SEI Stockholm Environment Institute

Ten ways to support climate change adaptation planning and decision-making

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IMAGE (ABOVE): The Karlstad case study analysed the potential effects of building a wall as flood protection.
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Background

Around the world, knowledge about climate change and its impacts is growing, yet the use of such information is failing to gain the policy traction necessary to adequately prepare for and adapt to the changes that lie ahead. The reasons for this gap are many and complex. Nevertheless, researchers, consultants and facilitators working with climate services have key roles to play in helping science inform policy and practice.

Against this backdrop, this brief provides targeted recommendations for co-designing actionable and user-focused climate services. By this we mean processes in which climate researchers and consultants work collaboratively with planners and other practitioners to develop climate information that supports adaptation planning and decision-making. We focus specifically on various means to enhance this collaboration. Thus, our brief addresses subject matters – vocabulary choice, relationship building and political agendas, for example – that may seem far afield from the natural focus of people in research-driven, science careers. Nevertheless, communications strategies and better understanding of the constraints facing people in the world outside of science lie at the heart of the current mission to give science a better policy foothold.

The climate change agenda means that scientists must find ways of advancing not just of knowledge itself, but the *use* of scientific knowledge – and soon. This brief aims to give people with climate expertise needed tools to help generate and target science that can inform more effective policies, make efficient use of limited funds, and reduce the vulnerability of people and places to the impacts of climate change.

The recommendations in this brief build on insights from two municipality-level case studies that are part of the research project HazardSupport, a five-year project with the Swedish Meteorological Institute (SMHI) to develop decision support for adaptation to natural hazards in Sweden.[1] One case study addresses responses to the increased likelihood of flooding in Karlstad, and the other addresses using "green infrastructure" to moderate heat waves in Stockholm (see André et al. 2019 and Leander 2019 for more details). Though these settings are specific to Sweden, the recommendations are not. Informed by our own experience in Sweden and beyond, these recommendations apply to a wide range of contexts.

1 https://www.smhi.se/en/research/research-departments/hydrology/hazardsupport-1.96217

The **Municipality of Karlstad,** which has long dealt with flooding issues, faces a decision about whether to construct a wall to protect a flood-prone residential area. The HazardSupport project developed a climate service to show how well such a wall is likely to work in a future climate, including in events of combined of river- and cloudburst-related flooding.

The **City of Stockholm** faces the challenge of creating resilience to heat waves, which are expected to become more frequent with climate change; and, at the same time, providing additional housing and amenities to accommodate a growing urban population. The city sought information on what role green spaces can play in moderating its air temperatures. HazardSupport developed a climate service that shows temperature differences between future scenarios with different green space ratios.

Here we distill the insights from our experiences into three categories that address relevant processes, formats and content used in climate services. We generate 10 key points from our experiences (Table 1).

Table 1. Summary of key recommendations

	Key recommendations
Process	Help practitioners articulate their needs, and challenge predefined solutions.
	Thoroughly assess the planning and decision-making contexts.
	Discuss outputs and time horizons early in the process.
	Involve facilitators in the co-design process.
Format	Adjust communication to the target audience.
	Combine different formats, including visualizations, to present the information.
	Align the climate service with existing planning tools and processes.
Content	Discuss resolution of data.
	Address uncertainty.
	Ensure transparency and traceability.

Recommendations

Process

1. Help practitioners articulate their needs, and challenge predefined solutions.

Practitioners often find articulating their specific climate information needs difficult. This is true not only for those with limited prior experience of using climate information, but also for more advanced user groups. In Karlstad, for example, despite stakeholders' good level of understanding of flood-related risks, it took time to define and specify their needs, and decide which factors to analyze. An iterative dialogue is required to promote knowledge exchange and learning between practitioners and climate scientists.

Evidence from our cases and beyond demonstrates that climate change adaptation options are often predefined, and that climate information is often used to evaluate the feasibility of a particular (often technical) solution, rather than to compare alternative adaptation options. This pattern is potentially problematic. Users may fail to explore – or may remain unaware of – potential, innovative solutions. This may lead to sub-optimal investments and less effective adaptation work. Scientists and facilitators can play a valuable role in supporting and assisting practitioners in expanding the scope, and considering alternative adaptation measures.

2. Thoroughly assess the planning and decision-making contexts.
The context in which the climate service takes place is important; context to a large degree defines how the service should be developed and the capacities available for implementation. Climate service development that spans a long time period may need to iteratively assess the planning and decision contexts as they evolve. An adaptation option often serves multiple purposes, but also needs to be weighed against other, competing – and sometimes conflicting – needs. In the Stockholm case, green spaces do not only mitigate heat, but also provide biodiversity and recreational benefits. At the same time, the need for more green spaces competes with the need for more housing and, therefore, densification of the city. In such respects, climate adaptation links to a range of other political agendas. This underscores the need to consider issues well beyond the climate change adaptation arena per se.

3. Discuss outputs and time horizons early in the process.
The different time horizons of practitioners, scientists and facilitators present a challenge in the co-design process. For example, maintaining the interest of municipal officials in the HazardSupport process over the comparatively long project cycle (five years) proved difficult. By contrast, researchers and facilitators viewed five years as a crucial time span for building trust, and for carrying out the research. To address the challenge of different time horizons, and to ensure full participation throughout the process, facilitators supported ongoing, direct communication between researchers and practitioners. Regular meetings and check-ins with participants sought to maintain momentum.

Co-designed climate services are not pre-defined at the outset. However, the open outcome of such processes may be in tension with practitioners' need for timely delivery of information to support specific decisions, and the need for accountability, not least in politically governed organizations dealing with strict decision-making hierarchies. For these reasons, the flexibility of the co-design process needs to be balanced with the parallel need for structure; the boundaries and scope of the climate service should be defined at an early stage to motivate the resource and time investments for practitioners. It is also important to clarify needs and expectations on delivery of services. Negotiations should devise a time plan to give scientists a reasonable period to do their work, and to give practitioners useful, timely information.

4. Involve facilitators in the co-design process.
Involving facilitators in designing and assisting the process can help overcome challenges to the co-design processes by increasing the exchange of information and learning between researchers and practitioners. Experience from the case studies shows that facilitators are important for initiating contacts between researchers and practitioners, and for arriving at a common understanding of what the climate service should encompass in the critical initial project phase. Once the frames and relationships have been established, researchers and practitioners can often initiate further contact and drive the process forward. Facilitators can address potential power dynamics in the group by ensuring, for example, that the process captures multiple perspectives, and that the language used is not too technical for some participants.

Format

5. Adjust communication to the target audience.
Climate service providers must adjust the format of the climate information, including the language and length of information, to different target audiences, depending on previous knowledge and expertise, roles in the organization, and the intended use of the information. Within an organization, such as a municipality, there is often a range of different target audiences, such as politicians, planners, property builders, and citizens.

This means that the understanding of the target audience needs to be quite specific. Moreover, participants' information needs vary with experience. As our case studies show, stakeholders' prior experiences of managing flood-related risks and heatwaves differed; as a result, they required different levels of detail in the information provided, from broad climate-related information to very detailed information for a particular location.

6. Combine different formats, including visualizations, to present the information.

The same information can often be presented in different ways, and climate researchers should carefully consider which formats they choose to ensure that the information is accessible. More technical information should be clearly distinguished from conclusions and take-home messages. Visualizations often provide powerful ways to convey complicated messages, including statistical concepts and uncertainty. Some visualizations, such as maps, may be more familiar and easier for participants to understand than others with which they have had no prior experience. In the Karlstad case study, for example, stakeholders considered maps that illustrated water levels to be very helpful. This was largely because stakeholders were used to this format, and they could easily interpret the information. To address differences in capacity and personal preferences for different communication formats, service providers should combine the use of visual and narrative formats.

7. Align climate services with existing planning tools and processes.

Officials in both Stockholm and Karlstad expressed a need to align climate services with existing planning tools and processes to be able to combine climate-related information with relevant non-climate-related information. As these cases suggest, climate change adaptation is typically just one among many factors that planners must consider. To increase the use and sustainability of the climate service beyond a given project, a co-designed process should take stock of and aim to integrate new climate data into existing planning tools. This requires an assessment of the planning and decision-making contexts, and, typically, looking beyond climate change adaptation issues per se. In Stockholm, for example, information from HazardSupport on green spaces for temperature regulation may be integrated into an existing Green Space Index planning tool, which weighs multiple benefits from green spaces in urban areas.

Content

8. Discuss resolution of data.

Practitioners typically request high-resolution climate data, such as localized data for short time intervals, which may be infeasible or even impossible to deliver. In such situations, researchers need to clearly explain the source of the problem, including trade-offs between resolution and certainty of the data. It is also important to dig deeper into understanding both the actual needs of the stakeholders, and how they intend to use the data. This can help identify creative solutions that are both useful for practitioners and feasible for scientists. Such solutions may include templates and archetypes rather than place-specific data. This issue surfaced in the Stockholm case study. If, for example, if generating high-resolution heat maps for individual neighbourhoods in a city is not possible, then developing heat maps for a small set of archetypal neighbourhoods may be an alternative. These archetype maps can then serve as reference points to illustrate the consequences of different urban planning strategies on air temperatures.

9. Address uncertainty.

Uncertainty is inherent in predictions about a future climate. At the same time uncertainty presents a challenge in everyday decision-making. Researchers have an obligation to clarify which uncertainties exist in climate data and how these uncertainties affect the interpretation and use of the results. However, researchers may have a tendency to overemphasize uncertainty; they should also communicate *certainty* in the data. As illustrated in the HazardSupport case studies, a co-design process can help identify strategies to address and present the issue of uncertainty. In Karlstad, for example, providers addressed uncertainty in projections of a future climate by adding a standardized "climate factor" to current water levels. They presented these results in map format that enabled practitioners to assess the relevant margins involving critical infrastructure. In Stockholm, the climate service described the importance of green spaces for regulating air temperature in the city in general, irrespective of the degree of future climate change.

10. Ensure transparency and traceability.
Climate researchers need to ensure transparency and traceability of data so that practitioners or consultants who want to use or further develop the data can correctly interpret and assess the quality and relevance of these data for their needs. Researchers should provide metadata, to specify uncertainties, provide information about data validity, stipulate which input data were used, and outine how any data were modified. In Karlstad, municipal officials indicated that they may want to further develop the climate service, or carry out similar studies for other locations in the municipality in the future. Thus, they may want access to some of the underlying data used in the initial project. However, because the climate service includes data that may become outdated over time, project researchers will provide a data contract, which specifies the period of time for which the results remain valid.

Final reflections

The recommendations presented in this Discussion Brief underscore the importance of using a structured, methodological approach for co-designing and co-producing climate services, such as the Tandem framework (see Daniels et al. 2019 for more detail), which was applied in HazardSupport. The recommendations provide empirically grounded illustrations of important matters to consider throughout all phases of a climate service design process. They emphasize the importance of assessing practitioners' needs and decision-making contexts at every step: identifying adaptation challenges, assessing information needs, understanding contexts, and implementing services. The recommendations reflect the understanding that for science to influence policy, good science alone is not enough. Climate experts also need well-crafted, facilitated science-stakeholder engagement processes.

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The Stockholm case study examined the degree to which "greening" of the city could make the city more resilient to heat waves. © RCLAY / SEI

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To read more about HazardSupport, please visit the project website:
https://www.smhi.se/en/research/research-departments/hydrology/hazardsupport-1.96217

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