Earth Systems and Climate Change Hub

National Environmental Science Programme

ACTIVITY REPORT

Building capacity to use climate change information

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Earth Systems and Climate Change Hub Report No. 22

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Contact

Enquiries regarding this report should be addressed to:

Earth Systems and Climate Change Hub
PMB 1
Aspendale Vic 3195

info@nespclimate.com.au

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Using climate change information toolkit

The ESCC Hub developed a climate change information toolkit to build both understanding of climate change and capability for using climate change information for decision making. The aim is to provide stakeholders with a better understanding of the climate system, an appreciation of climate change science, and the confidence to find and use climate change information to inform decisions.

The toolkit has two components:

- a modular climate change literacy workshop that can be offered in a half or full day
- a rapid climate change impact assessment methodology that can be applied across all sectors to co-produce climate change information and facilitate its use in decision making.

Climate change literacy workshop

The climate change literacy workshop uses six core modules that can be mixed, matched and customised to best suit the needs of stakeholders. These modules are:

1. Understanding the climate system and climate change science
2. Understanding climate change modelling and projections
3. Interpreting climate change projections
4. Using climate change information to understand climate change impacts
5. Choosing and using climate change information
6. Communicating about climate change

Climate change health check

A climate change health check is way of gauging the impact of climate change on a matter of interest. Depending on the aim of the assessment, it can be used as a way to collect impact information or as a preliminary step in a more detailed assessment.

There are five steps in a climate change health check:

1. Start – get the team together, identify the issue and stakeholders
2. Scope – invite experts to help draw out details and flag possible issues
3. Source – subject matter and climate experts collect the information they need
4. Synthesise – bring together subject matter and climate information and analyse
5. Share – package and distribute information so it is useful to all stakeholders.

Using the toolkit

Enquiries about using the climate change literacy workshop or climate change health check should be directed to the ESCC Hub.

Using climate change information toolkit

Stakeholder engagement has indicated that many people who are expected to use climate change information in their work are uncertain about how the climate system works, how the climate is changing and what climate change projections actually tell us. This means that existing climate change information, such as that provided on the *Climate Change in Australia* website (www.climatechangeinaustralia.gov.au), is not being readily accessed, understood and applied to inform decision and policy making.

The ESCC Hub developed a climate change information toolkit to build both understanding of climate change and capability for using climate change information for decision making. The aim is to provide stakeholders with a better understanding of the climate system, an appreciation of climate change science, and the confidence to find and use climate change information to inform decisions.

The toolkit has two components:

- a modular climate change literacy workshop that can be offered in a half or full day
- a rapid climate change impact assessment methodology – the climate change health check – that can be applied across all sectors to co-produce climate change information and facilitate its use in decision making.

The development of the toolkit was informed by participant feedback from pilot workshops and co-designed impact assessment activities.

By improving stakeholder climate change literacy and providing a practical process for applying climate change information, this toolkit will promote and facilitate the use of climate change information in impact assessments to inform policy, planning, adaptation responses and other decision making.

Climate change literacy workshop

Development

In order to maximise accessibility and relevance, a modular workshop was developed. This structure allows stakeholders to mix, match and customise content to best suit their needs.

Initially, the program was designed as a half-day workshop of core modules with the option of adding extension content with modules about more advanced content. However, discussions with stakeholders during the development of the pilot workshops suggested that most of the advanced content was not of interest to an introduction-level audience.

Stakeholder feedback during the delivery of the pilot workshops indicated that participants were interested in the use and communication of climate change information. In response, modules about choosing and using climate change information and applying it to a specific issue were extended, and a climate change communication module added.

Module content continued to be refined based on responses to participant surveys and ongoing engagement with stakeholders. This ensured that the level of difficulty and relevance of the six core climate change literacy modules was appropriate.

Modules

1. **Understanding the climate system and climate change science**

   A background to the climate system, including information on greenhouse gases, atmospheric processes, the role of oceans and relevant drivers of observed climate variability in the region. Includes discussion of global and regional observations and trends.

2. **Understanding climate change modelling and projections**

   An introduction to basic concepts around climate modelling (including emissions scenarios and downscaling) and climate change projections.

3. **Interpreting climate change projections**

   Walk through of current climate change projections for the area of relevance (e.g. state, regional, national) explaining how to read different maps, graphs and tables to better understand the information being conveyed.

4. **Using climate change information to understand climate change impacts**

   Introduction to identifying and developing climate change information for decision-making using a case study.

5. **Choosing and using climate change information**

   What types of information are available and which purposes are they suited to? Where do I find information and support?

6. **Communicating about climate change**

   Discussion of guiding principles for communicating climate change information as well as ideas for communication products for different purposes.

These six modules can be delivered quickly as a half-day (3–3.5 hour) information session or extended out with more interactivity and depth in a full-day workshop.

Pilot workshops

The workshops were developed over a number of pilot offerings in 2019 and 2020:

- Northern Territory mango industry – May 2019
- Victorian Department of Environment, Land, Water and Planning – November/December 2019
- Northern Territory Government – February 2020
- Horizon Energy – February 2020

Northern Territory mango industry – May 2019

This program was delivered in conjunction with an impact assessment being undertaken by the ESCC Hub and Northern Territory Department of Primary Industries and Resources (NT DPIR) to determine the impact of climate change on induction of mango flowering in the Territory. Early stakeholder engagement in this project revealed that many growers did not have the climate change literacy necessary to fully understand the outcome of the impact assessment, and a workshop was considered a good way to provide this information.

The workshop was titled *Making cents of climate change*, framing understanding climate change information as an economic imperative for primary producers. The full-day program was scheduled for the day before the Australian Mango Industry Association (AMIA) conference being held in Darwin, to maximise accessibility for growers wishing to attend.

The workshop was opened with a session by representatives from the NT DPIR and AMIA setting the scene for the day, talking about why understanding climate change is essential for the sustainability of individual enterprises and the whole industry. This was followed by climate change literacy modules that had been customised for the Northern Territory:

- Understanding the Northern Territory climate (based on workshop module 1)
- Understanding the future climate (based on workshop modules 2 and 3)
- Using climate change information (based on workshop module 5).

The workshop concluded with two research sessions from NT DPIR, explaining what research was being done and how the industry can use research outputs.

This workshop was well-received with participants rating it highly for relevance and accessibility. Most indicated that their understanding of climate change had improved as a result of the workshop.

Best things about the workshop from the participants' perspective included:

- "Simplified explanation of what influences the climate and climate change"
- "Specific examples to the NT made things relevant (and convincing)"
- "Looking at the long-term climate projections and what that might mean for the mango industry"

Suggestions for improvement included encouraging more growers to attend and including more industry-specific information. Almost all participants indicated that they would recommend the workshop to others.

Victorian Department of Environment, Land, Water and Planning – November/December 2019

This full-day program was delivered in collaboration with the Victorian Department of Environment, Land, Water and Planning (DELWP) to support the roll-out of Victorian Climate Projections 2019 (VCP19), new climate change projections for Victoria developed by CSIRO. In total, five full-day workshops were delivered: two in regional centres (Benalla and Warragul) and three in Melbourne.

The agenda comprised six climate change literacy modules:

- Introduction to the climate system and climate change science
- Understanding climate change modelling and projections
- Interpreting climate change projections
- Using climate change information to understand climate change impacts
- Choosing and using climate information and data
- Communicating about climate change.

Additionally, a module specifically on the new VCP19 projections products was included.

The workshops were well-received with participants rating it highly for accessibility and relevance, although a number of participants only thought the program was "a little" relevant.

Best things about the workshop from the participants' perspective included:

- "Better understanding of RCPs, modelling, other data sources and models. Great seeing a practical example of how rapid climate change assessments are undertaken and climate science is being practically used."

- “Understanding the science and technical work that has gone into the projections, as well as understanding how to interpret the results.”
- “Comms and stakeholder content as well as technical content. Q&A discussion time.”
- “A lot of practical applications and examples made it relevant and interesting.”

Suggestions for improvement included more time for questions, using more case studies and concrete examples, and having opportunities to work through participant issues as examples. Almost all participants indicated that they would recommend the workshop to others.

Northern Territory Government – February 2020

This program was delivered in response to a request from the Office of Northern Australia and was attended by representatives from Federal and Territory government departments. Due to time limitations, the program was delivered as a half-day information session.

- Introduction to the climate system and climate change science
- Understanding climate change modelling and projections
- Interpreting climate change projections
- Using climate change information to understand climate change impacts
- Choosing and using information and data
- Communicating about climate change.

This information session was well-received with participants rating it highly for relevance and accessibility. Most indicated that their understanding of climate change had improved as a result of the session.

Best things about the session from the participants’ perspective included:

- “Where and how to access available data; NT case study (local info); relevant NT/northern Australia projections used.”
- “The session on communicating information and the mango case study. The sessions were best when linked back to the Territory context.”
- “Enjoyed the deconstruction of the models and communicating about climate change.”

Suggestions for improvement included reducing data-heavy sessions and spending more time on Territory context and impacts. Almost all participants indicated that they would recommend the session to others.

Horizon Energy – February 2020

This program was delivered in response to a request from Horizon Energy in Perth and was attended by representatives from the power and water sectors. The full-day workshop was broken into two parts, allowing participants the choice of attending one or both sessions.

The theme of the morning session was understanding climate change science. The session used three climate change literacy modules:

- Introduction to the climate system and climate change science
- Understanding climate change modelling and projections
- Interpreting climate change projections.

The theme of the afternoon session was using climate change information. This session also used three climate change literacy modules:

- Using climate change information to understand climate change impacts
- Choosing and using information and data
- Communicating about climate change.

While the program was designed to allow people to come to just one session, most participants attended for the whole day. The workshop was well-received with participants rating it highly for relevance and accessibility. Most indicated that their understanding of climate change had improved as a result of the workshop.

Best things about the workshop from the participants' perspective included:

- "Discussing how organisations can use the climate change projections to inform risk assessments and planning."
- "Learning more about climate science."
- "Good structure and flow from topic to topic. Different presenters from different areas of expertise made it interesting."

Suggestions for improvement included having more local case studies and more opportunities to apply climate change information. Almost all participants indicated that they would recommend the session to others.

Other applications

The climate change literacy modules were also used outside of these workshops during the pilot period to deliver fundamental climate change science concepts. These instances included:

- **ESCC Hub roadshow for the Department of the Environment and Energy** (September 2019): modules 1 and 2 were modified to provide an introduction to the climate system and climate projections in a bigger program showcasing the work of the ESCC Hub.
- **World Heritage Area forum** (September 2019): modules 1, 2, 4 and 5 were used as the basis of an introductory presentation to provide an introduction to climate change and climate change science for Australia's World Heritage properties.
- **Agriculture Victoria workshop** (February 2020): Agriculture Victoria staff modelled a workshop for their staff on one of the Melbourne pilot workshops.

Key learnings

The value of local and relevant content and examples cannot be overstated. For this reason, it is critical to know the interests and expectations of participants before the workshop.

Most people (at this introductory level) are not interested in the data but in what the data tells them. Reproducing plots from Climate Change in Australia is not as effective as showing a regional map and speaking to what the changes in climate might look like at different places over time. The climate analogues tool on Climate Change in Australia is powerful in this regard.

Participants universally appreciated having access to climate scientists. While some of the presentations may have tended towards being inaccessible, the ability to talk to the researchers over coffee and lunch made up for this. This interaction also provided researchers with an excellent opportunity to hear directly from the people using their science for a new perspective on their work.

The opportunity to ask questions of the experts in the room is highly regarded, and time in the program to do this is appreciated by participants.

Climate change health check

Rationale

The application of climate change information to sectoral decision and policy making can be confusing. In an effort to assist stakeholders, the ESCC Hub drew on work undertaken by CSIRO to develop guidelines for using climate change information in the Pacific region.[1] However, these guidelines were aimed at national meteorological services, and so were too technical for sectoral stakeholders. Hub knowledge brokers worked with stakeholders to simplify the eight-step process used in the Pacific to a five-step rapid assessment process that was suitable for sectoral stakeholders working in partnership with climate change science providers. The result was the climate change health check methodology.

Purpose

A climate change health check is way of gauging the impact of climate change on a matter of interest. It can be used as a way to collect impact information or as a preliminary step in a more detailed assessment. This will depend on the aim of the assessment.

When a climate change health check is complete:

- It may provide all the information necessary to prepare an information product to raise awareness or inform decisions.
- More information about the impacts might be needed before any further action can be taken, so building on a climate change health check, a more detailed impact assessment can be undertaken.
- It may be necessary to determine the capacity to prevent or adapt to these impacts so building on a climate change health check, a vulnerability assessment can be conducted.
- It may be necessary to determine the likelihood of consequences of these impacts, so building on a climate change health check, a risk assessment can be conducted.

A climate change health check can be thought of much in the same way a person checks their own health. If they're not feeling well, a GP is often the first port of call. They can generally provide the necessary information to solve most health issues. However, if the GP identifies a potentially more serious health problem, a follow-up visit to a medical specialist – or in this case, a more detailed impact, vulnerability or risk assessment – might be needed.

Just as most times, it is only necessary to visit the GP to find the information needed to solve any health issues, the climate change health check will often provide the impact information that is needed without the need to invest more time and resources unnecessarily.

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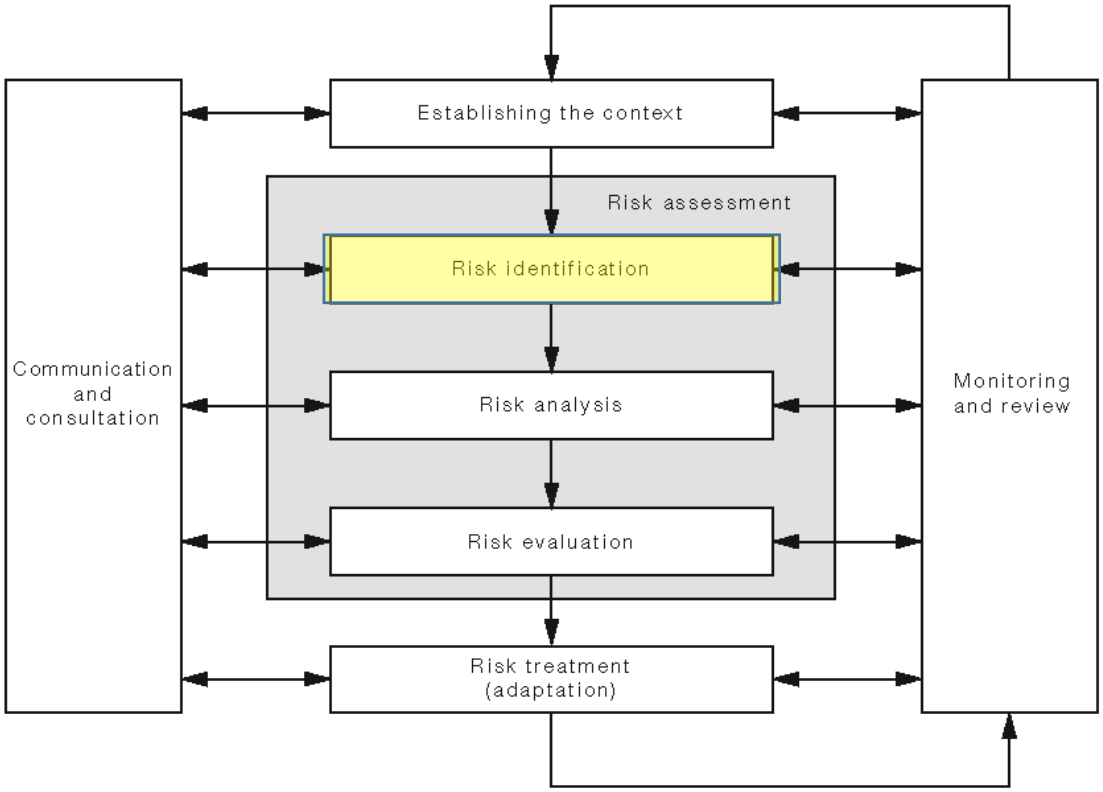
[1] See https://www.pacificclimatechangescience.org/publications/developing-climate-change-information/

Using the climate change health check in a broader framework: an example

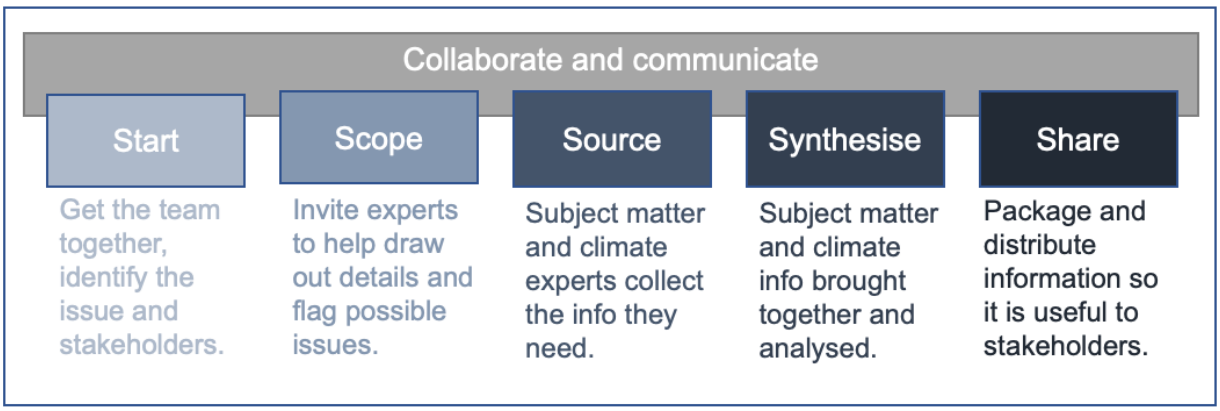
AS 5344–2013 *Climate change adaptation for settlements and infrastructure – a risk-based approach*[2] outlines a comprehensive risk management framework. The climate change health check process fits neatly into the risk identification step of this process (highlighted below).



Process

There are five steps in a climate change health check. Collaboration and communication with stakeholders are important features of the health check and take place across all steps of the process. Collaboration and communication are essential to co-design the assessment to ensure that it based on the best available information and meeting the needs of everyone involved. As such, the steps in the process serve as a guide only as the detail of the assessment changes in response to changing understanding of the issue of interest.

[2] Standards Australia (2013) AS-5334-2013 *Climate change adaptation for settlements and infrastructure: A risk-based approach*. ISBN 978 1 74342 480 3.



Step 1: START

- Assemble project team (ideally/at minimum a project leader (who is a knowledge exchange specialist), a climate specialist, and a subject matter specialist)
- Identify issue
- Identify potential key stakeholders and subject matter experts
- Draft communication & engagement plan

Step 2: SCOPE

- Hold first expert meeting, where you:
    - Define the issue/develop question
    - Identify relevant climate variables, and appropriate emissions scenario, time frame and time step
    - Review known information
    - Determine information needs
- Revise communication & engagement plan if necessary
- Finalise climate change health check scope (variables, time scale, thresholds, etc)

Step 3: SOURCE

- Find existing subject matter information
- Collect additional subject matter information as required
- Collect observed climate data
- Collect and evaluate climate model data
- Construct climate change projections

Step 4: SYNTHESISE

- Prepare draft technical report that brings together subject matter and climate change information
- Present key findings at second expert meeting, to ground truth results and discuss implications/recommendations
- Finalise technical report

Step 5: SHARE

- Prepare and deliver communication products in line with communication & engagement plan

Application

The climate change health check process was trialled in two case studies undertaken by the ESCC Hub – one using climate change science to help make decisions about primary production, and the other using climate change science to inform climate change adaptation planning in a World Heritage Area.

Understanding climate change impacts on mangoes in the Northern Territory

Mangoes are the Northern Territory's largest horticultural product, and the Territory is the country's largest grower of mangos. Flowering of mango trees is sensitive to the changing climate, specifically to minimum and maximum temperatures that are specific to different cultivars.

In this case study, the ESCC Hub collaborated with the Northern Territory Department of Primary Industry and Resources (NT DPIR) to use climate change information to investigate the possible effects of future minimum and maximum temperatures on three commercial cultivars and three that are in development.

The application of the five-step process from the case study report[3] is reproduced here.

Start

An enquiry to CSIRO for climate temperature thresholds by NT DPIR identified the opportunity for an assessment of the impact of climate change on mango production in the Northern Territory by the ESCC Hub. A project team was convened comprising horticulture experts from NT DPIR, climate experts from CSIRO and the Bureau of Meteorology (through the ESCC Hub) and knowledge brokering and communication specialists from the ESCC Hub. Preliminary discussions among the project team identified the possibility of focusing on mango flowering for the assessment. The team also organised an expert meeting for the next phase of the engagement and drafted a communication and engagement plan to guide the project.

Scope

The expert meeting was held in Darwin in February 2019 to learn more about the Northern Territory mango industry, how the changing climate might impact it, and how climate change projections could be used to support industry resilience and sustainability into the future. In addition to the project team, the meeting was attended by NT DPIR research, policy and

[3] Available at http://nespclimate.com.au/climate-change-impacts-in-the-northern-territory-mango-industry/

extension staff, representatives from the Australian Mango Industry Association and Northern Territory Farmers Association, and a number of growers.

Following this meeting, the project team agreed that resources were available to conduct a case study examining the impact of climate change on the induction of mango flowering. The draft communication and engagement plan was updated following learnings and suggestions from this meeting.

Source

With the assessment clearly scoped, the mango and climate specialists each undertook the required data collection and generation. While these specialist teams worked independently, they remained in close contact to ensure that the data being collected and generated was appropriate for the assessment.

Synthesise

Synthesis began with a face-to-face meeting of the project team to discuss results and their implications, as well as their presentation and communication, referring back to the communication and engagement plan developed in the first phase of the project and updated in the scoping phase.

Share

The case study report is the key communication product arising from the assessment. Additional products developed in line with the communication and engagement plan to ensure that growers, industry representatives and policy makers are informed of the results included a case study summary and results fact sheets for the three major growing regions.

Informing World Heritage Area climate change adaptation planning

The Gondwana Rainforests of Australia World Heritage Area is one of 20 World Heritage listed properties in Australia. There are gaps in the scientific understanding of the impact of climate change on the Gondwana Rainforests WHA, particularly changes to cloud cover. This is an important environmental variable for the property because cloud and fog provide up to half of the annual vegetation water requirements in high elevation forests.

In this case study, the ESCC Hub collaborated with property managers and developed lifting condensation level projections to provide information about changes to the cloud base in a changing climate, to complement existing temperature and rainfall projections. These projections can be used to inform the development of a climate change adaptation plan for the Gondwana Rainforests WHA.

The application of the five-step process from the case study report[4] is reproduced here.

[4] Available at http://nespclimate.com.au/informing-world-heritage-area-climate-change-adaptation-planning/

Start

While the importance of understanding changes in cloud base height in the Gondwana Rainforests was recognised, data to explore these changes was limited, with researchers using cloud base height data collected at a nearby airport. Given the clear risks presented by the changing climate to the World Heritage property, the Gondwana Rainforests Technical and Scientific Advisory Committee (TSAC) identified a need for further research in this area. As World Heritage was identified as a cross-cutting theme for the Australian Government's National Environmental Science Program, contact was made with two of the program's research hubs to investigate a potential partnership project between the ESCC Hub and the Threatened Species Recovery (TSR) Hub.

Working with the Gondwana Rainforests Executive Officer, the ESCC Hub established a core project team to explore options for research and collaboration with members of the TSAC and the TSR Hub.

Scope

The ESCC Hub convened a workshop at the University of Queensland in Brisbane on 8 October 2018, bringing together experts from key agencies to discuss available climate projections and identify specific data needs for ongoing climate change adaptation planning for the Gondwana Rainforests.

Discussions at the workshop clarified the management need for further information about how cloud base height and associated moisture availability may change in a changing climate to assist in risk management of flora and fauna in the upland rainforests. Existing ESCC Hub climate projections data and knowledge gaps were identified, with the potential for additional data and information after a period of research and evaluation.

The scope of this research and evaluation was determined at a meeting between the ESCC Hub and representatives from the managing agencies for the Gondwana Rainforests in February 2019. It was decided that the Hub would deliver temperature, rainfall and lifting condensation level projections, which could be used in ecological assessments to help determined the impact of climate change in the Gondwana Rainforests.

Source

With the assessment clearly scoped, climate and ecology specialists each undertook the required data collection and generation. While these specialist teams worked independently, they remained in close contact to ensure that the data being collected and generated were appropriate for the assessment. The development of this information is documented in this report.

Synthesise

Synthesis occurred concurrently with the Source step, as climate information was generated, incorporated into ecological assessments and interpreted. This was an iterative and

collaborative process, building capacity and understanding for both the project's climate and ecology researchers.

Share

The case study report is the primary means of sharing the results of this assessment. A technical note was also produced to accompany the dataset developed for this assessment.

Using the toolkit

Climate change literacy workshop

The climate change literacy workshop slides and facilitator's notes are available from the ESCC Hub. Important elements of the workshop are the involvement of a climate science expert and customisation of the content under the guidance of ESCC Hub knowledge brokers, so anyone wishing to conduct their own workshop with these materials is encouraged to contact the ESCC Hub for advice and assistance.

Climate change health check

The climate change health check approach is outlined in this publication and so is freely available. Any queries about applying this process should be directed to the ESCC Hub.

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