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COMMENTARY:

The rise of demand-driven climate services

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With the concept of climate services rapidly climbing research and research-funding agendas worldwide, the time is ripe for a debate about the objectives, scope and content of such services.

Over the past decade, multiple frameworks and agendas have been proposed for climate services^{1–7}. These initiatives have tried to keep up with an ever-growing knowledge base, a more informed appreciation of the importance of climate for decision-making, and a greater demand for all sorts of climate-related information. Yet there are still plenty of questions left about what climate services actually constitute, who their users are, how they relate to research, and what their value is for innovation, economic growth and development. Are the users of climate change research and of climate services necessarily the same? To what extent should the future of climate change research and of its researchers be inspired by the needs of service clients?

The World Meteorological Organization's (WMO) Global Framework for Climate Services (GFCS)^{4,6} defines climate services as “providing climate information in a way that assists decision-making by individuals and organizations. A service requires appropriate engagement along with an effective access mechanism and must respond to user needs.” It identifies a set of priority areas and sectors, but does not define which decision-making processes need what information, or why they need it. Rather the focus is on what information is available and the format in which it can be delivered⁶.

The American Meteorological Society (AMS)⁵ defines climate services as “scientifically based information and products that enhance users’ knowledge and understanding about the impacts of climate on their decisions and actions. These services are made most effective through collaboration between providers and users.” Again, multiple sectors are identified as important, but the focus is placed on the communication and provision of past, present and future climate data⁵.

The Climate Services Roadmap⁷ recently launched by the European Commission takes on a broader perspective where climate services can cover the “transformation of climate-related data — together with other relevant information — into customised products [...] and any other service in relation to climate that may be of use for the society at large.” Climate services are expected to include “data, information and knowledge that support adaptation, mitigation and disaster risk management”, covering a broad spectrum of decision-making processes⁷.

The historical evolution of climate services is analogous to that of weather services, starting from an observation-based emphasis and expanding to predictive services as capabilities increased and demands were more clearly articulated¹. Partly because of limited

effectiveness, their scope has shifted towards a more user-centred approach, focusing on data stewardship and active partnerships⁸. As yet, discussions about climate services have been largely dominated by a supply-side perspective and framed from a standpoint of climate observations and modelling.

Market development

A considerable market is expected to develop in the near future, much of it from the private sector for the private sector, as it is for weather forecasting services (for example private consultancies for media, farmers, utilities, shipping and air traffic). But the roles of public, private and academic sectors are sometimes difficult to distinguish in climate services⁵. The boundary between the public and private dimension is not easy to draw⁷, and assessing the value of these services for public and private sectors is complex⁵. All of this makes it difficult to establish clear market boundaries.

Comprehensive information about existing climate services is not readily available, suggesting that a market for such services and products may be growing slowly or not at all. It has been suggested that the current business area is relatively small, in both number and size of involved organizations⁷, and/or too fragmented⁴. Alternatively, could it be that the climate

services are still poorly defined or are not named as such by users, making the market particularly difficult to recognize?

Indeed, recent mapping exercises from Germany⁹, the Netherlands and Sweden¹⁰ suggest that there already exist vast numbers of providers and purveyors (that is, those that use climate data available from others and add value for users) who have the provision of all kinds of climate-related information in their portfolios. These include public bodies, private organizations, NGOs and consultants, among others. Both studies also report on the users of climate services but do it from a supplier's perspective (that is, "Who are the users of your service?"). This further strengthens the idea that climate services are still very much framed from the supply side.

Such a societally challenging, scientifically complex and long-term phenomenon as climate change can not reasonably be expected to automatically generate market opportunities that could easily be seized by public institutions and private entrepreneurs, without clear regulation or other forcing drivers. Climate services are not simple business-oriented consultancy practices that will grow without public support; they still require a coordinated climate research agenda.

Broadening concepts

If limited to providing access to climate data or associated information, uncorrelated to specific societal challenges and decisions, a climate services market may indeed be practically absent. Decision-making is often more concerned with potential (climate and non-climate) impacts, risks and ways to reduce them than with raw or even transformed climate data. Framing climate services from the perspective of improving accessibility to climate data (meteorological variables or primary impacts, for example) now seems outdated. Even perfectly tailored climate (change) information will generally be — with some notable exceptions — insufficient to adequately inform decision-making and response actions.

Some have suggested accelerating the growth of a market by expanding the concept of climate services to climate adaptation services^{11,12} and taking a wider perspective on the provision of value for climate-related decision-making processes. In addition to accessing climate data, climate adaptation services not only include socio-economic information relevant for analysing vulnerability and risk, but also support the identification, appraisal and implementation of adaptation options. Such a move is apparently covered in the EC

Climate Services Roadmap⁷, going beyond the implicit focus by the WMO-GFCS⁴ and AMS⁵ on the meteorological aspects of data generation and use.

Climate-related information is also important to inform mitigation decision-making, with benefits for long-term planning (locations of wind farms or large-scale solar plants, for example) as well as for the operational level (such as management of hydropower facilities, or saving fuel through the optimization of aircraft climb profiles or shipping routes). One might question, however, whether such services are climate- or weather-related. Even if this is an irrelevant question from a client standpoint, the same may not be true for climate change research.

The broadening of the concept to include better access to information on potential climate change impacts (on natural and socio-economic systems), as well as mechanisms for assessing vulnerability, adaptive capacity and the costs and benefits of adaptation and mitigation, seems a necessary, but not sufficient, condition for developing a viable climate services market.

Terminology issues

The development of such a market may well be hindered by its own terminology. For example, potential users (clients) are often less interested in long-term climate change, and consequently in adapting to it, than in managing short-term goals such as business continuity (in the case of companies) or growth and job creation (in the case of governments). Because these goals are interlinked with longer-term factors such as regulatory changes, debt service and resilience to (weather-related) extreme events, climate services need to move from science-driven and user-informed to demand-driven and science-informed practices.

This includes adapting to the preferred terminologies of its clients and using existing tools that are common practice within the user community, rather than developing new ones from a climate perspective. Furthermore, the provision of reliable climate information needs to go hand-in-hand with a proper understanding of the governance and cultural systems framing its use in decision-making processes, including those associated with policy practices.

The way forward

Climate services were initially focused on improving access to climate data but have since evolved into science-driven and user-informed activities. We argue that, to be successful, climate services

need to move (much faster) towards a demand-driven and science-informed approach. For a climate services market to develop, providers will need to adopt the terminology of their potential clients and understand their regulatory and cultural conditions. This requires more intensive (and potentially different) means of collaboration and communication between users, service providers and scientists, setting additional challenges for climate change researchers. It is our view that a consistent research agenda remains essential to improve the understanding of climate change science, but that an intermediate (or boundary) group of researchers and entrepreneurs will need to focus on use-inspired research. Such a move should ensure that service clients receive their money's worth of salient and sound knowledge, but also that the expected positive societal impact of climate research is firmly realized. □

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