Bridging Climate Research Data and the Needs of the Impact Community
Workshop Summary

InfraStructure for the European Network for Earth System Modeling
Copenhagen, 11-12 January 2011

The workshop

The workshop's main objective was to clarify the climate data needs of the user community in the area of climate change impacts, vulnerability and adaptation (IVA) in support of future climate modeling analysis in Europe. The workshop brought together 38 climate modelers and impact researchers using climate data. Involvement of policy makers, practitioners and other end users of climate information is planned for a next stage. The workshop addressed data needs in various sectors, notably water management, ecosystems and agriculture, coastal management, and urban development. This paper summarizes the main recommendations of the workshop that could be implemented in a stepwise fashion.

The workshop was organized by IS-ENES in collaboration with the European Environment Agency (EEA) and the CIRCLE-2 ERA network of the national climate change impacts, vulnerability and adaptation research programmes in Europe. Both IS-ENES and CIRCLE-2 are supported by the EU's 7th framework programme. The results of the workshop aim at supporting the development of the IS-ENES strategy, and were discussed in an IS-ENES Foresight meeting held from 2-4 February 2011 in Hamburg, as well as setting the stage for the development of a pan-European e-impact portal prototype to deliver climate scenarios for impacts, vulnerability and adaptation. They can also support the development of a European network of climate services as well as the European Clearinghouse on Climate Change Impacts Vulnerability and Adaptation (ACE), one of the elements of a new European Climate Change Adaptation Strategy to be developed following the EU White Paper on Adaptation. CIRCLE-2 will use the outcomes of the workshop to further develop joint initiatives in support of climate change IVA research programming in Europe.

Who are the users?

1. *Account for diversity of users.* Climate modeling, climate monitoring and other climate research activities should account for an increasingly diverse group of users, in terms of types of sectoral impacts and in terms of their functions (from impact modelers to governments at different levels to consultants and private sector decision makers). Also, it should be taken into account that different European regions have a very different level of knowledge, especially central and eastern European countries are as yet poorly represented in climate research networks. Data needs in sectors other than water and land management tend to be less well articulated and require special attention. As a first step in a process, the workshop mainly targeted IVA researchers, and there is a need for additional IS-ENES efforts to engage the actual end users in the various sectors and regions together with the IVA research and climate modeling communities.

2. *Distinguish between non-specialist, specialist and niche user communities.* Climate modeling output could distinguish between the needs of the impacts community for non-specialized, specialized, and niche users, both in terms of data volume, guidance and support provided. These types of services require different levels of expertise and resources - while non-specialized users may be served by largely more generic information, specialist and niche users require tailored information and arguably more interaction.

3. *Organize and maintain a user involvement mechanism.* Past efforts to improve the communication between the climate modeling and impacts communities at national and European levels have often failed because of the lack of resources and of a sustained interaction mechanism. A concerted effort is needed to develop such a mechanism, possibly in the context of a system of European climate services (see below). Required interactions include collaborative strategy development, regular feedback on evolving climate information portals, the joint development of guidance, periodic (e.g., bi-annual) European conferences, and management of expectations to avoid unrealistic demands.

What do the users need?

4. *Provide information in form of processed date (climate indices).* To better connect with the users, there is a need to focus on transferring information in terms of derived climate indices, some of which could be generically provided to non-specialist users, while other should be responding to the needs of specialists. While for the first user group these indices may be an end product, for specialist they are also a means to further select additional basic data for specific scenario-model combinations. Particularly indices on extreme events and on worst or best case scenarios are relevant from an impact perspective. Spatially explicit information (maps) and first order delta indices are particularly relevant. A much more active role of the user community is required to guide this process. Tools should be provided to support users to calculate specific indices themselves to allow greater flexibility.

5. *Provide post-processing tools (statistics, conversion, visualization).* To better respond to the needs of the impacts community, simple post-processing tools should be developed and made available, e.g. for simple statistics, data conversions, or visualization, accompanied by guidance on how to use and interpret the information with proper account of uncertainties and data limitations. However, for many applications, specific tailor-made information is required that cannot be meaningfully made available in a generic way and not only data and tools but also processing capacity should be available at data provider to support users.

6. *Provide (basic) error/bias correction of models*. Many impact modelers are not aware of the importance of bias corrections. Application of raw data can lead to wrong conclusions and bias correction leads to much improved results. A guidance document is required explaining the origin of these biases (model error, location, mismatch in initial conditions), and providing methods and tools on how to implement error or bias correction. Training of impact modelers on how to correctly use the data will improve the quality of their research. In consultation with impact researchers, climate modelers should urgently explore the feasibility to provide well-documented example datasets with bias correction, also including parameters other than precipitation and temperature, such as radiation and air humidity.

7. *Develop guidance on understanding and interpretation of uncertainties with impact community.* The climate modeling and impacts communities should jointly work on developing guidance for the wide variety of impact researchers and practitioners on how to deal with the different type, levels and relevance of uncertainties, especially those related to climate model uncertainties in a broader context that involves also other pertinent uncertainties. Because IVA researchers work with downscaled data, guidance should pay attention to uncertainties related to global models as well as dynamic and statistical downscaling.

8. *Support access to consistent information on socio-economic and land-use scenarios.* Impact researchers use climate model results in combination with other information, including climate observations, land-use information and socio-economic projections. Users of climate projections should be aided to access this information that is often also used as input for the climate model experiments. Examples of projects using the different data sources consistently should be provided. Also other data (e.g. discharge data, CO_2) should be made accessible in a coordinated fashion.

9. *Develop guidance on adequate selection of climate data jointly with the impacts community.* Impact modelers may in the future do ensemble runs themselves, but most researchers and practitioners will continue to work with a limited set of climate scenarios and models. The climate modeling and impacts communities should jointly work on developing guidance on how to select and interpret climate scenarios in a way that best matches their needs. Guidance should describe the models, summary statistics, model differences, comparisons with observations, using references to overview papers (e.g., ENSEMBLES, PRUDENCE, CORDEX). The eventual responsibility for the selection of models and scenarios, and the use of climate scenarios ensembles, should remain within the impact community.

How should the demand be met?

10. *Eventually provide different climate information in one linked system (monitoring, global and regional modeling).* Different types of climate information (observations, global climate model output, dynamically or statistically downscaled climate projections, derived climate indices, tools and guidance) should all be available through one network of linked, interoperable data portals, using similar structure and discovery tools to be able to use data from different national portals simultaneously, accompanied by appropriate guidance for users to find what they need. The current project-based search strategy familiar to specialists only should be changed into the facilitation of more problem-based search facilities also targeting non-specialists. Ideally, the impact community should find the required information through one entry point (e.g., a virtual portal). At the same time, the impact community should be encouraged to also enhance their coordination, either by sector or under a more generic umbrella (cf., the UNEP initiative PRO-VIA at the global level).

11. *Start discussing the European Climate Service System now.* To gradually work towards the required linked climate information systems, it is time to start a discussion on the characteristics of a pan-European Climate Service System. Synergies should be explored between various initiatives, such as the climate services component of the Global Monitoring of Environment and Security programme (GMES), the activities of EUMETNET, the CIRCLE-2 ERA-net, the Adaptation Clearinghouse for Europe (ACE), the Joint Programming Initiative Clik' EU, the Climate Knowledge and Innovation Community (KIC), national climate service institutions and others.

12. *Explore conditions and requirements for a European climate services system.* To support the development of a shared and linked European system of climate services many issues remain to be addressed. These include the possible definition of rules for database management at the European level. Also the legal and financial aspects of the provision of data and derived products for commercial use of research results should be elaborated, taking prior experiences of other initiatives, such as GMES, into account. A third set of questions relates to the links between a European system with national portals and other types of climate services, national databases having added value because of the higher resolution of scenarios, better validation and easy international access to national data.

13. *Develop the IS-ENES E-impact portal as a component of a wider European system*. During the lifetime of IS-ENES, the project's E-impact portal will be developed as a proof of concept stepwise filled with a limited number of use cases, not yet as an operational service. The portal does not intend to replace other (national) initiatives. The portal will not only provide access to raw data, indices and maps, but also provide bias correction examples, downscaled data from use cases, harmonized documentation and tools, and other relevant information. It should provide guidance to select models and projections. An impact user group will be set up, and a contact point for questions established.

14. *Improve accessibility of data by better integration/harmonization and user-friendly interfaces, removing barriers.* Access to climate scenario also beyond experienced expert users should be improved by better integration/harmonization of data sources at different geographic levels, guidance for selection of scenarios and interpretation of model uncertainties, and user friendly interfaces offering various data formats, removing as much as possible institutional or financial constraints. In several countries, access to climate data is hampered by financial, institutional, technical or other practical reasons. While raw data and common statistical output in useable format should be available for free, for services including specific post-processing activities and/or special expertise, payment may be appropriate.

15. *Develop training programmes on use and interpretation of climate modeling results.* The number of researchers and practitioners working with climate data is rapidly increasing, and the volume and complexity of climate model output will increase as new results become available (CMIP5, CORDEX). With notable exceptions, the user community is not well trained to use and interpret this information correctly and effectively. An urgent need exists to develop and implement training programmes for impacts researchers, for practitioners, and for students. Main messages and materials could be harmonized at the European level, using and integrating input from various related FP7 and other projects. Funding sources are to be identified for supporting such crucial programmes.

Prepared by Rob Swart/WUR/Netherlands, 18 March 2011

Comments on an earlier draft were provided by Sylvie Joussaume, Christian Pagé and Ronald Hutjes and by participants to the 2-4 February 2011 IS-ENES Foresight meeting in Hamburg.