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Exploring the use of seasonal climate forecasts in Europe through expert elicitation



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ABSTRACT

The importance of climate information for decision-making in sectors susceptible to climate variability and change is widely recognised. Advancements in climate science have led to an increased interest in seasonal climate forecasts (SCF) although in Europe very little is known about the practical use of these forecasts. To start filling this gap we conducted a workshop with experts in this subject area in order to elicit their knowledge and experiences regarding the current use of SCF in Europe.

We found that although the use of SCF across Europe is fairly limited, particular sectors such as energy, water, insurance, and transport are taking the lead. The central role of the European Centre for Medium-Range Weather Forecasts and National Meteorological Services as the main providers of SCF in Europe was also highlighted. Perceived barriers to their uptake tend to be associated with factors such as accessibility, relevance, and usability of SCF by the end-users.

Some of our findings are consistent with other experiences outside Europe where the uptake of SCF for decision-making has a longer history. For example, the interaction between actors, the usability of the information provided, and the influence of institutional and social factors have all been noted as important aspects influencing the use of these forecasts in Europe. However, as these findings are based on experts' knowledge further research with decision-makers and end-users is needed to better understand the use and potential benefits of SCF in Europe.

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Introduction

Climatic conditions have shaped societies for millennia. Since the emergence of Numerical Weather Prediction (NWP) and computer models in the 1950s, it has become possible to anticipate future weather a few days ahead. Climate models, developed from NWP models, produce forecasts, predictions or projections at a range of temporal and spatial scales. While in Europe, long-term climate change projections have received the most attention from decision-makers (Kovats et al., 2014; Biesbroek et al., 2010), developments in the science and models underpinning the study of climate variability and change have led to an increased interest in seasonal climate forecasts (SCF) (Hewitt et al., 2013; Buontempo et al., 2014). These forecasts cover “the next month up to a year into the future” and the information is provided as monthly or seasonal means (Goddard et al., 2012, p. 622). SCF have the potential to respond to the needs of a wide range of sectors and activities which are susceptible to, and influenced by, climate variability and change by helping to inform decision-making, improving operational activities, and enhancing profitability (Harrison et al., 2008a). For example, the susceptibility of the agricultural

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sector to weather conditions and the potential to use SCF to inform decisions and plan activities in agricultural systems is widely recognised by for example improving the timing for sowing, ploughing, and harvesting of crops (Doblas-Reyes et al., 2006; Cantelaube and Terres, 2005; The World Bank, 2008). Other European sectors such as water resources management, energy, insurance, disaster management, forestry, and health have also been identified as potential beneficiaries of such forecasts (Harrison et al., 2008b; The World Bank, 2008).

However, there is a lack of empirical studies and literature regarding the practical use of SCF in Europe (see Dessai and Bruno Soares, 2013). Given the paucity of knowledge in this field, the aim of this study was to elicit information from experts regarding their knowledge and experiences of the current use of SCF in Europe. To achieve this we conducted an expert elicitation workshop with European climate service providers representing a total of 11 countries, two European organisations, and various sectors including water, energy, tourism and health. The next section describes the methods used to elicit experts' knowledge during the workshop. "Results" Section presents the main findings from the workshop including the users and the producers of SCF in Europe, the chains of information (i.e. from providers to the users), and the perceived barriers and solutions to the uptake of SCF in Europe. "Discussion" Section discusses the key issues that arise from our findings and draws parallels with experiences from other parts of the world where the use of SCF has a longer history. "Conclusions" Section provides some concluding remarks.

Methods

The aim of this research was to elicit the knowledge and experiences from experts working at the interface between the production of SCF and the users of such information to better understand the use of SCF in Europe. The workshop was held in the Royal Netherlands Meteorological Institute (KNMI), in De Bilt, in The Netherlands in March 2013. A total of 24 experts from a range of European climate services providers attended, including National Meteorological and Hydrological Services (NMHS) as well as other organisations working at this interface (see Appendix A). These experts were selected based on their knowledge and expertise in the subject area (cf. Meyer and Booker, 1991) including through their involvement in European projects and initiatives focusing on SCF but also looking at the use of climate information and the development of climate services.

Experts' knowledge and expertise was captured by methods of knowledge elicitation (cf. Ericsson, 2006) which can be used in novel and emergent areas of research to help determine what is currently (un)known as well as what is worth investigating in a particular field (Meyer and Booker, 1991). These included interactive small groups discussions to probe and elicit experts' knowledge (Hoffman et al., 1995). The elicitation focused on three key issues: (1) identifying users of SCF in Europe; (2) identifying the flows of information from providers to users (here described as chains of information); and (3) identifying barriers and solutions to the use of SCF in Europe. The workshop was run and facilitated by both authors and one more person. Experts worked in mixed groups. Having mixed groups allowed forming groups with participants from different sectors of expertise (e.g. meteorology, tourism, health; see Appendix A) and geographical areas and hence contribute with a range of experiences and knowledge regarding the users. Each group were asked to identify and describe SCF users in Europe and to place each SCF user in a matrix according to prediction lead times and type of SCF use. The prediction lead time ranged from forecasts up to a month (sub-seasonal forecasts), from a month up to a year (seasonal forecasts), and annual (annual forecasts). SCF use were categorised as: those aware and using SCF (including advance and moderate users); aware of SCF and potential to use SCF; and not aware but potential to use. Each group then discussed their matrix and reported in plenary to all workshop participants. Discussing the groups' findings in plenary allowed all experts to be aware of what was being discussed in each group (e.g. to identify users that were being named by other experts such as the case of Electricité de France (EDF) which was put forward by different experts/groups as a current user of SCF) but also allowed further contributions to the wider discussion from everyone involved.

To identify the providers and the chains of SCF in Europe, experts were asked to describe a known chain of SCF provision i.e. from its production to its use in decision-making. Working in groups, experts were then asked to discuss the various chains and try to merge them by finding commonalities and linkages between them. This merging exercise allowed experts to identify organisations common to the various chains of SCF identified (when applicable) and cluster and converge them as much as possible. This in turn, permitted identifying those organisations that were most prominent in the chains of SCF provision.

To identify barriers to the use of SCF and solutions to overcome those barriers, participants were arranged in small groups and asked to brainstorm in their group, discuss, and cluster the main barriers to the use of SCF using post-its.

Each group was then asked to do the same with regard to solutions to overcome the barriers identified. As this was a brainstorm/discussion exercise the barriers and solutions identified by experts ended up being quite general in nature (rather than identifying barriers related to particular user/s). They then reported back the main findings from their table at the end of the session.

Results

The users of seasonal climate forecasts in Europe

During the workshop, a total of 35 users of SCF across a range of European sectors were identified by name. Fig. 1 illustrates these users where each icon corresponds to an organisation identified by participants according to the sector of their

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