EGU General Assembly

Information for Society: from CMIP to decision makers

EVENT REPORT

CMIP Coupled Model Intercomparison Project

WCRP CORDEX

WCRP

RIfS Regional Information for Society

Bibliographic Information

This report should be cited as: Dingley, B., Goldenson, N., Lake, L., Nilsson, L., and O'Rourke, E. (2024), *Information for Society: from CMIP to decision makers: Report from EGU24 Townhall.* https://doi.org/10.5281/zenodo.12163165

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Acknowledgements

The report was written and edited by the staff of the CMIP International Project Office (IPO), CORDEX IPO, and RIfS IPO who are hosted by ESA, SMHI, and Ouranos respectively. We would like to thank all colleagues who contributed to this report.

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EGU

The European Geosciences Union's General Assembly in 2024 (EGU24) was held in Vienna, Austria between 14-19th April 2024. EGU24 welcomed 20,979 participants from 116 countries, of which 18,388 people joined in-person in Vienna.

The Townhall

During EGU24, the Coupled Model Intercomparison Project (CMIP), Regional Information for Society (RIfS), and Coordinated Regional Climate Downscaling Experiment (CORDEX) International Project Offices (IPOs) of the World Climate Research Programme (WCRP) organised and facilitated an information gathering Townhall. The Townhall was designed to understand the challenges of producing information for society based on climate science. This included topics ranging from data access to the treatment of uncertainty and expert judgement over what constitutes robust, decision-ready information. These WCRP activities are tasked with supporting the production and use of climate data and are interested in understanding the range of practices employed by the EGU community over this entire chain.

The key objective of the event was to **gather knowledge from people who use climate information to better understand:**

- Where do they access data used to produce actionable information?
- What are the challenges of producing information for society?
- How do they handle issues in the data or represent the range of possibilities?

The Townhall opened with a few small introductory presentations, followed by lightning talks from climate information users before the audience split up into smaller breakout groups to share their experiences of some key topics along the climate information chain. Initial presentations were given by Claas Teichmann (GERICS), Daniela Jacob (GERICS), and Naomi Goldenson (RIfS) covering the event objectives, CMIP, CORDEX, RIfS, and the Vulnerability, Impacts, Adaptation and Climate Services Advisory Board (VIACS-AB), before providing some context on how information is received and used.

The event then welcomed five speakers from across the range of information users to talk about their experiences using climate information:

1. Claas Teichmann demonstrated the information sheets the GERICS produces.
2. Sven Kotlarski (MeteoSwiss) presented how climate scenario information is used in the Swiss National Climate Adaptation Strategy.
3. Gunhild Rosqvist (Stockholm University) provided a video explaining how the Sámi people use climate information in reindeer herding in Sweden.
4. Francesca Raffaele (ICTP) discussed the production and delivery of climate information to an energy company.
5. Michael Grose (CSIRO) explained how climate information is produced and used across Australia for decision making.

Following the data user stories, the event moved into breakout group discussions, designed to address the event objective across a range of discussion themes. Key discussion take-home messages have been summarised below. A full list of the items and ideas discussed can be found in Annex 1.

How can data format reduce barriers to its access?

Discussion leads: Claas Teichmann (GERICS), Maria Laura Bettolli (University of Buenos Aires)

The sup-topics for this discussion were:

- Data subsetting
- Downloading
- Providing pre-calculated metrics

Here part of the discussion seems to have revolved around various data formats where some formats were mentioned and also issues with converting between formats, although data format preference may vary a bit. There seems to be agreement upon the need for easy access which simplified ways of accessing data with tools for gridded/complex data including possibilities for efficient calculations and data cropping. There is also a need for data/ information packages, data streams in the cloud, precalculated indices and ensemble results, index per sector, guidance/tutorials and examples.
There was also a desire for more context specific data formats/simplified key metrics in common format.

Data access

Discussion leads: Melissa Bukovsky (University of Wyoming), Bruce Hewitson (University of Cape Town)

The questions in these discussions were:

- Where do you find data/information?
- How do you search for new information?
- What are your barriers to access?

The facilitators started by asking: Why do you trust data? The discussions then moved towards the questions: What is trustable data and who do you trust to give you guidance on how to find reliable data? Most participants agreed that relations are important and that asking an experienced colleague or friend is a common way to get the knowledge on where and how to find data. However, it is not easy to know how to download the correct data, for instance which format to use or which choices to choose on ESGF. It can sometimes also be difficult to know what data is available, especially for policymakers.

The challenges in the global south were also highlighted. Besides the issues above the global south also faces the challenges just to be able to download the data due to scarcity in resources for storage etc. The majority of the users are from the global south and their perspective needs to be considered when discussing data access.

How can documentation reduce barriers to accessing climate information?

Discussion leads: Melissa Hart (UNSW), Wendy Sharples (Bureau of Meteorology), Stefan Sobolowski (NORCE Climate)

Documentation was seen to be vital to both facilitating the use of climate information by the whole range of users and also, importantly, for ensuring that the information being used is fit for the specific purpose of each user/user group.

The issues with documentation raised included:

- Variability in the availability and quality of climate information documentation.
- A need for clear guidance on what product to use for what application e.g., when to use raw vs. downscaled data, or what model/s is most suitable for a specific region.
- Lack of information on representation of certain processes in models e.g., urban representation in global or earth system models.
- Documentation can be impenetrable for non-expert or interdisciplinary users with too much jargon and unclear definitions.

Therefore, the group concluded that the focus should be on co-developing documentation with users, which is:

- Openly accessible, standardised, and consistent with clear definitions.
- Free of jargon.
- Within a hierarchy that targets the capacities and needs of different user groups.
- Easy for users to determine whether the climate information is fit for their particular purpose, providing guidance on process representation or regional appropriateness for example.

The outcomes of this discussion will feed into the CMIP Model Documentation Task Team and Fresh Eyes on CMIP Documentation sub-group, and a joint Fresh Eyes on CMIP-RIfS project on responsible use of CMIP data.

Data guidance (1)

Discussion leads: Julia Mindlin (Leipzig University), Andrew King (University of Melbourne)

The sub-topics for this group discussion were:

- How to decide which models/data to use, including global vs regional data
- The impact of resolution

The discussion began with collective brainstorming of many of the issues that can arise with model data, and moved to the question of how a downstream data user can understand what to do. Some of the issues with model data that were identified as potentially relevant included:

- Are there enough simulations to constitute a robust ensemble? (And does the user know the importance of using more than one model?)
- Being aware that some models' climate sensitivity is unrealistically high (the "hot model problem")
- Relevant processes might not be captured if the resolution is too low
- Need to evaluate the model biases, and know whether bias correction was performed
- Need to evaluate the representation of extreme events
- Is the data accessible -- open and user-friendly? Can it be post-processed with cloud computing?

Further, users might not be aware that the same model might perform adequately for one variable but not another (e.g. extreme heat, but not precipitation), and that the biases might

depend on the region in question. The need for better guidance was agreed. Participants discussed how, as a practical matter, it can help to know someone at the data centre to better understand the strengths and weaknesses of a model for a given purpose, and how to use the outputs. For example, data centres might say, 'you can take this data and bias-correct it' but the user may not know how to do that. Those who lack this access often use the data that is most easily available, without requiring further post-processing, and without understanding all relevant caveats.

What do you do when different sources of information lead you to different conclusions?

Discussion leads: Claas Teichmann (GERICS), Maria Laura Bettolli (University of Buenos Aires)

The sub-topics for this group discussion were:

- Representation of the range of possibilities
- Understanding information uncertainties

The discussion seems to have revolved largely around transparency regarding uncertainties and fitness for purpose. Why do the models/data information sources diverge, how can users better understand the process and range of uncertainties/limitations, including that climate model results may not include the full range of possibilities. The use of storylines to help decision makers understand for instance how to implement the 'best' adaptation measures and that all sources of information might not be applicable to all specific questions.
For downscaling communities guidance towards how many/which GCMs to downscale plus uncertainties might be useful.

How can tools help when using climate information?

Discussion leads: Melissa Bukovsky (University of Wyoming), Bruce Hewitson (University of Cape Town)

The sub-topics for this group discussion were:

- What tools do you use?
- Barriers to using tools?
- Which tools do you wish existed?

The question: Which tools do you wish existed? was the question that the group found most interesting, and the discussions concluded that a tool should be easy to access and be intermediating between the producers and the users/decision makers. The user engagement and different levels of communications were added as important components. Tools that give a measure of "actionability" and tools that integrate artificial intelligence were also mentioned when wishing for future tools.

It was suggested that a sort of "cookbook" that describes how to work through the steps in the tools and how to merge data could be very helpful. The tool makers also need to know what the decision makers need.

Furthermore, it is important that all users are aware of the tools that already exist and how to use them. It can be difficult for decision makers to understand what the information produced by the tools means. Climate science needs to be decision relevant.

How do you communicate your needs?

Discussion leads: Melissa Hart (UNSW), Wendy Sharples (Bureau of Meteorology), Stefan Sobolowski (NORCE Climate)

The sub-topics for this group discussion were:

- What are the needs of the users of our climate information?
- How do different users communicate their needs?
- What are the best methods to identify user needs?

The group started with their own experiences of how they communicated their own needs, which was largely based on ad-hoc informal networks or events/conferences, often within experienced academic or research settings. This was often very beneficial but clearly not available to many users, which led to some sharing of user engagement best practice including:

- Utilising pathways/formats familiar to a user group e.g., turning climate model data into music to promote community engagement in an island community.
- Adopting co-production approaches right from the start rather than relying on users reviewing existing information.
- Working with social scientists who can advise on appropriate language, psychological approaches or communication formats.
- Providing easy to read (and concise) summaries targeted at policy and decision makers.

The focus then moved to brainstorming other ways to facilitate users to communicate their needs with the group generating the following ideas:

- Supporting more feedback from data users to data providers e.g., a tool to track user requests and specific needs for modellers to review and feedback.
- Increased use of knowledge brokers or intermediaries to take advantage of existing trusted relationships e.g., partnership between a farming organisation and local university in a region.
- Adopting methods from other disciplines e.g., market research focus groups have been used widely for many years and can be adapted to climate information provision.
- Embracing new forms of social media to access different audiences e.g., TikTok and Instagram for younger people.

The outcomes of this discussion will support the continually evolving communication and engagement strategies of CMIP, CORDEX and RIfS and help to highlight priority areas for action.

Data guidance (2)

Discussion leads: Julia Mindlin (Leipzig University), Andrew King (University of Melbourne)

The sub-topics for this group discussion were:

- Fitness for purpose
- How to determine which data to proceed with

In this discussion the difference emerged between the perspective of a scientist approaching these questions and that of a downstream data user, although what is a “user” was also

interrogated. A subject-matter expert scientist would examine the literature, but that could be a daunting task for a non-expert. One could easily find a paper that says that a model performs well on precipitation, for example, without realising that this was evaluated only on longer timescales, and not the shorter timescale of the users' application. Furthermore, there is a bias towards publishing positive results. Thus, many researchers would consult with an expert in the specific domain. Unfortunately, not everyone is humble enough to do this, or has access to the informal network of advice in larger research centres. Whether the data is fit-for-purpose can depend on the context -- two experts might say something different about the same data if they are asking different questions. It would be challenging for data providers to anticipate every possible use, so they need to hear from data users to provide better guidance.

Next Steps

The CMIP, RIfS, and CORDEX IPOs thank all the participants and discussion facilitators for their input and insight provided during this Townhall. The information gathered is invaluable and will be considered by activities across WCRP when producing, sharing, and using climate information, as well as for forming an important input to the generation of guidance materials in the future and co-development and co-creation of existing and future activities.