Using Climate Predictions to Better Serve Society's Needs

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Societies have always faced challenges and opportunities arising from variations in climate and have often flourished or collapsed, depending on their ability to adapt to such changes. In light of these challenges, there is a growing and urgent need to improve society's resilience to climate-related hazards and better manage the risks and opportunities from climate variability and climate change. This situation was recognized by governments, scientists, and decision makers at the World Climate Conference-3 in 2009, subsequently leading to the creation of the Global Framework for Climate Services (GFCS) under the leadership of several United Nations agencies.

Recent advances in scientific understanding and the ability to forecast climate variability and climate change have meant that skillful predictions are beginning to be routinely made on seasonal to decadal timescales. Such forecasts have the potential to be of great value to a wide range of decision making, where outcomes are strongly influenced by variations in the climate.

Access to credible forecast data, supported by informed guidance from the science community, could lead to significant advances in society's ability to effectively prepare for and manage climate-related risks. A clear opportunity therefore exists to develop new and improved methodologies that exploit the current and emerging prediction capabilities in climate science and, more important, to engage with potential users of such predictions in developing tools to extract useful and useable information tailored to specific sectoral needs.

To this end, the European Commission has recently commissioned a major 4-year-long project, called the European Provision of Regional Impacts Assessment on Seasonal and Decadal Timescales (EUPORIAS). EUPORIAS aims to develop prototype end-to-end climate impact prediction services operating on a seasonal to decadal timescale and to assess their value in informed decision making. This project began on 1 November 2012, coordinated by the United Kingdom's Met Office, in conjunction with a consortium of 24 organizations representing world-class European climate research and climate service centers; expertise in impact assessments and seasonal predictions; two United Nations agencies; specialists in new media (such as Twitter, Facebook, smartphones, and YouTube); and commercial companies in climate-vulnerable sectors such as energy, water, and tourism. In addition, the consortium has strong links with end user organizations, many of which will be involved in the project's activities through a stakeholder group and stakeholder activities. Interested stakeholders are encouraged to contact the project team.

EUPORIAS Structure and Purpose

The European Commission is investing in this research and development project to improve preparedness, reduce costs of emergency interventions, improve business continuity and resilience of society, prepare and stimulate a market for climate-dependent products and services, and increase the competitiveness of European Union (EU) businesses and the ability of EU regional and national authorities to make effective decisions in climate-sensitive sectors. The European Commission is also keen to develop a regional framework for climate services and thereby provide a key contribution to the Global Framework for Climate Services.

Two companion projects are intentionally linked to EUPORIAS. One project, the North Atlantic Climate (NACLIM) project, will look at observations in the North Atlantic and Arctic Oceans to improve the initialization of the seasonal to decadal forecasts and to improve our understanding of predictability over Europe. The other, called Seasonal-to-Decadal Climate Prediction for the Improvement of European Climate Services (SPECS), will improve climate forecast models and further improve understanding of climate predictability on seasonal to decadal timescales.

The majority of international research efforts to date have focused on improving the underlying climate prediction systems, rather than on improving the usability of the forecasts in practical applications. Reasons for this include a lack of well-accepted methods for relating the uncertainty/levels of confidence of seasonal to decadal forecasts to variables relevant for decisions, decision makers who act in a risk-averse manner, the limited usefulness of the skill of the forecasts for decision making, difficulties in integrating forecasts into existing decision support systems, and a lack of focus on specific user needs.

EUPORIAS will maximize the usefulness of seasonal to decadal forecasts by approaching the issue starting from the users' needs and then using this information to develop tools to forecast impacts (Figure 1). This will ensure that predictions provide user-relevant parameters, such as agricultural productivity, river runoff, and hydropower for the coming seasons and years. Improvements made to these impact parameters are likely to improve the overall performance of the prediction systems, given that some of the models used in the project explicitly account for some of these feedback mechanisms. Furthermore, EUPORIAS will provide an assessment of the chain of uncertainty in impact predictions on a seasonal to decadal timescale. A crucial aspect of the project will be to work closely with artists and new-media experts to explore alternative ways of engaging with decision makers and the general public to maximize the usefulness of the forecasts and the resulting tools and services.

Objectives of EUPORIAS

The EUPORIAS project will undertake several activities. First, an assessment of sector-specific vulnerability and an assessment of users' needs will be carried out. Then research will be conducted to make seasonal to decadal information relevant to decision

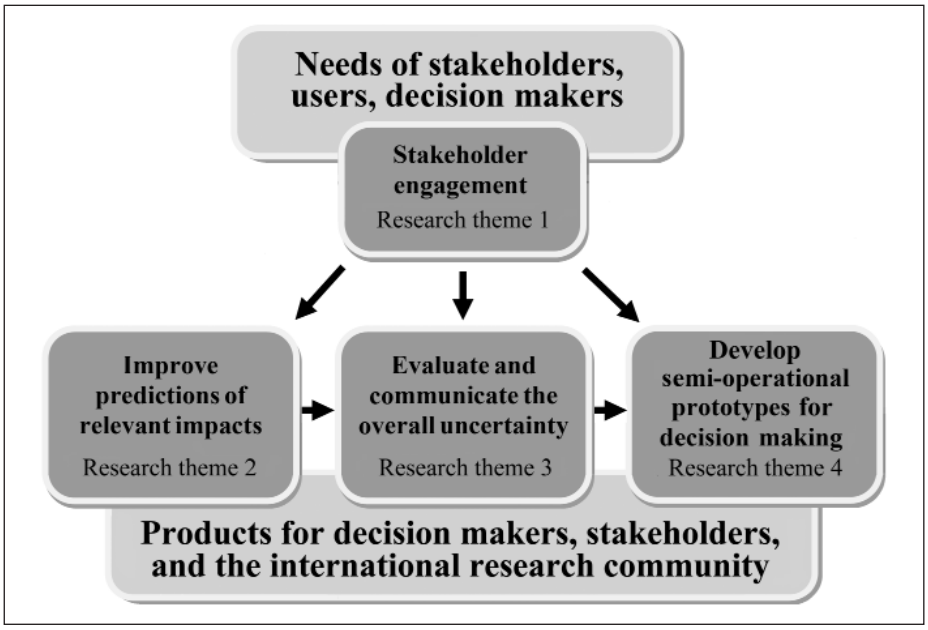

Fig. 1. Schematic showing how the European Provision of Regional Impacts Assessment on Seasonal and Decadal Timescales (EUPORIAS) project's four research themes are linked and how the project interacts with external research groups, stakeholders, users, and decision makers.

makers, including downscaling and calibrating climate information, producing impact-relevant climate information, and using models to predict the impacts of climate variability.

In parallel, research will be undertaken to quantify levels of confidence in the impact models, develop a framework for managing the inherent uncertainty in the predictions, and explore ways of communicating levels of confidence. Finally, building on all of the above, the project will develop some prototype climate services and conduct research into the use of climate information in decision-making processes, possible delivery tools, and an assessment of some business opportunities from climate services. A key feature of the whole approach in the project is that it will start from stakeholders' needs in developing service prototypes (Figure 1).

The project has the following key objectives:

- Develop and deliver reliable and trusted climate impact prediction systems for a number of carefully selected case studies. These will provide working examples of climate-to-impacts-to-decision-making services operating on seasonal to decadal timescales.
- Assess and document key knowledge gaps and vulnerabilities of important sectors (to include water, energy, health, transport, agriculture and food security, infrastructure, forestry, and tourism), along with the needs of specific users within these sectors, through close collaboration with project stakeholders.
- Develop a set of standard tools tailored to the needs of stakeholders for calibrating, downscaling, and modeling sector-specific impacts on seasonal to decadal timescales.
- Develop techniques to map the meteorological variables from seasonal to decadal predictions systems into variables that are directly relevant to the needs of specific stakeholders.
- Develop a knowledge-sharing protocol necessary to promote the use of these technologies. This will include making uncertain information fit into the decision support systems used by stakeholders to make decisions.
- Assess and document the current marketability of climate services in Europe and demonstrate how climate services on seasonal to decadal time horizons can be made useful to end users.

The primary forecast timescale for the project is 1 season to 1 year ahead, with a secondary focus on the more scientifically challenging 2- to 10-year timescale, which is less likely to provide reliable information in the coming few years. The main study area is Europe, with a potential secondary focus on parts of Africa, in particular with reference to food security, agriculture, and disaster risk reduction.

Preparing for High-Risk Events

The main outcome of EUPORIAS will be the development and the delivery of robust and usable probabilistic predictions of the impact of high-risk events. The tools developed will allow users to better understand high-risk climate patterns relevant to their sector, leading to enhanced business continuity through appropriate action being taken, thus making society more prepared and resilient to the impacts of climate variability and change. In turn, this will hopefully help reduce the associated costs of emergency interventions. Users will ultimately be able to use climate information in their decision making more easily and more effectively.

As an example, tools created by the project (with the involvement of climate service developers, providers, and users) will allow industries in the water, energy, and transport sectors to assess the impacts of a change in high-risk weather events, such as flooding, winter storms, heat waves, or droughts. The idea driving this effort is that it will improve preparedness for these events, for example, through modifying investment plans and reviewing contingency plans. Furthermore, if used effectively, it will encourage engagement with emergency responders and set realistic expectations about the level of confidence available through seasonal to decadal climate services. Similarly, the health and food security sectors will be able to use project tools to inform their medium-term (seasons to years ahead) responses to changes in airborne disease patterns, heat waves, etc. This will allow them to make better informed decisions while preparing their services, informing aspects such as staffing, infrastructure, product development, and preventative measures.

For more information, see http://www.euporias.eu/.

Acknowledgment

EUPORIAS is financed by the European Commission through the 7th Framework Programme for Research, grant agreement 308291.

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