



Conference summary and key outcomes

The International Conference on Regional Climate – CORDEX 2013, held in Brussels, Belgium 4-7 November, was jointly organized by the World Climate Research Programme (WCRP), the European Commission (EC) and the Intergovernmental Panel on Climate Change (IPCC), and was attended by over 500 participants from 97 countries. Thanks to the conference sponsors, about 90 participants were supported financially to attend the conference. Participation via web streaming and Twitter Questions and Answers provided opportunities for the community at large to attend the conference remotely and to interact with the audience.

The conference brought together the international community of regional climate scientists and stakeholders with a particular emphasis on the production, assessment and use of Regional Climate information and the CORDEX initiative. This landmark event provided a forum for addressing the following key challenges:

- Assessment and improvement of regional dynamical and statistical downscaling techniques;
- Development of regional climate change projections with associated uncertainties;
- Provision of reliable and actionable regional climate information;
- Use of regional climate information in vulnerability, impacts, adaptation studies;
- Dissemination of regional climate knowledge to policy-makers and a wide range of stakeholders and decision-makers.

The first day of the conference featured two important events: a High Level Session with the participation of the European Commissioners for Research & Innovation and for Climate Action, where the Intergovernmental Panel on Climate Change (IPCC) presented key findings from the IPCC Working Group I Contribution to the Fifth Assessment Report *Climate Change 2013: The Physical Science Basis*. This was followed by a Stakeholder Dialogue session focusing on how science-based regional climate information can best serve the needs of regional policy and decision-makers. This segment was intended to provide the global to regional socio-economic and policy context within which WCRP regional climate research activities and programmes operate.

The second segment of the conference, during the following three days, was organized around the key scientific outcomes from Phase I of the Coordinated Regional Climate Downscaling Experiment (CORDEX) project, encompassing results from all participating regions worldwide. This segment was designed to deliver on the current status and needs of regional climate science and modelling; to strengthen collaboration and synergies between the various CORDEX regional activities; and, in collaboration with other regional climate research initiatives, to outline the future priorities for regional climate science, with due consideration of

the UN Global Framework for Climate Services (GFCS), Future Earth (FE) and science-based assessments such as those of the IPCC. The segment also featured a dedicated Early Career Scientist event to strengthen the CORDEX networking and collaborations in regional climate science.

The breadth and depth of oral and poster presentations illustrated the relevance of CORDEX on the climate change agenda and the expected contribution to impacts, vulnerability and adaptation applications in areas such as water availability, agriculture and food security, health, and disaster risk reduction. In particular, the following four main conclusions were drawn.

International Conference on Regional Climate – CORDEX 2013 - Key outcomes

1. Dialogue and co-exploration with end-users

Participants recognized the need for a paradigm shift in which regional climate science operates by placing end-users expectations and needs at the heart of the development of regional climate information through a change in perspective on the analysis and exploitation of climate model outputs, leading to new science-policy approaches. For example, co-development and co-exploration amongst climate scientists and practitioners and stakeholders would ensure the appropriate tailoring of climate information at relevant spatial and temporal footprints with more effective two-way communication leveraging regional and local know-how. The need for training, capacity building and innovative information and knowledge transfer mechanisms would provide the necessary instruments for effective delivery of climate services contributing to the WMO-led UN Global Framework for Climate Services (GFCS) and the Future Earth (FE) initiative.

2. Added value of regional climate information

Presentations and discussions have highlighted the need to assess the potential of regional climate information to add value to the decision-making process, as compared to global climate simulations. In numerous cases, mean biases of Global Climate Models (GCMs) and Regional Climate Models (RCMs) are still of similar magnitude. Added value is best illustrated in higher order statistical analysis at the regional and local topographic and process level but much remains to be done to improve the physics of regional models, to demonstrate the robustness of results and to ensure the systematic skill enhancement of downscaling exercises. High-resolution observational data sets and archiving infrastructures such as the Earth System Grid Federation (ESGF) will be instrumental in supporting necessary model development and evaluation, and in gaining confidence in regional climate projections.

3. Uncertainty

Uncertainty cascading, whereby imperfect regional climate knowledge is transferred into the application arena for vulnerability, impacts and adaptation (VIA) studies was recognized as a key challenge faced by the CORDEX joint science decision-making undertaking. Regional climate downscaling relies on approximate information and a number of necessary assumptions (lateral boundary conditions, future forcing, model physics, etc) impacting results, and their relative contributions to uncertainty ought to be understood. The use of multiple RCMs or multiple downscaling methods appears to increase uncertainty, especially at smaller scales and there is a need to develop robust methods to

characterize and communicate uncertainty to the various end-users and stakeholders. Better uncertainty characterization would also help set priorities for improving downscaling. Multi-model ensembles of dynamical and statistical downscaled products require further innovative post-processing approaches to distil, fuse and possibly reconcile imperfect, and sometimes contradictory, information.

4. Future simulation framework (CORDEX-II)

The uptake of CORDEX data for regional climate analysis and VIA assessment has been encouraging and widespread, including in the developing countries. A critical mass of multi-model multi-method experiments is needed to capture the necessary uncertainty for robust decision-making and policy challenges. The growing range of practical applications will also require more complex models towards a better representation of the Earth System through Regional Earth System Models (RESMs). In addition, as the resolution of global models increases, it is recognized that regional downscaling tools should also aim at increasingly finer scales to provide added value and useful information for VIA applications. This may require revisiting the CORDEX domains and developing a clear science-based procedure for their selection. Furthermore, end-to-end pilot studies over selected subregions are needed to provide test-beds to explore a range of critical issues, such as:

- development of targeted as well as transferable analysis metrics to quantify where and when high resolution downscaling gives added value;
- process-based analysis of models, in part through targeted regional experiments;
- assessment of regional feedbacks (e.g. soil-atmosphere interactions);
- intercomparison of different methods (e.g. dynamical vs. statistical downscaling);
- detailed uncertainty analysis;
- co-exploration of regional and local scale information for VIA application;
- development and exploitation of high resolution observation datasets to support all of the above.

Such pilot studies can also provide frameworks of interactions with other WCRP programs, most noticeably GEWEX and CLIVAR.

Summary conclusion

The CORDEX-I experiment has been undoubtedly a successful framework to federate regional downscaling initiatives around a common experimental design through regional ownership and application. The aforementioned points illustrate the need to now adapt this framework to enhance the dialogue with end-users so as to meet the growing demand for tailored regional climate information and in particular towards updated regional climate assessments and truly operational regional climate services. These challenges will require underlying model developments, infrastructures and tools supporting the provision, assessment, processing, distillation, dissemination and informed use of regional climate information, and necessary training and capacity building efforts, especially in the developing world.

For more information, see <http://cordex2013.wcrp-climate.org/>.