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Sectoral use of climate information in Europe: A synoptic overview

Marta Bruno Soares [a,b,*], Meghan Alexander [a], Suraje Dessai [a,b]

[a] Sustainability Research Institute, University of Leeds, Leeds LS2 9JT, UK
[b] ESRC Centre for Climate Change Economics and Policy, University of Leeds, Leeds LS2 9JT, UK

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ABSTRACT

Society can benefit from usable climate information to better prepare and adapt to the risks and opportunities posed by climate variability and change. An adequate and effective provision of climate information – from historical observations through to seasonal forecasts, and multi-decadal climate change projections – is critical to inform planning and decision-making in climate-sensitive sectors. Central to this are the end-users of climate information and a growing emphasis on tailored climate information and services shaped by user needs. However, knowledge about the use of climate information across European economic sectors is limited. This paper identifies the spectrum of sectoral information requirements across a number of sectors including agriculture, forestry, energy, water, tourism, insurance, health, emergency services and transport sectors, drawing from an online survey (n = 462) and interviews with (potential) users of climate information (n = 80). This analysis reveals shared opportunities across sectors including the potential application of decadal climate predictions. In addition, common barriers and enablers to the uptake of climate information were also noted including the format of the information provided, the need for compatibility with existing in-house systems, and the perceived credibility and trust of information providers. This analysis also points towards a perceived increasing fragmentation of available information and the desire amongst end-users for a European body able to centralise and coordinate climate data. We highlight some of the current factors that still need to be adequately addressed in order to enhance the uptake and application of climate information in decision-making across European economic sectors.

Practical Implications

Access to useful and usable weather and climate information can help societies to better prepare, mitigate and adapt to the risks and opportunities posed by climate variability and climate change. Advances in observation networks, data processing and computer modelling have led to an expansion of available weather and climate information, from historical observations through to seasonal climate forecasts, decadal climate predictions and multi-decadal climate change projections. However, the uptake of this information amongst climate-sensitive sectors (e.g. agriculture, energy, water, health) and how this information informs real-world decision-making is not well documented. Moreover, the focus on improving technological and scientific capabilities has meant that less attention has been paid to improving the fit and usability of climate information (and climate services more broadly) to suit different end-user needs, as well as the various spatial and temporal scales of decision-making.

In the context of efforts being made to develop a climate services market in Europe (EC, 2015), this paper provides a synoptic overview of the current use of weather and climate information across key economic sectors in Europe. On the basis of mixed methods research performed within the EU EUPORIAS project, this paper triangulates the findings derived from qualitative and quantitative analysis of 80 in-depth stakeholder interviews and 462 responses from an online survey.

The research documents the wide range of sources from which organisations obtain different types of weather and climate information. In turn, variations are observed in terms of the frequency at which different types of information are used and nuances identified between different economic sectors. As one would expect, there is a general trend towards the application of weather forecasts

* Corresponding author at: Sustainability Research Institute, University of Leeds, Leeds LS2 9JT, UK.
E-mail address: m.soares@leeds.ac.uk (M. Bruno Soares).

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to inform operational day-to-day activities, whereas seasonal climate predictions and climate change projections are aligned to longer-term strategic organisational planning.

Interestingly, conflicting findings emerged in the context of decadal climate predictions which, whilst widely reported in the survey results, were not currently used by the organisations interviewed and were generally regarded as uncharted territory. Moreover, the term appeared to be misunderstood and misinterpreted (e.g. as synonymous to climate change projections or akin to forecasts for the next decade). Although this somewhat limits this aspect of the survey data, it simultaneously highlights an important gap in understanding and need for improved communication across scientific-practitioner-policy communities. Nonetheless, the interviews revealed a clear interest for developing decadal climate predictions in practice, albeit further research is required including to help understand how these may be translated into usable products.

The research also sheds light on the reasons why some organisations are not using climate information. Whilst based on a smaller sample (n=43), these findings give some insight into the potential barriers to the uptake of climate information. For instance, with 37% and 23% of the sample stating that current weather and climate information is either not useful or fails to suit their needs, questions must be posed on how this information can be better tailored according to end-user requirements. Another important observation is that 26% cited a lack of in-house expertise which suggests that either there needs to be some form of organisational/institutional capacity building to address this expertise-deficit and ensure appropriate resources are in place, or alternatively information needs to be provided in a way that is compatible with existing processes and in-house systems.

Furthermore, the research findings challenge the general assumption that scientific uncertainty is unwelcome as many felt that it was an essential component of climate information. Although 67% of survey respondents (n=128) felt that they needed information to be presented in a way that will help inform binary (yes/no) decision-making, the survey findings also revealed that a wide range of formats for presenting uncertainty are currently used (including text descriptions, numerical estimates, maps and graphics). A preference was expressed by interviewees towards numerical representations of uncertainty whether by single figures, percentages or confidence intervals. In turn, this enables organisations to quantify uncertainty, integrate within existing model or inform graphics to help communicate uncertainty to different audiences (e.g. maps).

The nuances observed between sectors in the use of weather and climate information highlights the diversity of needs and requirements that make-up the complexity of the users' landscape. Rather than viewing the 'end-user' as a homogenous group, this research confirms the importance of stakeholder engagement to better understand and tailor the provision of climate information accordingly. However, there remain important gaps to be filled. In particular, there is a clear interest in the use of decadal climate predictions, yet these remain poorly understood and limited to research-based applications. Moreover, in the wider context of efforts to develop a climate services market in Europe, there is a need to address numerous barriers and promote i) better understanding of climate information, including its parameters, limitations and scientific uncertainty; ii) improved coordination and standardisation across fragmented sources of climate information and accessibility; and iii) address current gaps in provision.

1. Introduction

Access to useful and usable climate information is an important step towards building climate resilient societies, where the risks posed by climate variability and change are anticipated and mitigated, and potential opportunities maximised (EC, 2015; Street, 2016; Goddard, 2016). This realisation is fast driving efforts to develop and promote a climate services market in Europe and safeguard the provision of climate information to assist decision-making across numerous climate-sensitive sectors (e.g. agriculture, energy, water, insurance) (ibid; Lourenço et al., 2015).

However, efforts to date have tended to concentrate on improving the underlying scientific prediction or observation systems whilst less attention has been paid to improving the fit and usability of climate information for decision-making (Lemos et al., 2012; Kennel et al., 2016). Correspondingly, the extent to which climate information is used to support decision-making is not clear. To address this, more recent research efforts have sought to better understand the needs and requirements of the end-user, asserting the importance of stakeholder engagement to better inform and tailor climate information to parameters and formats that are user-relevant (Street, 2016; Buontempo et al., 2014). Given the multiplicity of end-users and diversity of decision-making (i.e. across sectors and spatio-temporal scales), this is by no means a simple task. Moreover, research is often fragmented and concentrated in sector-silos, thus a synoptic overview of the use of climate information in multi-sector decision-making is noticeably absent.

Addressing this gap, the EU FP7 funded project EUPORIAS examined the European provision of regional impacts assessments on seasonal to decadal[1] timescales (http://www.euporias.eu/) (Hewitt et al., 2013). As part of this project, a European online survey and in-depth stakeholder interviews were conducted to assess user needs of climate information, with a particular focus on seasonal forecasts and decadal predictions. Drawing from these data, this paper presents a synthesis of the commonalities and sectoral differences in the use of climate information across Europe. In turn, we reflect critically on the implications of these findings in terms of tailoring climate information to specific user-groups and improving its usability and uptake to inform decision-making processes.

2. Literature

Recent efforts in Europe have sought to improve the accessibility, availability and usability of climate information within the emerging context of a climate services market (EC, 2015; Street, 2016). This new landscape of climate services has been framed internationally by the Global Framework for Climate Services (Hewitt et al., 2012) and more recently in Europe by the Roadmap for Climate Services and the Copernicus Climate Change Service (EC, 2015).

Although a contested concept, the notion of climate services normally refers to the development and/or provision of climate information and knowledge to support users' decision-making through tools, websites, and tailored products (see e.g. Vaughan and Dessai, 2014; Hewitt et al., 2012). Central aspects to this concept are i) the 'users' of the service, ii) the climate information that is required by the user, and iii) the provision of climate services.

The 'users' of climate services represent a wide range of organisations (public, private and civil society) and actors (e.g. end-users, intermediary/purveyor organisations) occupying a multitude of institutional settings and with varying interests in the type of climate information they require to support a range of applications and activities. Consequently, user requirements

[1] Decadal and interannual climate predictions are regarded as interchangeable in this paper.

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