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Building Bridges Between Climate Scientists and Decision-Makers

A cross-disciplinary collaborative approach is needed to respond to the climate crisis.

Reliable climate information is in high demand by decision-makers.

Creating and sustaining bridges between climate scientists and decision-makers can be beneficial for policy development and targeting research.

Introduction

Government and industry are responding at speed to the climate crisis. Signalling across federal, and state and territory governments is bringing about decarbonisation with the aim of increasing climate resilience. As decision-makers formulate and enact a range of climate change mitigation and adaptation policies, they inevitably engage with climate science on a variety of levels. Understanding and synthesising climate science into policy and action is at the heart of many policy development processes.

Creating effective policies based on the 'best available science' isn't always easy. The relationship between academia and non-academic environments can prove challenging as parties try to navigate differing priorities. Climate scientists offer findings, knowledge and expertise based on their research to influence and engage policy, while decision-makers balance effective and actionable policy with scientific advice.

Parliament house in Canberra. Climate change played a role in causing and intensifying the drought which helped enable the Black summer bushfires. Source: Australians struggled to breathe during the Black Summer bushfires.[1] If the smoke comes back, are we any better prepared? - ABC News

Decision-makers sometimes find it hard to determine the usefulness of research findings. Misunderstanding information, or failing to appreciate nuances and subtle caveats, can lead to erroneous conclusions and sometimes disillusionment amongst parties or even fractured relationships. Policy outcomes suffer as a result.

Knowledge brokers work at the interface of academics and consumers of climate information, sharing knowledge with the goal of facilitating communication and achieving improved outcomes for all. Here is a practical guide to facilitate engagement and bridge the gap between the climate scientist and decision-maker. It highlights the role of the knowledge broker in this space to steer and improve this process.

What is a knowledge broker?

Knowledge brokers are a growing group across government, industry and research communities who act as translators, interpreters, shepherds, advocates, mediators, advisors and gatekeepers, providing conduits for a two-way information exchange.

The role of the knowledge broker is significant in building and maintaining these two-way bridges to improve understanding across the scientist/decision-maker relationship. Primarily in government, this role extends to businesses, communities and households.

Knowledge brokers provide a focus, guiding parties through unfamiliar environments and new challenges associated with stakeholder requirements. They facilitate and engage in the co-design of targeted research or provide a mechanism to inform the academic community of possible research questions or novel applications of research findings.

The overarching aim of a knowledge broker is to help researchers understand non-academic audiences (Figure 1) and disseminate their research using selected and appropriate communication, while helping decision-makers use climate science appropriately to guide and develop relevant policy actions.

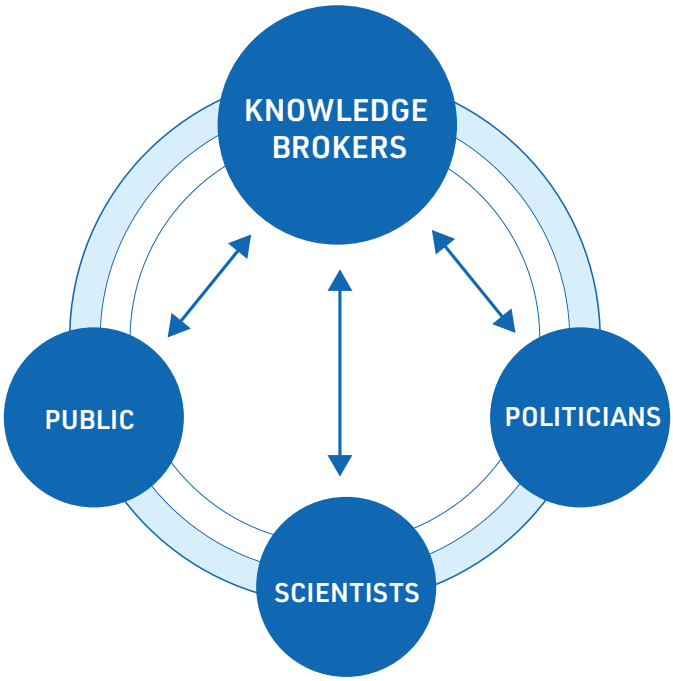

Figure 1: The role of the knowledge broker. Source: ARC Centre of Excellence for Climate Extremes

Trusted proponents and sources of information

Finding trusted sources of information, particularly online, is a hot topic as misinformation, bias and untrustworthy content continues to proliferate. Reliable and accurate information therefore needs to be identifiable and easy to access. For climate information, this is especially problematic as decision-makers begin to implment complex climate policy using complex scientific information.

To meet this requirement, knowledge brokers cultivate and maintain relationships with researchers and stakeholders as part of their role. They are in a position to act as trusted, reliable sources of information. Their position, as a representative of academic information, means they are endorsed by the researchers they represent, ensuring their credibility and are able to represent and promote the area of research to a variety of stakeholders.

Equally stakeholders rely on knowledge brokers to provide peer reviewed scientific information produced by reputable expert scientific institutions. The knowledge broker is in the ideal position to provide reliable sources of information trusted by researchers as well as stakeholders.

Unsung heroes

Other fields such as software engineers, modellers and data managers have become the foundation or backbone of the climate science community as well as critical to the efficacy of the knowledge broker process. They are the unsung heroes of data rich environments who enable the software and infrastructure that helps connect users of climate data with the best available information.

They develop and support the multi-institutional collaboration and systems used in the climate community by improving workflows and producing quality software, making research faster and more reliable.

These multi-institutional arrangements are founded on highly collaborative arrangements with open sharing of software and data - a culture intrinsic in the academic environment without the commercial-in-confidence constraints of industry or business.

Knowledge brokers, supported by software engineers, modellers and data managers help stakeholders to recognise and differentiate these multi-institutional systems, and help support important information exchange.

Climate science is complicated

The discipline of climate science includes mathematicians, atmospheric scientists, oceanographers and physicists. There are many other fields which intersect, such as geologists, chemists, biologists, soil scientists and hydrologists. All these sciences are wrapped up in technology, supported by computer science and data science, including incorporating new technologies such as artificial intelligence and machine learning.

The complexity of climate science stems from multiple phenomena which interact, cascade and compound. For example, Cyclone Jasper which swept Queensland during the summer of 2023-24 (Figure 2), involved a tropical cyclone, colliding with moist winds from multiple directions producing torrential rain, causing flooding and disruption to the whole region.

Accurately forecasting the short term behaviour of a cyclone over several days uses established weather forecasting techniques. However, determining whether climate change affected the location, intensity or behaviour of a cyclone involves many other research fields. Describing an event on the scale and complexity of Cyclone Jasper, with so many component phenomena, requires an in-depth understanding of many additional processes as well as further research.

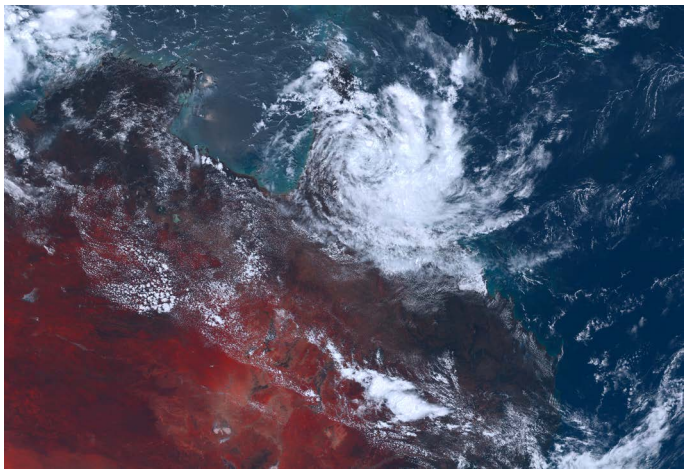

Figure 2: Himawari-8 satellite image (14/12/2023 12h00) of Tropical Cyclone Jasper after making landfall over Far North Queensland. Source: Japan Meteorological Agency. Himawari-8.

Climate models are one method which provide an opportunity to understand our climate. However they require interpretation to fully utilise their strengths, understand their weaknesses and when they are not appropriate tools for a particular problem. Knowledge brokers provide help here, discussing requirements with stakeholders explaining their capabilities and outlining some inherent uncertainties in the information they provide[2,3].

Continuing to build knowledge

The Earth's climate system is influenced by many interactions including the sun, ocean, atmosphere, land, and ice as well as our behaviour. Interconnections and feedbacks between all these component systems can amplify or diminish effects or changes on our climate with regional and local variations (Figure 3). As the climate is reshaped by climate change, work is progressing on how weather systems shape our current and future surface weather and how they interact with climate variability and climate change[4]. Research continues on understanding various aspects of climate and weather phenomena, refining insights with new information and discoveries. This work is on-going and the nature of scientific discovery.

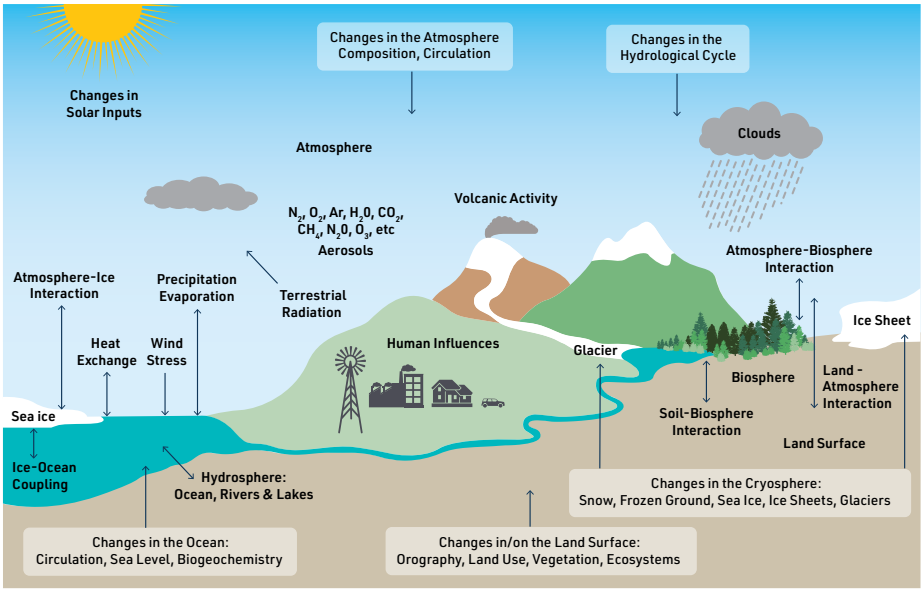

Figure 3: The elements of climate models. Source: Adapted from the IPCC.

Knowledge brokers help disseminate work on scientific discovery beyond academic communities to other stakeholders. Knowledge brokers can help stakeholders identify sources of uncertainty, such as assumptions made in climate simulations, approximations of real world phenomenon or constraints in computing power[5]. This helps stakeholders consider a range of outcomes and adjust responses to future risk appropriately.

Problems of scale

Working with uncertainty (Figure 4) is difficult for decision-makers who often need highly specific, location-based and time dependent information, communicated simply in an accessible way. Occasionally decision-makers may want to extend a finding more broadly. As such, decision-makers sometimes encounter a reluctance from climate scientists to draw conclusions from their work when the research is not designed to be interpreted beyond one location or one issue. Scientists would be concerned to protect their professional reputations which may be impacted by the misuse of their research.

For example, extending findings about rainfall in Sydney to the rest of the country is very likely to be incorrect. Climate scientists generally specialise in a relatively narrow field although most have a range of knowledge in associated areas. Expanding conclusions which go beyond their research boundaries can be problematic if they become scientifically misleading, resulting in reputational risk.

Conversely, where a finding is about a large system, drawing small scale conclusions can also be misleading. For example, climate projections might point to declining rainfall over Victoria, but that does not necessarily mean a specific farm in a specific location within Victoria will see lower rainfall. Knowledge brokers can help decision makers draw appropriate conclusions from climate information.

Figure 4: The future is uncertain. Source: The ARC Centre of Excellence for Climate Extremes | Working with Uncertainty in Climate Planning and Adaptation - The ARC Centre of Excellence for Climate Extremes

Learning a new language

Climate information is usually saturated with its own jargon commenting on 'projecting' our future under different 'scenarios', similarly weather reports keep us up to date on the latest rainfall or heatwave, using terms about phenomena such as La Niña. Misunderstanding or misinterpreting these highly specialised words for decision-makers can have unintended consequences.

Encountering unfamiliar terms, such as global and regional climate models, or a myriad of acronyms, such as CMIP, CORDEX, NarClim, ENSO (Figure 5) can be overwhelming. There is a need for digestible, easy to access, scientifically accurate information products which are a summary of academic output but also accessible to a non-academic audience.

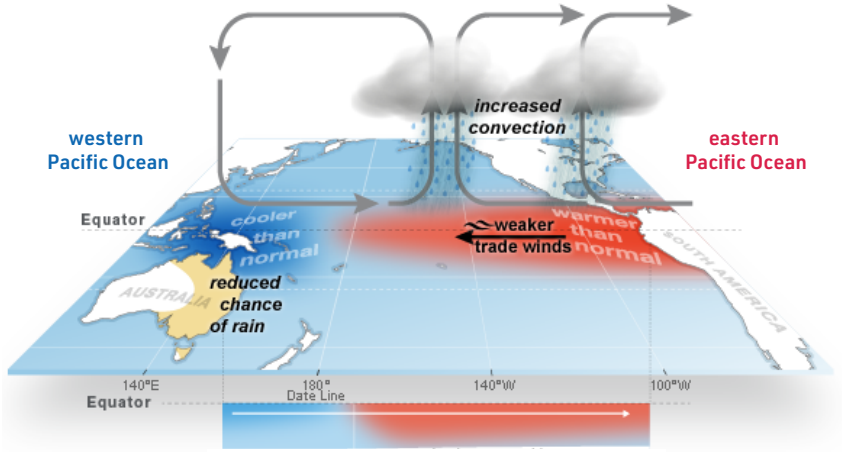

Figure 5: Schematic diagram of El Niño- Southern Oscillation (ENSO) in the tropical Pacific Ocean. Source: adapted from Bureau of Meteorology.

Translating scientific research into "plain English" is a major part of the knowledge brokering role. Understanding audience requirements, as well as working closely with scientists – sometimes word by word – to provide accessible, easy to understand explanations is essential.

They can help by providing explainers[6] or '101' information on a variety of climate topics (Figure 6).
They have unique access to climate researchers and a view of decision-maker requirements giving them the opportunity to tailor explanations at the right level for accessibility and insight.

Decision-makers regularly promote and advertise their policies to inform the public. As more climate related policies are being enacted, explaining the technical subtleties of climate science is essential as outlined by Article 12 of the Paris Agreement which details the need to take, "measures, as appropriate, to enhance climate change education, training, public awareness, public participation and public access to information...".

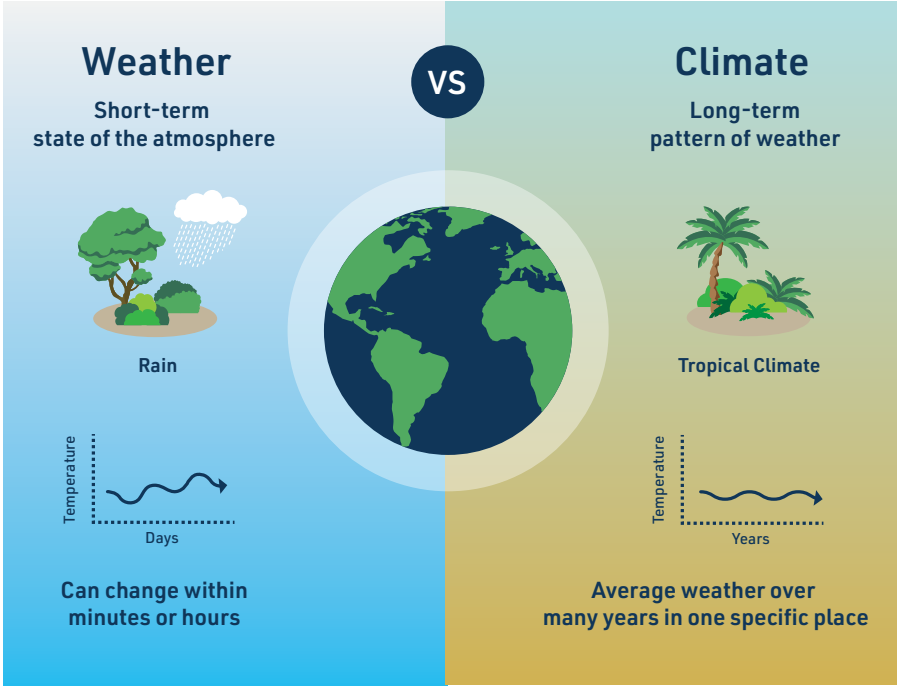

Figure 6: What is the difference between weather and climate? Source: ARC Centre of Excellence for Climate Extremes.

Understanding each other's world

Understanding the complexities of machinery of government or organisational structures (Figure7) and processes of business organisations is invaluable when approaching non-academic stakeholders. For example, in government, researchers require help with distinguishing information about government, the roles and responsibilities of its different levels and the delivery of services. Most people would probably be surprised at how little world class researchers know about how the government works.

The research landscape is equally complex. Finding expert views can be hard in a sea of universities, schools, centres, institutes, departments, and research groups, let alone expertise in CSIRO, other government agencies and not-for-profit groups. And expertise tends to be highly niche and many academics will not speak outside one specific niche area.

Even once you've found the speciality area, obtaining a single opinion on a topic can sometimes be the wrong approach. For example, multiple conclusions can be drawn from the same observational data, especially where there are complex interactions such as in the climate system.

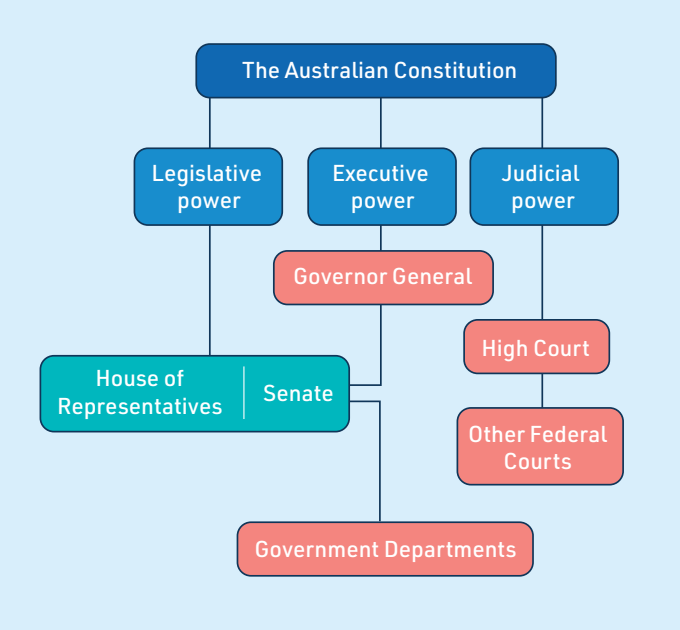

Figure 7: Levels of government. Source: ARC Centre of Excellence for Climate Extremes.

Seeking multiple points of view and using a range of possible outcomes in policy responses would be favourable, though understandably challenging, in the pressurised time poor environment. A knowledge broker can help here, providing decision makers with a synthesis consensus view on a topic from multiple lines of evidence.

Everyone is time poor – but in different ways

Stakeholder timelines sometimes mean that short term answers are often required. However, the requirement for quick answers can be at odds with the scientific process. Research can be long-term (sometimes decades), and can involve collecting data or experimenting to analyse results with reference to a hypothesis. In addition, researchers can work on multiple projects juggling various sources of funding on multiple timelines making them equally busy.

Decision-makers, quite understandably, sometimes ask apparently simple questions that turn out to require years of work to answer usefully. Knowledge brokers can help both sides here - helping decision makers access information effectively, while explaining why answers to questions cannot be provided next week, next month or sometimes next year.

Communicating the science

Communicating climate science, and the implications of climate change, relies on clear, accessible summaries and explanations of complex concepts. Messages can be hampered by the language used and lead to serious misunderstandings around the uncertainty inherent in much of the climate information. For many, the result is confusion and lost audiences, for others it's a science system failing to provide actionable information and for others it is a policy environment lacking robust information.

The use of visual communication in science is an often overlooked yet an essential part of ensuring that research engages a wide range of audiences while ensuring that it has maximum impact and consequently inspires action. Use of visual information to communicate complex concepts is well known, but it is not an area climate scientists are trained in.

'Graphic design can play an essential role in science by making complex information and concepts more accessible and comprehensible, particularly for those who do not qualify as scientists.'[7]

An image can help to make scientific information more approachable and accessible via:

- Creating meaning and narrative more efficiently and effectively.
- Help an audience make connections where a concept has complex and inter-woven relationships.
- Highlighting irregularities or patterns/trends in a data set, as well as noting correlations or interactions between variables.
- Allow the reader to see a difference or change between variables by depicting a comparison.
- Illustrating steps or stages of a process.

In essence, the visualisation of a scientific concept, whether in the form of a photograph, an editorial illustration or infographic, has the ability to engage more audiences quickly and in a powerful way that leads to learning. However, the use of graphic design cannot exist in a vacuum in this context - it's just one of many useful tools to aid in the communication of science. Moreover, knowledge brokers play an important role to bridge between stakeholder's needs, scientific information and effective communication.

Pathways to knowledge building

As policy problems change, climate science is evolving to provide information core to guiding policy responses. The need to establish, maintain and develop the role of knowledge brokers is core to effective communication. Without recognition, these bridging roles, academia and decision makers will continue to remain siloed.

There are 5 actions that could help establish and recognise the role of the knowledge broker in climate science as well as other disciplines.

- Recognising the role of the knowledge broker as an effective mechanism to help academics and stakeholders come together bringing dividends to both groups.
- Defining core skills in science, policy and communications as prerequisite skills central to the effectiveness of this role.
- Establishing a career pathway in the field which currently does not exist. The availability of positions relies on short term contracts in research organisations or ad hoc positions becoming available.
- Establishing a community of practice to bring similar roles together to share experiences and provide community and vital networking opportunities.
- Professional development to recognise the on-going nature of the role and to help improve and evaluate new innovative techniques and skills.

Tapping an existing resource

As the climate crisis unfolds and policy responses gather pace, knowledge brokers can bring decision makers and climate scientists together to understand and appreciate the fundamentals and behaviour of the climate system. This will help apply relevant policy responses more effectively on the scale required. There are benefits to working collaboratively; harnessing the outputs of academic endeavour can help avoid potential pitfalls in policy design while science can truly influence national policy.

Written by

Angela Kaplish
is Lead Knowledge Broker at the ARC Centre of Excellence for Climate Extremes. Her work centres around translating and explaining climate science for government audiences. She has previously worked in the federal government, private industry and NGOs both in Australia and the UK.

Georgina Harmer
is the Graphic designer at the ARC Centre of Excellence for Climate Extremes. Her focus is on visual problem-solving with an approach that balances aesthetics and functionality. She works closely with E&I team members to create effective designs across digital and printed platforms.

Alice Wilson
is a Knowledge Broker at the ARC Centre of Excellence for Climate Extremes. Alice translates climate information to facilitate action, climate change mitigation and adaptation and is interested in a people centred approach to climate action. Alice holds a Master of Environment from the University of Melbourne.

Paola Petrelli
is the leader of the Computational Modelling Support team at the ARC Centre of Excellence for Climate Extremes. Her work focuses on delivering software and data solutions to support the Centre's researchers. Paola holds a PhD in Science and has worked managing, analysing and publishing climate and oceanographic data for most of her career.

Professor Andy Pitman
is the Director of the ARC Centre of Excellence for Climate Extremes. His expertise focuses on terrestrial processes in climate modelling, including the water, carbon and energy fluxes, extremes and the robustness of climate models at various scales.

Produced by

Engagement and Impact Team - Knowledge brokers: Angela Kaplish, Alice Wilson
Communications: Laure Poncet **Graphic design:** Georgina Harmer

References

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https://thepolicymaker.jmi.org.au/building-bridges between-climate-scientists-and-policymakers/]

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Contact
clex@unsw.edu.au

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