2021

Resilience through climate services

A.M.S. Ibarra

C. Hewitt

Y. T. Winarto

S. Walker

V. W. Keener

See next page for additional authors

CellPress
Gold Standard for the Global Goals
1 ton of CO_2 offset
One Earth

Voices

Resilience through climate services

Climate services can provide valuable information that can help society to enhance resilience, survive, and even prosper in the face of climate risk. However, priorities might differ across sectors, regions, and scales. This Voices asks: what are the priorities to advance and deliver climate services for resilience and preparedness?

Anna M. Stewart Ibarra
Inter-American Institute for Global Change Research (IAI)

Climate services for health in the Global South

Despite extensive research on climate and health, few studies progress beyond the initial evidence of climate-health linkages to test, implement, and evaluate decision-support tools such as epidemic early-warning systems. This is particularly problematic in the Global South, where the burden of climate-sensitive diseases is greatest, and funding is limited in comparison with that for studies led by the Global North. Investments are urgently needed to support the co-development and sustained implementation of tools tailored for the health sector in the Global South. Tools, developed from research, must be readily available for use without the end user requiring prior modeling or programming expertise and respond to local needs and priorities. This work must be underpinned by strong partnerships between the national climate and health sectors that are formalized, lasting, and built on trust. This requires political will and support from senior leadership, coupled with engagement of the communities most vulnerable to climate impacts through participatory processes. Political mandates are needed for national health sectors to address climate adaptation and for climate sectors to address health impacts. Best practices for cross-sectoral collaboration include formal collaboration agreements, joint work plans with dedicated resources, data-sharing agreements, joint spaces for dialogue (e.g., climate-health forums), and a supported career path for climate-health professionals. At the IAI, we are addressing these needs in the Americas through training and funding for multi-national transdisciplinary science networks.

Chris Hewitt
Centre for Applied Climate Science, University of Southern Queensland; UK Met Office

Develop scientific capability and user engagement

Two priorities for advancing and delivering climate services are to continue developing the scientific capability that underpins climate services and to build the dialogue and collaboration right across the climate-service value chain, which includes those involved in research, development, innovation, service delivery, and decision- and policy-making. The capability needs to be more strongly guided and driven by the needs of the resilience and preparedness communities to provide salient and actionable climate information and knowledge while ensuring that such information and knowledge remain scientifically credible and robust. This is not always an easy balance to achieve, especially where the gaps between the science-based capability and the specific needs of decision-makers are (often) large, and in a landscape where the demands and interests are being seen from a growing range of sectors and communities recognizing the potential risks and opportunities arising from climate variability and climate change. However, wider dialogue and engagement right across the value chain should be seen as highly beneficial despite challenges getting people together and investing the time required. Bringing researchers, developers, providers, and users of climate information for decision-making together, perhaps through co-development of climate services, can build relationships and trust, share knowledge, assess needs and gaps, and build capacity, all to ultimately lead to better decisions and outcomes for resilience and preparedness to climate and environmental change.

Yunita T. Winarto and Sue Walker
Center for Anthropological Studies, Faculty of Social and Political Sciences, Universitas Indonesia; Agricultural Research Council & University of Free State (South Africa)

Life-long learning is key for Indonesian farmers

Climate services for farmers are aimed to improve their capability to anticipate future seasonal-climate conditions under the risks of climate change. By anticipating such conditions, they can make decisions that help them sustain yields and/or alleviate impacts of harvest failure in the current or forthcoming planting seasons. These practices can only be carried out through experience gained under similar climate conditions in the past combined with the ability to correctly interpret their fields' present agroecosystem situation. Equipping farmers with such skills, improving their local empirical knowledge, and developing capacity is the prime objective of climate services. Without knowledge of climate change and its consequences, farmers would not be able to modify their conventional cultivation strategies. In Indonesia, the Science Field Shops (SFSs), introduced by a team of agrometeorologists and anthropologists, represent an example of how a dialogic learning between farmers, scientists, and agricultural officials can increase farmers' agrometeorological knowledge. Eight services are provided to improve farmers' learning and not the farming technology per se: (1) measuring rainfall daily, (2) observing agroecosystem of their own fields, (3) analyzing vulnerability and yields, (4) organization of the SFSs, (5) delivering seasonal climate scenarios, (6) introducing new knowledge, (7) carrying out experiments in farmers' own fields, and (8) digitizing rainfall and agroecosystem data. Yet, application of those services by farmers themselves can only be sustained through continuous evaluation, support, and trust among participants.

Victoria W. Keener
East-West Center

Increase access for more equitable adaptation

As climate impacts from floods, droughts, and storms increase in frequency and intensity across the Pacific Islands region, there is the risk of further exacerbating inequities unless services are coordinated across international donors and sectors. Climate services are often implemented in a piecemeal manner, resulting in a fractured adaptive landscape with overburdened stakeholders. The colonial, military, and nuclear histories of the Pacific Islands have increased the vulnerability of different demographics to climate risks, and these same groups often lack the necessary financial or human resources to access or implement climate services. Climate boundary organizations aim to generate and communicate credible science that is relevant to local needs. These organizations, for example the NOAA Regional Integrated Sciences and Assessments network and the SPREP Pacific Adaptation to Climate Change Programme, can serve as a link between researchers, communities, and policy-makers and will be increasingly critical in facilitating climate solutions. Although the existing bottom-up climate services approach has been effective, there is potential to overlook historically underserved communities. A centralized regional climate-services boundary organization that connects international Pacific Islands, such as the World Meteorological Organization RA-V Pacific Regional Climate Centre Network, would help streamline access to funding, standardize climate data, evaluate risks, and facilitate interventions. Meanwhile, integrative planning frameworks that foster cross-sectoral collaboration, such as One Water, could further strengthen climate resilience.

Isadora Christel
Barcelona Supercomputing Center (BSC)

Effective communication in climate services

As a science-communication expert working on climate services, I'm often asked how climate change is being conveyed to society. Although relevant, this subtly signals the belief that communication only matters for public outreach. However, communication is ever present in climate services. For instance, user engagement in climate services is an ongoing conversation that requires building a shared understanding between experts of sometimes very divergent disciplines. A fruitful interaction between a climate scientist and a winery production manager, for example, takes time because each stakeholder needs to learn the other's vocabulary. Not surprisingly, the need for further work on common terminologies and narratives in climate services is a frequently noted challenge. Communication of uncertainty is also crucial. Traditionally, the challenge has been undertaken from the climate-science perspective, but effective communication of uncertainty must also consider behavioral, psychological, and perceptual aspects. Moreover, a climate service is usually provided through visuals, which requires decisions on color scales, visual encoding, and information layout. All these aspects and

decisions are not always addressed with the support of the right experts on user experience or data visualization—a problem, again, of communication (or lack thereof) between experts of multiple disciplines that need time and help to build real cross-disciplinary bonds. Social scientists, science communicators, data-visualization experts… all deal with relevant aspects for climate services. We need to understand that climate services go far beyond climate science.

Jules Bayala
CIFOR-ICRAF

Making climate information useful for African users

My experience in climate-information services has been in generating and delivering information in a format that is understandable for users by using the most appropriate channels. This includes strengthening capacities of key stakeholders (meteorology service staffs, researchers, NGOs, and extension staffs) in generating and understanding user-friendly climate information and in how to support and empower farmers to identify and plan farming and other livelihood activities, fitting farmer's contexts. In addition to directly enabling farmers to better cope with and adapt to climate variability and change, there is a need for an extension approach that enables stakeholders to work collaboratively towards common goals and to play complimentary roles in supporting farmers leading to an improved understanding of farmers' requirements and how to meet them. When capacitated, farmers can use climate information to make strategic plans long before the growing season, based on their improved knowledge of local climate features, e.g., which crops or varieties to grow, when to sow, which area to crop, or which off-farm activity to add to the livelihood portfolio. Capacitated farmers are stimulated to make their own decisions in identifying, assessing, and planning agricultural innovations and non-agricultural options to suit their conditions and improve their livelihoods. They also become efficient channels of information, which allows for scaling up through informal social learning and formal farmer-to-farmer knowledge transfer to use climate information for programming livelihood options and reducing production risks.

Hannah Bloomfield
Department of Meteorology, University of Reading

Keep the lights on needs-enhanced collaboration

Power systems across the globe are evolving to meet climate-mitigation targets, as around 75% of global emissions are currently contributed from energy systems. These changes include investing substantially in renewable energy, with many countries aiming for net-zero emissions by 2050. Without knowledge of when it will be sunny, windy, or raining, it is no longer possible to reliably manage a highly renewable power system, which makes these more sensitive to variations in weather and climate, from days to decades ahead. Power systems, therefore, are becoming increasingly sensitive to extreme-weather events, such as heat waves, extended cold snaps, or wind droughts. This creates a range of new challenges for power-system operators, where high-quality meteorological data are becoming crucial for informed decision-making. This could be weather forecasts a few hours to weeks in the future, to schedule plant maintenance or anticipate peak demands. Alternatively, systems planners and policy-makers could require details of long-term climate conditions to plan for the possibility of extreme events or the impacts of climate change on the resilience of present-day power-system infrastructure. The impacts of climate variability and climate change on power systems is a key topic in energy-meteorology research groups (such as the group I am part of at the University of Reading). For climate services to be most effective, it is essential that best practices from both energy and meteorology are incorporated, with transdisciplinary training for stakeholders ultimately making decisions.

Serious limitations in climate services

In July 2021, extreme precipitation events in Central Europe resulted in a very high death toll and huge economic damages. Should this come as a shock? Could these dramatic consequences have been significantly prevented? The answer is both yes and no. Based on the scientific literature, it is not at all surprising that extreme precipitation events with large damages are becoming more severe and increasingly frequent.

Kirsten Halsnæs
Management Engineering Department, The Technical University of Demark

Tonya Haigh
National Drought Mitigation Center, University of Nebraska Lincoln

Daniela Jacob and Guy P. Brasseur
GERICS Climate Service Center, Helmholtz-Zentrum Hereon; Max Planck Institute for Meteorology

Despite this expectation, there seems to have been a large disconnect between scientific knowledge and levels of preparedness in terms of response options, disaster risk reduction and management efforts, and climate change adaptation. It has been clearly demonstrated that translating scientific knowledge into implementable and practical response measures is challenging, requiring a smart use of climate services. The term "smart" should be understood in a multi-dimensional way, where users such as decisionmakers, local societies, emergency units, and the financial sector should play a very active role in both guiding and translating scientific knowledge to ensure actionable climate services. Examples of this relate to coastal flood protection, where climate data on the future frequency of storm surges combined with socioeconomic damage assessments provide a basis for coping strategies, including policies going across domains like city planning, nature preservation, business interests, and finance. Many bridges need to be built across multiple disciplines and governance arenas in order to develop and implement useful climate services that can prevent terrible events such as those that occurred in July 2021.

Building trust in climate services

Building society's trust in climate services is a challenge and a priority for our time. Social science points to the importance of engagement and co-production to build trust and credibility. To meet this challenge, we need investments in both targeted and ongoing stakeholder interactions related to both climate variability and climate change information. Targeted engagement improves climate-service providers' understanding of specific decision contexts. Every climate-related decision depends upon specific climate driver(s), time and place characteristics, connection to desired outcome or good, and social context. Climate-service interactions in the form of information co-production with decision-makers help to tailor climate services to the context and ensure information and products are relevant and used. On-going engagement shapes how climate information is understood and trusted by decisionmakers. One central United States climate webinar series has used locally trusted presenters to engage and inform participants in informal climate science discussions and Q&A sessions every month for ten years. The webinars increase users' awareness of regional climate issues, understanding and interest in information, and communication of climate science with others. These "real-time" climate services build capacity for using information, as users steadily build trust in communicators. Increased investment in such targeted and ongoing interactions are needed to advance societal climate resilience.

Toward the grand transformation

Addressing climate change with sustained solutions requires profound modifications in society's mode of operation. We must redefine the way in which we produce and consume energy, develop and manage cities, organize mobility, conduct agriculture and produce food, and limit water and air pollution and in which rich nations interact with poorer populations, while also adapting to the changes in climate resulting from our past actions. Over the past decade, Climate services (CS) have been established to help society cope with climate risks and opportunities and to support climate mitigation and adaptation strategies. CS provide decision-makers and other users with observational data, regional model projections, tailored information, and guidance of national and local relevance that are context specific, useful, and usable. To achieve this, CS have successfully initiated dialogues between a broad and diverse scientific community and different actors in society, co-developed large portfolios of products, and gained substantial experiences. Now, as the climate crisis deepens, and solutions must consider different aspects of mitigation, adaptation, and sustainable development, CS based on balanced, credible, and cutting-edge scientific and technical information are needed more than ever. Thus, in the next decade, CS will have to review their "raison d'être" and redefine their mission to be catalysts for the forthcoming societal grand transformation towards sustainability and environmental justice, through transdisciplinary approaches involving all sectors of society.

Bart van den Hurk
Deltares (Delft); Vrije Universiteit (Amsterdam)

Mainstreaming climate services

National and European climate-mitigation policies aiming to reduce carbon emissions, and national and regional adaptation policies to respond to climate change impacts, rely heavily on science-based guidance. For mitigation, experts provide advice on how to reduce emissions and by how much. For adaptation, coping with extreme-weather conditions requires extensive expert information for designing infrastructure, spatial planning, guidelines, legal frameworks, and policy strategies. However, in many of these application domains, climate change—or the extreme-weather features that are related to this—is not the only driver for the decisions to be made. Different environmental pressures (air quality, nitrogen cycles, water quality), societal trends (land-use change, socio-economic developments, demography), and other factors (finance, societal acceptance) simultaneously shape the climate response and affect the outcome of the decision process. This implies that the climate information provided via climate services is to be integrated (or ''mainstreamed'') in the broad information flow that is steering the choices, Choices that address a wider range of topics, values, and visions than climate change alone. Choices that reflect societal risk tolerance, solidarity, and environmental appreciation. This does pose a challenge to the practice of climate servicing, both for the providers and the clients of the services. The ''climate'' element of the service is only a piece of the puzzle, and its "mainstreaming" will need to be consistent with the notion that most decisions are governed by multiple factors and considerations.