the purpose of the ETS, and limit such an effect.

Blog on monitoring climate policies. Stefan Bößner's blog post 'Easier in theory than in practice: The nitty-gritty details of monitoring climate policies and emissions' has been published on the CARISMA website. He argues that the EU's policy and emission monitoring has improved considerably, but much room for improvement remains.

Stakeholder engagement in EU Accession Countries. For the upcoming country case studies on policy implementation and contextual factors, active interaction between CARISMA researchers and experts through interviews and meetings is envisaged in November and December 2016, specifically in the Western Balkans region.

Workshop on international research and innovation collaboration. The CARISMA project organises a one-day workshop on the topic of research and innovation (R&I) collaboration within climate change mitigation technologies between Europe and emerging economies. The workshop, to be held 20 February 2017 in Amsterdam, will provide a platform to share knowledge from research undertaken in the CARISMA project and collect insights and experience from practitioners involved in international R&I programs.

Mitigation science-policy workshop. The CARISMA project organises a science-policy workshop on climate change mitigation policies. The workshop, to be held 27 March 2017 in Stockholm, aims to bring together representatives from recently finished and ongoing EU-funded projects that offer new insights into climate change mitigation policies, with relevant practitioners (including policy-makers and business representatives). More information will be available soon via the CARISMA website.

Improved CARISMA website. CARISMA's project website, www.carisma-project.eu, has been redesigned and updated. It is now easier to find project reports, policy briefs, and blog posts, as well as latest news and event announcements. While the website focuses specifically on outputs of the project, CARISMA has also launched an online portal for EU-funded mitigation research in a broader sense (see below).

Online portal for EU-funded mitigation research

The CARISMA project has recently launched an online portal on climate change mitigation. The portal has been developed together with other EU-funded projects, and aims to enable the exchange of information on mitigation research and innovation. The projects will post highlights of their work so that information from different EU-funded research and coordination projects relevant to mitigation can be easily accessed in one place.

The portal covers a range of mitigation-related topics, including mitigation technologies and practices, scenarios and models, links to relevant data sources, case studies, policy information, and issues on stakeholder engagement.

In addition to CARISMA, other EU-funded projects involved in the portal include ADVANCE, CD-LINKS, GREEN-WIN, PATHWAYS, and TRANSrisk. Other relevant projects are welcome to join, in order to enable smoother dissemination of research outcomes.

The portal, that is still in early stages of development, is available at www.climatechangemitigation.eu.

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