

INFORMATION NOTE

Update on recent research activities of the EU 7th Framework Programme for Research and Technological Development in the field of Climate Change

This information note¹ has the scope of providing to the Secretariat of the UNFCCC updated information on the most recent research activities in the field of climate change undertaken under the European Union's Seventh Framework Programme for Research and Technological Development (FP7), and managed by the European Commission. This information is provided as background for the upcoming session of the Research Dialogue that will take place during the 36th session of SBSTA (14-25 May 2012, Bonn, Germany).

This information note includes an introduction to FP7, as well as a summary of scientific highlights of relevance to the Convention generated by research undertaken at European level, including with respect to the two topics explicitly identified in the SBSTA 35 conclusions (long-term global goal and technical and scientific aspects of emissions by sources, removals by sinks, and reservoirs of all greenhouse gases, including emissions and removals from coastal and marine ecosystems).

1. INTRODUCING THE EUROPEAN 7TH FRAMEWORK PROGRAMME FOR RESEARCH AND TECHNOLOGICAL DEVELOPMENT

The 7th Framework Programme for Research and Technological Development (FP7) is the EU's main instrument for funding research in Europe, including through cooperation with international partners. With its budget allocation of €50.5 billion over the period 2007-2013 it represents one of the largest research programmes in the world. The FP7 covers EU's 27 Member States and 14 associated countries². A specific feature of the FP7 is that it promotes international cooperation in the field of Science and Technology with third countries, both developed and developing. Approximately 15 percent of the total budget of FP7 is estimated to have been allocated to climate-related research. It is also estimated that about 75% of the research activities address sustainable development issues.

As the largest of the four Programmes in which FP7 is articulated, the Programme "Cooperation" supports collaborative research through projects carried out by transnational consortia. It comprises 10 thematic areas, including a specific theme on

¹ The information presented in this note has been provided by staff of the European Commission and does not necessarily reflect the views of the European Commission. It is not an official submission by the European Union and it is not the result of a formal adoption procedure by the EU.

² Albania, Bosnia & Herzegovina, Croatia, Faroe Islands, Former Yugoslav Republic of Macedonia, Iceland, Israel, Liechtenstein, Moldova, Montenegro, Norway, Serbia, Switzerland, Turkey.

"Environment (including climate change)" with a total budget of approximately € 1.8 billion, and other six themes that are climate change-related (Energy, Transport, Industrial Technologies, Agriculture and Food, Space, Socio-economic Sciences and Humanities). Climate change is also addressed under the "Capacities", "People" and "Ideas" Programmes of the 7th Framework Programme which address respectively: a) the enhancement of research infrastructures and innovation capacities throughout Europe and international cooperation activities; b) needs of the scientific community in terms of training, mobility and career development (Marie Curie actions); and c) "frontier research" by researchers from both Europe and third countries (implemented through the independent European Research Council).

In addition to their activities under the 7th Framework Programme and in the context of the wider establishment of a European Research Area (ERA), the European Union and its Member States have further enhanced their cooperation through the creation of Joint Programming Initiatives (JPIs) that aim to increase the value of relevant national Research and Development (R&D) funding by concerted and joint planning, implementation and evaluation of national research programmes. In the field of climate change, two relevant JPIs have been created to tackle the themes "Agriculture, Food Security and Climate Change" (FACCE-JPI) and "Connecting Climate Change Knowledge for Europe" (JPI-Climate). Furthermore, impacts of climate change are also addressed under other relevant JPIs such as the ones on "Urban Europe", "Cultural heritage & global change" and "Healthy and Productive Seas and Oceans".

Starting from 2014, the fundamental societal challenges posed by climate change will continue to be prioritized under Horizon 2020, the new EU Framework Programme for Research and Innovation for the period 2014-2020 which is expected to be adopted by the European Parliament and the Council within the year 2013.

2. SCIENTIFIC HIGHLIGHTS FROM FP7

This section presents a summary of recent scientific highlights from selected EU-supported research projects that are of particular relevance to the UNFCCC, as well as of information on recently started projects and initiatives that are currently in the pipeline. Since this is not intended to be a comprehensive list of EU-supported research projects, further information about specific projects funded by FP7 can be searched through the CORDIS database (http://cordis.europa.eu/projects/home_en.html). Additional information on climate-related projects funded by the Environment (including climate change) Theme is available at http://ec.europa.eu/research/environment/index_en.cfm.

2.1. Climate modelling and atmospheric processes

FP7 continues to support major research in the area of climate modelling aimed at increasing understanding of climate variability, improving climate prediction and projections on decadal and centennial time scales, and assessing the risks of abrupt and

irreversible change. A set of climate modelling projects supported by the EU is working on reducing uncertainties in the representation of key physical and biogeochemical processes in Earth System Models (ESMs) such as clouds, aerosols, stratosphere dynamics. Furthermore processes previously not accounted for such as the coupling of the carbon and nitrogen cycle, ice sheets melting/mass variations, permafrost thawing will be incorporated. The projects contribute to the CMIP5 initiative.

In particular, the *EUCLIPSE*³ project aims to reduce the uncertainties in the representation of cloud processes, their radiative properties and feedback on climate, concentrating its efforts on new generation ESMs. The project has already developed observational datasets, initiated case studies for different cloud types and is executing climate model runs that will be used for the AR5 of the IPCC. A key objective of *COMBINE*⁴ is to improve initialisation techniques in order to make best use of ocean observations and sea ice analysis to reduce model biases. Furthermore, the project will incorporate chemistry-aerosol-cloud interactions, a more realistic representation of the Stratosphere, ice sheets and permafrost in current ESMs. First model simulations are promising as they show better agreement between observations and model calculations. The recently started *EMBRACE*⁵ project aims to reduce the main systematic biases in European ESMs, targeting 3 areas: a) Moist convection and its interaction with tropical clouds and ocean circulation; b) Marine and terrestrial carbon cycle; and c) land-surface and climate interactions and their impact on regional climate. The ESMs will also be used to investigate the risk of abrupt changes to potential tipping points in the climate system, such as the stability of the Atlantic Ocean circulation and the stability of tropical and boreal forest ecosystems to global warming. Finally, the project *PEGASOS*⁶ - which will also contribute to the IPCC process - represent a major effort to reduce uncertainties related to impact of aerosol particles on climate.

There are also fundamental scientific uncertainties in characterizing both the climate and air quality impacts of short-lived gases and many aspects (for example, the regional dependence) are quite distinct to those for the longer lived climate gases already included in the Kyoto Protocol. The recently started initiative *ECLIPSE*⁷ will build on existing knowledge and use state-of-the-art chemistry and climate models to (i) improve understanding of key atmospheric processes (including the impact of short-lived species on cloud properties) and characterize existing uncertainties; ii) quantify the radiative forcing and climate response due to short-lived species, incorporating the dependence on

³ "EU Cloud intercomparison, process study and evaluation" project (EUCLIPSE), <http://www.euclipse.eu/>.

⁴ "Comprehensive Modelling of the Earth system for better climate prediction and projection" project (COMBINE), www.combine-project.eu.

⁵ "Earth system Model Bias Reduction and assessing Abrupt Climate change" project (EMBRACE), <http://www.smhi.se/embrace>.

⁶ "Pan-European Gas-AeroSOls-climate interaction Study" project (PEGASOS), <http://pegasos.iceht.forth.gr/>.

⁷ "Evaluating the CLimate and Air Quality ImPacts of Short-livEd Pollutants" project (ECLIPSE), <http://eclipse.nilu.no/>.

where the species are emitted; (iii) refine the calculation of climate metrics, and develop novel metrics which, for example, consider rate of climate warming and go beyond using global-mean quantities; (iv) clarify possible win-win and trade-off situations between climate policy and air quality policy; (v) identify a set of concrete cost-effective abatement measures of short-lived species with large co-benefits.

2.2. Long-Term Global Goal and Climate Change Impacts

In order to inform the ongoing debate about the potential impacts associated with the long-term global goal to hold the increase in global average temperature below 2 °C above preindustrial levels and the possibility by the international community to consider strengthening the long-term temperature goal to a more limited warming of 1.5 °C above pre-industrial level, European researchers are investing significant efforts in reducing uncertainties in climate projections and in improving methodologies of assessing impact and vulnerabilities.

A multi-model analysis of future climate change undertaken under the framework of the *ClimateCost*⁸ project which aims at advancing knowledge of the economics of climate change has assessed three emission scenarios at both global and European scale⁹: a medium-high non-mitigation baseline scenario (A1B); a mitigation scenarios (E1), which stabilises global temperature change at about 2°C above pre-industrial level, and a high-emission scenario (RCP8.5). The analysis shows that under a medium-high emission baseline (A1B), with no mitigation, the climate models project that global average temperatures could rise by between 1.6°C and 2.3°C by 2041-2070, and 2.4°C and 3.4°C by 2071-2100, relative to the modelled baseline period used in the project of 1961-1990. However, the models project much larger temperature increases for Europe in summer, and strong regional differences across countries, for example, the Iberian Peninsula has a mean projected increase of up to 5°C by 2071-2100. The projections for the E1 (mitigation) scenario, broadly equivalent to the 2 degrees global target, only diverge significantly from A1B after 2040 (i.e. the differences only emerge in the latter part of the century). Therefore, mean global temperature is projected to increase by about 1°C by 2011-2040 relative to the 1961-1990 baseline irrespective of the emission pathway. However, under an E1 stabilisation scenario all long-term changes are significantly reduced. Average global temperatures are projected to increase by about 1.5°C by 2071-2100 compared with the 1961-1990 baseline. The stronger wetter signal in Northern Europe and the drier summer in Southern Europe are both considerable reduced. However, even under this mitigation scenario, summer temperatures in Europe are projected to increase by more than 2°C and possibly in excess of 3°C by 2071-2100

⁸ "Full costs of climate change" project (ClimateCost), www.climatecost.cc.

⁹ Christensen, O. B, Goodess, C. M. Harris, I, and Watkiss, P. (2011). European and Global Climate Change Projections: Discussion of Climate Change Model Outputs, Scenarios and Uncertainty in the EC RTD ClimateCost Project. In Watkiss, P (Editor), 2011. The ClimateCost Project. Final Report. Volume 1: Europe. Published by the Stockholm Environment Institute, Sweden, 2011. ISBN 978-91-86125-35-6. (http://www.climatecost.cc/images/Policy_brief_1_Projections_05_lowres.pdf)

relative to the 1961-2100 baseline , highlighting the need for adaptation and mitigation. The study has also considered the RCP8.5 'high' scenario which results in a global warming of about 3.5°C by 2071-2100 relative to the 1961-1990 baseline. The analysis highlights the uncertainty in projecting future climate change and how this results in wide variations in quantification of impacts and related level of damage costs. In turn, this uncertainty also affects estimation of the costs and benefits of adaptation. However, while it is essential to recognise and try to quantify this uncertainty, it is clear that there is a need to plan robust strategies to prepare for uncertain futures, rather than using uncertainty as a reason for inaction.

The EU-funded project *IMPACT2C*¹⁰ – started in November 2011 – aims at better quantifying and enhancing knowledge of climate change impacts. The project will address issues related to climate and impacts modelling, vulnerabilities, risks and economic costs, as well as potential responses, within a pan-European sector based analysis. *IMPACT2C* utilises a range of models within a multi-disciplinary international expert team and assesses effects on water, energy, infrastructure, coasts, tourism, forestry, agriculture, ecosystems services, and health and air quality-climate interactions. *IMPACT2C* introduces key innovations. First, harmonised socio-economic assumptions/scenarios will be used, to ensure that both individual and cross-sector assessments are aligned to the 2°C (and 1.5°C) scenario for both impacts and adaptation. Second, it has a core theme of uncertainty, and will develop a consistent methodological framework integrating the uncertainties within and across the different sectors. In so doing, analysis of adaptation responses under uncertainty will be enhanced. Finally, a cross-sectoral perspective is adopted to complement the sector analysis. A number of case studies will be developed for particularly vulnerable areas, subject to multiple impacts (e.g. the Mediterranean), with the focus being on cross-sectoral interactions (e.g. land use competition) and cross-cutting themes (e.g. cities). The project also assesses climate change impacts in some of the world's most vulnerable regions: Bangladesh, Africa (Nile and Niger basins), and the Maldives. The first results from this project are expected by the end of 2012.

2.3. Climate Change and Marine Ecosystems

Acknowledging the key role of the marine environment in climate regulation, as well as the impacts that climate change and other stressors are having on marine ecosystems, the FP7 has invested significantly in better understanding the dynamic interactions between marine ecosystems, climate and atmospheric processes. All relevant results of EU-funded research about climate change impacts on the marine environment have been recently collected by the *CLAMER*¹¹ project which has summarized physical, biological and

¹⁰ "Quantifying projected impacts under 2°C warming" project (*IMPACT2C*), www.hzg.de/mw/impact2c.

¹¹ "Climate Change and Marine Ecosystem Research Results" project (*CLAMER*), <http://www.clamer.eu>.

socio-economic effects of climate change in different European regions, and identified main research gaps in this field¹².

A relevant and pioneering line of research under FP7 has concerned ocean acidification, studied in the two projects *EPOCA*¹³ and *MedSeA*¹⁴. EPOCA significant results indicate that, due to the uptake of CO₂ released by humans, 10% of Arctic surface waters will become corrosive to shells and skeletons of organisms in less than 10 years, and that half will become corrosive by mid-century¹⁵. The EPOCA time series observations confirm that this region is indeed a hotspot of rapid changes resulting from ocean acidification¹⁶. Biological and ecological responses of key organisms have been analysed in this region through a large-scale mesocosm experiment in the Kongsfjord off Svalbard, Norway. Moreover, EPOCA researchers have analysed a wide range of future climate scenarios, finding out that only stringent but economically feasible carbon emission mitigation measures would limit ocean acidification over this century (32% increase in acidity instead of 100% increase without mitigation)¹⁷. In the Mediterranean area, about 30% of marine plants and animals could be lost from coastal habitats by the end of this century due to the effect of ocean acidification¹⁸. The MedSeA project is currently undertaking a deeper investigation of the ecological impacts on the Mediterranean Sea due to warming and acidification, while in the next two years it will also investigate the socio-economic effects of acidification, particularly on tourism and aquaculture.

The *CARBOCHANGE*¹⁹ project aims to quantify more accurately the ocean CO₂ uptake under climate change and how it will evolve in the future. The project (endorsed by the IMBER²⁰ and SOLAS²¹ initiatives) has contributed to the newest Global Carbon Project budget analysis which shows that the world oceans took up 26% of CO₂ emissions to atmosphere in year 2010. In particular, through extensive dataset analysis and modelling work, CARBOCHANGE has calculated that the Nordic Seas presently provide 8% of the

¹² CLAMER project and Marine Board (2011), "Climate Change and Marine Ecosystem Research. Synthesis of European Research on the Effects of Climate Change on Marine Environments". Marine Board Special Report, pp. 151.

¹³ "European Project on Ocean Acidification" (EPOCA), <http://www.epoca-project.eu/>.

¹⁴ "MEDiterranean Sea Acidification in a changing climate" project (MEDSEA), <http://medsea-project.eu/>.

¹⁵ Beaufort L., Probert I., de Garidel-Thoron T., Bendif E. M., Ruiz-Pino D., Metzl N., Goyet C., Buchet N., Coupel P., Grelaud M., Rost B., Rickaby R. E. M. & C. de Vargas. 2011. Sensitivity of coccolithophores to carbonate chemistry and ocean acidification. *Nature* 476: 80–83.

¹⁶ Olafsson J, Olafsdottir S R, Benoit-Cattin A, Danielsen M, Arnarson T S and Takahashi T. 2009. Rate of Iceland Sea acidification from time series measurements. *Biogeosciences* 6: 2661-2668.

¹⁷ Joos F., Froelicher T. L., Steinacher M. and G-K Plattner. 2011. Impact of climate change mitigation on ocean acidification projections. pp. 272-290. In: Jean-Pierre Gattuso and Lina Hansson. *Ocean acidification*. Oxford University Press.

¹⁸ Rodolfo-Metalpa R., Houlbrèque F., Tambutté É., Boisson F., Baggini C., Patti F. P., Jeffrey R., Fine M., Foggo A., Gattuso J-P. and J. M. Hall-Spencer. 2011. Coral and mollusc resistance to ocean acidification moderated by warming. *Nature climate change* 1: 308–312.

¹⁹ "Changes in carbon uptake and emissions by oceans in a changing climate" project (CARBOCHANGE), <http://carbochange.b.uib.no>

²⁰ Integrated Marine Biogeochemistry and Ecosystem Research (IMBER), www.imber.info.

²¹ Surface Ocean Lower Atmosphere Study (SOLAS), www.solas-int.org.

ocean carbon sink. Observational data from the project will be used to improve existing models in order to better predict future changes in ocean carbon cycle and assess the continuous effectiveness of northern Atlantic as sinks under future climate conditions.

Finally, several projects are also addressing issues related to the sustainable management of oceans and sea in the context of a changing climate. According to a multi-model analysis carried out as a joint work of many international projects, including the EU funded project *MEECE*²², climate change could lead to a decrease of primary productivity (PP) of the global ocean between 2% and 13% at the end of the century, with large regional disparities²³. However, at present, there is still a significant lack of knowledge regarding how multiple climate-related and anthropogenic stressors impact marine populations and how impending climate changes may alter the ecology and biogeochemical cycling of oceans. As part of a multidisciplinary international effort linked with similar activities in the US and Canada, the FP7 program *EURO-BASIN*²⁴ aims to better understand the basin scale processes impacting upon these ecosystems, to be able to predict likely future ecosystem states due to climate change, and to be able to integrate from the basin scale to the local scales the economically important dynamics of basin and shelf ecosystems for the advancement of ecosystem based management strategies.

2.4. Sources and sinks of greenhouse gases (GHGs) from terrestrial ecosystems

Terrestrial ecosystems play a key role in the global carbon cycle, acting both as significant sources and sinks of GHGs. Deforestation, agricultural activities and land use changes account for a significant share of global GHGs emission, while at the same time there is a huge potential for increasing carbon sequestration capacity through afforestation, reforestation and forest conservation activities; improved agricultural practices; and natural ecosystem conservation and restoration. The EU is funding a series of projects that aim at improving understanding of terrestrial carbon cycle and its response to global warming and increased climate variability resulting from climate change.

The *CARBO-EXTREME*²⁵ project investigates the effect of climate variability and extremes on terrestrial carbon sources and sinks in Europe, including soil carbon. Important findings indicate that drought is likely to become a dominant threat to carbon-cycle related ecosystem services in Central and Southern Europe. Hence, climate-related

²² "Marine Environmental Evolution in a Changing Environment" project (MEECE), <http://www.meece.eu>.

²³ M. Steinacher, F. Joos, T. L. Frölicher, L. Bopp, P. Cadule, V. Cocco, S. Coney, M. Gehlen, K. Lindsay, J. K. Moore, B. Schneider, and J. Segschneider (2009) "Projected 21st century decrease in marine productivity: a multi-model analysis", *Biogeosciences Discuss.*, 6, 7933–7981, 2009

²⁴ "European Union Basin-scale Analysis, Synthesis and Integration" project (EURO-BASIN), <http://www.euro-basin.eu>.

²⁵ "The terrestrial Carbon cycle under Climate Variability and Extremes – a Pan-European synthesis" project (CARBO-EXTREME), <http://www.carbo-extreme.eu/>.

targets should consider the water cycle and its variability. Taken together, climate extremes appear to have the most diverse, largest, often lagged and longest-lasting consequences for carbon cycling in forests compared to other land-cover types.

The main objective of a new project called **GHG-EUROPE**²⁶ is to calculate more accurately the contribution of different land-use types to the emissions of CO₂, CH₄ and N₂O in Europe and propose options available in agriculture and forestry to keep carbon sinks and minimise GHGs emissions. Preliminary results shows that the land use changes leave their traces in the carbon balance of ecosystems for decades to centuries. Carbon losses occur within 10 to 20 years while carbon uptake in soils is slow so that it can take a century or more to reach the original carbon stocks. This asymmetry of 'slow in - fast out' is not adequately considered in the National Submissions of many countries under the Kyoto Protocol. The project is also developing methodologies and data as scientific background for the new activity "wetlands management". The activities contribute to the ongoing update of the IPCC Guidelines and will facilitate the implementation of "wetlands management" under future commitments.

Permafrost deposits are estimated to contain approximately 50% of the estimated global below-ground organic carbon pool and more than twice as much as the amount contained in the current atmospheric carbon pool. A projected decline in the extent of permafrost will have a major impact on the Earth system, affecting global climate through the mobilization of carbon and nitrogen stored in permafrost. The recently started EU-funded project **PAGE21**²⁷ aims to understand and quantify the vulnerability of permafrost environments to a changing global climate, and to investigate the feedback mechanisms associated with increasing greenhouse gas emissions from permafrost zones. The project will use of a unique set of Arctic permafrost investigations performed at stations that span the full range of Arctic bioclimatic zones. International collaboration is a key aspect of PAGE21 which brings together numerous European institutions and a large number of international partners from Russia, Canada, USA, and Japan.

Several on-going international research cooperation projects are also active in this field. Key scientific and technical aspects related to REDD+ are addressed by the projects **I-REDD+**²⁸ and **REDD-ALERT**²⁹ through analyses and case studies in Southeast Asia (China, Indonesia, Laos, Vietnam), Africa (Cameroon, Kenya, Nigeria) and Latin America (Colombia, Peru). Main objectives include: a) Quantifying GHG emissions and removals and improving accounting (methods, default values) of the consequences of land use change for GHG emissions in tropical forest margins including peatlands; b) Developing remote sensing and community based methods for monitoring of land use change and C-stocks; c) Assessing the benefits and costs of REDD+ for livelihoods at

²⁶ "Greenhouse gas management in European land use systems" project (GHG-Europe), <http://www.ghg-europe.eu/>.

²⁷ "Changing Permafrost in the Arctic and its Global Effects in the 21st Century" project (PAGE21), <http://page21.org>.

²⁸ "Impacts of Reducing Emissions from Deforestation and Forest Degradation and Enhancing Carbon Stocks" project (I-REDD+), <http://www.i-redd.eu>.

²⁹ "Reducing emissions from deforestation and degradation through alternative land uses in rainforests of the Tropics" project (REDD-ALERT), <http://www.redd-alert.eu>

local levels (REDD+ rent vs. opportunity and transaction costs) as well as socio-cultural 'costs' of changing lifestyles and development pathways d) Developing and testing a monitoring, reporting and verification (MRV) systems. The *CLARIS LPB*³⁰ project aims at projecting the regional climate change impacts in La Plata Basin (LPB) in South America focusing on the 2010-2040 and 2070-2100 periods, and at designing adaptation strategies for land-use and other relevant economic sectors. The project to date has: (a) improved the description of past climate variability of the region and the understanding of key processes governing the climate natural low-frequency variability; (b) produced a coordinated ensemble of regional climate change scenarios, including the various components of the hydrologic cycle and the feedbacks on land-surface-atmosphere, also in terms of extreme events; (c) investigated some adaptation strategies for agriculture and hydrology sectors, in close collaboration with local stakeholders. Another recently started FP7 project, *AMAZALERT*³¹ focuses on the Amazon region and will in particular: (a) provide models of global climate and Amazon land use, vegetation and socio-economic drivers to quantify anthropogenic and climate induced land-use and land cover change; (b) define scenarios for possible courses of action in the region, including an early warning system for detecting any imminent irreversible loss of Amazon ecosystem services.

2.5. Polar research

The Arctic region is known to be particularly sensitive to increased greenhouse gas concentrations in the atmosphere. For instance, recent results from the *ATP*³² project showed that the temperature increase in the past 50 years is almost twice as large in the Arctic (1.1°C) than on global average (0.6°C)³³. The Arctic sea ice is diminishing at an alarming rate. The sea ice extent as well as its thickness has reduced significantly leading to the fact that today the summer arctic ice volume is only about half of what it was in the 1970s³⁴. The ATP project is also looking at implications on the marine ecosystem and socio-economic impact of the warming. In particular, it is working on the identification of potential tipping points due to climate change which may have severe consequences for fishing in the region.

Building on a long line of European research on the Arctic environment and climate change, several ongoing FP7 projects are also studying its atmosphere, cryosphere, hydrosphere and/or ecosystems, and analysing their interplay with climate change. The

³⁰ "A Europe-South America network for climate change assessment and impact studies in La Plata Basin" project (CLARIS LPB), <http://www.claris-eu.org/>.

³¹ "Raising the alert about critical feedbacks between climate and long-term land use change in the Amazon" project (AMAZALERT), www.eu-amazalert.org.

³² Arctic Tipping Points (ATP) project, <http://www.eu-atp.org/>.

³³ Timothy M. Lenton (2012): Arctic Climate Tipping Points, *AMBIO* 41(1), 10-22.

³⁴ Wadhams, P. (2012). Ice cover, ice thickness and tipping points. *AMBIO* 41 (1): 23-33.

RECONCILE³⁵ project studies the atmosphere in the Arctic in order to better quantify the effects of climate change on stratospheric ozone depletion. Specifically, this project contributed to the recent discovery in 2011 of severe loss of ozone in the region³⁶. The **ice2sea**³⁷ project meanwhile is addressing the single most important source of uncertainty in projections of future sea-level rise by advancing the understanding of melting continental ice-sheets and glaciers in the polar regions. The project has completed its observational work and is finalizing its modelling component. The results of this project will be combined with contributions to global sea-level rise from other sources (e.g. thermal expansion) to produce state-of-the-art projections of future global sea-level rise that are expected contribute to the 5th Assessment report of the IPCC. A different project, **THOR**³⁸, is exploring the effects of the melting of the Greenland ice sheet on the global ocean circulation patterns. By the end of the project a reliable system to forecast changes in the circulation patterns due to melting ice-sheets will be in place, and estimates of the probability of extreme climate events in the European and North Atlantic region will be produced. In addition, the **HYPOX**³⁹ project is enhancing monitoring of oxygen depletion due to global warming and eutrophication in various water bodies, including the Arctic Ocean.

Finally, the **ACCESS**⁴⁰ project looks at climate change as an opportunity to develop economic activities such as transport, fisheries, oil and gas extraction in the Arctic region. It will take into account the effects of these activities on climate change and propose mitigation measures as well as options for more involvement of local populations in governance and decision-making processes.

2.6. Adaptation to Climate Change

Research into the manifold dimensions of impacts, vulnerability and adaptation to climate change continue to receive significant support by the FP7. For example, the project **CLIMSAVE**⁴¹ is developing largely qualitative scenarios at the European scale in the form of stories involving the participation of a broad range of stakeholders. The scenarios are developed along two major axes: *Solutions to innovation (effective to ineffective)* and *Economic development (gradual to 'rollercoaster')*. The resulting stories

³⁵ "Reconciliation of essential process parameters for an enhanced predictability of arctic stratospheric ozone loss and its climate interactions" project (RECONCILE), <https://www.fp7-reconcile.eu/>.

³⁶ Manney et al., Unprecedented Arctic ozone loss in 2011, Nature, 2011.

³⁷ "Estimating the future contribution of continental ice to sea-level rise" project (Ice2sea), <http://www.ice2sea.eu/>.

³⁸ "Thermohaline overturning - at risk?" project (THOR), <http://www.eu-thor.eu/>.

³⁹ "In situ monitoring of oxygen depletion in hypoxic ecosystems of coastal and open seas, and land-locked water bodies" project (HYPOX), <http://www.hypox.net/>.

⁴⁰ Arctic Climate Change, Economy and Society (ACCESS) project, www.access-eu.org/.

⁴¹ "Climate Change Integrated Assessment Methodology for Cross-Sectoral Adaptation and Vulnerability in Europe" project (CLIMSAVE), www.climsave.eu.

will be quantified and used as input for an Integrated Assessment Platform (IAP) that will serve as an interactive exploratory web-based tool improving the understanding of surrounding impacts, adaptation responses and vulnerability under uncertain futures. Its holistic framework is intended to complement, rather than replace, the use of more detailed sectoral tools used by sectoral professionals and academics. Final results including the public access of the IAP are expected for the end of 2012.

The project *MEDIATION*⁴² addresses key elements in the chain of impact, vulnerability and adaptation to climate change such as methods and metrics for impacts and vulnerability analysis and costs of impacts and adaptation options. The components of the project (methods and tools) will be connected in an iterative fashion, making use of a number of diverse case studies in different regions in Europe which combine selected regional, sectoral and cross-sectoral characteristics and policy questions. In essence, the focus will be on the development of a decision support framework as a tool capable of the evaluation and strategic planning of adaptation measures and strategies with regard to hydro-meteorological and climate changes and extremes. The common platform will provide integrated web-enabled access to the *MEDIATION* toolbox, as well as to literature hints, spatially resolved climate impact and vulnerability maps, knowledge about regional adaptation, and guidelines how to use the information, taking due account of uncertainties. Final results are expected by the end of 2012.

Several European research projects have studied climate change impacts on the water cycle and provided recommendations about adaptation. The recently completed *WATCH*⁴³ project studied climate change impacts on the global water cycle with the aim to clarify the overall vulnerability of global water resources to climate change. *WATCH* results provide the first assessment of the global hydrological cycle on a daily time-frame at 50km grid scale resolution for the past (20th century) and future (21st century), as well as a new global analysis of water scarcity⁴⁴. Regional studies were also undertaken, focusing for instance on the Mediterranean area through the *CIRCE*⁴⁵ project which will soon publish the Regional Assessment Climate Change in the Mediterranean (RACCM) study. Current research also considers specific impacts of climate change on certain ecosystems and hydrological process. The *ACQWA*⁴⁶ project investigates the consequences of climate change in mountain regions where snow and ice are an important part of the hydrological cycle. Vulnerable groundwater and dependent

⁴² "Methodology for Effective Decision-making on Impacts and Adaptation" project (*MEDIATION*), <http://mediation-project.eu>.

⁴³ "Global Change and Water" project (*WATCH*), <http://www.eu-watch.org>.

⁴⁴ Harding, R.J. and Warnaars, T.A. (2011), Water and global change: The *WATCH* Project Outreach Report. Centre for Ecology and Hydrology, Wallingford, 40pp. Available at <http://www.eu-watch.org>.

⁴⁵ "Climate change and impact research: the Mediterranean environment" project (*CIRCE*), www.circeproject.eu.

⁴⁶ "Assessing Climate change impacts on the Quantity and quality of Water" (*ACQWA*) project, www.acqwa.ch.

ecosystems are studied under the *GENESIS*⁴⁷ project, while the *MIRAGE*⁴⁸ project studies climate change impacts on intermittent river management.

2.7. Climate Change and Natural Hazards

In the area of climate change and natural hazards, European research aims to improve understanding and modelling of climate changes related to the hydrological cycle at scales that are relevant to decision-making. At present, scientific information about water-related impacts of climate change and their socio-economic dimensions is not sufficient, especially with respect to water quality, aquatic ecosystems and groundwater. The FP7 is funding a series of on-going projects aimed at developing methods and technologies for improved assessment, forecasting and monitoring, management and mitigation of climate-related hazards, in particular floods and droughts,. For instance, the *IMPRINTS*⁴⁹ project is working on improving preparedness and risk management for flash floods and debris flow events and provides detection tools which are directly used by civil protection and meteorological services. The project *DROUGHT-R&SPI*⁵⁰ focuses on improved understanding of drought causes and impacts and on the development of early warning systems in Europe. This initiative is complemented by the *DEWFORA*⁵¹ project which establishes a strong international cooperation partnership among EU and African countries. In the same vein of international cooperation, the *CORFU*⁵² project is developing advanced strategies for improved flood management in cities in partnership with China, India and Bangladesh, while the *CLIWASEC*⁵³ cluster of projects on 'Climate change impacts on water and security' builds up cooperation among EU countries and neighbouring Mediterranean countries aimed at analysing, using a multidisciplinary approach, the effects of climate change on water and human security, and to identify effective adaptation and prevention measures. Finally, going beyond impact assessment, the *CONHAZ*⁵⁴ project has compiled and synthesised current knowledge on cost assessment methods to strengthen the role of cost assessments in the development of integrated natural hazard - including climate-related extreme events - management and adaptation planning⁵⁵.

⁴⁷ "Groundwater and Dependent Ecosystems" project (GENESIS), www.thegenesisproject.eu.

⁴⁸ "Mediterranean intermittent river management" project (MIRAGE), www.mirage-project.eu.

⁴⁹ "Improving Preparedness and Risk Management for Flash Floods and Debris Flow Events" project (IMPRINTS), <http://imprints-fp7.eu>.

⁵⁰ "Fostering European Drought Research and Science-Policy Interfacing" project (DROUGHT-R&SPI), www.eu-drought.org.

⁵¹ "Improved Drought Early Warning and FORecasting to strengthen preparedness and adaptation to droughts in Africa" project (DEWFORA), www.dewfora.net.

⁵² "Collaborative research on flood resilience in urban areas" project (CORFU), www.corfu-fp7.eu.

⁵³ The CLIWASEC cluster is made up of the following projects: "Climate Change, Hydro-conflicts and Human Security" (CLICO), "Climate Induced Changes on the Hydrology of Mediterranean Basins" (CLIMB) and "Water Availability and Security in Southern Europe and the Mediterranean" (WASSERMed). The cluster website is www.cliwasec.eu.

⁵⁴ "Costs of Natural Hazards" (CONHAZ) project, <http://conhaz.org>.

⁵⁵ CONHAZ project (2012), "Costs of Natural Hazards - A Synthesis", available at <http://conhaz.org>.

2.8. Climate Change and Health

Climate change will affect and impact human health in different ways. In addition to direct impacts of projected temperature changes on human health (e.g. heat-waves, cold snaps) and the effects on human security of natural hazard and extreme weather events, climate change will impact on the future distribution and spread of infectious diseases, and in particular of Vector-Borne Diseases (VBDs). The impacts may be direct, in terms of outbreaks of disease among human populations, or indirect, in the form of outbreaks of diseases that affect domesticated animals or plants, and therefore jeopardise food security, agriculture-based economic activities and trade.

Amongst the FP7-funded projects working in this field, the initiatives *HEALTHY FUTURES*⁵⁶ and *QWeCI*⁵⁷ bring together European and African research to investigate the interplay between climate variability and a number of human and animal diseases with major socio-economic impacts in Africa (Kenya, Malawi, Rwanda, Senegal, South Africa and Uganda), particularly high-impact vector-borne diseases such as malaria and Rift Valley fever. Outcomes of the projects will allow health stakeholders and planners to react in a timely and cost-effective manner to reduce the severity of epidemic outbreaks and make long-term decisions regarding health infrastructure investment. Along the same lines, the project *VIROCLIME*⁵⁸ will use hydrological models to determine the effects of climate change on the variation in viral flux, and therefore in risk associated with viral disease to promote a novel approach to the management of water-related disease. Case studies from European countries and Brazil are being undertaken to produce an empirical baseline that will inform the subsequent modelling work of the project.

The health impacts of greenhouse gas (GHG) reduction policies in Europe, China and India are being studied by the projects *PURGE*⁵⁹ and *URGENCHE*⁶⁰. Both projects are experimenting different approaches to modelling of health-related exposures in different urban settings and are developing methodological frameworks to assess urban GHG reduction policies with the greatest co-benefits on health and well-being of local populations. The ultimate objective is to deliver assessment tools and guidance that are useful for the development of win-win mitigation policies for different urban areas in Europe and Asia.

⁵⁶ "Health, environmental change and adaptive capacity: mapping, examining and anticipating future risks of water-related vector-borne diseases in eastern Africa" (HEALTHY FUTURES), www.healthyfutures.eu.

⁵⁷ "Quantifying Weather and Climate Impacts on Health in Developing Countries" project (QWeCI), www.liv.ac.uk/qweci.

⁵⁸ "Impact of climate change on the transport, fate and risk management of viral pathogens in water" project (VIROCLIME), www.viroclime.org.

⁵⁹ "Public health impacts in URban environments of Greenhouse gas Emissions reduction strategies" project (PURGE).

⁶⁰ "Urban Reduction of GHG Emissions in China and Europe" project (URGENCHE), www.urgence.eu.

Another set of projects is investigating additional health-related impacts of climate change such as the impact of increased UV radiation (*ICEPURE*⁶¹ project) and the risks associated with the potential remobilization of environmental contaminants (such as mercury, PCBs, etc.) for human population in the Arctic and Europe (*ArcRisk*⁶² and *CLEAR*⁶³) in order to gain insight into changes that may later impact other areas and assess future scenarios related to climate change.

2.9. Economics of Climate Change Mitigation and Adaptation

The area of economics of climate change is increasingly gaining prominence at the European level. In addition to the already active projects mentioned below, several projects will be launched in 2012 and 2013 to further support research on issues related to economic assessment of costs and benefits of mitigation policies at the European and global level, as well as the estimation of costs of inaction and costs and benefits of adaptation.

Amongst the already active FP7-funded projects in this field, the *CLIMATECOST*⁶⁴ project has carried out an assessment of impacts and economic costs of climate change in Europe and at the global level. This included a bottom-up sectoral impact assessment for Europe, as well as a global economic modelling analysis with sector-based impact models and utilization of computable general equilibrium models. The work undertaken under the project has been summarized in short technical policy briefs focusing on the impacts and costs related to sea level rise, river floods, energy, health and ancillary air quality benefits in Europe that are already available, while the final reports at the global level will be released before the end of the year. The project *AMPERE*⁶⁵ is carrying out an intercomparison of different energy-economy-climate models to produce more robust assessments of the costs associated with bringing about long-term emissions reductions and with promoting low carbon technology. This project will shed light on how a variety of assumptions – concerning for instance future climate policy and available mitigation options – affect the mitigation scenarios, their feasibility and cost. In its first year of life, AMPERE has analysed the scenarios produced by the range of 18 models in the case of no global climate policy. In the next year, the scenarios under a range of other assumptions will be produced. The *LIMITS*⁶⁶ project, launched in October 2011, will

⁶¹ "The impact of climatic and environmental factors on personal ultraviolet radiation exposure and human health" project (ICEPURE), www.icepure.eu.

⁶² "Arctic health risks: Impacts on health in the Arctic and Europe owing to climate-induced changes in contaminant cycling" project (ArcRisk), www.arcrisk.eu.

⁶³ "Climate change, environmental contaminants and reproductive health" project (CLEAR), www.inuendo.dk/clear.

⁶⁴ "Full costs of climate change" project (CLIMATE COST), www.climatecost.cc.

⁶⁵ "Assessment of Climate Change Mitigation Pathways and Evaluation of the Robustness of Mitigation Cost Estimates" project (AMPERE), <http://ampere-project.eu>.

⁶⁶ "Low Climate Impact Scenarios and the Implications of required tight emission control strategies" project (LIMITS), www.feem-project.net/limits.

use key global integrated assessment models to run climate mitigation and adaptation scenarios under new conditions and constraints. The policy implications will be thoroughly evaluated. Thirteen models will be used throughout the project covering a wide range of different aspects. Using these models, LIMITS will explore the implications and uncertainties in reaching a 2°C target under different assumptions regarding the remaining leeway for greenhouse gas emissions, technology availability, the participation of different regions in international climate policy, and implementation obstacles. LIMITS will place particular emphasis on the major global economies as they account for most of the emissions and host the largest mitigation capacity.

Under the Socio-economic Sciences and Humanities (SSH) theme of FP7, the EU is also supporting several projects addressing broad issues related to a transition to sustainable, low-carbon societies, and in particular the nexus among energy, environment, transport and land-use. The *PACT*⁶⁷ project investigates societal transition to a low carbon future using both "back-casting" and traditional "forecasting" on long and very-long term scales (up to 2100) and has contributed to the report "World and European Energy and Environment Transition Outlook" (WETO-T)⁶⁸ that was published at the end of 2011. Two modelling-oriented research projects called *PASHMINA*⁶⁹ and *GLOBAL-IQ*⁷⁰ are looking at long-term societal transformation in the context of global environmental change, including climate change. The SSH specific programme is also funding *SPREAD*⁷¹, a qualitative and participatory social platform on sustainable lifestyles, focusing on mobility patterns, residential sector habits and production/consumption. Finally, it is also worth mentioning the EU support to foresight expert group and report called "Global Europe 2050"⁷² that tackles, amongst others, the questions of energy and climate change in both the "narrative scenarios" and in their quantification.

2.10. Geoengineering

In order to address a significant knowledge gap, the EU is supporting projects that investigate the efficacy, costs and potential side effects of various climate engineering options. The project *IMPLICC*⁷³ is currently investigating the feasibility and implications of certain solar radiation management techniques, while a new initiative for

⁶⁷ "Pathways for carbon transitions" project (PACT), www.pact-carbon-transition.org.

⁶⁸ European Union (2011), "World and European Energy and Environment Transition Outlook". http://ec.europa.eu/research/social-sciences/pdf/publication-weto-t_en.pdf.

⁶⁹ "Paradigm shifts modelling and innovative approaches" project (PASHMINA), www.pashmina-project.eu.

⁷⁰ "Impacts quantification of global changes" project (GLOBAL-IQ).

⁷¹ "Social Platform identifying Research and Policy needs for Sustainable Lifestyles" project (SPREAD), www.sustainable-lifestyles.eu.

⁷² European Union (2011), "Global Europe 2050". http://ec.europa.eu/research/social-sciences/events-191_en.html

⁷³ "Implications and risks of engineering solar radiation to limit climate change" project (IMPLICC), <http://imPLICC.zmaw.de>.

a comprehensive assessment of key geoengineering options will start in mid-2012 with the aim to address the associated risks and uncertainties, as well as socio-economic and governance issues.

2.11. Climate Change, Agriculture and Food security

Under the FP7 theme on the "Knowledge-Based Bio Economy" (KBBE), additional major research efforts are being promoted by the EU to tackle problems related to the increasing global demand for food and biomass and their environmental and climate implications. Several projects funded under this theme are directly relevant to the work done by the UNFCCC as they address both the mitigation and adaptation potential of more sustainable and climate resilient primary production systems.

For instance, several projects – often involving broad international cooperation with developing countries – are investigating water use in agriculture, taking into account a changing climate. The issue has been mainly tackled by improving crops drought resistance (*PGRSECURE*⁷⁴ and *DROPS*⁷⁵) and by enhancing water use efficiency in irrigated agriculture (*SIRRIMED*⁷⁶, *EAU4FOOD*⁷⁷ and the recently selected *FIGARO*⁷⁸). The projects *SMARTSOIL*⁷⁹ and *CATCH-C*⁸⁰ aim to identify and promote the best farming practices to preserve soil functions and fertility, improve production and reduce carbon emissions. In the area of livestock production, several projects deal with both animal management strategies and breeding solutions, with projects such as *ANIMALCHANGE*⁸¹ and *NEXTGEN*⁸², addressing respectively mitigation and adaptation options for sustainable livestock production under climate change, and methods to preserve farm animal biodiversity and improve sector resilience.

Other projects aim at building knowledge on the opportunities, risks and feasibility of exploiting energy crops as alternative to fossil fuels, such as *SWEETFUEL*⁸³ focusing

⁷⁴ "Novel characterization of crop wild relative and landrace resources as a basis for improved crop breeding" project (PGRSECURE), <http://pgrsecure.org>.

⁷⁵ "Drought-tolerant yielding plants" project (DROPS), www.drops-project.eu.

⁷⁶ "Sustainable use of irrigation water in the Mediterranean region" project (SIRRIMED), www.sirrimed.org.

⁷⁷ "European Union and African Union cooperative research to increase food production in irrigated farming systems in Africa" project (EAU4FOOD), www.eau4food.info.

⁷⁸ "Flexible and precise irrigation platform to improve farm scale water productivity" project (FIGARO).

⁷⁹ "Sustainable farm management aimed at reducing threats to soils under climate change" project (SMARTSOIL), <http://smartsoil.eu>

⁸⁰ "Compatibility of agricultural management practices and types of farming in the EU to enhance climate change mitigation and soil health" project (CATCH-C), www.catch-c.eu.

⁸¹ "An integration of mitigation and adaptation options for sustainable animal production under climate change" project (ANIMALCHANGE), www.animalchange.eu.

⁸² "Next generation methods to preserve farm animal biodiversity by optimizing present and future breeding options" project (NEXTGEN), <http://nextgen.epfl.ch>.

⁸³ "Sweet sorghum, an alternative energy crop" project (SWEETFUEL), www.sweetfuel-project.eu.

on sweet sorghum as biomass for energy production, and the project *JATROPT*⁸⁴ on *Jatropha curcas*.

In the forestry area the project *BACCARA*⁸⁵ studies the effect of climate change on forest biodiversity and productivity, while the project *BENWOOD*⁸⁶ promoted the exchange of experience in the area of Short Rotation Forestry (SRF) in the framework of the Kyoto protocol and developed SRF guidelines and standards for land use management in CDM countries, with focus on Brazil, India, China and African countries.

2.12. Low-carbon Technologies

Within the "Cooperation" programme of FP7, additional climate change mitigation research, particularly concerning the development of low-carbon technologies, is funded under the "Energy", "Transport (including aeronautics)" and "Information and Communication Technologies (ICT)" themes. With a budget of €2.3 billion, the Energy theme focuses on sustainable energy solutions aimed to reduce GHG emissions, including renewable energy technologies, clean coal technologies, smart energy networks, and energy efficiency and savings. With a budget of €4.2 billion, the "Transport" theme includes, among its activities, the reduction of GHG emissions from both air transport and surface transport. Finally, with a budget of €9 billion, the ICT theme encompasses research on intelligent ICT-based transportation systems, as well as on solutions to prevent or reduce vulnerability and to mitigate the consequences of natural disasters.

It should also be mentioned that several European Technology Platforms (ETPs) have been established in support of FP7 planning. The ETPs are industry-led fora charged with defining research priorities in a broad range of technological areas. Amongst the established ETPs, several focus on environmental technologies aimed to reduce GHG emissions, such as the ETP for "Zero Emissions Fossil Fuel Power Plants", the ETP for "Hydrogen and Fuel Cell Platform" and the ETPs for "Photovoltaics, Wind energy and Biofuels". Furthermore, a Joint Technology Initiative (JTI) on "Fuel Cells and Hydrogen" has been set up as tool to support the implementation of the related ETPs Strategic Research Agendas through a public/private partnership financing mechanism.

Further information is available on the Europa server at <http://ec.europa.eu/research/index.cfm?lg=en&pg=who&cat=a&tips=on>.

⁸⁴ "*Jatropha curcas*, applied and technological research on plant traits" project (JATROPT), www.jatropt.eu.

⁸⁵ "Biodiversity and climate change, a risk analysis" project (BACCARA), www.baccara-project.eu.

⁸⁶ "Coordination actions in support of sustainable and eco-efficient short rotation forestry in CDM countries" project (BENWOOD), www.benwood.eu.

3. EUROPEAN CLIMATE CHANGE RELATED RESEARCH INFRASTRUCTURES SUPPORTED BY FP7

FP7 supports as well – through its Capacities Programme - the management of existing European research infrastructures providing funds for networking, for granting transnational access to researchers and for developing the infrastructure potential. In the field of climate change research, projects have been granted for several observing systems and for large scale facilities, among which: ocean research vessels⁸⁷, simulation chambers for atmospheric processes⁸⁸, earth system modelling supercomputing⁸⁹, airborne research⁹⁰, arctic terrestrial research⁹¹, aerosols-clouds and trace gases⁹², non-CO2 observing system⁹³, the global ocean observing system⁹⁴.

Support has been as well granted for supporting the development of new research infrastructures, like: *EUROARGO* (the global ocean observing system), *ICOS* (the integrated carbon observing system), *COPAL*⁹⁵ (a high payload aircraft for atmospheric research), *IAGOS-ERI*⁹⁶ (instrumented commercial aircrafts for tropospheric research) and *SIOS*⁹⁷ (the Svalbard integrated Arctic earth observing system).

Several of the above mentioned infrastructure projects contribute to the various global observing systems and participate to the building of the Global Earth Observation System of Systems (GEOSS).

4. INTERNATIONAL COOPERATION UNDER FP7

International cooperation with third countries is an integral feature of the EU Framework Programmes for Research ranging from large-scale international collaboration efforts to the promotion of networking platforms and increased researcher mobility. All parts of the Programme are open to international cooperation. As demonstrated by several projects mentioned in this information note, participation of and collaboration with researchers from both other developed countries and developing countries is widely encouraged throughout FP7 and well beyond the specific tools supporting international cooperation. Furthermore, it should also be noted that, given the global nature of climate change, the

⁸⁷ www.eurofleets.eu.

⁸⁸ www.eurochamp.org.

⁸⁹ <https://is.enes.org>.

⁹⁰ www.eufar.net.

⁹¹ www.eu-interact.org.

⁹² www.actris.net.

⁹³ www.ingos-infrastructure.eu.

⁹⁴ www.euro-argo.eu.

⁹⁵ www.copal.net.

⁹⁶ www.iagos.org.

⁹⁷ www.sios-svalbard.org.

international cooperation dimension of FP7 is particularly significant under the theme "Environment (including climate change)". In this respect, it is worth noting that already under the 6th Framework Programme (2002-2006), the "Global Change and Ecosystems" thematic programme was the one with the highest third country participation (more than €37 million granted to third country participants).

Under FP7, there are various projects, falling under the category of "**Specific International Cooperation Actions (SICAs)**", dedicated specifically to international cooperation, with a geographical focus on developing countries. Under FP7, €180 million have been budgeted to fund these activities. SICAs address research problems of mutual interest and benefit between the EU and international cooperation partner countries (ICPC). In particular, they aim to: support EC scientific and economic development through strategic partnerships with third countries in selected fields of science; facilitate contacts with research partners in third countries; and address specific problems that third countries face or that have a global character. Throughout the implementation of FP7, several calls have targeted international cooperation activities with Latin America, Africa, and Asian countries, resulting in the funding of a number of climate change-related projects, including research on the health impacts of climate change-induced droughts and desertification, on the development of sustainable energy systems, on natural resources management and climate-resilient agriculture, etc.

5. FURTHER INFORMATION ON FP7

EU's Research Portal:	www.ec.europa.eu/research
General information on FP7:	www.ec.europa.eu/research/fp7
Participants Portal (Specific information on FP7 programmes, projects and calls):	https://ec.europa.eu/research/participants/portal/page/home
CORDIS project database	http://cordis.europa.eu/projects/home_en.html
Overview of projects funded by the Environment (including climate change) Theme	http://ec.europa.eu/research/environment/index_en.cfm?pg=climate
For updates of particular collaborative opportunities in 2012 for third countries and regions:	http://ec.europa.eu/research/inco