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Climate Compass

A climate risk management framework for Commonwealth agencies

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This guide was produced for the Commonwealth of Australia with financial assistance from the Department of the Environment and Energy. The authors of this guide are Brenda B. Lin, Veronica A.J. Doerr, Lesley Andrew, Mark Stafford-Smith, and Russell Wise.

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Foreword

Australia is already experiencing the impacts of a changing climate, particularly changes associated with increases in temperature, the frequency and intensity of extreme events, changing fire weather and shifting rainfall patterns.

Climate Compass is a framework designed to help Australian public servants manage the risks from the changing climate to policies, programs and asset management. It includes step by step instructions, guidance, and information to develop an understanding of climate change risks.

Climate Compass builds on the best climate change adaptation research and science over the past decade. *Climate Compass* reflects the current leading practice in guidance for climate risk management and planning for long-term, uncertain, pervasive change.

Climate Compass was developed in two phases. The first phase resulted in a draft framework. In the second phase, the draft framework underwent a process of user-testing and review from leading domestic and international adaptation experts. The project team would like to thank the four agencies involved in the user-testing process. Your experience informed the redesign of this final framework, so it is more useful, accessible and applicable to the work of the Australian Public Service.

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Contents

Introduction

What is *Climate Compass*?

Climate Compass helps you, as an Australian public servant, identify and take action to manage the risks and opportunities for your areas of responsibility that arise from the changing climate.

Climate Compass has three cycles to manage the risks posed by the changing climate:

- **Scan:** a high-level pass to prioritise further work or scope the other cycles
- **Strategy:** a formal climate risk assessment of a particular area of work, (such as policy theme or Division) to develop a defensible climate risk management strategic plan
- **Project:** detailed climate risk management for specific projects, including operational planning and decision-making.

Each cycle contains instructions to help you identify risks and opportunities, and ways to address them. Each cycle is written succinctly to make it easy to follow.

If you need further help, the ***Technical Supplement*** provides more detailed information on specific topics. It also contains advice on where else to find further data, guidance, and decision-support tools. Hyperlinks within the cycles point to relevant sections in the Supplement. Look for text that is ***bolded and italicised***: click on it to go to the relevant section of the Supplement.

In the cycles, you will also find some Hints and Case Studies, providing tips for the simplest ways forward and insights into how others have completed the steps.

Who should use *Climate Compass*?

Climate Compass is best led by a core facilitation team who can guide its use within your agency (especially if completing a *Scan* cycle to look at climate risk across your entire agency). This team is ideally composed of:

- people with some existing climate change experience, and
- people with either risk management, business continuity, or futures thinking experience.

Ideally the people with expertise in risk management should be from within your agency, as these people have direct experience of your agency's risk management process. The climate change experience could be external to your agency, if necessary. If you are completing a *Strategy* or *Project* cycle, it is important that your core facilitation team involves the officers responsible for the policies, programs or assets in focus.

Climate Compass has been designed to be easy to understand and work with. However, climate risk is still a new concept to many people and requires new ways of thinking to be integrated into your existing risk management processes. People who already have some background knowledge in risk management and climate change can make this happen efficiently, while helping others to build capability so it will be easier in the future.

There may be enough knowledge within your agency that any officer can use *Climate Compass* to identify and treat climate risks without a core facilitation team. *Climate Compass* has been also designed with that perspective in mind and further information on the approach is provided in ***Facilitation Team to Individual Officers*** of the *Technical Supplement*.

Where to begin – *Scan, Strategy* or *Project*?

Climate Compass identifies three key climate risk management cycles of different detail and purpose: *Scan*, *Strategy* and *Project*.

The purpose of three cycles is to recognise the iterative nature of addressing climate risk. The cycles use similar steps to build that iteration. They primarily differ in the detail recommended at each step. Three cycles are also used to encourage initial high-level, rapid assessments to target subsequent more detailed effort where it is most needed. Using the cycles as intended should make it seem much more achievable to start taking action, even if resources are limited and action must be prioritised.

Scan is the typical starting point as it gives a high-level sense of the climate risks your area of responsibility may be exposed to, the nature of those risks, and where to prioritise further effort.

Many agencies may first decide to complete a *Scan* of the climate risks to their business. This would determine the highest priority areas for more detailed climate risk management activities, such as completing a *Strategy* cycle. If following this approach, it is likely that a core facilitation team will have responsibility for completing a *Scan* of an agency.

Strategy is primarily a deeper identification, assessment and treatment of risks relevant to a particular area that has been prioritised for climate risk management. This prioritisation may have been determined by a *Scan* cycle. The *Strategy* cycle draws more heavily on climate and other impacts information.

In practice, a *Strategy* cycle could be focussed on the work of a Division, specific policy or program, objective or outcome. The core facilitation team for a *Strategy* cycle should involve some of the team who led the *Scan* cycle (if following this approach), but also officers responsible for the policy or program in focus.

Project is a detailed assessment and operational plan for a more focused area of work:

- to develop a specific action to address climate risk or
- to ensure climate risk is taken into account as part of the overall risk assessment for a specific action.

The *Project* cycle would most commonly be used by an asset manager or by a program manager concerned with ensuring that those carrying out projects under the program are effectively accounting for climate risk. The details of a Project are often bespoke to your agency, policy or program area. As such, *Climate Compass* has only provided some general guidance on the *Project* cycle to ensure it can be strategically aligned with the approach taken in *Scan* and *Strategy*.

Depending on what work your agency has done on climate risks in the past and what you are currently trying to achieve, you may need to work through all of the cycles or just one or two. *Scan* can be used at any level as it may provide a broad overview of risks at higher levels of organisation, but can equally be used as the first scoping step for a *Strategy* or *Project* at any scale. As a general rule, *Strategy* will usually be done at a higher level of your organisation, over a broader suite of responsibilities, than *Project* will.

Note that it is unlikely you will simply work linearly through the process presented in *Climate Compass*. You will probably go back and forth over steps as you develop your understanding of the climate risks and build a process that is appropriate to your risk management challenge. How you approach this is up to you, your goals and level of experience.

If you are still unsure which cycle or cycles are right for you, the following table provides more information that may help.

Overview of assessment cycles

Cycle	Scan	Strategy	Project
What are you doing?	A high level scan of climate risks across your agency or key policy/program/asset areas	Developing strategies for prioritising and managing the climate risks faced by an already prioritised policy/program/asset area to determine further action.	Focusing on a specific policy/program/asset to develop a detailed risk management plan over time and implement the first steps.
Why are you doing it?	You have not really explored climate risks before and want to understand what areas of your agency or policy/program/assets are facing climate risks	You know the general areas of climate risk in your agency and now want to understand the decisions that are affected by climate risks within the priority areas, and to develop broad plans to treat the risks	You know specific climate risks need to be acted on and want to decide on detailed changes to policy or program investments to manage these.
What will you get from this?	A plan for which areas of your agency or policies/programs/assets you should concentrate effort in future climate risk management action.	A treatment plan or plans addressing decisions that influence climate risks in the priority areas, as well as identifying areas that do not yet need action.	Decisions on how to manage specific climate risks, including identifying specific investment needs.
Example	You are working from a central risk management area in your agency and you are scanning your agency to identify where climate risk management should be a priority. You identify the work of three Divisions as first priority to carry out a more detailed climate risk assessment.	Your central risk management area has identified parts of your Division as a priority for climate risk management. You are looking at these areas of work to develop a sequenced treatment plan and identify that the programs managed by four teams in particular need detailed risk treatment plans.	The programs your team is responsible for have been identified as at risk from the changing climate. You are creating a detailed plan for how your team can manage climate risks to your program, at both the program and project levels.

Get started

1. Read through the steps involved in the different cycles.
2. Decide which cycle to begin with based on what you need to achieve and resourcing.
3. Form your core facilitation team.
4. Follow the cycle.

If in doubt, start with the *Scan* cycle. It can be a stand-alone cycle or the work that you begin can form the scoping step for the *Strategy* or *Project* cycle.

Storm damage along the coastline at the Gold Coast, Queensland. © CSIRO

Scan cycle

The *Scan* cycle provides a high-level identification of areas of your agency's policies, programs and assets that will be affected by a changing climate. It provides a relatively rapid, first pass to focus further work.

Climate Compass is not prescriptive. You could use the *Scan* cycle as a stand-alone activity to stimulate internal discussions and build capacity to think about climate risks, or help initially explore whether a policy or program might be developed. You could use it in a more directed way as well, as the first step in developing a specific policy, strategy or project to address climate risk, to plan further work so that it involves the right stakeholders and targets priority areas to be efficient and effective. There is no right or wrong answer.

At the end of the *Scan* cycle, you will have identified the main climate risks to your areas of responsibility, decided which of those are a priority to address in further work, and identified who should be involved in that further work. You will also have a basic plan in place to revisit your priority climate risks in the future and reassess priorities as circumstances change.

Scan cycle

Step 1: Scoping – set the scope including the why, what and who

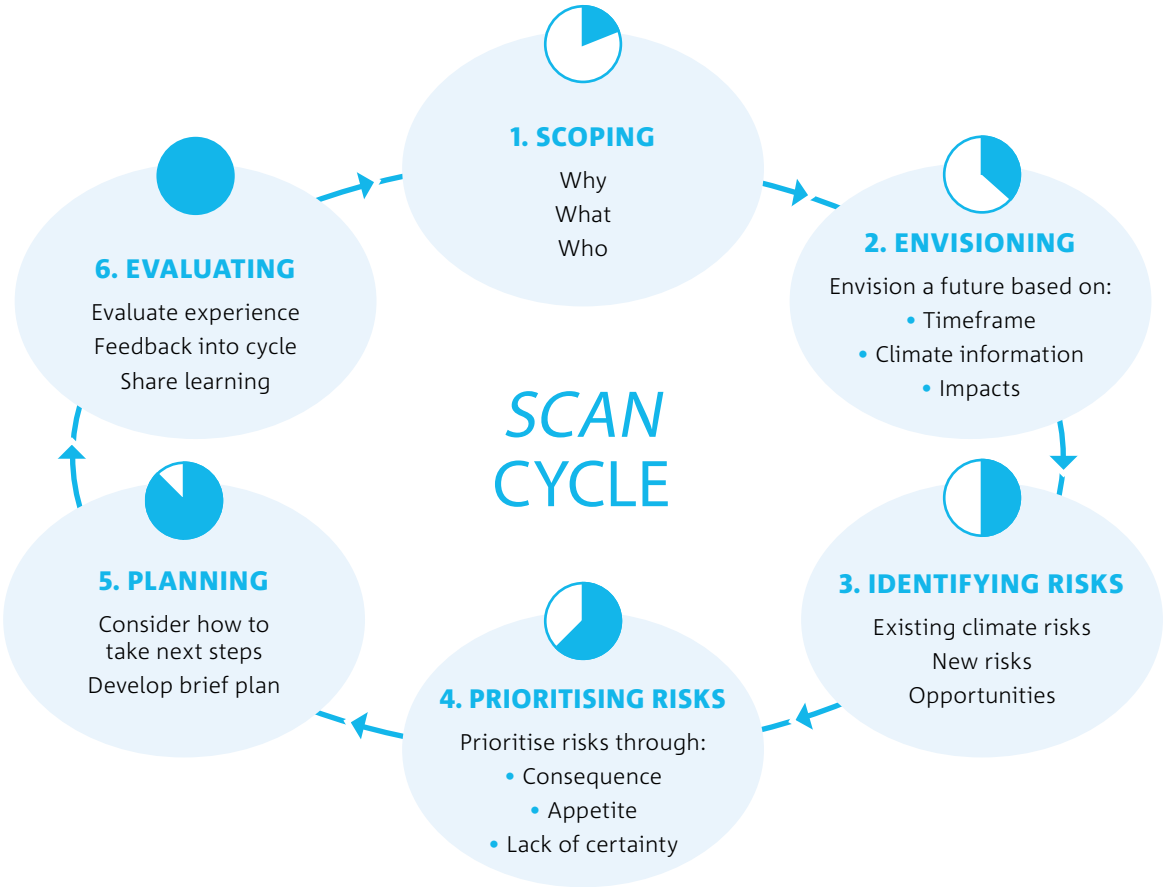
Step 2: Envisioning – envision a scenario with greatest plausible change

Step 3: Identifying Risks – brainstorm climate risks given this future

Step 4: Prioritising Risks – decide which climate risks to focus on

Step 5: Planning – determine next steps to address priority risks

Step 6: Evaluating – embed Scan in future processes and share learnings



Step 1: Scoping – set the scope including the why, what and who

This step is about scoping the *Scan* activity itself – being clear about why you are doing it, what areas of responsibility you intend to consider, and who should be involved in what capacity.

Answer the following three questions and record your thoughts and conclusions as they will help inform further work.

HINT

Keep a record using existing project planning templates

Your agency is likely to have standard project planning templates. A *Scan* can be a project just like any other. So if they are simple enough, use those templates to record your answers to these questions and the decisions you make in working through *Climate Compass*.

Why are you doing a *Climate Compass Scan*?

Be clear about your aim and background for the *Scan cycle*. Questions that you could consider are:

- Do you need to make decisions with long-term implications, such as land-use or infrastructure planning, and are aware the effectiveness of these decisions may be undermined in the future if climate change is not considered now?
- Is there an immediate sense of risk and urgency to address your climate risks because the effects of climate change are already potentially reducing the effectiveness of policies, programs, projects or assets that your agency is responsible for?
- Do you want to identify opportunities in the changing climate?
- Are you complying with a directive, including legislation and regulations (such as work, health and safety regulations)? Are you complying with a directive from management to consider climate risk?
- Are you responding to interest and pressure from outside stakeholders?
- Is climate risk still in the early stages of discussion within your agency and you need something to support these early conversations?
- How are decisions made in your area of work – is a *Scan* essential to getting further organisational support to address climate risk?
- Do you already have support to do more but want to focus your work to maximise its effectiveness?

HINT

Get the most out of your *Scan* by avoiding detail

Scan is a prelude to focus further discussions and activities. The most common pitfalls in the *Scan* cycle are spending too much time and going into too much detail. To help avoid these pitfalls, try the following:

- Plan to accomplish the *Scan* in a limited amount of time. While every situation will be different and more time may be needed to scan broader portfolios of responsibility, *Scan* is intended to be accomplished within weeks, not months.
- Do not be tempted to look at actual climate datasets or analyses of impacts – look only at high-level summary information. More detail and evidence can be incorporated in later cycles and with further work.
- If you are struggling to have enough knowledge within your team, consider bringing a range of people together for a small workshop to envision the future and identify risks and their consequences, rather than delving into the literature.
- If it starts to feel too large and overwhelming, take that as a sign that you are going too deep and pull it up to a higher, more strategic level. This could involve scanning broader areas of responsibility and/or focusing on broader, more strategic objectives, aims and goals.
- Revisit why you are conducting a *Scan* (which you recorded in Step 1) and make sure your approach is matched to that purpose.

What areas of responsibility to include?

Which of your policies, programs, assets, goals, or objectives should be within scope for the risk assessment? Which can be left out?

Your choices here will structure the *Scan*, defining the areas within which you explore climate risk. The areas need to be broad enough and strategic enough to keep the *Scan* at a high level. The types of areas to consider depend on how your agency operates.

Pick one framing that works for you. Choose from the following list or create your own framing:

- Goals or Objectives
- Desired outcomes
- Divisions
- Policy or broad Program areas
- Types of assets

HINT

Keep PBS Outcomes in mind

While you may find they are too broad to perform a *Scan* with, the Portfolio Budget Statements outcomes should always be kept in mind, and may provide a useful starting point.

Once you have decided which of the above is the right framing for you, list all of the elements of this frame. For example, if you have decided to use Divisions, list your Divisions. If you have decided to use objectives, list the objectives for your agency.

Decide if there are some that don't need to be considered at this stage. This could be because they are being considered as part of other processes or because they have no potential to be impacted by climate change, even indirectly.

You may need to try a couple of different framings, to find the one that fits best. Only you can determine which framing can work for you.

CASE STUDY

Categorising areas of responsibility

Different departments may use different framings to categorise their areas of responsibility because of the different ways in which they think about objectives and plan for particular outcomes. The Department of the Environment and Energy scanned their policies and programs for climate risks as high-level outcomes are built into their programs. The Department of Agriculture and Water Resources structured their climate risk management around their different Divisions because that is where high-level objectives are specified. Parks Australia considered how climate risk would interact with their agency's enterprise risks.

Who should be involved and in what ways?

Be clear on who will lead the *Scan* process.

As already noted, the leaders are likely to be a facilitation team who will involve others as needed. The **core facilitation team** could include people with:

- climate change adaptation or planning experience, sourced internally or brought in from elsewhere
- internal risk management expertise, particularly if that is the functional area most likely to have carriage of the process going forward or which contributes existing practices that this work needs to align with
- business continuity experience, as this functional area often has a whole-of-systems view that is useful in considering climate risk
- futures thinking experience, though some people with experience in climate change adaptation and planning will be skilled in this.

HINT

Use your agency's stakeholder management templates

There are multiple purposes for involving stakeholders – to gather their knowledge, gain their endorsement, or help them take action. Your existing stakeholder management templates may already be designed to help you work through this.

Ideas about **who else to involve** will generally emerge from your articulation of why you are doing this and what areas of responsibility should be in scope, much like a standard stakeholder engagement plan. As the *Scan* is a fairly simple, high-level process, there is no need to be too extensive or complicated here, and direct engagement of stakeholders in the *Scan* process may involve a light touch. However, be clear about the following:

- Will you need to gather information from others because the core facilitation team will not have the relevant information themselves? If so, consider how to do this in a simple way, perhaps through informal conversations or a small group workshop.
- Will you need to keep the Executive or other key decision makers engaged to ensure you are meeting their needs and expectations? If so, consider how best to brief them, including whether there are existing mechanisms to do so.
- Who do you expect to be in a position of taking action beyond the *Scan*? Involving them now will help ensure your work can be carried forward.
- Are there stakeholders, either internal or external, who may feel threatened or excluded if they are not involved? If so, consider how best to give them a sense of involvement in the process.
- Is there another agency who may be similar to yours who you could seek advice from or work in collaboration with?

CASE STUDY

Involving risk management and foresighting teams

The Department of Agriculture and Water Resources found involving their central risk management team essential to aligning their *Scan* within existing risk management procedures. It also gave them an opportunity to communicate with their Executive, which regularly reviews risks, providing a potential avenue for gaining support beyond the *Scan*. The Department of Health found it useful to engage with their team that does foresighting – looking well into the future to inform strategy now. Working with people from different areas within the Department of Health provided an opportunity to get many perspectives on impacts from climate change early. This approach seeded the need to consider climate impacts more widely in the Department of Health and succeeded in setting a direction for the strategy phase.

Draw up a simple plan

With these considerations in mind, document how you will carry out the remainder of the *Scan*.

Ensure you clearly articulate the goals of the assessment, identify what areas of responsibility you will include (and justify why any are left out), and identify what types of individuals or functional areas need to be involved in the remaining steps and how they will be included. Be clear about the end point for this exercise, including time frames and approval processes.

As *Scan* is a rapid first pass for high-level identification of risks, this plan could be as simple as a one-page brief.

What have you accomplished in Step 1 – Scoping?

You should have:

- An understanding of the goals you are working towards in conducting a *Scan*
- Identified which parts of your agency, or policies, programs or assets are going to be included
- Produced a short written plan of action for conducting the rest of the *Scan*, including who needs to be included and how

Step 2: Envisioning – envision a scenario with greatest plausible change

To be able to identify climate risks, you first need to explore how climate change may affect the world in relation to your areas of responsibility.

As it is not possible to fully predict or know the future, this is best done using a qualitative approach. This is especially true in the *Scan* cycle as you need to remain at a high level. The aim here is to envision a scenario of ***Greatest Plausible Change*** in the world to ensure your assessment is robust to what the future might bring and a range of associated risks.

At this stage, you do not want to exclude any major risks from consideration – prioritisation of which of them to address will occur later.

Decide on the timeframe you should be considering

Decide how long the consequences might last for decisions or actions in your areas of responsibility and think about that point in the future – be it 2030 or 2090. This is called your ***Decision Lifetime***.

HINT

Make the choice of *Decision Lifetimes* simple

Summary information on projected climate changes is available for 2030, 2050 and 2090 on Climate Change in Australia. Picking one of these as the end point of your decision lifetime will make it easy to use simple climate change information to support your *Scan*.

CASE STUDY

Choosing timeframes based on decision lifetimes

Participants in the pilot Climate Risk Masterclass used different timeframes depending on the hypothetical policies and programs set out in the climate risk management exercise. Only climate risks out to 2030 were considered for Sporty Kids, a hypothetical short term program to encourage active children because few decisions made now would lock in consequences or constraints beyond that timeframe. In comparison, the hypothetical infrastructure program needed to consider climate risks out to 2090 as new infrastructure would need to be operational at least that long.

Paint a picture of that scenario

What is the ***Greatest Plausible Change*** that climate change (and other drivers) may create in the world by the future date you are considering?

Craft a scenario of the greatest plausible change as richly as you can to put a vision of that future world in your mind, and in the minds of any others you are involving in the *Scan*. Ask yourself:

- What *types of change* could you expect?
- *How much change* of those types may occur by the future date you have chosen?

This is a qualitative, brainstorming process but it should be grounded in the basics of what we know about climate change and other relevant drivers and their impacts.

You are effectively using the simplest possible ***Scenario Analysis*** approach by creating one scenario based on greatest plausible change. This is consistent with the recommendation of the G20 Task Force on Climate-related Financial Disclosures to use scenario exercises to identify climate risks.

When crafting your scenario, be sure to consider the direct climate changes (like shifts in temperature and rainfall), the indirect climate-related changes (like increases in drought), and the changes that may arise from the policies and practices of others (like the consequences of increased drought if landholders are not able to change their practices in response). For more guidance, see ***Greatest Plausible Change*** in the *Technical Supplement*.

Your scenario should be able to articulate: What will the world be like at the end of your decision lifetime if all changes you selected come to pass?

HINT

Get a sense of the future using the Analogues Explorer

For the *Scan*, you only need to paint a qualitative picture of the future under greatest plausible change. One of the easiest ways to do this is to use the Climate Analogues Explorer on Climate Change in Australia. Select 'RCP 8.5' which is the highest emissions scenario, the timeframe you are considering, and a location in Australia. The Explorer will then indicate which other locations in Australia currently have climates similar to the one your location may experience in the future. (You may need to adjust the settings at the bottom slightly if there is no direct analogue.) This can give you an instant view into the potential look and feel of climate change relevant to your area of responsibility. For example, at 2090 under RCP8.5 Canberra could have a climate similar to Muswellbrook, Scone, Dubbo or Parkes.

Getting information to help paint the picture

You could source the information necessary for the scenario of greatest plausible change from the following:

- Gather people with some diverse knowledge and experiences together to craft a scenario.
- Work with any summary or review documents on climate change impacts relevant to your agency.
- Build a vision of the ***Greatest Plausible Change*** from high-level information about the changing climate (see ***Sources of Climate and Climate Impacts Data*** and ***Selecting the Right Climate Information***).
- Include information on other drivers of change, like population growth, increasing urbanisation and changes in technology.

HINT

Decide how futuristic you can go

Climate change is well-recognised as a significant disruptor and threat multiplier. As a result, the risks and opportunities that eventuate will be hard to predict. People also have a tendency to imagine the future as more similar to the present than it actually will be. If you asked people 40 years ago to imagine the world we have today, they would have got it wrong and almost certainly underestimated change. It is important to envision your greatest plausible change future in as bold a way as you can. This is what will allow you to identify the most significant risks and truly test your area of responsibility.

However, people can also feel threatened by change and a very changed future can highlight many risks and inadvertently become disempowering and a barrier to action. Only you will know how far you can push this futures thinking in your area of work, to get the most benefit without disempowering your colleagues.

What have you accomplished in Step 2 – Envisioning?

You should have:

- Decided how far in the future you should be thinking, based on how long-lived the consequences for your decisions and actions truly are
- Painted a rich picture of the greatest plausible change in your world given that timeframe, relying on summary information and potentially input from others rather than detailed data

Step 3: Identifying Risks – brainstorm climate risks given this future

To identify high-level climate risks, you need to think of the scenario you developed in **Step 2 – Envisioning** and ask yourself how all your areas of responsibility listed in **Step 1 – Scoping** would fare in that scenario if you did nothing differently.

If in **Step 1 – Scoping** you decided to focus on Divisions or policies or program areas be clear on their objectives and goals. This will make it easier to identify risks because otherwise you're just investigating change or impact, not risk. A risk is anything that makes it harder to achieve your objectives or goals.

HINT

Do Steps 2 and 3 together

It is useful to complete Steps 2 and 3 close together in time (at the same workshop or within the same work week). You may even find you need to iterate between them as brainstorming risks may lead you to update your ***Greatest Plausible Change*** scenario.

Identify the risk types already considered in your agency

Your agency may have a risk management approach that includes particular types or categories of risk. For example, there may be risks to:

- Work health and safety
- Reputation
- Trust and cooperation within government
- Financial sustainability
- Infrastructure and assets
- Legal liability and compliance
- Strategic direction
- Governance
- Sustainability and reliability
- People and communities, including your stakeholders, who may also have risk transferred to them by others

HINT

Don't forget about opportunities

Climate Compass draws on risk management to frame the approach. However, climate change may present just as many opportunities as it does risks. In risk management, opportunities are still considered and are often called 'upside risks'. Thus, every time *Climate Compass* mentions 'risks', be sure to think not just about problems arising from climate change but also the opportunities.

Develop your own list of risk types if you need to

If your agency does not have formal categories of risk types to work with, create your own checklist drawing on the one above.

If you need more guidance, think about the following and add any risk types that come to mind as a result:

- existing risks that are climate and may be different under climate *change*
- extreme weather events
- social, political and financial risks that may be linked to physical risks
- transition risks – risks arising from the anticipatory political and societal changes aimed at mitigating climate change
- indirect risks due to changes in supply chains (upwards or downwards)

List climate risks for all areas of responsibility

Consider each of the goals and objectives, defined in **Step 1 – Scoping** (noting that if you decided to focus on Divisions or policies or programs areas, clarify their objectives and goals). In turn, consider whether each of the risk types identified above, affect your ability to achieve the goal or objective in the context of your ***Greatest Plausible Change*** scenario. Then list the high-level risks and opportunities. See also ***Identifying Climate Risks***.

For example, your goal may be to maintain market access for agricultural producers. In **Step 2 – Envisioning** you have created a greatest plausible change scenario for 2050. Systematically, you consider whether there is a work, health and safety risk, reputational risk to government, financial sustainability risk, etc, to your goal in your greatest plausible change scenario. In this example, you may decide there is no work health and safety risk, but there are reputation risks for government and financial sustainability risk.

Each area of responsibility may incur multiple types of climate risk, and present multiple opportunities to improve delivery of objectives and outcomes.

HINT

Start with current climate risks

While we often think of climate risks as risks that will arise in the future, many climate risks exist now, like natural disasters associated with extreme events. Start by thinking about your current climate risks and ask what new risks may arise as the climate changes.

Use open-ended brainstorming within the structured process recommended above.

The key issue here is to take a precautionary approach – if there is a possibility of risks, include them at this stage. It is important to think broadly about what areas are potentially sensitive to current or future climate change.

It can help to engage your internal (and perhaps external) stakeholders at this stage, bearing in mind that this is only a *Scan*. Including stakeholders ensures that your work aligns with their knowledge and values, and can help provide a higher level of creative input.

What have you accomplished in Step 3 – Identifying Risks?

You should have:

- Listed high-level climate risks and opportunities for each of the areas of responsibility you are considering (from **Step 1 – Scoping**)

Step 4: Prioritising Risks – decide which climate risks to focus on

Now that you have your list of climate risks and opportunities, you will need to prioritise them to decide which to take forward and explore further.

Traditional risk management processes ask you to use a risk matrix with a likelihood and consequence scale to determine an overall risk rating. Priorities are then pre-determined based on the combined rating (the more extreme the combined risk rating, the higher the priority).

However, this approach is not entirely suitable for climate risks. It tends to de-emphasise or even exclude risks where the likelihood may be uncertain, even if the consequences are major or catastrophic. It also fails to take into consideration the fact that the likelihood and consequences of a given risk will change over time. As a result, it can create a limited and inaccurate view of climate risk. It may also put undue emphasis on risks that are extremely hard to address at the expense of those that could be readily managed.

Even if you continue taking a traditional risk management approach to prioritising your climate risks, you will need to use a modified matrix. One critical change is that you need to consider the likelihood and consequences of risks in the context of the greatest plausible change scenario you created, assuming no additional risk controls are applied. This means avoiding the temptation to consider the recent past to inform the future and instead cast your mind forward through the full timeframe you decided to consider in **Step 2 – Envisioning**. It is not enough to simply ask what the consequences of the risk are today.

Note that there is no single best-practice approach to modifying a risk matrix to include climate risk. You can decide what works best for you. Below is a suggested approach that may be the most straightforward. If it does not suit your agency, two other options are presented.

Any of these approaches can be combined (prioritise risks with potentially catastrophic consequences, but then also risks of a certain type that have at least moderate consequences).

The important thing is to decide on your approach *before* starting to prioritise, so decisions are clear and transparent and the same approach can be followed (or modified as necessary) in the future.

Remember, this is only the *Scan* cycle, so a fairly simple process of prioritisation is appropriate. Any priority risks (or priority areas of responsibility like Divisions or programs of work, as this may be a more practical way to prioritise) will be taken forward from here, where risks will be examined in greater detail to see if and what action is warranted.

See ***Risk Management for Climate Risk*** for more information.

Prioritise based on consequences alone

Consequences are the effects that result when a risk is realised or incurred. They are independent of how likely it is that the risk will be realised or incurred. If likelihood may not be as clear as for other types of risk, it is possible to prioritise risks entirely based on the severity of their consequences. A given risk may have many different types of consequences, so:

- Specify all the different consequences of each risk.
- Rate those consequences in terms of severity (e.g., minor, moderate, major, etc.), using your best judgement (this is how all risk consequences are rated).
- In keeping with the precautionary principle and the principle behind the use of greatest plausible change, assign each risk an overall consequence rating based on the maximum rating of any of its consequences, or some sort of 'sum' of the consequences.

Alternative – prioritise certain types of risk based on your risk appetite

'Risk appetite' refers to both the amount of risk an organisation is willing to carry as well as the type or nature of the risk the organisation believes it is most sensitive to. For example, some organisations have an appetite for financial risk while very few are willing to take risks with people's safety.

You can use this approach to prioritise without having to rate the likelihood or consequence of risks. To do this:

- Rank the risk types you used to structure **Step 3 – Identifying Risks**, ordering them from those your agency is least willing to incur to those your area is most willing to incur. Those at the top of the list will be your top priorities.

Alternative – prioritise risks that are less certain

Likelihood of climate risks being incurred may be particularly difficult to rate and may change over time. It is certainly not suitable to assess likelihood based on experiences in the past, which is often recommended in typical risk management. In situations of reduced certainty, it is tempting to leave risks with uncertain likelihood off the risk table, or to downgrade their likelihood ratings. Instead, it may be possible to:

- Add an 'uncertain' rating and make this a high priority, especially if the consequences are moderate to catastrophic.

CASE STUDY

Prioritising based on consequences

The Department of Agriculture and Water Resources prioritised the risks they identified using the risk management procedure outlined in their department's Enterprise Risk Policy and Framework. This ensured a consistent approach which aligned with their department's policy on risk management. To prioritise the risks identified, they determined an estimated risk rating for each risk through consideration of the likelihood of the risk occurring and the severity of consequence. To ensure the greatest plausible change was identified, they considered many different types of consequences for each of the risks they identified. The final rating of severity was based on the most severe rating for any of the consequences.

What have you accomplished in Step 4 – Prioritising Risks?

You should have:

- Decided on a way to prioritise your risks – it may build on but should not be exactly like a standard risk matrix approach
- Applied that method to put your risks or areas of responsibility into a priority order for further analysis beyond the *Scan*

Step 5: Planning – determine next steps to address priority risks

In the *Scan* cycle, you are not yet considering specific risk treatments. You are planning which priority risks to explore further and how.

For each priority risk, consider how to take the next step

If you are using *Scan* to decide where to put more attention – for example to decide which of your areas of responsibility warrant a deeper investigation through a *Strategy* cycle – develop a short plan to commence those deeper investigations. In your plan, you will want to specify the following:

- who should lead the *Strategy* or other further work
- whether any coordination across different priority areas is needed
- whether an external consultant should be engaged to assist
- any changes in risk management procedures or other types of processes that may be needed to enable further work on climate risk
- whether your agency as a whole needs to start a process of amending its overall goals and objectives because the risks to achieving them are too great
- whether there are any other significant barriers that might need to be removed first before further investigations can commence

It may be helpful to revisit **Step 1 – Scoping** to consider the goals behind further investigation and who should be involved.

If you are using *Scan* as the first step in a *Strategy* or *Project* cycle, look through the steps of those cycles and use the priorities you identified in **Step 4 – Prioritising** to develop your more focused project plan.

If necessary, sequence efforts to address priority risks

If you have a number of priority risks to address and resources to explore them further are limited, you may need to decide which need further work *now* and which can be addressed later.

This is a very simple version of ***Using Adaptation Pathways***.

HINT

Upcoming activities can provide an easy way to decide which priority to tackle first

Is a policy or legislation coming up for review? Is a program about to do a new round of funding? Is an asset about to undergo maintenance? Do you have a new policy or program under development? These upcoming activities can mean that certain priorities make sense to tackle first.

If you do need to sequence, here are some criteria that will influence the order of the priority risks:

- Relationships between risks – some risks may influence others, and these more foundational risks should be started first as addressing them will have more widespread benefit.
- Lead time to implement – areas that may take a long time for treatments to be developed and implemented need to be started first.

- Remit provided by senior executive and/or appetite of stakeholders – areas more likely to win support may be started first.
- Legislative or policy requirements or constraints – some risks may need to be addressed first either because of the need to comply with legislation or because they represent constraints on areas that could otherwise be acting more fully or more rapidly.
- Effectiveness in managing the climate risk – if high priority risks seem very hard to address, it may be worth putting them later in a sequence while you build skills with risks that may seem more straightforward.
- Decision lifetime – depending on your organisational culture, you may wish to tackle short-term immediate risks first because you will have a more immediate impact, or tackle long-term pervasive risks first because they are more important to address.
- Consistency with other organisations who are managing similar climate risks – sharing resources and insights with others can make the process more efficient.

Develop a brief report

Taking action at the end of the *Scan* cycle may mean you submit a brief or report to senior executive detailing your findings and next steps.

You will need to make sure that you have the endorsement of the relevant decision-makers identified in **Step 1 – Scoping** to enable further work to be undertaken.

CASE STUDY

Presenting your results

The Department of the Environment and Energy presented the findings of their *Scan* to Division Heads. The findings were presented in a style similar to a traffic light report highlighting areas for further climate risk management. The Climate Policy Team in the Department of Agriculture and Water Resources conducted a *Scan* of all the divisions in their department and prepared a report for their Executive Management Committee who will determine if further risk management action and consultation with divisions is necessary. The report identified 'priority risks areas' - those with a high or extreme estimated risk rating that may require further consideration and risk management action.

What have you accomplished in Step 5 – Planning?

You should have:

- A rough plan (and sequence if necessary) for how to further explore priority risks
- Confidence that you will now be spending resources on a deeper exploration only where it is a priority need for your agency
- A report on the *Scan* process and potentially a written further project plan

Step 6: Evaluating – embed Scan in future processes and share learnings

Evaluate, learn and plan to update

Scan should be repeated over time as a quick way to check whether risks and their relative priorities are changing, both as the climate changes and as we continue to respond to climate risks. Make an explicit plan to revisit the *Scan* process once every few years.

HINT

Embed climate risk in existing formal processes

Ongoing climate risk management is more likely to be successful if it is embedded in formal organisational processes rather than if it relies upon particular people or relationships to make it happen.

This plan should also take advantage of what you have learned to make the *Scan* process even more streamlined and successful next time. To do that, evaluate the process you have used in *Scan* by asking the following questions and deciding if you should do anything differently next time:

- Did you identify new risks or opportunities (upside risks) you weren't aware existed?
- Do you have greater confidence moving forward with addressing climate risk?
- Did the effort involved in *Scan* seem worthwhile for the outcomes? If not, could you have put more limited effort into *Scan* to get the same results?
- Did you identify barriers to considering climate risk that you weren't aware of?
- Do you have better awareness of how to move forward with climate risk?

Share your journey to help others

Sharing your learning is an important component of the risk management planning process – it will help to improve risk management practice generally across all of government. It may be beneficial to you as well, particularly if you are able to share with your senior executive or other key decision-makers.

One of the most effective ways to share your experience is through the ***Resilience Builders Network***.

What have you accomplished in Step 6 – Evaluating?

You should have:

- Evaluated the overall benefit gained from using *Scan* to focus further work
- Put in place mechanisms to ensure the *Scan* can be revisited and updated
- Shared your learning

Heavy rain in Queensland
Photo by Liese Coulter. © CSIRO

Strategy cycle

The *Strategy* cycle is a formal process to identify climate risks for areas of your responsibility that have been deemed a priority, and plan a strategic approach to address those risks.

The *Strategy* cycle follows the same steps as the *Scan* cycle, but you delve more deeply into some steps, draw on more existing information sources, and focus more on risk treatments. This greater depth means that *Strategy* requires more time to complete compared to *Scan*. It is directed at the set of priority risks already determined through *Scan* or a similar high-level process to ensure that the extra resources required to complete it are focused on clear priorities.

At the end of the *Strategy* cycle you should have a strategy or plan for managing the climate risks or capturing the climate opportunities for the areas of responsibility that are within your remit. This may include some areas that do not need action now, as well as others where a *Project* cycle may be needed to develop a specific operational plan.

Strategy cycle

Step 1: Scoping – set the scope including the why, what and who

Step 2: Constructing – construct a scenario with greatest plausible change

Step 3: Identifying Risks – clarify risks and prioritise them

Step 4: Prioritising Actions– identify and sequence actions to address risk

Step 5: Planning – develop a strategy and implementation plan

Step 6: Evaluating – embed learning in your plans and share lessons

Step 1: Scoping – set the scope including the why, what and who

This step is about scoping the *Strategy* activity – being clear about why you are doing it, what areas of responsibility you intend to consider, and who should be involved in what capacity.

Answer the following five questions, and record your conclusions as they will help inform further work. If you have already conducted a *Scan*, most of these steps can draw on work you have already done.

HINT

Keep a record using existing project planning templates

Your department is likely to have standard project planning templates. A *Strategy* can be a project just like any other, so use those templates to record your answers to these questions and the decisions you make in working through *Climate Compass*.

Why are you doing a *Climate Compass Strategy*?

There could be multiple reasons, and they will be slightly different to your reasons for doing a *Scan* (if you have done one). Questions to consider are:

- Did you conduct a *Scan* and realise there is further work to do to identify and take action on priority climate risks?
- Did you previously begin exploring climate risks using something other than *Scan* but realise you needed a more formal approach?
- Have you previously been addressing climate risks largely at a project level and realise you need a more comprehensive, strategic approach?
- Have you identified significant potential opportunities in the changing climate and want to ensure you are taking advantage of them?
- Are you complying with a directive, including legislation and regulations (such as work, health and safety regulations)? Are you complying with a directive from management to consider climate risk?
- Are you responding to interest and pressure from outside stakeholders?

What areas of responsibility to include?

If you have previously done a *Scan*, this step is complete as you will include the risk or risks that were prioritised.

If you did not conduct a *Scan*, either go back and do so, or consider how other work you have done will allow you to specify priorities. These need to be framed around goals or objectives, desired outcomes, or policy or program areas and the high-level risks they may face. See *Scan* cycle's ***Step 1 – Scoping*** for more information.

What are your aims in addressing climate risk?

Refer to existing strategic documents about the areas of responsibility and high-level climate risks prioritised for inclusion in *Strategy*. Identify the goals, objectives, or desired outcomes, paying attention to how they are described.

Consider how realistic each of these goals or objectives are in a changing climate.

Depending on how realistic the goals or objectives are, your aims in addressing climate risk may be to:

- eliminate the risk to ensure these objectives will be fully achieved (because they are realistic)
- partially mitigate the risk by reducing the chance that the objectives won't be achieved, or
- understand whether new more achievable objectives need to be developed.

These aims may only become clear to you as you go through *Strategy*, so you may skip this step if it is unclear to you. But if you can be clear about how fully you intend to address climate risk now, it will help you identify risks and actions to address them within clearer boundaries, making your task more efficient.

CASE STUDY

Different ways to focus *Strategy*

Parks Australia performed a *Scan* of their enterprise risks and realised that *Strategy* would be usefully focused on the priority risks they identified but at the scale of individual parks. In contrast, a preliminary *Scan* by the Wetlands Policy Team suggested that a priority risk across all Ramsar wetlands in Australia as a result of climate driven ecosystem change was the potential for sites to no longer meet certain Ramsar listing criteria. In extreme cases, this could lead to loss of Ramsar listing status. This priority risk could be addressed through a *Strategy* conducted across all wetland sites.

What existing processes and practices do you need to link with?

For the results of a *Strategy* cycle to be carried forward into implementation, they will likely need to fit into your agency's existing processes for planning, forming strategy, and decision-making. These processes may also differ across different areas of responsibility you have prioritised for inclusion in *Strategy*.

Below are some questions, not all of which may be relevant, to trigger thoughts about how you operate.

- How is the governance of your agency structured – branches, sections and cross-communication?
- What are the key activities of your area of responsibility, including operating standards, regulations and procurement as well as outputs?
- What is the history of engagement on climate change issues?
- What is the relationship of your agency with its stakeholders, especially when engaging on climate change?
- How does your agency gather information and make its decisions?
- How do you interact with other agencies and institutions and do your risks depend on what they do (i.e. are there cross-dependencies)?

If there are likely to be major institutional blockages in implementing any conclusions from *Strategy*, then you should place more emphasis on institutional analysis and lead times for institutional change within the subsequent steps of *Strategy*.

Who should be involved and in what ways?

First and foremost, you need to be clear on the team who will lead the *Strategy* process. As already noted, they are likely to be a ***core facilitation team*** who will involve others as needed. See ***Step 1 – Scoping*** in *Scan* for further guidance.

HINT

Use your agency's stakeholder management templates

There are multiple purposes for involving stakeholders – to gather their knowledge, gain their endorsement, or help them take action. Your agency's existing stakeholder management templates may already be designed to help you work through this.

Develop a stakeholder engagement plan, identifying who your stakeholders are, the outcomes you want to achieve with each stakeholder, and how you will engage with them – especially whether and how you will involve them in the steps of *Strategy*.

It is important to have a clearly defined plan for stakeholder interactions across multiple levels. Stakeholders may provide much of the needed information. You will also be empowering your stakeholders and preventing possible blockages in risk treatment implementation. Leading practice climate risk management emphasises stakeholder engagement, but careful planning is required to build positive and productive relationships with your stakeholders, involving them directly in the planning process.

Ideas about who else to involve and how will generally emerge from your articulation of why you are doing this, what areas of responsibility should be in scope, and particularly what processes and practices you need to link with to ensure your resulting plan has support and will be acted upon.

You want to be clear about the following:

- Will you need to gather information from different functional areas because the core facilitation team will not have the relevant information themselves? If so, consider how to do this in a sufficiently in-depth way, perhaps through a working group or workshops.
- Will you need to keep managers or senior executive engaged to ensure you are meeting their needs and expectations? If so, consider how best to brief them, including whether there are existing mechanisms to do so.
- Who do you expect to be in a position of taking action beyond the *Strategy*?
- Are there other key decision makers who will be needed to endorse your *Strategy* or facilitate further action? Do you need a key decision maker to champion this work? If so, keep them aware of and engaged in the process so they can prepare to drive change forward.
- Are there stakeholders, either internal or external, who may feel threatened or excluded if they are not involved? If so, consider how best to give them a sense of involvement in the process.

- Are there other procedures, operating standards, regulations, or rules that must you comply with? Are those clear or do you need to actively involve other people in the process as a result?
- Is there another agency who may be similar to yours who you could seek advice from or work in collaboration with?

HINT

Collaborate with your key stakeholders

As a general rule, the more directly you involve stakeholders in the *Strategy* cycle, the more they can contribute to improving the resulting plan, and the greater sense of ownership they will have over it. This makes it much more likely they will help take the risk management plan forward into action, if required. You should aim at the start to involve stakeholders as early and as often as possible.

Draw up a plan

Document how you will carry out the remainder of S*trategy*.

Ensure you clearly articulate the goals of the assessment, identify what areas of responsibility and/or priority risks you will include, and identify what types of individuals or functional areas need to be involved in the remaining steps and how you plan to include them. Be clear about the end point for this exercise, including time frames and approval processes.

What have you accomplished in Step 1 – Scoping?

You should have:

- An understanding of the goals you are working towards
- Confirmed areas of responsibility and/or high-level priority risks you will address
- An endorsed plan of action for the rest of this *Strategy* activity, including when and how to bring different stakeholders into the process

Step 2: Constructing – construct a scenario with greatest plausible change

To be able to identify climate risks and appropriate treatments, you first need to explore how climate change may affect the world in relation to the priority focus areas for *Strategy*.

The *Scan* cycle used a qualitative visioning process. If you did not conduct a *Scan*, you may wish to refer to ***Step 2 – Envisioning*** in the *Scan* cycle.

The aim in this step in *Strategy* is to build on your vision of the ***Greatest Plausible Change*** that you developed in *Scan*. This draws more heavily on data sources to create a mixed qualitative and quantitative view of the future. This is why we say you are now 'constructing' a scenario rather than 'envisioning' it.

Decide on the timeframe you should be considering

If you conducted a *Scan*, use the ***Decision Lifetime*** selected for that cycle.

If you did not conduct a *Scan*, refer to ***Step 2 – Envisioning*** of the *Scan* cycle and ***Decision Lifetimes*** to decide on the decision lifetime(s) most relevant to your priority areas of responsibility and/or high-level risks.

HINT

Build in some iteration

It's difficult to identify climate risks without envisioning the future, but it's also difficult to envision the future in enough detail without having a sense of the nature of climate risks. To get past this 'chicken and egg' problem, conduct **Step 2 – Constructing** and **Step 3 – Identifying** at the same time, working back and forth between them a few times.

Construct your scenario using a variety of data sources

What is the greatest plausible change that climate change (and other drivers) may create in the world by the future date you are considering?

To construct this scenario, you will need to ask yourself:

- What *types of change* could you expect?
- *How much change* of those types may occur by the future date you have chosen?

You are effectively using a simple ***Scenario Analysis*** approach, remaining consistent with the recommendation of the G20 Task Force on Climate-related Financial Disclosures to use scenario exercises to identify climate risks.

Getting information to construct this scenario

To source information to construct this scenario, you will need to combine quantitative information with qualitative information and expert opinion. This is partly because there are many potential climate changes and impacts that have not been studied or are still unclear. If you restrict yourself to only the available quantitative information, you may end up missing important risks.

HINT

Use the Regional Climate Change Explorer to get summary data about climate change

While *Strategy* makes more use of data than *Scan*, you do not need to access full datasets of climate projections. The Regional Climate Change Explorer on Climate Change in Australia provides summary information from data for different parts of Australia. Pay particular attention to information for 'RCP 8.5' which is the highest emissions scenario and is most appropriate to consider when thinking about greatest plausible change.

Start with existing impacts analyses

Begin by sourcing credible scientific information on climate change impacts relevant to your area of work. There may be many papers available, but look in particular for summary or review documents to give you reliable information without overwhelming you with detail. Use impacts information and analyses that were done for your decision lifetime and for a high emissions scenario (see also ***Emissions Scenarios and Climate Projections***).

When thinking about which impacts to include, consider impacts in each of the categories that are used when thinking about risk:

- **Physical impacts** – both direct and indirect impacts of the change in climate itself
- **Transition impacts** – changes that others make to respond to a changing climate which may in turn impact your area of responsibility
- **Liability impacts** – things that may change in the world as others seek to limit their liability

Using the same categories but focusing first on impacts rather than risks is important because your scenario is about change in the world – direct and indirect impacts. Impacts are just changes, not all of which actually create risk. Later, you will determine whether these impacts present risk for your areas of responsibility.

HINT

Run a workshop

Running a climate impacts and risks workshop is one of the quickest ways to construct this future using expert opinion. Invite a diversity of experts relevant to your area of responsibility, come prepared with existing information, and work together to build the table above.

Supplement with expert opinion

There may be little existing information about impacts of climate change in your area, or the information available may be qualitative and/or partial. It is important to supplement any information available with expert opinion drawn from impact and adaptation researchers as well as you and your stakeholders, particularly those with direct experience of existing climate risks. The degree to which you will do this will depend on how much existing impacts information you can source. Gathering expert opinion on impact should be done using a structured discussion process. Gather a set of experts (including yourself and your key stakeholders) and go through the following steps to produce a table like the one shown on page 33:

- Access and record relevant summary climate change information (see ***Sources of Climate and Climate Impacts Data*** and ***Selecting the Right Climate Information***) – the first column of the table on page 33.
- Drawing on this information, specify some of the derived climate-related changes that may occur within your decision lifetime under a high emissions scenario – the second column of the table below. An example might be longer and/or more severe droughts.
- Specify the flow-on impacts – the changes in the types of things you have responsibility over – the third column of the table below. An example might include land degradation if land management practices do not change in response to increased drought conditions. Consider physical impacts, liability impacts, and transition impacts.
- Add to the table any additional impacts you are aware of from the summary and review documents you have found and additional expert opinion. Trace those back to think about and record in your table how they might arise from derived climate-related changes and from the direct climate changes as well.
- Add other major drivers of change and the flow-on impacts they may create. Consider population growth, demographic shifts, increasing urbanisation, changes in technology and the future of work, etc.
- Consider whether the flow-on impacts from other drivers interact with climate change in some way such that there are additional impacts you should specify or existing ones you should modify.
- You may need to work forwards and backwards through the columns a few times to be confident you have captured the physical, liability and transition impacts that are important to your area of responsibility and linked them to information available on changes in climate and other drivers.

The end product should be a table like the one below but specific to your areas of responsibility and priority high-level risks, followed by a list of the information sources you consulted.

Example of linking direct climate changes with derived changes and flow-on impacts, and including impact arising from other drivers of change. (Note that content is example only, not fully explored or referenced.)

Direct climate changes	Derived climate-related changes	Flow-on impacts
• Change in rainfall in different seasons • Increase in mean temperature • Seasonal changes in relative humidity • Increase in evapotranspiration	• More frequent extreme temperatures • Longer periods of extreme temperatures • Hotter 1-in-20 year hottest days • Decreased available moisture/soil moisture • More frequent/more intense drought	• Reduced crop quality • Reduced yield volume • Larger properties with fewer managers to ensure financial sustainability despite reduced quality and yield – and less labour for stewardship as a result • Reduction in market access for some agricultural commodities • Increase in areas unviable for existing commodities • Land and/or social degradation in areas where commodities produced do not change quickly enough • Increased risk of bushfire disrupting production and regional vibrancy/viability
Other drivers of change	**Derived changes**	**Flow-on impacts**
• Increased urbanisation	• Movement of workers to cities • Reduced labour including skilled labour available in regional areas • Reduced vibrancy of regional areas	• Reduced local ability to self-manage transition to new agricultural commodities (especially given potential disruption from bushfire noted above) • Larger properties to make better use of reduced labour force • Greater automation • Reduced financial sustainability for regional support industries

The final column of this table describes your constructed scenario representing greatest plausible change, developed using a mixture of data and information sources.

CASE STUDY

Different ways to construct the greatest plausible change scenario

The Wetlands Policy Team knew there was general information on impacts available, but not necessarily specific to the Ramsar wetlands they needed to include in *Strategy*. The team planned to use an ecological vulnerability analysis (looking at things like exposure and sensitivity) to identify how much wetlands might be under pressure to change and in what ways, then explored whether those ecological changes presented risks to the ability of managers to achieve currently stated management objectives

What have you accomplished in Step 2 – Constructing?

You should have:

- Decided how far in the future you should be thinking, based on how long-lived the consequences for your decisions and actions truly are
- Constructed a rich picture of the 'greatest plausible change' scenario in your world given that timeframe, integrating qualitative and quantitative data and expert opinion

Step 3: Identifying Risks – clarify risks and prioritise them

Specify the risks for your decisions, policies, programs and outcomes

To identify the more specific risks posed by the greatest plausible change scenario you constructed, you first need to identify the specific decisions and details of policies and programs in your priority areas of responsibility that you are focusing on. You then need to ask yourself whether each of them will be at risk of failing to achieve their objectives and outcomes as expected if the greatest plausible scenario constructed in **Step 2 – Constructing** were to be realised.

This is best done through a structured discussion using the following steps:

- List the goals, objectives or outcomes for each policy, program or area of responsibility you are prioritising in your *Strategy*.
- Ask if there is a risk that these wouldn't be achieved (assuming you do nothing differently) in the greatest plausible change scenario you have constructed. If there are risks, list them using a new column in the table you began in **Step 2 – Constructing**. See below for an example table.
- To go a bit deeper, list the more specific decisions, methods, or approaches used to deliver each policy, program or area of responsibility.
- Ask if there is a risk that these will become harder or lead to different outcomes in the greatest plausible change scenario you have constructed. If there are risks, list them in the table you began in **Step 2 – Constructing**. See below for the example table.

HINT

Build in some iteration

You may need to go back to **Step 2 – Constructing** briefly if you find you don't have enough information about an aspect of your greatest plausible change scenario that you need in order to explore a potential risk. For that reason, it makes sense to work through **Steps 2 & 3** at the same time, going back and forth between them as needed.

Example of specifying risks for a hypothetical program to provide assistance to primary producers. Risks derive from asking how flow-on impacts would affect decisions and objectives of that program (which are not shown). (Note that content is purely hypothetical and no relationship to existing programs or practices should be inferred.)

Direct climate changes	Derived climate-related changes	Flow-on impacts	Risks
• Change in rainfall in different seasons • Increase in mean temperature • Seasonal changes in relative humidity • Increase in evapo-transpiration	• More frequent extreme temperatures • Longer periods of extreme temperatures • Hotter 1-in-20 year hottest days • Decreased available moisture/soil moisture • More frequent/more intense drought	• Reduced crop quality • Reduced yield volume • Larger properties with fewer managers to ensure financial sustainability despite reduced quality and yield – and thus less labour for stewardship • Reduction in market access for some agricultural commodities • Increase in areas unviable for existing commodities • Land and/or social degradation in areas where commodities produced do not change quickly enough • Increased risk of bushfire disrupting production and regional vibrancy/ viability	• Assistance funding allows producers to delay transitioning their commodities and contributes to land degradation • Assistance funding is oversubscribed resulting in a reputational and potential liability risk to government • Assistance funding has no long-term benefit when delivered in areas that are increasingly unviable for physical or social reasons • Assistance funding does not adequately support producers to transition to new commodities (risks from failure to transition), contributing to regional declines, a reduction in the national economy, and a failure to take advantage of emerging market opportunities • Policies and/ or markets force transition without adequate assistance to do so, creating potential liability risks and failed new markets
Other drivers of change	**Derived changes**	**Flow-on impacts**	
• Increased urbanisation	• Movement of workers to cities • Reduced labour including skilled labour available in regional areas • Reduced vibrancy of regional areas	• Reduced local ability to self-manage transition to new agricultural commodities (especially given potential disruption from bushfire noted above) • Larger properties to make better use of reduced labour force • Greater automation • Reduced financial sustainability for regional support industries	

HINT

Don't forget about opportunities

While this process is framed around risks, opportunities are just as important. When considering the new opportunities that may arise from a changing climate, the risk is often that there are insufficient processes to recognise and take advantage of them. In the table above, there are opportunities for producers to transition to new commodities and many of the risks relate to lack of support by government for making the transition or existing support mechanisms inadvertently preventing or delaying the transition.

To ensure you are being systematic about identifying risks and opportunities, remember to ask yourself at each step if you have considered the three types of risks that might arise from the three types of impacts:

- **Physical risks** – risks arising from direct or indirect impacts of the physical changes to the climate itself
- **Transition risks** – risks arising from the process of adjusting to a changing climate, including changes in policies and global markets (or lack of changes in these, which may constrain an appropriate response)
- **Liability risks** – the exposure of an organisation or decision-maker to litigation or legal proceedings due to action or inaction on climate change

You should now have a complete list of possible risks within your decision lifetime for the areas of responsibility you have prioritised for *Strategy* if greatest plausible change occurs. If you have not involved key stakeholders in creating this list, you should at least involve them now to review the list.

Prioritise risks

The conventional risk assessment approach is to rate the likelihood of each risk, rate the seriousness of its consequences, and put these into a risk matrix which then automatically rates the severity of the risk.

However, this approach is not entirely suitable for climate risks. The rationale and processes for prioritising are the same as in *Scan*. So see ***Step 4 – Prioritising Risks*** in *Scan* for further guidance. The ***Risk Management for Climate Risk*** section in the *Technical Supplement* also includes some example modified risk tables and matrices that you can use.

Prioritise your risks. Then, adjust your priority list by eliminating risks that you don't need to consider treating for the foreseeable future. Depending in how you prioritised, these may be risks that you have rated as having insignificant or minor consequences, or certain types of risks that your agency has a high appetite for. If in doubt about a risk, keep it in as you will have an opportunity to further prioritise in the next step.

Just remember to keep a record of all the risks you considered, as those currently thought to have minor consequences may still become more significant in the future. So any plans to revisit the *Strategy* in future years (organised in **Step 6 – Evaluating**) should revisit all risks identified. You should now have an ordered set of priority risks to consider addressing.

What have you accomplished in Step 3 – Identifying Risks?

You should have:

- Identified the specific risks posed by your greatest plausible change scenario
- Prioritised these risks using a modified version of traditional risk management approaches

Step 4: Prioritising Actions – identify and sequence actions to address risk

HINT

Language – actions to address risks

Ways to address risk are typically called 'risk treatments' in traditional risk management. However, when addressing climate risk, some actions may not seem like 'treatments,' so *Climate Compass* generally refers to 'actions to address risk' or 'risk responses'. This also includes ways to foster new opportunities that may arise.

Identify possible actions to address the risks

Brainstorm possible ways to address your risks.

When brainstorming, it is important to put all ideas on the table. Don't constrain yourself at this point by dismissing ideas because of prevailing attitudes, policies or assumptions. A risk response may not be possible or may appear uneconomic at this moment, but climate change is a long-term challenge and the situation may change over time.

Actions which seem unlikely at the moment may turn out to be the preferred choice. Other actions to address risk may already be in the scope of current management plans and just need to be adjusted.

HINT

Diversity improves brainstorming

Engage with a diversity of stakeholders to brainstorm ways to address risk. This will ensure all possible ways to do so are considered.

Brainstorming can often be included in workshops you may already be running to work with your stakeholders to identify impacts and risks.

To brainstorm effectively, consider the following types of actions to address risk, appropriate to the scale and scope of *Strategy*:

- Change the way decisions are made, especially strategic ones
- Bring new information into a decision-making process
- Adjust the objectives or outcomes being sought
- Change the mechanism by which something operational is done
- Develop a detailed management or investment plan for more specific actions (such as through the *Project* cycle)

Where an option to address risk doesn't seem achievable at the moment, decide what the barriers are and whether it is worthwhile taking action to reduce or eliminate those barriers. These types of actions could include:

- Forming partnerships with other areas of government
- Commencing a new stakeholder engagement process
- Sourcing new information that is deemed critical but is currently unavailable.

Assemble actions into adaptation pathways

Consider how possible actions to address the risk interact, and group (or bundle) them.

By combining risk responses you may be able to better manage your climate risk. You could implement a range of risk responses at the same time or you may need to assemble them into a sequence for a staged implementation.

Combining your risk treatments into groups is referred to as bundling. Assembling the bundles into sequences, (called ***Adaptation Pathways***), allows a staged approach to addressing climate risks.

HINT

Interdependent actions may simply be necessary sequences

An example of two interdependent actions may be the development of a policy on revegetation to account for shifting ecosystems and the roll-out of a new grants program for revegetation activities to maintain biodiversity. The success of the second action relies on the successful implementation of the first one, so these should be bundled together.

Here is one approach to bundling:

- Screen the actions identified so you have a shortlist that seem addressable, at least in some way.
- Group actions that are interdependent or complementary (see Hints). Each bundle will contain one or more treatment measures and different bundles can contain some of the same treatments.
- Label your bundles so that you can differentiate them when you assess them
- Iterate if necessary. Often, thinking about these bundles may lead you to identify new treatment measures or possibly competing ones that need to be resolved.

HINT

Complementary actions are things that benefit from happening at the same time

For example, your goal may be to reduce the effect of heat on your outside workers, so complementary actions may be to implement a policy of altered working hours in extreme heat times and roll-out compulsory first aid training.

Once actions have been bundled, identify *when* you would implement the actions in each bundle.

A suggested approach to sequencing your bundles is to identify the time taken to implement each individual measure (see ***Decision Lifetimes***):

- Consider when current risk controls will cease working (for example, sea-level rise reaches 50cm, or heatwave conditions occur on more than 10 days a year). You may need to explore some of the climate change projections to do this (see ***Sources of Climate and Climate Impacts Data*** and ***Selecting the Right Climate Information***).
- Work backward from when your current risk controls will cease working, and consider when new actions would need to be working to effectively replace current risk controls.

- Then consider when the process of planning those new actions would need to be started so they would be working when required.
- If the action is part of an interdependent bundle, include *all* the interdependent actions as a bundle in this process. Identify when you need to commence planning the first action in the chain.
- Identify complementary actions or complementary bundles and whether they will be implemented at the same time based on the above work. If not, adjust timings to ensure they are.

It can be useful to create a visual 'map' of this sequence and timing of actions to see how your options fit together over time.

If you have only a few priority risks and a few actions to address them with near-term or clear objectives, your map will probably be fairly simple. If you are working with multiple priority risks and many interdependent and/or complementary actions to address them, you may have quite a complex map.

HINT

Lay out all your options

Visualise all your options to address all your risks. Some of these options may not be pursued. By laying them all out, you can see what initial actions are no regrets because they might contribute to addressing multiple risks. You can also see whether some initial actions might prevent other options being taken later. What is important here is to see how your risk management options interact with each other and when they need to be implemented.

Select which options to pursue

Identify which pathway or bundle of treatments is preferred for each priority risk.

Assess the options against each other by considering:

- Which options to address each risk are likely to manage the climate risks *most cost effectively?*
- Which options leave you with the *most future flexibility* to deal with uncertainty?

Clearly note which options are preferred and do not need to be implemented yet (and record a justification for this). Keep a record of all of your options as you may want to revisit these decisions in the future.

HINT

Involve your stakeholders

Involving stakeholders directly in your assessments and decision-making may be critical. While an option may seem to be strongly economically beneficial, it may not be socially acceptable. Or an option that appears to be only mildly beneficial from an economic perspective may help bring your stakeholders together and foster a positive environment for the implementation of other actions into the future.

Your selection should be based on a qualitative assessment with the input of your stakeholders. To answer the questions above, consider the following:

Legislative or policy requirement constraints: Some options to address climate risk may be constrained by legislation, guidelines or policies.

Acceptability from stakeholders: The effect of treatment options on stakeholders will influence the acceptability of implementation.

Effectiveness: Conventional risk assessments select the 'optimal' or most cost-effective response. Under climate change, this can actually lead to greater risk exposure since there is uncertainty about what to optimise for. It is more useful to consider which option is most robust to the uncertainty. Alternatively, think about which initial action(s) move in the right direction to support many alternatives later.

Risk allocation: Make sure that you have the accountability and authority to implement the treatment option or add interdependent actions to build this.

Decision lifetime: Consider how long the action might continue to be effective. Long-lived actions might seem preferable, especially if they are likely to operate well regardless of what the future might bring. Short-lived actions may be preferable if they help keep options open for the future.

Consistency: Actions that are similar to those being used by comparable agencies dealing with similar climate risks may be more cost-effective to implement. Research the experience of similar agencies grappling with comparable risks.

Do not be surprised if this thinking identifies new options, or leads you to expanding your adaptation pathway and bundling in more interdependent actions. Be prepared to iterate back to previous steps until you are satisfied with your sets of actions.

Formal economic assessment of treatments

You may want to invest in a formal economic assessment of different actions or whole adaptation pathways. However, this is usually not necessary or cost effective in the *Strategy* cycle. It becomes more important for large or contentious *Project* cycle assessments. If required, below are different evaluation techniques that you may want to consider to appraising risk treatments:

- Cost-benefit analysis
- Cost-effectiveness analysis
- Multi-criteria analysis
- Economic impact assessment
- Deliberative process
- Real Options Analysis

Note that all of these may require some degree of modification to appropriately support decisions that are robust to future uncertainty, especially cost-benefit and cost-effectiveness analysis. More information is available in the *Project* cycle.

Select thresholds and triggers to monitor

You should now have identified a preferred pathway to address your climate risks.

If you are on a pathway with near-term objectives, you may not need to identify thresholds and triggers as you may be implementing your action and seeing results in the near future. If this is the case, skip ahead to ***Step 5 – Planning***.

If you are undertaking a more complex pathway over a longer period of time, thresholds and triggers will help you respond to changing climate risks by determining when review, decisions and possibly new actions are necessary. Further information on selecting thresholds and triggers is below.

Add your thresholds and triggers onto your pathway. This now puts the trigger points into the plan as actions to initiate new options or review and adjust the plan.

Select your thresholds

Decide which types of thresholds you are going to use.

A threshold describes the time until, or level of change at which, your goals, objectives or outcomes can no longer be achieved without changes. You will need a threshold for each priority risk.

Here are some different types of thresholds:

- Physical, like sea-level rise, increase in average temperature or increase in bushfires
- Economic, like changes in insurance premiums or changes in operating costs
- Social, like community satisfaction, number of lives at risk, or community access to facilities.

Where possible, thresholds should be:

- measurable
- assessable from information already available over time
- directly linked to the decision you are going to make.

Note, thresholds could be one-off measures or a series of events occurring over a set time period or within a certain timeframe (for example, a particular percentage reduction in rainfall over a certain period).

Select your triggers

Decide which triggers you are going to use.

Triggers indicate when you need to make a decision or act in order to avoid reaching a threshold – when you need to begin implementing or significantly review your adaptation pathways.

When you are deciding on your triggers, there are three things you need to think about:

- **Decision interval:** How long will it take to make a decision or implement your risk management option?
- **Safety buffer:** What size safety buffer should you include in case of unforeseen circumstances?
- **Monitoring interval:** When will the data be available to evaluate whether you have reached a trigger point or not?

You can work out a trigger by subtracting your decision interval and safety buffer from your threshold. For instance, if your threshold is 0.5 metres of sea-level rise, you may have factored in some decision time and a safety buffer based on expected rates of sea-level rise and identified a trigger point of 0.3 metres of sea-level rise. That means when 0.3 metres of sea-level risk is reached, you begin the process of implementing a particular action or adaptation pathway of actions so you will be ready to manage risks associated with 0.5 metres of sea-level rise when that eventuates.

What have you accomplished in Step 4 – Prioritising Actions?

You should have:

- Brainstormed actions to address your priority risks and take advantage of opportunities
- Assembled your actions into 'adaptation pathways' of related actions, sequenced over time
- Selected which actions to take now
- Created thresholds and trigger points to stimulate new action in the future

Step 5: Planning – develop a strategy and implementation plan

Write a strategy

While this may seem obvious, the steps up until now have involved thinking, structured conversations, and mapping your pathways. Articulate your recommendations in a formal strategy-style document (for example, a brief) and seek endorsement.

Write an implementation plan

Develop an implementation plan. Seek endorsement to ensure that the climate risks are managed into the future. The implementation plan could for example, be an attachment to your brief.

Use your agency's project management process to develop your implementation plan. However, there are some unique factors for managing climate risks you may need to consider:

- **Project and pathway evaluation:** It is important to evaluate your treatments to determine their effectiveness in reducing your climate risk. It is equally important to evaluate your adaptation pathway to track that you are still following the appropriate pathway to manage climate risks. However, climate change presents a number of challenges for evaluation, including determining success, collection and monitoring of data to measure your success and a shifting baseline. (See ***Step 6 – Evaluating*** for more information).
- **Authorisation:** Your implementation plan will need to be endorsed by senior leadership to ensure treatments can be implemented if and when triggers are reached. The fact that triggers may be reached years in to the future means you may need endorsement embedded into agency procedures.
- **Review:** Identify when the implementation plan will be revisited.
- **Plan for assessing the status of thresholds and triggers:** see the next sub-step for more information

Assess status of thresholds and triggers

Monitor the status of thresholds and triggers.

To support this, particularly if you are on a complex adaptation pathway, develop a thresholds and triggers monitoring program.

You must first establish data sources for your triggers and thresholds. When identifying what data to monitor, here are a number of useful considerations:

- Timing of the data collection
- Getting the right scale of data
- How you will get the data
- What kind of proxy data is acceptable if you cannot get data directly applicable to the trigger or threshold
- How or if the data will be analysed.

You must also decide on operational factors for your monitoring programme, such as:

- Who is responsible for the data collection and how will it be sustained?
- How will findings be compiled and reported?
- To whom the findings are reported?
- Have resources been allocated to monitoring?
- How will the monitoring of triggers be coordinated with evaluation of treatments or the adaptation pathway?

Implement actions to address risk

Start managing your climate risks.

Implementation is unique to your circumstances. You may simply begin a monitoring program for triggers and thresholds or you may be beginning to implement the actions to address risk themselves. Alternatively, you may have decided you want further information or to develop a business case for a large investment, in which case the action may be to embark on a *Project* cycle of climate risk management. This most likely will be the most time-consuming step, but you will see your plans become a reality.

What have you accomplished in Step 5 – Planning?

You should have:

- Written your strategy and developed your implementation plan
- Gained endorsement of the plan
- Begun implementation, as appropriate to your management of climate risks

Step 6: Evaluating – embed learning in your plans and share lessons

Evaluation needs to occur at two levels:

1. Evaluation of the implemented treatments, similar to a project evaluation
2. Evaluation of your adaptation pathway, to ensure that you are still on track to manage your climate risks.

HINT

Use your agency's monitoring and evaluation framework

Your agency's monitoring and evaluation framework should be sufficient to evaluate your actions to address climate risk, but will need to be augmented to allow for evaluation of your adaptation pathway.

Evaluate the success of your actions

You should be considering evaluation by the time you develop your implementation plan, as you will need to plan what to monitor to ensure you *can* evaluate.

Conventional project evaluation should be largely applicable, but there are a number of issues which are unique to evaluating climate risk management options. During your evaluation, do the following:

- **Think about when you expect benefits to be measurable:** Benefits may accrue further in the future than usual, so assessment must continue over long periods. Use proxy indicators that change in the short term but assist in predicting long-term change.
- **Compare with similar situations where actions have not been taken:** Risk management is often about avoiding impacts, so success can only be directly measured by assessing the impacts that occur in the absence of your actions to manage climate risk. This can be done by comparing different places or different assets.
- **Don't expect obvious evidence of success:** Climate change impacts may be harder to isolate against other drivers (for example, changing demographics), especially over the short term, so causation is hard to prove. You can observe the impacts of climate variability and near-term changes, assess how actions to address risk are coping with those changes, and extrapolate into the future. Evidence of success may sometimes only be clear at higher more strategic levels, so consider taking your evaluation up a scale and/or assessing changes in the attitudes or knowledge of your stakeholders.
- **Remember that success may be temporary:** The baseline shifts as the climate changes, which may alter what is considered an appropriate and effective action. Temporary success is still success – but see the next section on evaluating your adaptation pathway.

Evaluate your adaptation pathway

Use the triggers and thresholds in **Step 5 – Planning** to stimulate a review of your pathway. If you didn't identify triggers and thresholds, you may plan to review your pathway on a regular (for example, five yearly) basis.

To conduct a review, step through the *Strategy* cycle again. This can be done quickly, but pay particular attention to recreating a ***Greatest Plausible Change*** scenario, as this is what will allow you to reconsider your overall pathway rather than just the specific actions within it.

The following may be useful questions to ask yourself in your evaluation of the pathway:

- Has there been an obvious change in the climate itself?
- Are you still heading in the direction that you thought you were? If not, why not?
- Do your goals still seem achievable and realistic?
- Have external factors, like unintended consequences and significant regulation changed?

HINT

It is important to evaluate your pathway

You really need to know both whether you are doing things right as well as whether you are doing the right things. Doing things right means being effective in implementing actions. Doing the right things means your pathway is delivering the results expected.

Evaluating your adaptation pathway involves using the triggers and thresholds to stimulate review of whether it's time to change the actions you are pursuing, either to progress along a pathway of actions that are dependent on each other or to switch your strategic approach altogether. Pathway evaluation is important to ensure that the pathway remains responsive to external change while delivering on the goals of your agency.

Pathway evaluation (which is similar to adaptive learning) is not business-as-usual for most organisations. Adaptive learning has been put into practice in only a few situations, such as military or contingency planning. Yet it is imperative to do some of this, even if it is new and different, as without it, you may remain stuck managing your climate risks in ways that are no longer effective as the world changes. Additional information and sources in ***Using Adaptation Pathways*** may help.

Share your lessons

Sharing your learning is an important component of the risk management planning process. It will help to improve risk management practice generally and will help make it easier to make climate risk management standard practice in the future.

Share your experiences with organisations with which you have interdependencies. This enables you to have discussions about ensuring that those interdependencies are not a source of untreated risk (or missed opportunities).

You do not have to share everything you experienced with everyone. You may have a strong experience in one area. For example, you may be engaged successfully with key stakeholders. Develop a story, based on your reflections of the experience.

One way that you could share your learning is through the ***Resilience Builders Network***.

What have you accomplished in Step 6 – Evaluating?

You should have:

- Developed an approach for evaluating your actions to address climate risk as well as your full adaptation pathway
- Shared your experience

Drought-affected agricultural land

Project cycle

The *Project* cycle develops and implements a detailed plan for operationally managing climate risk in a specific priority area. This might include developing a new asset, managing risks to an existing asset, supporting staff capacity, or implementing some controls within the activities of a program. In particular:

- You may be a **program** manager, ensuring that the investments in that program all take account of climate risk, including requiring proponents to address climate risk in proposals.
- You may be an **asset** manager, looking at a major new infrastructure project (e.g. a major building on a national park or a defence facility), or developing a detailed plan to manage climate risk on an existing major asset. In general, you will only be carrying out a *Project* cycle assessment if you have a significant specific investment to manage. The on-going management of all aspects of a large asset such as a national park are more suited to the *Strategy* cycle assessment, and smaller activities can be prioritised and implemented directly from a *Strategy* cycle process.

Project cycle activities may be quite diverse and may need to be specifically tailored to existing processes in your agency. *Projects* are also likely to require more detailed use of climate data and may require the use of climate adaptation experts. We use more technical language in this cycle and provide less step-by-step detail than for *Strategy*, except for a few steps that involve special considerations, e.g. for assets with longer operating lifetimes. Our focus is on providing recommendations for how to ensure the processes you or a consultant follow are consistent with *Scan* and *Strategy* and the overall strategic rationale of *Climate Compass*. This section may therefore be more useful for adaptation experts than APS officers directly, or it may inform a statement of requirements for an adaptation expert's project.

Project cycle

Step 1: Scoping – set the scope including the why, what and who

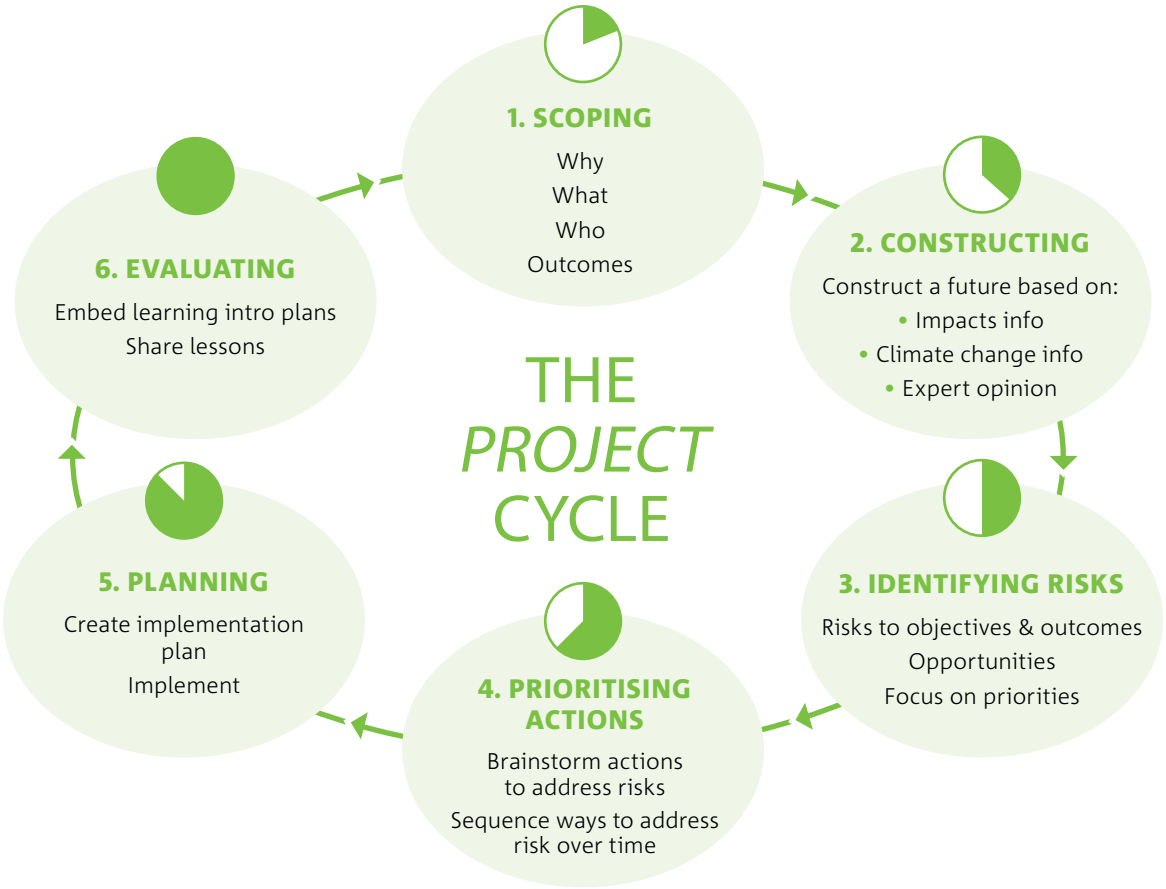
Step 2: Constructing – construct a scenario with greatest plausible change

Step 3: Identifying Risks – clarify risks and prioritise them

Step 4: Prioritising Actions– identify and sequence actions to address risk

Step 5: Planning – develop an implementation plan

Step 6: Evaluating – embed learning in your plans and share lessons



Step 1: Scoping – set the scope including the why, what and who

Scoping for Projects can be done the same way it is for ***Step 1 – Scoping*** in the *Strategy* cycle. As always in scoping your activity, be clear on your goals and objectives. Are they to keep staff or assets safe, avoid public harm, maintain economic activity, protect an environmental asset, or some combination of purposes like these? You may have already considered these matters in a previous *Strategy* cycle, so draw directly on that prior information.

If you are managing a *program* (as opposed to an asset), you will need to distinguish the risks to the program itself from the risks to the projects or activities to be undertaken within the program. Use this scoping step to think about whether you will need to make this distinction throughout the *Project* (because the project will address both) or only early on, and how you will stay focused on the program vs. project/activity scale.

What have you accomplished in Step 1 – Scoping?

You should have:

- An understanding of the goals you are working towards
- Confirmed assets, programs, or similar to address
- An endorsed plan of action for the rest of this *Project* activity, including when and how to bring different stakeholders into the process

Step 2: Constructing – construct a scenario with greatest plausible change

In Steps 2 and 3, your approach depends on the nature of your *Project* activity:

If you are a:	In Steps 2 and 3 you will:	So that in Step 3 you can:
Program manager	Identify what climate risk considerations are important for others to explore when developing proposals for the projects implemented under this program, in order to minimise the risks that your program ceases delivering its intended outcomes	Develop amendments to program guidelines to ensure climate risks are considered where appropriate in the existing program workflows, and assess that these criteria are abided by in funded activities
Asset manager	Assess climate risks on the asset (proposed project or extant asset and operating environment). This may be in the form of a classic detailed risk assessment or a more free-form adaptation assessment. This may be qualitative for smaller assets, but can be very quantitative for large or socially sensitive assets	Develop simple or comprehensive adaptation pathways for managing climate risk on the asset design and operation, detail dependent on the size and sensitivity of the *Project*

In this Step, you develop a scenario based on ***Greatest Plausible Change*** for your ***Decision Lifetime***, following the same general instructions that are in ***Step 2 – Constructing*** in the *Strategy* cycle. The main difference is that you may need to make use of more detailed and specific climate change projections data in order to conduct a quantitative impact assessment, particularly if you are an asset manager. See ***Sources of Climate and Climate Impacts Data*** as well as ***Selecting the Right Climate Information***.

We suggest you use the *Climate Trends* information where possible or as a first pass as it is easier to understand and implement in your risk assessment than the climate projections data. Use the projections data if you are making larger, longer-term or contentious risk management investments or you are modelling the impacts of different climate scenarios for someone else to use in risk management planning.

Such a quantitative impact assessment would be your scenario, and would need to use ***Emissions Scenarios and Climate Projections*** consistent with greatest plausible change principles.

If you are a program manager, you may need to construct your scenario focusing on both the impacts to your program itself (its objectives) and to the activities within it (their ability to continue and be effective).

When to build the scenario with a more quantitative impacts analysis

When considering assets, a more quantitative approach relying on climate data rather than trend or summary information may be required. There are two broad ways to assess risks at this more detailed level. One is the relatively 'top-down' impact assessment (which starts with climate data, input into an impacts model that usually emphasises exposure, leading to consequences for people or organisations). The other is a 'bottom up' vulnerability assessment (which starts with 'local' experience of climate vulnerabilities and asks how these may change in the future, usually emphasising sensitivity and adaptive capacity). Where possible, large projects should consider multiple approaches, but if resources are limited, it is best to prioritise a more quantitative impacts framing where physical assets predominate (e.g. building a new railway) and a more qualitative 'vulnerability' framing where social issues are the principal concern (e.g. building a network to support doctors' in-service training).

What have you accomplished in Step 2 – Constructing?

You should have:

- Decided how far in the future you should be thinking, based on how long-lived the consequences for your asset, program or other responsibility truly are
- Constructed a rich picture of the greatest plausible change in your world given that timeframe, relying on more detailed climate data and potentially conducting a quantitative impact analysis or a largely qualitative vulnerability analysis

Step 3: Identifying Risks – clarify risks and prioritise them

Specify the risks for your Project

The approach described in ***Step 1 – Scoping*** in the *Strategy* cycle can also be used here. Your impact or vulnerability analysis from **Step 2 – Constructing** above forms the description of flow-on impacts and you now need to identify the risks arising from these impacts. You do this as described in *Strategy*, focusing on your objectives and activities and systematically asking if there are physical, transition or liability risks to the ability to achieve your objectives or conduct your activities. In general, there may be a stronger focus on activities and tasks, with a lighter focus on policies in the *Project* cycle.

The following special considerations may apply:

Program manager: You need to identify both the risks to your program directly, but also what activities under the program may be at risk and how that in turn may create risk for the program itself.

For example, a *program* that funds grants for infrastructure observes that its grantees are failing to account for an increasing frequency of disasters. If the same stretch of road is damaged by floods repeatedly, it may expose you to legal liability if people are killed or property is damaged as a result of foreseeable risks. It may also create fiscal risk for the Commonwealth budget if there is a resultant increase in disaster recovery payments.

HINT

Program managers may have many stakeholders – get their help

A *program* manager will need to engage those who carry out activities within the program, such as those seeking funding or writing assessments and submissions. Use them to help identify the diverse climate risks to their activities and to decide how this flows through to risks for the whole program.

Another *program* that assesses environmental impact studies may realise that some studies are not allowing for climate change so that proponents are being approved to plant inappropriate types of trees for rehabilitation. This may rapidly undermine public trust in the *program* even though the effects of climate change are at an early stage.

This also means that in *Project*, a program manager in particular may need to consider multiple timeframes (shorter (before 2030) and longer (beyond 2090)) depending on the breadth of activities.

Asset manager: As an asset manager undertaking the *Project* cycle, you will be building or running a major asset for your agency such as a new base, a major office development or managing people. If there are many aspects to your operation, you should have carried out a *Strategy* cycle assessment to identify priority risks and pathways forward (and directly treat smaller issues), so that in this *Project* cycle you are focused on a particular significant investment.

HINT

Draw on existing climate risk work in the Project cycle

The *Project* cycle aligns most closely with existing climate risk and adaptation work that is publicly available, so make use of these existing examples. Globally, there is a great deal of experience in adaptation planning for major assets in particular that can be drawn upon through sites such as the UK Climate Impacts Programme.

Prioritise risks

The conventional risk assessment approach is to rate the likelihood of each risk, rate the seriousness of its consequences, and put these into a risk matrix which then automatically rates the severity of the risk. Your Project will likely have an extensive risk register of this type that you need to supplement with climate risks, particularly if you are managing an *asset*.

However, the same approach is not entirely suitable for climate risks. In *Project*, the rationale and processes for prioritising risks are the same as in *Scan*. So see ***Step 4 – Prioritising Risks*** in *Scan* for further guidance. The ***Risk Management for Climate Risk*** section in the *Technical Supplement* also includes some example modified risk tables and matrices that you can use.

Be aware that if you are a *program* manager, your ultimate concern is the risk to the program itself, so program-level risks may be your priorities. However, it is the risks to the activities that will determine many of your treatments (see next step).

Finally, adjust your priority list by eliminating risks that you don't need to consider treating for the foreseeable future. Depending in how you prioritised, these may be risks that you have rated as having insignificant or minor consequences, or certain types of risks that your agency has a high appetite for. If in doubt about a risk, keep it in as you will have an opportunity to further prioritise in the next step.

You should now have an ordered set of priority risks to consider addressing.

What have you accomplished in Step 3 – Identifying Risks?

You should have:

- Identified the specific risks posed by your greatest plausible change scenario
- Prioritised these risks using a modified version of traditional risk management approaches

Step 4: Prioritising Actions– identify and sequence actions to address risk

Identify possible actions to address the risks

Brainstorming possible ways to address priority risks is done in the same way for *Project* as it is in ***Step 4 – Prioritising Actions*** in the *Strategy* cycle.

If you are managing a *program*, the special consideration at this stage is that you will need to identify how to reduce the *program* risks by seeking to ensure that activities within the *program* manage their own risks. For a grants program this may be by requiring that proponents address climate risks in their proposals. For example, in a program that assesses business cases for new infrastructure, you may achieve this by requiring proponents to explicitly consider the effects of climate change in their cost-benefit assessments. There may also be risks which must be managed at the *program* level directly.

For *assets* it is particularly important to think broadly about possible response options – for example looking for options that may be *robust* across many alternative (uncertain) scenarios, rather than optimised to perform well in just one (see ***Using Adaptation Pathways*** for more discussion of this).

HINT

Draw on existing climate risk work in the Project cycle

For *assets*, you can increasingly draw on a wide range of existing risk registers and treatments for particular sectors. For example, a comprehensive listing of coastal risk measures is available at Coastal Hazard Adaptation Options: Compendium for Queensland Coastal Councils.

Assemble actions into adaptation pathways

Bundling actions and creating adaptation pathways is done in the same way for *Project* as in ***Step 4 – Prioritising Actions*** in the *Strategy* cycle. See also ***Using Adaptation Pathways***. The *Project* cycle is arguably the most common and most practical application for adaptation pathways so some attention to detail here may be useful, even if it means relying on an external consultant. For example, you will probably need to consider trajectories of change in climate-related impacts to assess the sequence in which to initiate the various treatments. This information should help you prepare for selecting preferred pathways. If this sounds too difficult or technical, an adaptation expert may be warranted.

For *program* management, you may largely see that your actions need to be taken now, but some interventions may not be required until later into the future. However, if you are influencing activities within the program to act on climate risk, those implementing these activities need to think about timing of interventions as discussed in this Step, and you may need to require this of them.

Some transition and liability risks may relate to events that will not happen for decades, and yet cause changes in policy or community behaviour now. Consider carefully when the risk to the *program* will really emerge. In addition, some issues, such as making changes that are coordinated with other parts of government or that require changes in community attitudes, may have significant lead times (see ***Decision Lifetimes***).

For a new *asset*, most of your actions may be part of a current building plan. You may still develop an adaptation pathway that considers how the asset may be upgraded to deal with changing climate risk in the future, or to take advantage of opportunities (e.g. changing sources of, or needs for, energy).

Management of an existing major *asset*, including people, is likely to see some no regrets actions taken soon with others scheduled into the future in response to key triggers (see below).

Select which options to pursue

The general guidance provided in ***Step 4 – Prioritising Actions*** of the *Strategy* cycle is still applicable here, perhaps even more so as formal economic assessment of options is more common and more warranted in the *Project* cycle, at least for individual significant investments.

As a *program* manager, prioritise actions to address risks to the *program* (as opposed to individual activities) and the expected success in treating these risks. This may involve assessing which pathway is best for each individual program risk (if there is more than one) then deciding whether some pathways are more important than others in terms of the overall program risk, whether some measures can treat multiple risks simultaneously, and which pathways may need pursuing at a later date. In making these choices, you should pay attention to when the risks in the program activities become important, and what lead times there are to ensuring that those carrying out the activities manage the risks.

For an *asset* manager, bringing climate risk into an existing business case assessment for larger investments with longer lifetimes should include:

- considering multiple scenarios of the future not just greatest plausible change, looking for options that are *robust* to any future uncertainty affecting the asset (see ***Selecting the Right Climate Information*** and ***Using Adaptation Pathways***)
- asking how climate risks may alter costs and benefits in any cost-benefit assessment, including trade-offs between set up/construction costs and operating/maintenance/replacement costs and effects on benefits flows from the project.

Formal economic assessment of treatments

Unless you are making very large or contentious investments, it is usually adequate to carry through a well-structured qualitative assessment process. However, in some cases, including major assets, you may need a more formal cost-benefit analysis. For a cost-benefit analysis, you need to value a variety of costs and benefits, and ask how climate may affect each:

- the costs and benefits for market goods
- the costs and benefits of non-market goods (for example, clean water)
- the goods or services that are used in the production of final goods and services (known as intermediate goods such as savings in travel time from transport projects)
- the effects of a decision that were not taken into account in the price (known as an externality; for example, unpriced pollution)
- the time dimension, as you will need to value the costs and benefits of a decision into the future at today's value (this is called discounting to net present value).

In general you should consider large investment options in the context of a variety of future scenarios, including one involving only moderate climate change (e.g. RCP4.5) – for more details see ***Selecting the Right Climate Information***. This means applying scenario-based cost-benefit analysis. You should also consider sensitivity analysis against any major uncertainties (such as demand) that are not already represented in the scenarios.

Cost-benefit analysis is a widely used assessment method which is not ideal in climate scenario analysis but can be adjusted to handle long-term climate risks. Note that the selection of the discount rate (the rate you choose to discount to net present value) influences the results of the analysis and should made the subject of sensitivity analysis. You may also want to consider the following assessment methods:

- *Cost-effectiveness analysis* – If you have already decided that you are going to treat the risk, then the question becomes what is the most cost-effective way to do this? In other words, you have decided that you want to invest in some kind of option and you need to know which option is the most cost-effective in terms of delivering the desired outcome. Cost-effectiveness analysis is a tool to help you choose from your identified options.
- *Multi-criteria analysis* – evaluates financial values alongside other values, such as equity, social or environmental values. These values are standardised and converted into one single value. Multi-criteria analysis is useful when some benefits of different adaptation options are difficult to quantify and where expert opinion can be trusted to inform the decision. The selection of weightings can be contentious.
- *Economic impact assessment* – examines the effect of an adaptation option in a specified location (such as suburb, region, state or nation) on financial flows or economic activity Economic impact assessments do not directly inform decision-making by providing a value that can be compared, like cost-benefit analysis or multi-criteria analysis. Instead economic impact assessments provide information about the scale of economic activity impacted by the option.
- *Deliberative processes* – where a group of stakeholders come together to receive, exchange and analyse information, and eventually come to an agreement on the issue, with the outcomes informing decision-making. The deliberative process allows stakeholders to interrogate different adaptation options with the knowledge that their recommendation will be considered or adopted (depending on the nature of the process) in decision-making. Deliberative processes encourage greater public participation and enhance transparency, legitimacy and accountability, typically in government decision-making.

Select thresholds and triggers to monitor

This is a fundamental part of adaptation pathways and the same actions in ***Step 4 – Prioritising Actions*** in the *Strategy* cycle apply here.

What have you accomplished in Step 4 – Prioritising Actions?

You should have:

- Brainstormed actions to address your priority risks and take advantage of opportunities
- Assembled your actions into 'adaptation pathways' of related actions, sequenced over time
- Selected which actions to take now
- Created thresholds and trigger points to stimulate new action in the future

Step 5: Planning – develop an implementation plan

In the *Project* cycle, planning and actually implementing are done using the same general guidance provided for ***Step 5 – Planning*** in the *Strategy* cycle.

The difference is that the focus in *Project* is on implementation at a more operational level. No strategy or strategic plan is required, your Project work is likely to fall under a strategic plan developed in a prior *Strategy* cycle. Instead, you can expect the implementation plan to have quite defined steps to action.

For example, if you are a *program* manager, your implementation plan may involve writing about your requirements for project proponents to address climate risk in their project proposals under the program, developing guidelines for them to do this, and developing the method you will use to assess whether proponents have met this requirement.

HINT

Find efficiencies to implement your monitoring

Try to combine tasks so you use the same data to guide implementation, assess success, and monitor thresholds and triggers. For example, the Queensland Reconstruction Authority has developed their DARMsys™ system to assess needs after natural disasters. But the same system can be used to record their response actions, compare the results where actions were and were not taken to assess success, and evaluate whether thresholds (e.g. of % damage) are being reached such that different actions or a different pathway need to be taken. Developing something like this could be part of an implementation plan.

If you are an *asset* manager and your *Project* is about the development of a new major asset, your implementation plan may involve working with a designer to change the design, sourcing different materials for the construction, and working with the construction company to manage builder safety during construction.

Just as in *Strategy*, it is critical that you build into the implementation plan tasks to assess thresholds and triggers, particularly if you have a longer-term adaptation pathway. These are likely to be more specific, operational and possibly on-the-ground measures than for a *Project* than for *Strategy*, particularly if you are an *asset* manager. Be sure to include tasks to gather the information to assess the effectiveness of your individual actions, not just your overall pathway (see ***Step 6 - Evaluating***).

What have you accomplished in Step 5 – Planning?

You should have:

- Put together an implementation plan
- Gained endorsement of the plan
- Started implementing the plan
- Started tracking thresholds and triggers

Step 6: Evaluating – embed learning in your plans and share lessons

The same approach to evaluation presented in ***Step 6 – Evaluating*** of the *Strategy* cycle should be used here.

It may seem like sharing your *Project* experiences with others is less useful compared to sharing your experiences with *Strategy* because the details of your *Project* are likely to have limited broad applicability. Yet it is only through sharing that useful resources such as those mentioned in the Hint box in ***Step 4 – Prioritising Actions*** can be developed. The more we share, the more efficient our processes can become.

What have you accomplished in Step 6 – Evaluating?

You should have:

- Developed an approach for evaluating your actions to address climate risk as well as your full adaptation pathway
- Shared your experience

Dense bushfire smoke shrouding powerlines and cattle

Technical Supplement

This *Technical Supplement* provides more detailed guidance on technical climate risk management issues that are relevant in all the *Climate Compass* cycles. Different levels of technical detail are often needed for each cycle – the supplement will direct you to the information that is most relevant to you.

The figure below shows how each section of the supplement fits together, but you may also be directed to a specific section from the links in the guide itself.

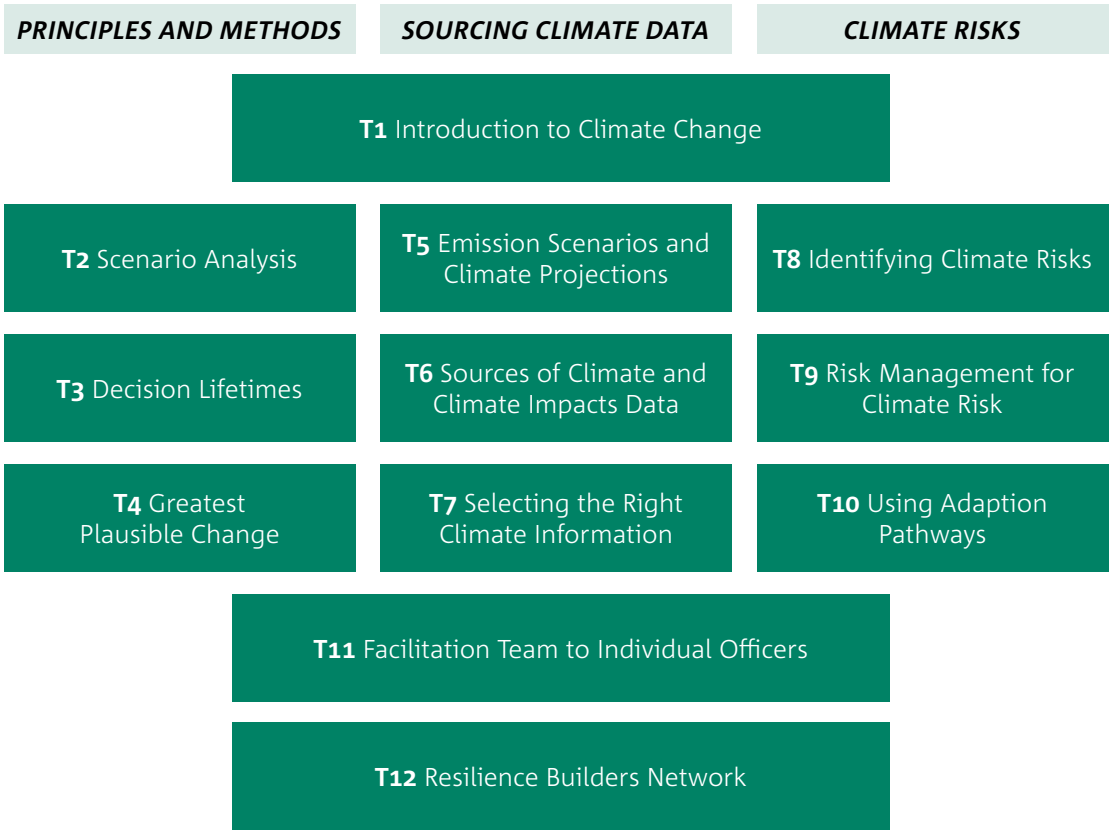


Figure 1: How the different sections of the Technical Supplement work together

T1: Introduction to Climate Change

Deciding what to do about climate risks, involves having some basic understanding the Earth's climate system, how and why changes are happening in the climate we experience, and exploring the implications of this for how we can live safely on the planet.

Many areas of research must come together to inform this understanding, inevitably involving a whole set of specific terms.

You do not need a detailed knowledge of these disciplines and all their specific terminology to use *Climate Compass*, but it is important to understand a few key terms and concepts outlined in this introduction.

Beyond this introduction, further general information on climate change science and adaptation can be found in these places:

- Climate Campus, Climate Change in Australia
- Glossary, Climate Change in Australia
- Climate, Bureau of Meteorology
- *State of the Climate*, Bureau of Meteorology and CSIRO
- *The science of climate change: Questions and answers*, Australian Academy of Science

What is weather? What is climate? What is climate change?

Weather is what we experience at a location over short periods of time – hourly to monthly or so.

Climate is the average weather that a location experiences over many years, even thousands of years. This means for example, due to our understanding of climate, you can generally expect Sydney to be warmer than Hobart, but on a given day Sydney may be cooler than Hobart due to the weather. Key climate variables include temperature, rainfall and wind.

Climate change refers to changes in the climate (the average weather) that persist for an extended period of time, typically decades or longer. Climate change therefore occurs in addition to or on top of variability from year to year.

How is the climate changing?

To manage your climate risks, you need a general understanding of how the climate has changed and how it is projected to change in the future. Below are the key findings from the 2016 *State of the Climate* report by the Bureau of Meteorology and CSIRO.

The 2016 *State of the Climate* report for Australia, released by the Bureau of Meteorology and CSIRO found:

- Australia's climate has warmed in both mean surface air temperature and surrounding sea surface temperature by around 1°C since 1910.
- The duration, frequency and intensity of extreme heat events have increased across large parts of Australia.
- There has been an increase in extreme fire weather and a longer fire season, across large parts of Australia since the 1970s.
- May-July rainfall has reduced by around 19 per cent since 1970 in the southwest of Australia.
- There has been a decline in rainfall of around 11 per cent since the mid-1990s in the April–October growing season in continental southeast.
- Rainfall has increased across parts of northern Australia since the 1970s.
- Oceans around Australia have warmed and acidity levels have increased.
- Sea levels have risen around Australia. This rise in mean sea level amplifies the effects of high tides and storm surges.

Projections for the future are:

- Australian temperatures are projected to continue increasing with more extremely hot days and fewer extremely cool days.
- The number of days with weather conducive to fire in southern and eastern Australia is projected to increase.
- Winter and spring rainfall is projected to decrease across southern continental Australia, with more time spent in drought.
- Past and ongoing greenhouse gas emissions mean further warming of ocean temperatures.
- Sea-level rise and ocean acidification around Australia are projected to continue.

Sections ***T6*** and ***T7*** of this *Technical Supplement* address how to access climate change data in detail for each cycle of *Climate Compass*.

What is the relationship between climate change adaptation and mitigation?

Emissions reduction (mitigation) focuses on reducing the amount the climate will change. Adaptation refers to actions to reduce the impact of climate change. Adaptation is needed because the climate has already changed and some future changes are unavoidable. Some actions can achieve both mitigation and adaptation goals. In general, taking action to understand and reduce climate risk falls under the category of adaptation.

Other common terms

Managing the impacts of climate change can get technical. Below is a sample paragraph of commonly used terms when managing the risks from a changing climate, so you can see how they work in context. After the paragraph is a glossary which unpacks each highlighted term.

Climate projections are used to assess **climate risks**. Projections are developed from **climate models**. Climate models describe how the future climate may evolve if certain **emissions scenarios** eventuate, but which scenario eventuates in reality depends on the amount of **greenhouse gases** the world emits.

Once we understand the possible climate risks, we can apply **risk treatments** to undertake **climate adaptation**. One way to help avoid **maladaptation** is by using an **adaptation pathways** approach over the **decision lifetime** of your climate risks.

Climate projection: the response of the climate system over the coming decades to an **emissions scenario** as simulated by a **climate model**. Projections provide us with a sense of the range of future climate conditions that may emerge, for which we must plan. (By contrast a 'prediction' aims to describe what will actually happen, like a weather forecast for tomorrow. A true climate prediction is not currently possible beyond a few months).

Climate risks: refers to how climate change could impact you or your organisation. Climate is made up of two primary types of risk, physical and transition risks.

- Physical: the physical risks associated with rising aggregate global temperatures. For example, this could be direct impacts to the built environment from increasing intensity and frequency of extreme weather or more gradual changes like rising sea levels.
- Transition: these are associated with activities that may (or may not) occur in the processes of adjusting towards a lower-carbon economy. "Stranded assets" are an example of where exposure to transitional risk may arise.

In addition, liability risks can arise when a person or entity may be held responsible for not acting sufficiently on physical or transition risks, causing damage to others.

Climate model: models of how the Earth's climate system works that incorporate the properties and interactions of the atmosphere, oceans, land and ice to simulate the climate of the past, present and future. Global climate models ('GCMs') simulate the entire world, but may work better for some climate attributes (like cloud formation) or in some regions (like the Arctic) than others. Regional climate models ('RCMs') may be used to model climate in more detail for a particular location.

Emissions scenarios: are representative estimates of future emissions of greenhouse gases, aerosols and other pollutants. The current set of scenarios used globally are called Representative Concentration Pathways (RCPs). There are four, RCP2.6, RCP4.5, RCP6, and RCP8.5, which range from very low to high emissions pathways and correspond in general to very low to high levels of eventual climate change. Emissions scenarios are used in combination with climate models to produce future climate projections. See section ***T5*** for how to apply these.

Greenhouse gases: natural and anthropogenic gases in the atmosphere that absorb and emit radiation at specific wavelengths which affect how much heat is retained in the atmosphere. The greenhouse gases are primarily water vapour (H2O), carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4) and ozone (O3).

Risk treatments: the measures that may be implemented to manage climate risks, including taking advantage of any opportunities. Treatment measures can be hugely diverse depending on the risk you are trying to treat and the cycle you are working on. *Climate Compass* often refers to them more simply (and broadly) as 'ways to address risk'. Case studies of situations similar to your risks may help you brainstorm the range of measures you have available to you.

Climate adaptation: The process of implementing **risk treatments** to adjust to actual or expected **climate risks**. Adaptation may be talked of as *autonomous* (arising from within, by the community or business) or *planned* (actively structured from above, by central planning in a large organisation or government). It could also be *incremental* (where the central aim is to maintain the essence and integrity of a system or process at a given scale) or *transformational* (which changes the fundamental attributes of a system in response to climate and its effects).

Maladaptation: occurs when you implement an action that reduces your climate risk in one area or in the short-term, but increases risk in other areas, on other groups, or in the medium- to longer-term. For example, you may build a sea wall to decrease erosion locally, but the sea wall may actually increase erosion on neighbouring beaches. Maladaptation occurs when interventions may achieve a narrow aim but result in unintended negative side effects.

Adaptation pathways: are sequences of **risk treatments** arranged over time, which help deal with future uncertainty and ensure that early actions do not close off options later. See section ***T10*** for further information.

Decision lifetime: the period over which the implications of a decision play out – a full decision lifetime is made up of a *lead time*, *operating time*, and *consequence time*. See section ***T3*** for further information.

T2: Scenario Analysis

Identifying, assessing and treating climate risks is helped by adopting a scenario analysis approach. Scenario analysis enables thinking about the interactions between long-term changes and decision-making today, and to handle the implications of uncertainty in longer term projections of the future.

Using scenario analysis to identify climate risks is a key recommendation of the G20 Taskforce on Climate-related Financial Disclosures. The Taskforce's 2017 *Technical supplement: The use of scenario analysis in disclosure of climate-related risks and opportunities* provides the rationale and detailed advice on climate risk scenario analysis. Various Australian organisations, including major banks, are now undertaking climate scenario exercises as part of their strategic planning and risk management processes.

Scenario analysis is a key element of effective climate risk management. This type of analysis helps decision-makers visualise:

1. what future conditions or events are probable or possible
2. what their consequences or effects might be
3. how to respond to, or benefit from, the future conditions even in the face of uncertainty.

Scenario analysis aims to capture the richness and range of possibilities, stimulating decision-makers to consider the full range of changes and identify robust responses. It also challenges the prevailing mindset.

In the case of climate change, scenario analysis allows an agency to explore and develop an understanding of how the physical and transition risks and opportunities associated with climate change might impact business over time.

A critical aspect of scenario analysis is the selection of a set of scenarios that cover a reasonable variety of future outcomes, both favourable and unfavourable. While there is an almost infinite number of possible scenarios, risk assessments usually apply a limited number of scenarios to provide the desired variety. The section ***T7*** suggests how to select specific climate scenarios, but a general framing is shown in the infographic below. While it is relatively straightforward to develop multiple scenarios, the ways to make decisions across them (instead of making decisions for a single scenario) are still in development and include adaptation pathways approaches (***T10***).

A scenario describes a path of development leading to a particular outcome. Scenarios are not intended to represent a full description of the future, but rather to highlight central elements of a possible future and to draw attention to the key factors that will drive future developments. It is important to remember that scenarios are hypothetical constructs; they are not forecasts or predictions nor are they sensitivity analyses. A key feature of scenarios is that they should challenge conventional wisdom about the future. In a world of uncertainty, scenarios are intended to explore alternatives that may significantly alter the basis for "business-as-usual" assumptions. As discussed in the Taskforce's 2017 *Technical Supplement*, scenarios should be plausible, distinctive, consistent, relevant, and challenging.

You may also need to reflect on socio-economic trends, such as population and economic growth. Your area of responsibility will determine what other information you need, but some resources that may be relevant include:

- Australian Bureau of Statistics
- Australian Bureau of Agricultural and Resource Economics and Sciences
- Intergenerational Reports

For examples of how emissions scenarios and information on direct climate changes can be used to develop broader scenarios of change, see the following sources. They may also inspire you to see how your scenario can be developed as a picture, infographic or a story to make it easier to think about the physical and transition risks and opportunities it entails.

The Carbon Crossroads infographic by the Cambridge University Institute for Sustainability Leadership

Australian Adaptation Futures, storylines and infographics used in CSIRO's Adaptive Value Chains work

Choose Your Future, emissions pathways infographics developed by the World Resources Institute

T3: Decision Lifetimes

A **decision lifetime** is the period over which the implications of a decision play out.

A full **decision lifetime** is made up of a *lead time* (till the decision becomes operational), *operating time*, and *consequence time* (this may include the time to decommission an asset or the path dependency established by an action; Figure 2).

It is important to recognise that the full *decision lifetime* of an activity may extend well beyond the original activity. For example, a policy decision to build a flood protection levee may take five years to gain design approvals and build. The levee itself may only be operational for 30 years, but during that time people may have been encouraged to build behind it (a common effect called 'asset anchoring'). As such decision-makers in the future are essentially locked into re-furbishing the levee – the consequence time is much longer than 35 years.

The ***decision lifetime*** helps determine how far into the future you need to look.

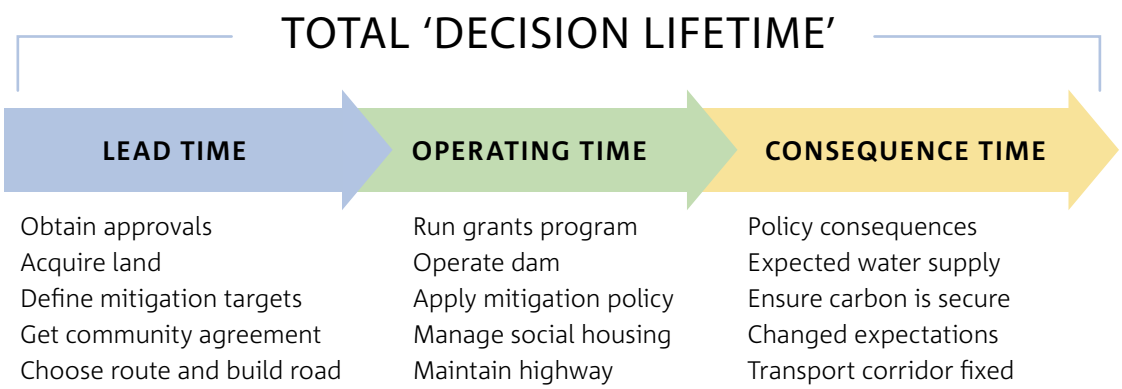


Figure 2: A decision lifetime is made up of lead time + operating time + consequence time, with some examples shown below. We often fail to think through the consequence time. A decision may lock in long-term path dependency. For example, once a road is there, it can be resurfaced easily, but it is a major decision to change the route.

T4: Greatest Plausible Change

When you are identifying risks that you may face, it is important to consider **greatest plausible changes** in the world so that you are proactively managing risks that may result from those changes. Looking at the greatest amount of change may sound extreme, but it is to ensure that you include all possible risks, even if you quickly rule them out. It also helps to mitigate for the fact that people often have a hard time imagining change and tend to underestimate the amount of change that may happen. Once deciding how much action to actually take, you can use a more balanced view of what the future may bring.

By **greatest plausible change** we mean the upper end or positive and negative extremes of any ranges that the climate projections identify, and then the extremes of changes in the world that may result from that degree of climate change. This is not usually the absolute extreme, but rather a level of change corresponding to the 95% or 99% percentile of possibilities.

However, if you have a particularly risk averse decision (for example, keeping a runway open or a critical electricity connector working), then you may choose a more extreme value. How you interpret 'plausible' depends on your attitude to risk, but you should document this.

When you are considering the indirect physical risks as well as transition risks, you then use the same way of thinking to look for the greatest plausible changes in policy or technology. Sometimes this may correspond to the least climate change.

In practice, for the *Scan* cycle, use the range suggested by the *Summaries* climate information on Climate Change in Australia but remember that it may include positive and negative changes. For example, in the Australian climatic region, the Monsoonal North, temperature may increase by +2.8°C to +5.1°C by 2090. In this case, the greatest plausible change for temperature from current conditions is +5.1°C. However, for the same region, rainfall may change between -25% to +20%, so these are the greatest plausible negative and positive changes.

For the *Strategy* cycle, use the same logic as for *Scan*, but use the range suggested by the *Climate Trends* information on Climate Change in Australia (or equivalent). These sources of information generally provide more detail for different emissions scenarios as well as information for a greater range of climate variables (i.e. not just temperature and rainfall).

See ***T6: Sources of Climate and Climate Impacts Data*** for further information on *Summaries* and *Climate Trends* climate information, particularly Table 1 to access these types of information online.

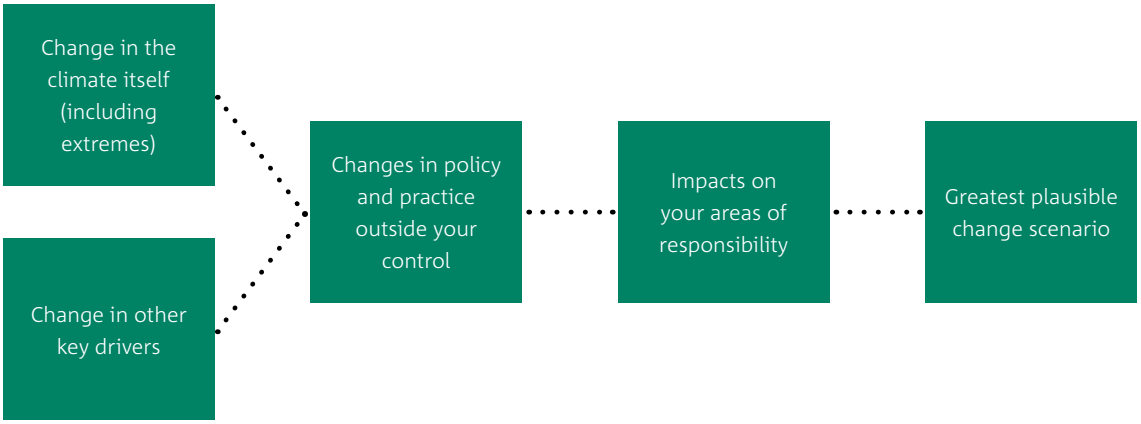


Figure 3: Building an understanding of greatest plausible change. Working from the left to the right of the above, you can begin by using Climate Change in Australia to get summary information about the physical changes in the climate. Then you may want to think about other key drivers of change, like population growth. Decide how those might affect policies or practices that are outside your control. Take that information and ask how those changes would impact on your areas of responsibility. These impacts then become the greatest plausible change scenario that is relevant to you. See also ***T8*** for how to think about impacts and from there identify risks.

T5: Emissions Scenarios and Climate Projections

The Intergovernmental Panel on Climate Change has adopted four emissions scenarios called Representative Concentration Pathways (RCPs). The RCPs span the range of possible trajectories of climate change resulting from increasing greenhouse gas concentrations.

The four RCPs are RCP2.6, RCP4.5, RCP6, and RCP8.5. These are named technically after future radiative forcing values, but basically range from very low to high greenhouse gas concentrations in the atmosphere. Greenhouse gases included in these RCPs include those from burning fossil fuels, land use change and industrial processes such as making concrete.

If the Paris Agreement goals were fully met, the world would probably track between RCP2.6 and RCP4.5. Current commitments by countries (assuming they are actually met) would track somewhere similar to RCP4.5. If we continue historical emissions patterns, the world will probably track RCP8.5. Given there is not yet any certainty that we will meet the Paris commitments, good risk management should consider this whole range of futures.

In the short term (to 2035 or so) there is not much difference between the trajectories of the different RCPs. Given that the world has been tracking the RCP8.5 path we recommend using this emission scenario for decisions with short decision lifetimes. In the medium to long term the trajectories of the RCPs diverge markedly. Risk treatments that play out over the medium to long term (for example, for large infrastructure and land use planning) should look for responses which are robust to this uncertainty.

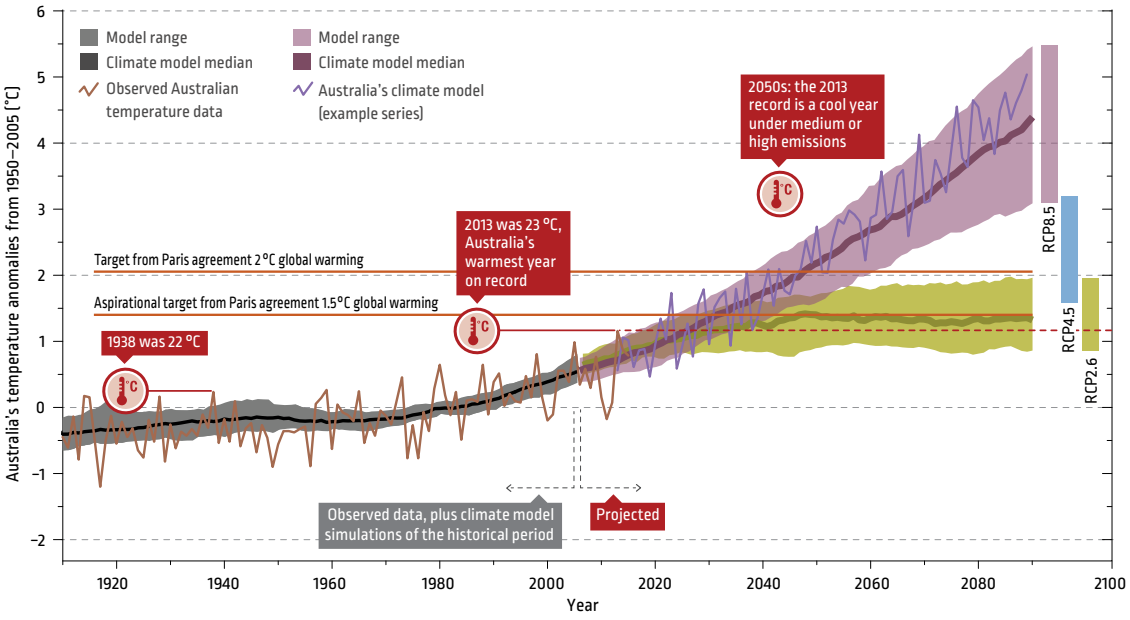


Figure 4: Australian mean annual surface warming in the past and for future emissions pathways. RCP8.5 is the high emissions scenario and RCP2.6 is the very low emissions scenario. From this graph you can see how the trajectories of the emissions scenario diverge markedly in the medium to long term. Series are relative to the 1950–2005 average, brown is observations, shading is the range of 20 year-year averages for up to 40 climate models, thick lines are the median of the models, purple is a simulation from Australia's community climate model (ACCESS) showing what a future time series may look like for high emissions including year-to-year variability. Global warming targets from the Paris Agreement are shown relative to pre-industrial temperature and converted to a relevant temperature band for Australia.

Source: Australia's changing climate by CSIRO and Bureau of Meteorology

For each RCP, climate modellers run many global climate models (GCMs) to assess how the future climate may unfold. Different GCMs may represent part of our understanding of the climate better than others, or may better represent the climate in different parts of the world. As a consequence, the different models provide different results (or climate projections). This represents the uncertainty in our understanding of how the climate works. Of course the different RCPs also represent uncertainty, but the uncertainty over the amount of greenhouse gases that will be released.

GCMs mostly predict climate on a coarse grid. For example, they may predict a single value for temperature for a 500x500 km^2 area. Regional climate models (RCMs) take the global climate projections and attempt to 'downscale' them to smaller grid cells, perhaps of 10x10 km^2. These help to provide more detailed climate projections, for example taking account of local topography or modelling the formation of cyclones. RCMs are not necessarily any more certain as this approach has limits.

Some climate risks can be related directly to extremes in temperature or rainfall, predicted by the GCMs or RCMs. For other climate risks, like flooding, coastal inundation or vegetation changes modellers must combine climate projections from GCMs or RCMs with other data, such as building data, elevation mapping or biodiversity models to estimate these risks. These impacts datasets are very useful for climate risk assessments, but have not yet been produced for a wide variety of potential impact areas.

Visit the modelling and projections section of Climate Campus, Climate Change in Australia for more information.

T6: Sources of Climate and Climate Impacts Data

The source of national-level climate projections for Australia is the Climate Change in Australia website (see box below). This website has a wealth of information about how future climates are projected, and what changes are expected in different parts of Australia at different times in the future up to 2100.

Various Australian states have downscaled projections. As you progress through your *Climate Compass* cycles management process, you may find that downscaled projections like these are more appropriate than the information available on Climate Change in Australia. However, at least at the *Scan* level, the projections available on Climate Change in Australia are likely to be enough to get you started.

Box 1: Climate Change in Australia

Climate Change in Australia hosts the most comprehensive set of climate projections ever developed for Australia. The climate projections use up to 40 global climate models (GCMs) driven by four emission scenarios and are presented for eight regions of Australia which will be affected differently by climate change. Results have been prepared for 21 climate variables (both on the land and in the ocean) and for four time periods (centred on 2030, 2050, 2070 and 2090).

To help improve accessibility, useability and relevancy of the projections, the website houses 14 interactive tools for exploring the data at different levels of complexity. This ranges from the Regional Climate Change Explorer, a tool which presents summary statements of projected change for each region, through to a projections data downloads facility, the Climate Futures Tool. Climate Change in Australia hosts a 'Climate Campus' for learning more about climate science and using projections in climate change impact assessments.

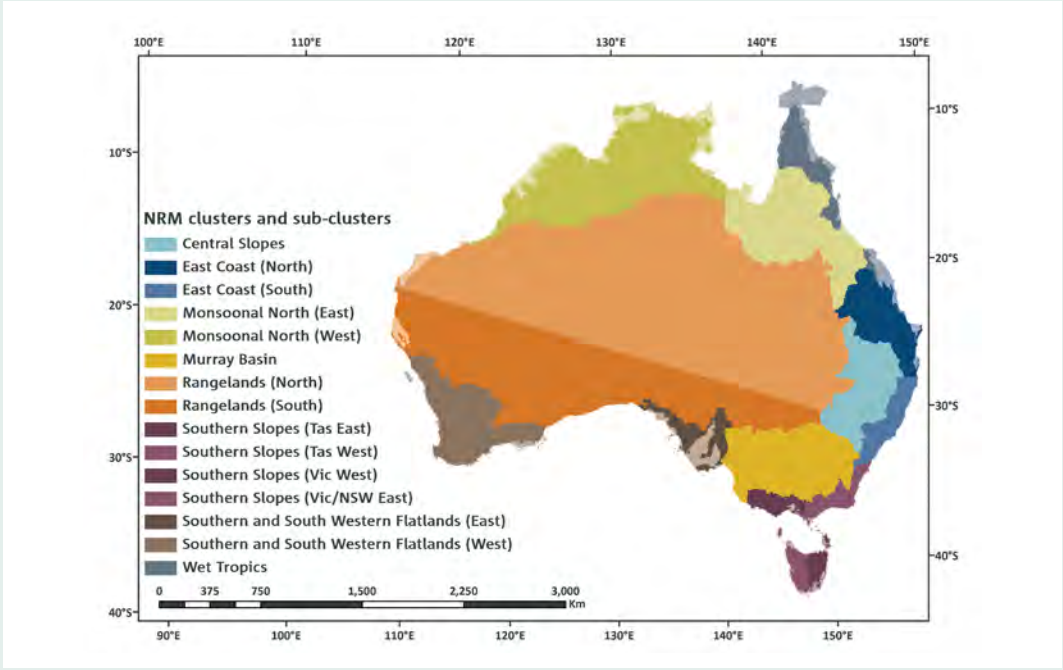


Figure 5: Climate Change in Australia provides climate information across the eight regions (14 sub-regions) of Australia

For *Climate Compass*, it is useful to distinguish three levels of detail in climate information and data available for each region on Climate Change in Australia. These are called, in increasing detail, *Summaries*, *Climate Trends*, and *Projections Data*, and each is associated with specific tools on the website.

People often seek unnecessary detail for climate projections, which then becomes confusing. **We encourage you to use the simplest level of detail that is sufficient for your purposes**. This level of detail is strongly related to the cycle of planning in which you are engaged. Guidelines for selecting climate information are presented in the following table.

Once you have chosen the level of detail you need from your climate projections, you still may need to choose appropriate scenarios, models and projections. Guidance for this is provided in ***T7***.

Table 1: Levels of detail in climate projections information, with descriptions and relevant tools available on Climate Change in Australia

Level of detail	Description	Example tool from Climate Change in Australia	Operational cycle relevance
Summaries	Starting point of considering climate risks: descriptive summaries of likely regional trends in various key climate elements, with simple indication of confidence in direction and magnitude	Regional Climate Change Explorer Marine Explorer Climate Analogues	Particularly relevant for the *Scan* cycle, but is often useful in the other two cycles when you are trying to understand projected climate changes at a high level.
Climate Trends	Builds on *Summaries* information: the regional information is enriched with simple, interpreted graphs showing the range of results from all climate projections (emissions scenarios and models)	Climate trend pamphlets Extremes Data Explorer Marine Explorer	Generally relevant in the *Strategy* and *Project* cycles.
Projections Data	The most technical and detailed information: Access to full suite of projections through the Climate Futures Tool, to help users categorise credible outcomes for different variables, and exemplar projections which could be used to provide representative detailed model data.	Climate Futures – note completion of an online course is required	Primarily used in the *Project* cycle for specific planning analyses of bigger, longer-term or contentious investments that require detailed climate information.

State and territory governments have produced downscaled climate projections to inform their climate risk management. An up-to-date list of these resources can be found on Climate Change in Australia, but at time of writing include:

- NSW and ACT Regional Climate Modelling (NarCLIM) by the New South Wales and Australian Capital Territory governments in collaboration with the University of New South Wales
- Climate Change in Queensland (online map application) by the Queensland Government
- High Resolution Climate Change Projection Data for Queensland by the Queensland Government
- SA Climate Ready by the Goyder Institute for Water Research in partnership with the South Australian Government
- Climate Futures for Tasmania by the Antarctic Climate and Ecosystems Cooperative Research Centre in collaboration with the Tasmanian Government.

For some circumstances, you will also need climate change impacts information. There is a range of hazard-specific impacts information, information on approaches to assessing climate risks and how to make decisions under uncertainty, and case studies on the experiences of others in assessing and responding to climate risks. Selected resources below:

- ABARES provides climate information relevant to a range of sectors that influence agricultural productivity.
- AdaptNRM takes national-level adaptation approaches and information sources and makes them accessible and regional, particularly for regional natural resource management planning.
- Adapt NSW has resources and research to help understand and adapt to climate change impacts in New South Wales.
- Australia's 7th National Communication on Climate Change, Chapter 6: Climate Change Vulnerability and Adaptation (2017) is the most recent summary of Australia's approach to adaptation.
- Climate Adaptation CSIRO and Strengthening Australia's resilience to climate change provides access to non-commercial in confidence adaptation and climate impacts research by CSIRO.
- Climate Data Online by Bureau of Meteorology provides detailed observed climate information across Australia.
- Climate Ready Victoria is focused on adaptation by providing climate impacts information for 6 regional areas of Victoria.
- CoastAdapt by the National Climate Change Adaptation Research Facility provides simple coastal inundation maps of local areas to assist with understanding impact and the need to take adaptation steps.
- Coastal Risk Australia by Cooperative Research Centre for Spatial Imagery demonstrates areas vulnerable to coastal inundation.
- Earth Systems and Climate Change Hub, part of the National Environmental Science Program, is focussed on researching climate change science to supply useful and accessible climate information for Australia.

- Enterprise suitability mapping – Tasmania, combines Climate Future for Tasmania climate projections with enterprise suitability modelling to help farmers match local soil and climate information with the right crops for those conditions.
- Intergovernmental Panel on Climate Change Fifth Assessment Report: Impacts, Adaptation and Vulnerability 2014 provides the most comprehensive and reliable synthesis of global peer reviewed literature on climate change impacts, adaptation and vulnerability.
- National Climate Change Adaptation Research Facility Adaptation Library contains research report and information to support decision-makers throughout Australia to manage climate change risks.
- Sea-level rise by the Antarctic Climate and Ecosystems Cooperative Research Centre and CSIRO provides information specific to sea level rise projections.

In practice, if a large amount of impacts information and analyses have been produced in your domain, it may be useful to simply use Google™ to search for the most up-to-date publicly available information. Include terms like 'review', 'synthesis', or 'summary' in your search to narrow it to the kinds of synthesis documents that provide consensus information for *Scan* or *Strategy* in particular.

T7: Selecting the Right Climate Information

There are some key principles for selecting the right climate information to use in your climate risk assessment:

1. When you are identifying what risks ought to be considered, it is important to look at greatest plausible change (section ***T4***). This helps to ensure that you do not miss any risk. In general, this means looking at change under the RCP8.5 emissions scenario. However, when you are deciding about treating the identified risks you need to understand the full range of possible levels of change, so as not to over-react too soon.[1]

2. Your choice of how comprehensive a range you choose should also be affected by the riskiness of the issue you are considering. For example, you may consider a wider range if the decision involves the potential loss of human lives or a very large investment. There is no right or wrong here, but you need to justify your choices.

3. People tend to seek more detailed information than they need in most cases. In general, the level of detail you use should be closely matched to the cycle of planning. Use summaries for the *Scan* cycle, a bit more information for the *Strategy* cycle, and only get into complex details in the most substantial or risky *Project* assessments. The guidance below will encourage you to stay as simple as is acceptable, while using what is available.

4. For the *Strategy* and *Project* cycles in particular, you should look for data that extends out to your full decision lifetime (see ***T3***).

1 This is in line with the TCFD (2016), which recommends "that organizations use, at a minimum, a 2° Celsius (2°C) scenario and consider using other scenarios most relevant to the organization's circumstances, such as scenarios related to Nationally Determined Contributions (NDCs), business-as-usual (greater than 2°C) scenarios, or other challenging scenarios."

In practice, these principles lead to the following recommendations for each cycle (see Table 2):

For *Scan*, the key resources on Climate Change in Australia are its Analogues Explorer and its Regional Climate Explorer. The Analogues Explorer provides the simplest view of the future, letting you know where in Australia may be currently experiencing a climate similar to the one projected for the future for any town or city of interest, which helps you quickly get a very real sense of what the future might be like. The Regional Explorer provides summaries for each Australian reg ion of projected change in mean annual temperatures and rainfall and the resulting effects in different seasons on temperature and rainfall extremes, sea-level rise, fire weather, humidity, solar radiation and evaporation.

Use the greatest levels of change in these (maximum values at RCP 8.5) to identify risks, and the full range described to prioritise further action.

If you are concerned by sea-level rise or sea temperatures, also look at the Marine Explorer or CoastAdapt.

For *Strategy*, use the summaries from Regional Climate Explorer. You should also consider obtaining more of a sense of the trajectory of change to help consideration of timing by using the Climate trend pamphlets or the less annotated Time Series Explorer. Figure 6 shows how to interpret a *Climate trend pamphlet*.

For decision lifetimes out to about 2035 it is sufficient to use only the range in the RCP8.5 emissions scenario, since there is little divergence between scenarios by this time.

For longer decision lifetimes, use RCP8.5 for identifying risks, but also low (RCP2.6) and medium (RCP4.5) scenarios to understand the range of possible futures when prioritising actions. Detailed logic is laid out in the decision trees in Figure 7.

For *Project*, follow a similar approach as for *Strategy* for small or low risk projects.

For large investments or high-risk decisions, you may need to access detailed climate projections through the Climate Futures Tool on Climate Change in Australia, or from similar down-scaled projections from other sources.

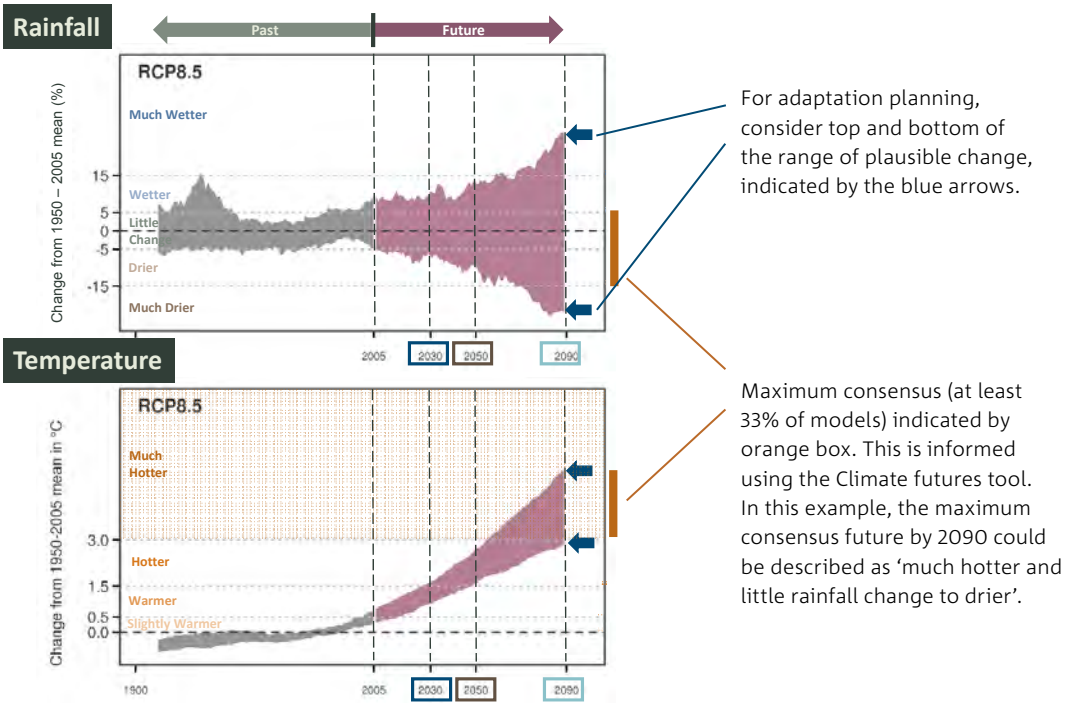
In this case, you may need to commission expert advice. If you do decide to commission expert advice consider using the principles outlined in Figure 8 and at the beginning of this section. Figure 8 refers to the 'grid' produced by the Climate Futures Tool, for which explanation and training is available on Climate Change in Australia.

Figure 8 also refers to decisions that are 'once-off' as opposed to ongoing adaptation pathways (see ***T10***). For some types of investments (for example, large infrastructure or major policy decisions like coastal retreat), you might invest in highly quantitative specialist analyses for which you can apply a more comprehensive set of projections. In such cases you are likely to be commissioning a bespoke consultancy anyway.

Table 2: Choosing climate data for each *Climate Compass* assessment cycle

Assessment cycle	Envisioning/Constructing/ Identifying	Prioritising/Planning	Tools from Climate Change in Australia
Scan	Use qualitative information on analogue cities/towns and regional summary descriptions, noting greatest levels of change	Use regional summaries, considering whole range of change	Analogues Explorer Regional Climate Change Explorer Marine Explorer for sea level rise
Strategy	Use regional summary descriptions and regional trajectories for RCP8.5, considering greatest plausible change in these (both positive and negative where direction is uncertain)	Consider greatest and least plausible change derived from regional trajectories for RCP8.5 as well as RCP2.6 and RCP4.5	Climate trend pamphlets Time Series Explorer (Also Extremes Data Explorer, Marine Explorer)
Project	In general use sources as for *Strategy*, though a bespoke impacts assessment may be appropriate for large investments	Often climate trends are still adequate, but for bigger, longer-term or contentious investments that require detailed climate information, access the full suite of projections datasets through the Climate Futures Tool.	As for *Strategy* where possible. Climate Futures Tool – note: completion of an online course is required

Time series of rainfall (top) and temperature (below) for the historical period (1900 to 2005; grey) and projected period (2005 to 2099; purple) showing the 10th to 90th percentile of the 20-year running mean from 40 CMIPS models.



In this example, the rainfall variable is increasing and decreasing through time (model dependent) and the temperature variable is increasing through time (i.e. change in one direction).

Figure 6: Trend pamphlet example – the shaded area shows the range of plausible change (with the greatest plausible change level indicated by the blue arrows) and the smaller 'maximum consensus' range (gold bar alongside figure) for two variables (rainfall and temperature) in one region for one emission scenario (here high, RCP8.5) over the next century.

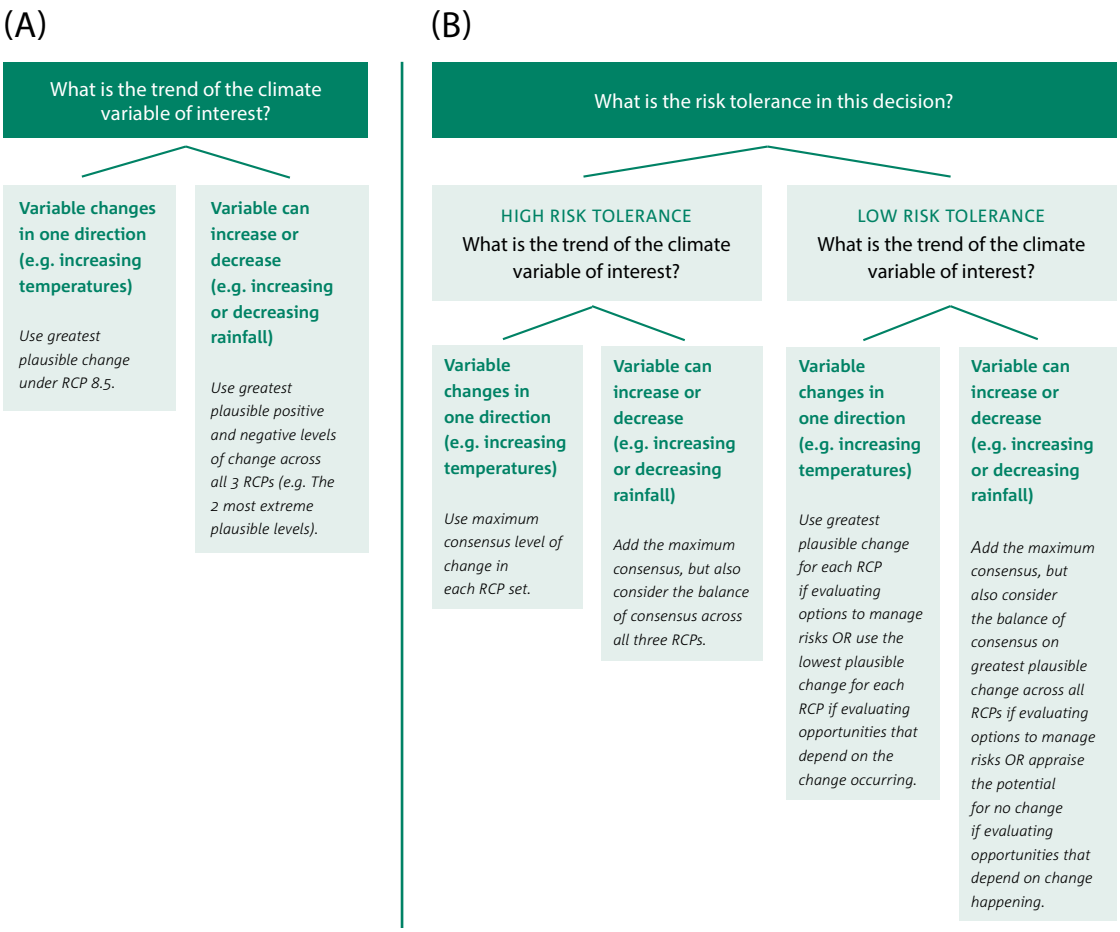
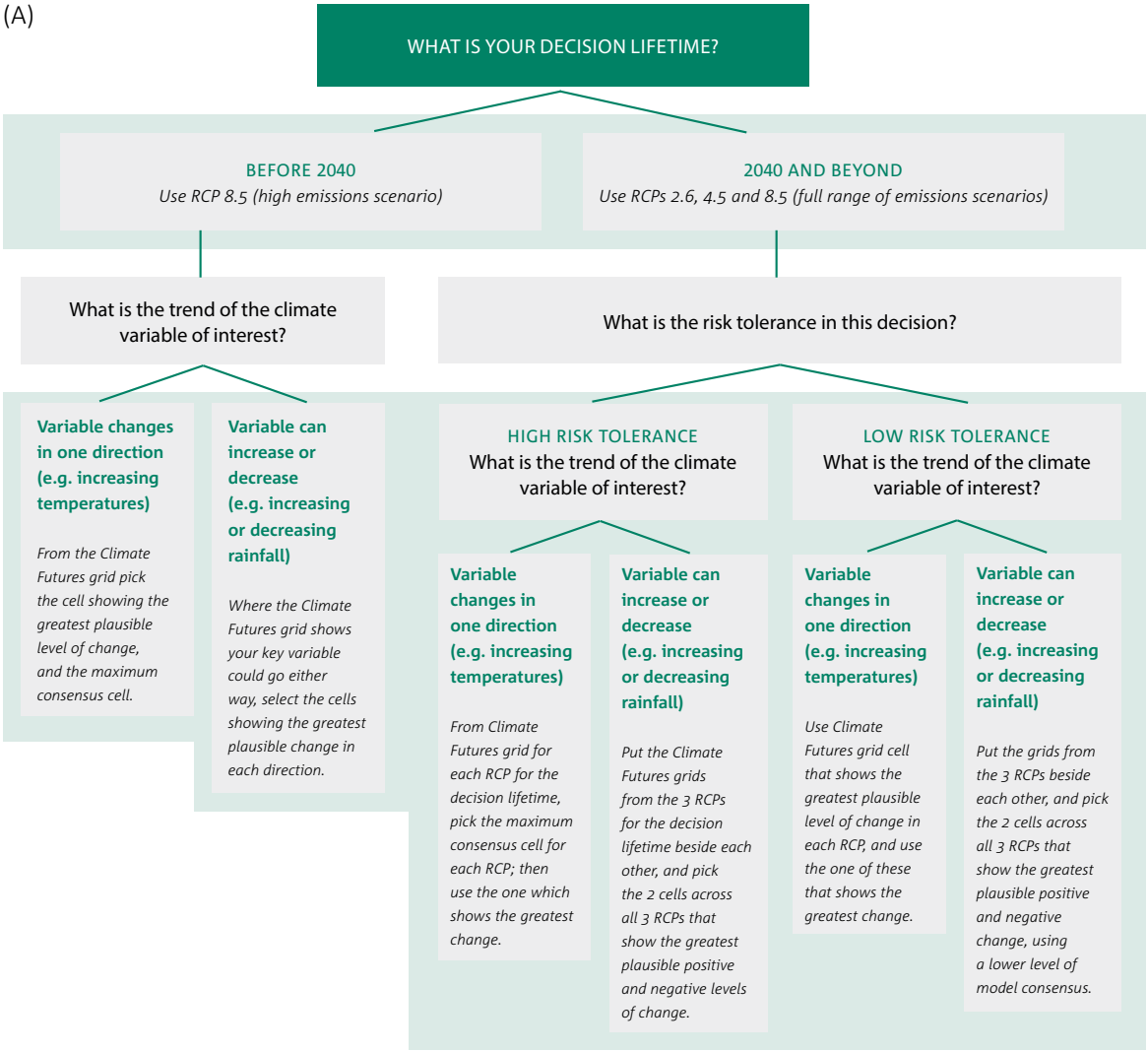


Figure 7: Logic for selecting climate scenarios for *Strategy* (or *Project* when *Climate Trends* data is sufficient). Part A guides the selection of climate information when identifying your climate risks (Steps 2 and 3). Part B guides the selection of climate information when assessing risk treatments and planning for implementation (Steps 4 and 5).

(A)


WHAT IS YOUR DECISION LIFETIME?
BEFORE 2040
Use RCP 8.5 (high emissions scenario)
2040 AND BEYOND
Use RCPs 2.6, 4.5 and 8.5 (full range of emissions scenarios)
What is the trend of the climate variable of interest?
What is the risk tolerance in this decision?
Variable changes in one direction (e.g. increasing temperatures)
From the Climate Futures grid pick the cell showing the greatest plausible level of change, and the maximum consensus cell.
Variable can increase or decrease (e.g. increasing or decreasing rainfall)
Where the Climate Futures grid shows your key variable could go either way, select the cells showing the greatest plausible change in each direction.
HIGH RISK TOLERANCE
What is the trend of the climate variable of interest?
LOW RISK TOLERANCE
What is the trend of the climate variable of interest?
Variable changes in one direction (e.g. increasing temperatures)
From Climate Futures grid for each RCP for the decision lifetime, pick the maximum consensus cell for each RCP; then use the one which shows the greatest change.
Variable can increase or decrease (e.g. increasing or decreasing rainfall)
Put the Climate Futures grids from the 3 RCPs for the decision lifetime beside each other, and pick the 2 cells across all 3 RCPs that show the greatest plausible positive and negative levels of change.
Variable changes in one direction (e.g. increasing temperatures)
Use Climate Futures grid cell that shows the greatest plausible level of change in each RCP, and use the one of these that shows the greatest change.
Variable can increase or decrease (e.g. increasing or decreasing rainfall)
Put the grids from the 3 RCPs beside each other, and pick the 2 cells across all 3 RCPs that show the greatest plausible positive and negative change, using a lower level of model consensus.

(B)

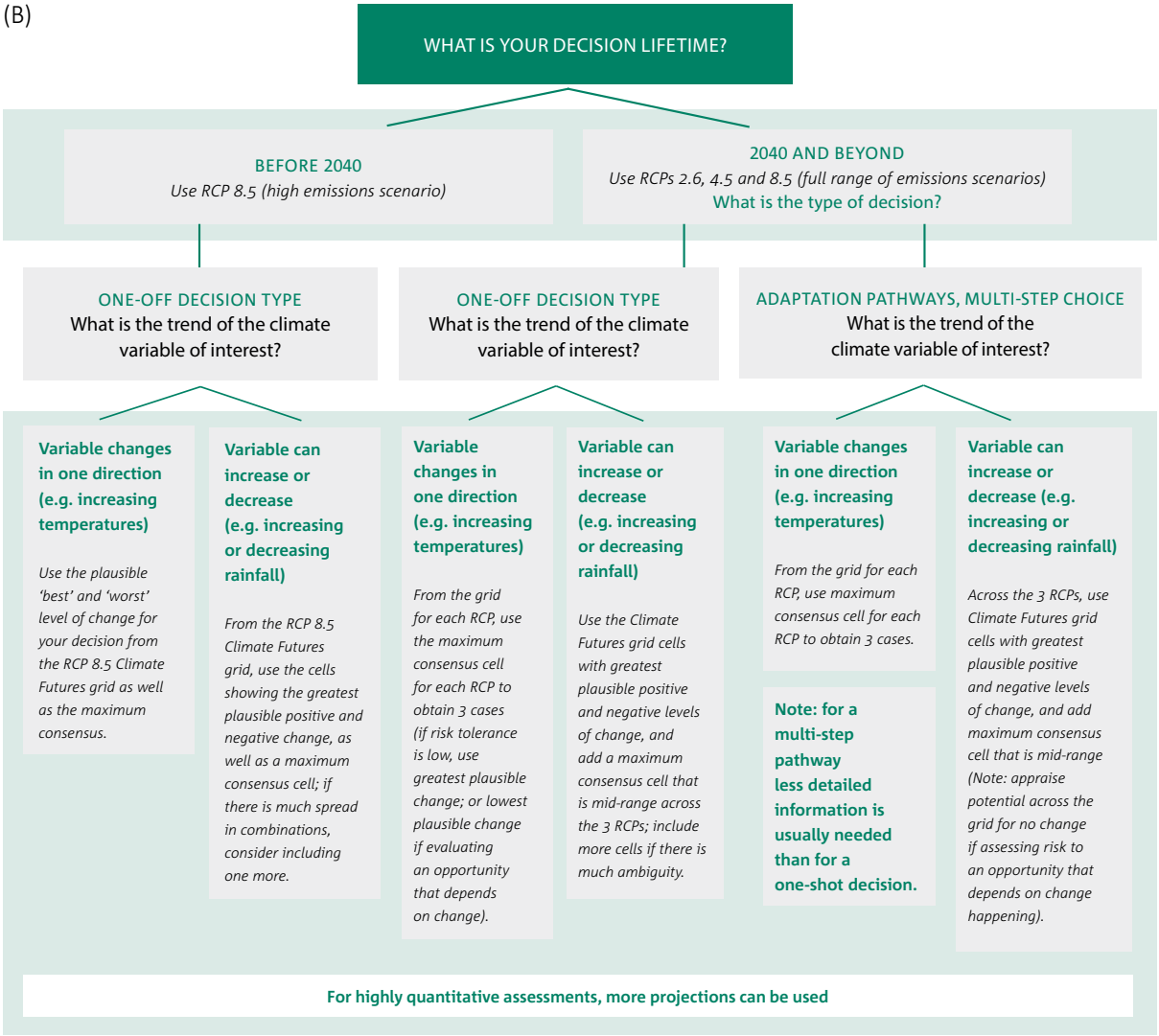


Figure 8: Logic for selecting climate scenarios for *Project*, if projections data detail is required. Part A guides the selection of climate information when identifying your climate risks (Steps 2 and 3). Part B guides the selection of climate information when assessing risk treatments and planning for implementation (Steps 4 and 5).

T8: Identifying Climate Risks

Once you have identified the scenarios of temperature and rainfall change, or other climate variables of relevance to you where possible, you need to think about impacts using a qualitative thought exercise (see ***T4***) or by accessing projections of impacts (such as flooding or wind damage, or changes in crop production). When you look for these impacts projections, try to find evidence that they are modelled based on climate projections that represent a similar level of change to those you have selected to consider.

When you first start thinking about climate risks, it can be challenging to identify the wide variety of ways in which impacts may affect the goals and objectives of your agency. It can be tempting to think that any impact or change is a risk, but this is not usually the case and leads to a much longer list of 'risks' than you actually need to consider. This section provides some diverse examples of identifying risks, and then suggests a few different ways to approach brainstorming the risks that matter for you.

Climate risks can impact the effectiveness of a policy, program or asset, either directly or indirectly. A direct impact could be extreme heat causing a transformer to fail, or more intense rainfall causing flooding, which closes an office. An indirect impact could be changes in export transport as changes in rainfall cause farmers to change their export crops.

Some of these impacts can be related directly to climate data (for example, the heat effect on transformers), others must be interpreted through their effects on other drivers (for example, flooding must be modelled in response to rainfall changes and elevation and building data). Indirect impacts may often need to be assessed more qualitatively.

Subsequently, you will need to translate likely directions of climate change into impacts (see also ***T4***). For example, an increase in very hot days and heatwaves may see increased component failures in infrastructure. A decrease in rainfall may mean less potable water. Changing temperatures and rainfall may cause complex flow-on effects to the biodiversity and health of our landscapes.

Many impacts cannot be derived from specific changes in climate elements. To find out about these, you will need to search other sources, work with others or get an analysis done specially (noting this is usually not warranted for the *Scan* or *Strategy* cycles).

Table 3: A simple list of many of the general types of changes and examples of the types of possible flow-on impacts.

Direct climate-related changes	Derived climate-related changes	Examples of flow-on impacts
Physical climate • Mean Temperature • Maximum Temperature • Minimum Temperature • Rainfall • Rainfall in different seasons • Solar Radiation • Evapotranspiraton • Wind Speed • Relative Humidity	• Extreme Temperature • Extreme Rainfall • Drought • Coldest Night • 1-in-20 year Coldest Night • Hottest Day • 1-in-20 year Hottest Day • Wettest Day • 1-in-20 year Wettest Day • Sea-level rise • Sea surface temperature • Salinity • Acidification • Fire weather	• Coastal inundation risk • Infrastructure damage • Heatwave mortalities • Transformer failures • School or worksite closures • Crop growth • Change in growing seasons • Biodiversity change • Changing invasive species • Damage from extreme winds • Flood risk • Bushfire frequency • Food security • Water supply security
Sources of transition risks • Changes in public and investor sentiment • Paris Agreement	• Disinvestment from carbon intensive industries • New energy technologies • New transport technologies • Land-based emissions reduction activities	• Stranded assets including investments • Rearrangement of energy networks • Changed road network needs

These types of changes can lead to impacts in a wide range of different areas of decision making, and it is important to consider all of these. Table 4 is a typology of decision-making areas for agencies; if you ask whether there are impacts in each of these categories, and then whether those impacts will affect the ability to achieve goals and objectives, it will help to ensure you cast a wide net in identifying the risks that arise from such diverse impacts.

Table 4: Six types of decision areas in Commonwealth agencies, with examples of decisions or objectives (and some possible risks to these).

Categories	Examples of decision areas and possible climate risks
1. Staff OH&S	Health of outdoor workers (heatwave impacts on rangers in Uluru National Park) Staff safety in disasters (cyclones affecting staff in Philippines or quarantine inspectors in Torres Strait)
2. Owned assets	Offices, if not rented (hail storm risks in Canberra) Coastal assets (naval bases and sea level rise) National parks (fire management and saline intrusion in Kakadu)
3. Programme outputs	Productive asset investments (flooding impacts on large infrastructure; disasters affecting critical infrastructure) Asset services contributions (heat/flood impacts on aged care facilities) Natural resource assets (ensuring adaptation in the National Landcare Program)
4. Portfolio objectives	"Resilience & lifetime wellbeing of Australians" goal affected by acute climate risks "Biosecurity and Emergency Response" outcome affected by chronic climate changes
5. Interactions across portfolios	Emissions goals impeded by land use limits and city growth failings Local government repairs and maintenance budgets not targeted to reduce disaster recovery costs
6. Economy-wide systemic risks	Productivity rises and tax (budget growth slowed by more disasters or reduced outdoor workforce in north) Increasing compound events overwhelming disaster management funding Increased wheat production in Canada and Russia competing with our exports

There are a variety of processes you can use to explore what decisions are affected by climate change, and whether that presents actual risk. You should brainstorm or workshop at least one of the following approaches (preferably more, even all) with the appropriate diversity of stakeholders for each of the identified decision areas. Each of the approaches is likely to trigger different ways of thinking about future risks.

1. Start with a variety of documented climate changes (the summary descriptions from Climate Change in Australia probably suffice for this – see ***T6***) and ask whether each one could affect any of your decisions in the areas you have identified. For example, you may take the potential for increased fire weather risk and ask whether it affects any of your policy outcomes, such as placing some natural resource management outcomes or infrastructure at risk. This approach is a good starting point, but tends to result in narrow conclusions, so it is a good idea to mix it with another one.

2. Consider the overall goals of each decision area and ask whether, and if so when, those goals may be undermined by climate impacts (in the absence of changed approaches). For example, the goal for aged care facilities may be to maintain a dignified and safe life for old people, but increasing heatwaves and flood risks may undermine this goal for facilities which are not adapted to these effects. Ensure that you consider limits to social processes as well as to infrastructure. For example, heatwaves may overwhelm the effectiveness of air conditioning assets, but they may also overwhelm the capacity of aged care support networks in the community.

3. Consider the major types of decisions in each area and ask whether the consequences of each can be affected by climate risks. If so, ask what the *decision lifetime* (see ***T3***) of this decision is and how the relevant climate driver may change on this timeframe. For example, your program may be investigating where irrigation infrastructure needs updating. This investment assumes horticulture will continue as is for at least 50 years, but temperature and rainfall changes may be making horticulture marginal in some regions by 2060.

4. Ask what your stakeholders' preferred vision is for the outcome of this service delivery in 20 or 50 or even 100 years' time. Then explore whether changing climate risks could undermine the meeting of this vision.

The best way to get a comprehensive coverage is to have diverse stakeholders in the room, even for a 1–2 hour brainstorm.

This step is really important to develop a long list of possible risks. You will then systematically work out which really matter, and whether treatments are needed in the near future, and you will be able to set many risks aside for now. But if the risk does not make it on to your initial long list, then it will never be considered properly.

T9: Risk Management for Climate Risk

If your climate risk assessment is being carried out within your agency's usual risk management procedures, then you will probably want to use the risk matrix that is applied to other risks. However, be aware that climate change does create some novel challenges for this approach, as outlined here.

Conventional risk management practices use a risk matrix with a likelihood and consequence scale to determine an overall risk rating of an event after existing controls are applied. A typical matrix may look like the Table below.

Table 5: Sample conventional risk matrix

	Consequence				
Likelihood	**Insignificant**	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost certain	Medium	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	Medium
Rare	Low	Low	Low	Low	Medium

Consequences are the negative effects of an event on each of your decision areas. Likelihood is the chance of this event occurring.

It is usually up the officer managing the risk to make an informed assessment on the likelihood of the risk becoming an issue and then the consequence of that issue. A risk rating is provided on the matrix, which determines if the risk needs to be managed further than existing controls. Usually at least the high and extreme risks must be addressed, depending on your agency practices.

However, climate change creates some novel challenges for assessing consequences and likelihoods. Consequence and likelihood will not stay constant through time, and nor will the effectiveness of any current controls. Risk management processes tend to assume constant levels of likelihood, consequence and risk prioritisation, but climate change can change these profiles over time. Furthermore, the long-term nature of climate change means it is very unlikely that the values of your agency or its stakeholders will remain constant over the period of concern. This means the risk assessment process ideally needs to find ways to formally consider that:

- Climate change will cause ongoing changes in likelihoods. For example extreme heatwaves that are considered *rare* in the current climate will increase in likelihood to become *possible* and then *likely* over time. Allow for these changes during your chosen decision lifetime.
- Events with catastrophic consequences that are considered rare in the current climate may increase in likelihood, for example long-term droughts, like the Millennium Drought. In general, at the Identifying and Prioritising steps (Steps 3 and 4) of any cycle, you should include *all* plausible events rated 'Catastrophic' in further assessment, even if their likelihood is currently rare. You may legitimately decide against treating them for now at the Planning step, Step 5.
- Climate change may drive changes that are hard to envisage. For example, major towns may become uninhabitable owing to recurrent and cumulative events like increased average temperatures or regular flood events. If these changes are not envisaged as part of the 'greatest plausible future' scenario, or that scenario is not adequately kept in mind during the risk identification process, the risks associated with such changes will not be considered.

- Climate change may increase the likelihood of simultaneous or multiple consequences. For example, there may be an increased likelihood of simultaneous high sea-level events and heavy rainfall events in the catchments inland of coastal settlements. By treating each risk separately in the traditional risk assessment process, these concurrent or interdependent risks may be missed.
- You should consider the risk tolerance of your stakeholders. For example, their concern about a catastrophic consequence on one of your goals may be different to yours. Their values (and yours) may also change over time into the future.
- You should also be aware that catastrophic physical consequences in the longer-term future may play out in the near term through social and political consequences, and these may have more immediate implications for your operations than the eventual physical effects. For example, anticipatory changes in legislation to increase building standards may change construction costs, or demand management to prepare for future reductions in rainfall may affect access to water supplies now.

In ***Step 4 – Prioritising Risks*** of the *Scan* cycle, we have suggested a few different ways to prioritise risks, which may influence the way a risk matrix is used and how it needs to be modified to better deal with climate risks. These suggestions were:

- prioritise based on consequences alone
- prioritise certain *types* of risk based on your agency's risk appetite
- prioritise risks that are *less* certain

These are not the only options and this is still an active area of development, with no best-practice approaches clear yet. The tables below provide some examples of how risk recording and risk matrices might be modified to apply these approaches. Note that you may wish to develop your own approach – these are just suggestions and examples and the ideas about best-practice are likely to rapidly evolve.

Table 6: Sample risk identification table that allows for prioritisation based on consequences alone or based on risk type (just two possible approaches). Note that these approaches involve prioritisation directly in the risk identification table and thus do not require a risk matrix to determine the rating – just clarity about which consequences are priorities, whether a higher number of consequences makes a risk a priority, and/or which risk types are priorities.

Risk	Risk owner	Sources of risk	Existing controls	Risk Rating		
				Risk Type	Consequences	Rating
<The risk identified>	*<Who owns the risk>*	*<Where the risk arises from – how it comes from climate impacts>*	*<Existing methods to manage the risk>*	*<The type of risk based on pre-defined categories (e.g. work safety, economic, etc.)>*	*<The full set of consequences of the risk>*	*<The resultant rating based on risk type and/or number and type of consequences>*

Table 7: Sample risk matrix modified to include risks with uncertain likelihood (just one possible approach, showing some prioritisation of less certain risks). This risk matrix could be used with a normal risk identification table, not necessarily a modified one as above. Ensure that you decide what your consequence and likelihood labels mean, aligned with your agency's approach to risk.

	Consequence				
Likelihood	**Insignificant**	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost certain	Medium	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	Medium
Rare	Low	Low	Low	Low	Medium
Uncertain	High	High	High	Extreme	Extreme

T10: Using Adaptation Pathways

Risk treatments are often arranged into a sequence to be responsive and flexible to changing circumstances, or even multiple sequences that may represent alternative courses of action in the future. This is called an **adaptation pathway** approach. Thresholds and triggers are used to signal the implementation of the next treatment in the sequence, or a shift to an alternative sequence. At times you may need to use multiple treatments at once; we call this bundling.

Adaptation pathways can be short and once-off, or can be more complex, particularly where managing the risk is a process of adaptive decision-making over time. An iconic example of the latter is the Thames Estuary 2100 project, which identified a series of options for upgrading London's defences against sea-level rise. This mapped a currently preferred pathway through these options, from small upgrades now to a point where a new barrage would need to be built, with a series of decision points triggered by increasing degrees of sea-level rise. At each decision point, the preferred pathway of measures will be reviewed to see whether the original sequence of measures was still sensible in face of new knowledge about rates of sea-level rise and new technologies. The first major revisiting of the adaptation pathway is being undertaken in 2018.

Adaptation pathways generally establish a structured, continuous process of assessing and implementing risk treatments in response to new information and changing circumstances. The approach enables decision makers to identify no regrets action that can be taken now without cutting off options later, creating an adaptive, robust response to uncertainty. *Climate Compass* overall includes a simple use of adaptation pathways, with some increasing complexity through the three cycles:

***Scan* cycle:** In this cycle, adaptation pathways thinking is very simple. It is simple about deciding whether there are some actions to take now and some to postpone until later.

An adaptation pathway in a *Scan* cycle could be identifying that two Divisions need to begin managing their climate risks today as they are about to embark on a grants program to build long-lived infrastructure and are developing policy for infrastructure spending. Another Division may only need to start considering their climate risks when maintenance costs exceed a certain amount due to climate-related damage. A fourth Division may need to simply monitor the changing climate and the actions of other agencies before they act.

***Strategy* cycle:** In this cycle, adaptation pathways are aimed explicitly at prioritising and sequencing a portfolio of risk treatments. For example, this might help manage climate risks to a Division's infrastructure grants program. Along one pathway, the risk may be partially treated immediately, by writing grant guidelines for project proponents to consider climate risks in their applications, and then requiring assessors of applications to check that climate risks are being considered by proponents. Longer-term treatments may be to develop a method for proponents to use, improve the data on climate or impacts for proponents, initiate assessments on the infrastructure after extreme weather events, and/or to learn about the effectiveness of different approaches to building resilience.

***Project* cycle:** In this cycle, detailed action-specific adaptation pathways should be the default approach for risk management of major activities. Although examples to date are dominated by major infrastructure projects (visit CoastAdapt for some case studies), the approach is just as valuable for major social or environmental programs.

Adaptation pathways are readily applied to many asset style decisions, in order to reduce the risk of making a decision now with long-lived consequences. However, newer types of adaptation pathways that focus at a more strategic decision-making level are increasingly applied to guide the overall directions of adaptation, particularly to avoid maladaptive outcomes.

Program managers may find it more important to encourage the activities they oversee to take an adaptation pathway approach than to apply it at the program level itself. However, even for those managing programs there are likely to be some measures that should be implemented before others, and it is useful to think about ensuring that future options are not closed off by earlier actions.

Box 2 outlines key ways of thinking that can be incorporated into an adaptation pathways approach to reduce the risk of making a decision now.

Box 2: Strategies for reducing decision risk

Hallegatte (2009) suggests a variety of approaches to seeking options that reduce the riskiness of decision-making in the face of uncertainty:

(i) Select ''no-regret'' strategies that yield benefits even in absence of climate change, or across many possible futures.

(ii) Favour reversible and flexible options, such as demand management before committing to major infrastructure investment.

(iii) Buy ''safety margins'' in new investments, such as building larger foundations for a bridge so its height can be increased cheaply later if needed.

(iv) Promote soft adaptation strategies, including a long-term perspective, such as institutional change, instruments like insurance, and changes in practice such as planning for longer time frames.

(v) Reduce decision time horizons, such as building movable homes so the commitment to a location is shorter term.

Any of these strategies can be adopted in adaptation pathways and may trigger thoughts about different options. It is always important to consider whether an option creates path dependency (locking you into future directions rather than ensuring future options remain open) and possible later maladaptation, but these options in general are less likely to do this than committing to a major long-lived asset.

Source: Hallegatte, S. (2009) Strategies to adapt to an uncertain climate change. Global Environmental Change-Human and Policy Dimensions 19, 240–247.

Adaptation pathways thinking interacts in a key way with the uncertainty represented by scenarios (***"T2: Scenario Analysis"***). When the future is uncertain, it is not helpful to have a response that works really well in one future but fails altogether in others. Whereas planning for a single future generally means we look for the best response for that future, planning across many scenarios often means looking for *robust* options, which may not be optimal in any one future scenario but continue to work reasonably in all of them. This is a very different way of developing options, which is explored further in the guidance provided by Infrastructure Australia for their large project proposals[2]. Often a robust option, as indicated above, involves all the ideas of adaptation pathways and avoiding path dependencies that are described above.

For some examples of different types of adaptation pathways and more information on developing and using them, see the Adaptation Pathways Network, the Adaptation Pathways Playbook, and CSIRO's Enabling Adaptation Pathways.

2 See: http://infrastructureaustralia.gov.au/policy-publications/publications/assessment-framework-ipl-inclusion.aspx

T11: Facilitation Team to Individual Officers

In general, we expect *Climate Compass* to be used as a framework for a core facilitation team with some combined climate change and risk management background knowledge to help identify and assess climate risks. The core facilitation team may perform much of the work of a *Scan* themselves, or may facilitate others who will have carriage of the results to appropriately apply *Scan*, *Strategy* or *Project*. However, once the basic *Climate Compass* framework has been learnt and broader basic climate change planning capability has been built, almost any APS officer can follow the process, especially where specialist climate data is not needed.

There are generally four different type of officers within the Australian Government which could use *Climate Compass*: policy officer, program officer, asset manager and corporate officer. The officers can use *Climate Compass* in different ways depending on their role and their specific areas of responsibility (Table 7). An area of responsibility may include any decisions that need to be made regarding a policy, program, asset or corporate service.

Table 8: Examples of the ways that different officers may use the *Climate Compass* cycles. Different roles may be more likely to use certain cycles than others.

Role	*Scan*	*Strategy*	*Project*
Policy officer	When developing a new policy or, reforming or assessing risks to an existing policy.	When developing a new policy, reforming or assessing risks to an existing policy, or when contributing to the development of programs or projects.	Less likely to use, as typically policy officers are more strategy focussed, rather than operational decision-making.
Program officer	When conceptualising the overarching framework for their new program or reforming or assessing risks to an existing program.	When developing the operationalising documents for the program or reforming or assessing risks to an existing program.	Operational decision-making related to their program.
Asset manager	Less likely to use, as typically a scan cycle would be completed by a strategy-focussed officer.	When developing a management plan for their specific asset.	Implementing the management plan for their specific asset.
Corporate officer	When managing the risk register for the agency.	Developing plans to manage risks to corporate areas of responsibility.	Applicability depends on area of responsibility. For example, may be used to by asset managers in corporate area or those responsible for work health and safety.

It is important to have clear communication to all the officers involved in climate risk management, as different groups of officers may be performing risk assessments at the difference levels of the agency or within different cycles. Continuity of strategic thinking is required across the different cycles, and information sharing is critical to efficiency, so some continuity of officers involved across the cycles is desirable.

T12: Resilience Builders Network

The Resilience Builders Network is an online community of practice open to all Australian Government officers engaging in climate risk management.

The Network is accessible via the digital collaboration service GovTEAMS. If you are interested in joining, please email climate.adaptation@environment.gov.au.

The Resilience Builders Network features:

- A library of key tools and resources related to climate and disaster resilience.
- Opportunities to connect with fellow public servants engaging in climate risk management.
- Ad hoc newsletter updates tracking new developments in climate risk management, including activities in the private sector.
- An events calendar which collates upcoming public climate risk workshops, conferences, seminars and lectures.

We encourage you to share your climate risk management experience and learn from the experience of others through the Resilience Builders Network.

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