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Climate Systems
THE UNIVERSITY OF MELBOURNE
National Environmental Science Program
Enabling best practice adaptation

Australian Adaptation Database

Contents

The research outlined in this document is ongoing and methods will continue to be updated as they evolve.

The Climate Systems Hub is funded by the Australian Government under the National Environmental Science Program.

1. Scope

The Australian Adaptation Database is the first national scale adaptation stocktake conducted in Australia and aims to collate and categorise adaptation action conducted in all Australian states and territories. This database does not include international adaptation initiatives unless they contribute to Australia's climate resilience.

As illustrated by the Bureau of Meteorology (figure 1), Australia's climates are extremely diverse across the country and vary greatly even within each state or territory. Across these climates, expected climate changes include increased frequency in heatwaves, longer fire seasons and more frequent extreme fire danger days, reduced average rainfall, longer droughts, increased heavy rainfall events with impacts on flooding, and increased coastal inundation, erosion and storm surge (1). Adaptation responses taken across Australia are also extremely diverse, varying by location, jurisdiction, industry, and climate risk, among other things. Collecting substantial data on all adaptation initiatives occurring across Australia is difficult for this reason, especially due a lack of existing smaller-scale datasets to draw on. To conduct Australia's first adaptation-stocktake at a national scale we set out to collect a sufficient sample of adaptation examples from across the country, until reaching a point such that we can draw sufficient conclusions about the type and extent of adaptation progress. The approach chosen seeks to capture data across each different:

- scale and jurisdiction
- geographical location
- sector
- type of adaptation
- type of hazard.

Australia's first National Climate Risk Assessment, undertaken in 2023 and 2024, has begun preliminary work to understand how the diversity in climate risks can be understood and aggregated at a national scale (1). Working closely with the National Climate Risk Assessment, this project has taken into consideration the priority hazards and systems at risk when developing its methodology for classification of adaptation activities

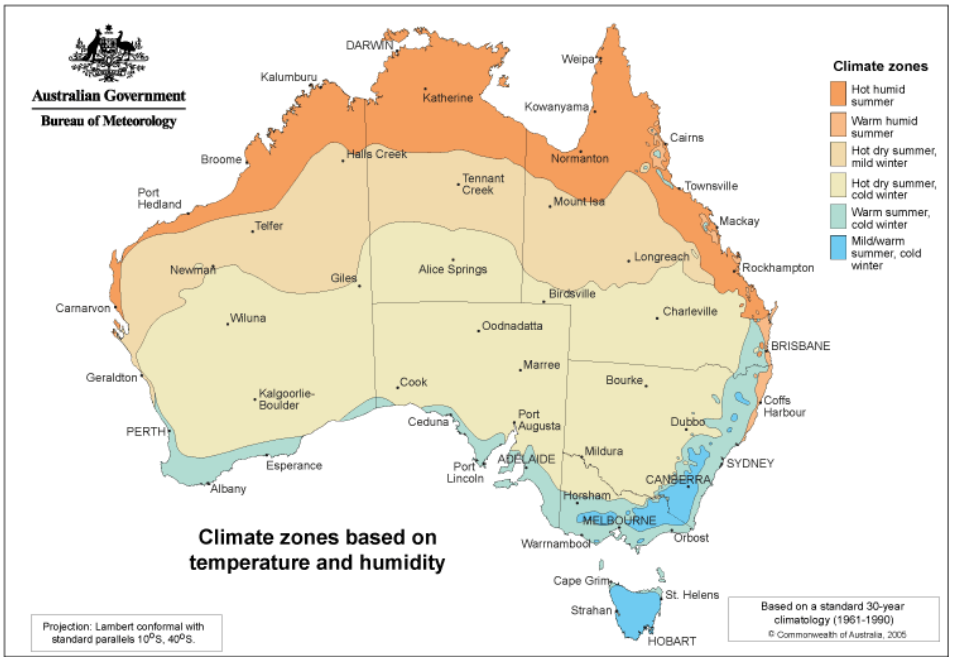

Figure 1: Australia's climate zones based on temperature and humidity (2).

2. Data collection

The project has taken a cumulative approach to data collection, which has been undertaken over more than 1.5 years, beginning in July 2023, and is ongoing (funding dependent).

a. Survey

Data collection began with a short survey[1] designed to collect key examples of adaptation activities in Australia from adaptation professionals. The survey consisted of ten questions that asked the participant to identify a key example of adaptation and some basic details about the type of hazard it was responding to, and the type of adaptation it was. These questions were kept to a minimum to help maximise the response rate.

This approach of drawing on insight from experts in the field was used to collect a variety of examples given that many examples of adaptation are not explicitly labelled as such or are not shared widely in public documents. The survey was initially shared with attendees at the Climate Adaptation 2023 conference in Adelaide, Australia, and was later distributed to additional participants via email, who were identified through existing contacts, their workplaces and snowballing methodologies. Target participants included staff in local, state and federal government departments, private sector practitioners (such as in consulting and insurance), researchers, and people working for not for profits.

In total over 440 attendees at the conference, and over 830 email recipients were invited to participate in the survey in the period between July and September 2023. The survey returned 103 responses during this period, which equates to approximately an 8% response rate.

The survey has since been used as an ongoing method to collect data and has continued to be shared at other Australian conferences and workshops where the research team is presenting.

b. Consultation

To extend the data pool, more direct consultation with key stakeholders was required. The project began consultation by presenting to the national Adaptation Working Group and inviting representatives from relevant state, territory and federal government departments, as well as local government associations, to meet with the research team. Throughout 2024 the project team met with these representatives to provide an overview of the adaptation database and invite contribution of relevant examples of adaptation, either directly or via the survey. As publicity surrounding the database increased the project team was increasingly contacted by other stakeholders (primarily other government departments) who wished to learn more and contribute.

The consultation with key stakeholders was a reciprocal opportunity to learn about the need for a national adaptation dataset and allowed opportunity to discuss the use and design of the database and its outputs. Stakeholders outlined the growing obligation for adaptation reporting, a lack of consistency across jurisdictions, and the absence of a central repository of evidence for reporting. Throughout the project data has been made available to stakeholders

[1] Ethics approval from the University of Melbourne Human Ethics Committee granted in July 2023 (Project ID 26428).

for their own uses, and a commitment made to ensure the database be publicly available by the end of the project's first iteration (EOY 2025).

[Currently underway] Finally, given the strong inputs from governments to the database there remains a need for additional consultation with key stakeholders from the private and not-for-profit sectors. Efforts are being made to consult with key industry bodies, the private sector, and social services, not-for-profit organisations, and private philanthropists and funders. This process is ongoing throughout 2025 and beyond (funding permitting)

c. Desktop research

Desktop web-based searches have been used to further investigate and fill identified gaps in the dataset (where possible).

[Currently underway] The methodology outlined above lacked opportunity to collect data about civil society adaptation interventions and household scale adaptation, a recognised weakness of the approach. To address this, news databases offered a readily available repository of information which extends to local, household and civil society scale. The Australian Broadcasting Corporation (ABC) News website (a free to access, national news database which draws on a network of local news outlets in regional towns and major cities), was searched for key words 'climate adapt' in conjunction with key words relating to hazards, climate events or variability (see below). A Google Advanced Search was also used to conduct a search, restricting to the chosen domain. Each article found was screened for mention of climate change adaptation and key details about adaptation interventions extracted, until a pre-determined stopping point was reached (i.e. the first 50 results for each set of criteria were reviewed). If climate change adaptation was not explicitly mentioned, smaller-scale actions (e.g., farmers switching from livestock to crops) that relate to adaptation were also considered. This approach also returned examples of government-led adaptation efforts.

Table 1: Overview of search terms

Key search terms	Explanation
Climate adapt	Used to restrict the search to news articles which discussed climate adaptation or other relevant topics.
fire rain flood frost humidity erosion temperature heat wind storm ocean snow drought sea level rise	Used to highlight specific hazards which adaptation might be responding to, using plain language common to news articles rather than technical terms.

[Not yet conducted] In the future, online searching will also be used to identify extract adaptation examples from the websites of local government areas. Australia has 566 local government areas, and while most of their website do not reflect the actual depth of their adaptation work, reviewing their websites allows the research teams to collect information on adaptation policies and plans and highlight any significant interventions. Additional meetings with local government associations are also necessary.

d. Linkages with the National Climate Risk Assessment

Early in its development the project was expanded to contribute to the work of the Australian Climate Services in developing the National Climate Risk Assessment. This collaboration was additional to the existing database project but provided opportunity for additional resources for data collection and coding, and for consultation with stakeholders through workshops already being held as part of the National Climate Risk Assessment Process. The National Climate Risk Assessment was conducted in two stages: the First Past Risk Assessment and Second Pass Risk Assessment.

During the first pass risk assessment, beginning in July 2023, researchers conducted an initial assessment of climate adaptation policies across the key 'systems at risk' identified in the National Climate Risk Assessment Methodology (see appendix I). The goal of this 'Rapid Policy Scan' was to provide an initial overview of climate adaptation policies across each system, and identify gaps or areas of focus within state and national government policies.

The Rapid Policy Scan process began with Google searches, conducted using key words of "climate adaptation" and "policy" along with the key terms from each system at risk. Each result was screened and key adaptation policies, plans and strategies (and related activities) extracted, until the pre-determined stopping point was reached (i.e. the first 50 results for each set of criteria were reviewed). Following this, more targeted search terms were used by incorporating state or territory-names (e.g., "Western Australia," "climate adaptation policy," "infrastructure"). Further analysis of policies, programs and strategies occurred at a later stage. Data from this process has been reviewed against inclusion criteria (below) and included in the Australian Adaptation Database.

The Rapid Policy Scan and emerging database findings informed the presentations used for consultation workshops, where researchers presented a concise summary of the key findings at eight workshops held in 2023. Over 250 stakeholders from all levels of government, non-government organisations, industry and academia were in attendance at these workshops. Workshop participants were given opportunity to suggest additions to the policy scan and database.

During the second pass risk assessment, beginning in July 2024, updated findings from the adaptation database were shared at workshops. Researchers attended and presented at four workshops during September – November 2024, which including participants from all levels of government, experts on climate adaptation and risk assessment, and industry stakeholders. This provided opportunity to gather feedback and validate the objectives of the database.

Following this consultation process, researchers contributed findings from the database, as it stood in October 2024, into a report Insights from the Adaptation Stocktake: National Climate Risk Assessment. This report is forthcoming, to be published by the Australian Climate Service. Additionally, the project contributed data and analysis to each of the eight synthesis reports on key systems at risk.

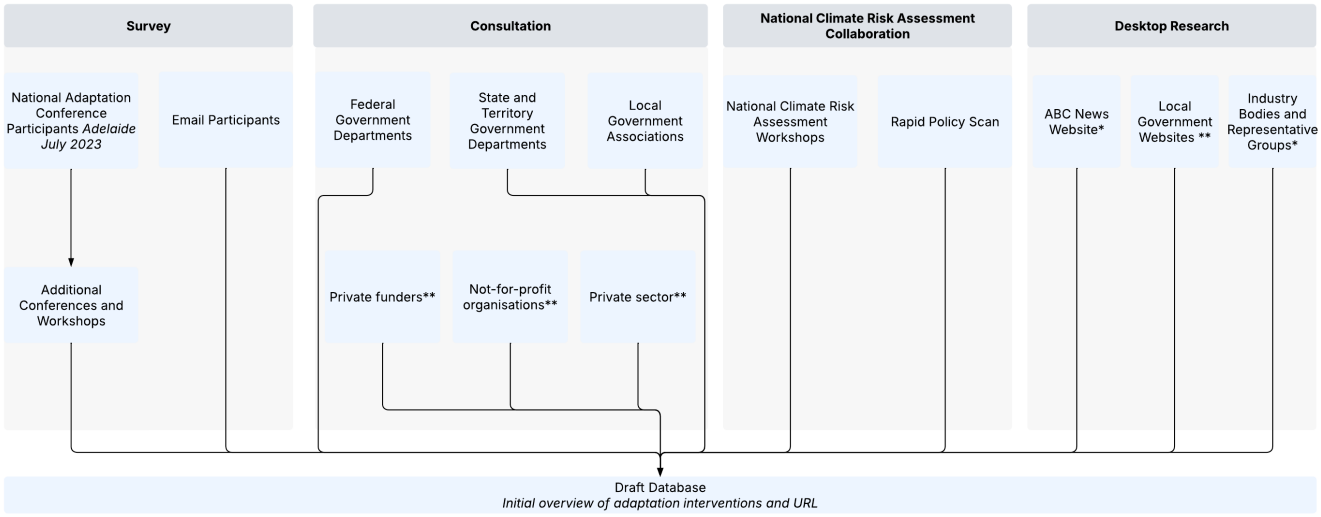

Figure 2: A complete overview of the data collection process which resulted in the initial database. This initial database contained a name of each adaptation initiative, a description and a link to further information.

3. Database structure

Selecting attributes and designing a database structure that was both informative and feasible required several iterations. During the planning phase, the research team developed a set of research questions to guide the Australian Adaptation Stocktake. Key adaptation tracking literature was reviewed and considered during this process (3–14).These questions are as follows:

- What is the distribution of adaptation across physical locations? (Geographical location)
- At what scale (i.e. local, region, state, national) have most adaptation plans, projects, and programs taken place? Which scale has the least?
- Which actors are undertaking adaptation (i.e. private sector, local community, government), and which are less active?
- What hazards or risks have been addressed most frequently, and which have not been addressed as much?
- What types of adaptation actions are being conducted?
- What sectors have seen the most adaptation? Which have seen the least?
- Is adaptation progressing in Australia?

These research questions guided what information was required for the database. Key attributes included location, scale, actor, hazard, date and type of adaptation response, although others including information on sector, outcomes, funding, and evaluation findings were also discussed.

The data type and structure for each attribute was equally important, needing to take into account the availability of data and impact on data analysis. The three key types of data are detailed below:

1) Numerical: The most straightforward database attributes are numerical and can easily be analysed within a large dataset. Attributes such as year are well suited to this, however, few adaptation variables are numerical.
2) Categorical: Data that is not numerical can still be grouped into

pre-defined categories to allow quantitative analysis. Using existing categories is preferable (i.e. official Australian Bureau of Statistics (ABS) jurisdiction names), however, in other circumstances new categories were necessary (discussed further below).

3) Text: Using text-based entry for attributes with limited data availability was necessary to allow for flexibility to include information that was found (i.e. for evaluation details and funding details), but this does complicate analysis across the database.

Many of the attributes identified also needed to allow for multiples in coding – i.e. many adaptation activities involve numerous lead organisations or numerous local government areas. This helped to accurately represent the nature and type of adaptation activities but complicates data analysis and requires attention to how data is communicated to avoid misinterpretation (for example, the count of local government areas does not equal the number of initiatives).

The attributes chosen for inclusion were iteratively revised based on data availability and review (as was the coding process). For example, it was initially proposed that the database should contain details about aim, outputs and outcomes in order to analyse the quality of evaluation activities, however this was later revised down to a text-based column on 'output' and 'evaluation details' due to a lack of available information.

Categorical variables were used often to classify our data. ABS statistical areas and jurisdictions were applied to location data, and existing categories drawn from the IPCC and National Climate Risk Assessment processes. Given limited pre-existing research on adaptation stocktaking, the research team also found it necessary to construct several data categories based on review of the literature, prior experience and review of the data collected - most significantly with respect to the 'purpose' category. More details on the logic surround the 'purpose' category is outlined in the paper titled 'A method for tracking progress towards climate change adaptation in Australia', attached on the 'Metadata' page.

During this iterative process it became clear that climate change adaptation efforts often do not conform with the same geographical boundaries, political jurisdictions, or pre-prescribed definitions of hazards that are commonly used during risk assessment processes. Often times, adaptation responses are shaped by social characteristics, geographic regions (which do not align with Australia Bureau of Statistics data), cross-jurisdiction collaborations, funding and grant schemes and other influential factors. This has influenced the way our methodology has been developed to ensure we can accurately reflect Australia's adaptation environment and understand trends and gaps arising.

Once more than 500 database entries had been tested, the consistency of information about projects and categories used for coding proved reasonably stable. This allowed for the data structure to be finalised and transferred into an SQL Database. The final list of attributes to be included in the database are described in Table 2.

Table 2: A summary of the different attributes included in the database; full detail available in 'Overview of database categories' document.

Attribute	Multiples	Type	Description
Identification Number (ID)	1	Numerical	A unique numerical identifier assigned to each individual database entry.
Name of Initiative	1	Text	The unique name of the entry as given by the lead organisation.
URL	1	Text	The most relevant URL to a website with more information about the project.
Description	1	Text	A summary of the key points about the adaptation project and any significant anomalies in the coding.
Lead Organisation	3	Text	The organisation(s) responsible for initiating and implementing the adaptation initiative.
Actor	3	Categorical	The type of organisation that is leading the initiative.
State or Territory	1	Categorical	The Australian state or territory where the initiative is based.
Region	1	Text	The Australian region where the initiative is based, if applicable
Local Government Area	4	Categorical	The Australian local government area where the initiative is based.
Town or City (SA2)	1	Categorical	The Australian town or city where the adaptation has occurred, if relevant, using Australian Bureau of Statistics Statistical Area 2 lists.
Hazard	4	Categorical	The climate hazard the adaptation responds to, building on priority hazards identified in the National Climate Risk Assessment Methodology.
Purpose	2	Categorical	The intended purpose of adaptation project: what the adaptation aims to achieve.
Output	1	Text	The tangible products or services produced as a result of this activity.
Evaluation Details	1	Text	Details on pre-existing monitoring and evaluation, including URL links.
Scale of Implementation	1	Categorical	The scale at which the adaptation output is aimed, reflecting the actor/group or system that is changing.
Start Year / End Year	1	Numerical (or text)	The date the entry was last updated by the research team.
Status of Completion	1	Categorical	Indicates whether the project is in progress or complete.
Funding Details	1	Text	Any publicly available details on funding amount, type, or funder and URL link to details.
IPCC Adaptation Categories	1	Categorical	Categorising the type of adaptation using a four-category approach taken from IPCC AR6 WGII Chapter 16: categorising adaptation into infrastructure and technological, institutional, nature based and behavioural and cultural (IPCC, 2022).
National Climate Risk Assessment	4	Categorical	Using an approach developed in the National Climate Risk Assessment Methodology to categorise adaptation actions by the 'system at risk' that they are seeking to protect.

'System at Risk'			
Tags	3	Categorical	Additional notes if a program, project, or initiative is part of something larger or related across entries (i.e. a grant program).
Source	1	Text	The data collection method and source.

4. Verification and coding

Once the initial data is collected, or the adaptation initiative has been identified, each entry requires further investigation, verification and coding.

Duplicates were removed from the dataset prior to coding.

Due to the nature of our database and intended outputs (as a publicly available dataset), it was made clear from the outset that this research only sought to collect information that was already publicly available or not restricted. Each entry was investigated further using a URL link that was provided and / or google search to identify other relevant information and coded to the above structure. Entries where no information

can be found online are flagged for further investigation.

To allow for analysis, and given the information made available, the coding process is inherently reductive and cannot always capture the full detail or nuance for each individual adaptation intervention. Researchers were instructed to code each category according to the most significant or primary details, with additional information added to the 'description' as needed. Given the database is designed as a stocktake which provides a general overview of adaptation, it does not differentiate between positive or maladaptive outcomes of adaptation, as some other databases may attempt, nor is information about every initiative absolute, however, each entry provides a URL to follow for further information.

a. Inclusion: defining 'adaptation'

The project defines adaptation as a purposeful response to reduce vulnerability or increase resilience to future climate. This is because assessing the full extent of autonomous adaptation is particularly challenging given it may be mainstreamed in standard procedures or occur across all scales and sectors of social activity.

As is often discussed in the literature, one of the biggest challenges faced during adaptation stocktaking is the way in which adaptation is conceptualised. Many activities which are not labelled as 'adaptation' can still contribute directly to reduced vulnerability or increased resilience. Further to this, in Australia many activities conducted with adaptation in mind have been beholden to political processes that have required them to avoid using key terms such as 'climate change' or 'adaptation' and instead using terminology such as sustainability and resilience. This distinction is particularly difficult in the policy, planning and strategy space where the level of relevance of adaptation can vary greatly.

Despite this, it is particularly important to recognise adaptation work which is being mainstreamed into work such as disaster risk reduction: which is increasingly becoming synonymous with adaptation as future climate risks are routinely taken into

account. In response, our methodology was designed with practitioner and stakeholder input and generally aired on the side of inclusion, and with an open mind about why adaptation professionals have put forward each adaptation example. While the data collection focussed on intentional adaptation, it did capture some instances of actions thought to reduce vulnerability if recommended by participants, even if this was not obviously the primary purpose of the activity.

The database does not evaluate the adaptation interventions collected or make judgements on their success. However, when it is available evidence of evaluation is noted for further analysis.

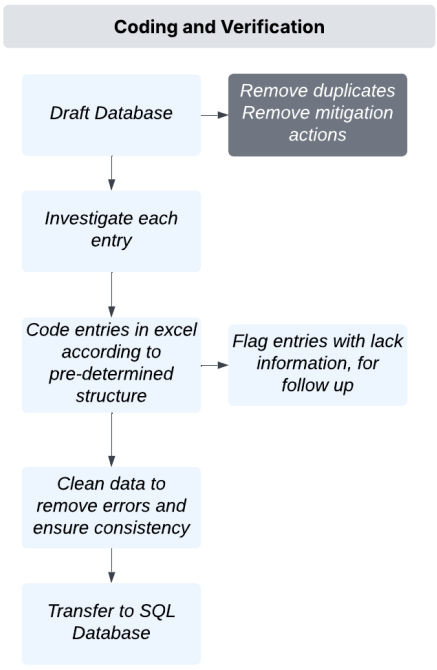

Figure 3: A summary of the data validation and coding process.

b. Exclusion

The exclusion of some data collected was necessary during the review of entries. In particular, it was necessary to exclude interventions which were directly focussed on climate change mitigation responses. Whilst mitigation is an important contribution to future resilience, it is not the focus of this research and is more extensively covered by carbon reporting procedures.

Other exclusions were made on discrete basis where there was no logical link between the work that was conducted and climate change adaptation, though few such exclusions were made. Entries were also excluded if they focussed on reducing risk overseas rather than in Australia.

5. Limitations

The Australian Adaptation database provides a useful overview of adaptation across the nation and insights into the type of adaptation activities being undertaken. It provides insight into potential gaps where adaptation might be lacking, however, it cannot make absolute statements about which jurisdictions, sectors, regions or scales are most prepared due to limited reporting from some jurisdictions. It should also be recognised that a high number of activities doesn't necessarily equate to greater resilience, given activities might differ in effectiveness.

6. Data analysis

There are numerous approaches which can be taken for analysing and visualising the data contained in the database. Here we summarise that which has been taken to visualise the data on the Australian Adaptation Database website.

The table provided on the 'search' page of the website consolidates the SQL Database into an easy-to-read format, displaying each intervention as a single row alongside the most important columns. Where there are multiples for a given column in this table, attributes are listed and separated by ','.

The dashboard on the 'search' page summarises the results in the table in a numerical format. Because most categories allow multiples (i.e. "Hazard" contains up to 4 different hazards), the counts displayed in the graphs do not equal the total number of entries. Instead, these counts are calculated as a count of the number of times that attribute appears in the dataset, for each distinct initiative (row). Percentages are used to more accurately represent the data as it is intended, as a proportion of the total, but counts are also visible when hovering over the graphs with your mouse.

7. Data storage and reporting

Once verified and cleaned the data is entered into an SQL Database maintained by the research team. SQL is well equipped to deal with databases with a large volume of entries, and to be used by multiple users simultaneously (i.e. when linked to a website).

In line with the intention for this database to be publicly accessible, it is made available through a custom web-portal that allows users to filter and view basic analysis of the results. Users also have the ability to view individual entries and follow URL link for further information. Also available on the web portal is a summary of all relevant metadata and methodology, including academic research papers and other outputs.

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9. Appendices

Appendix I

National Climate Risk Assessment Methodology is available at the following link: https://www.dcceew.gov.au/sites/default/files/documents/national-climate-risk-assessment-methodology.pdf

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