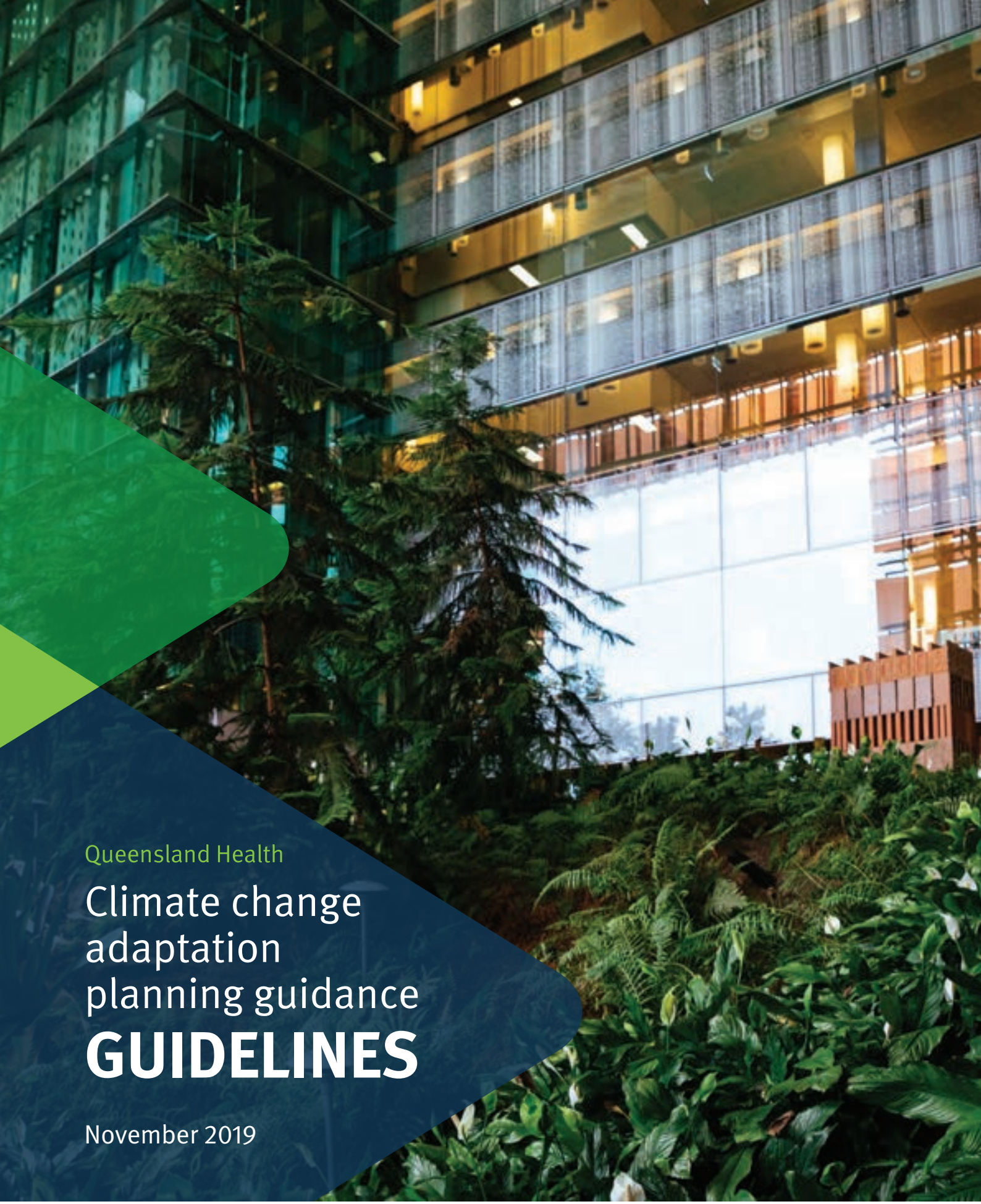

Queensland Health

Climate change adaptation planning guidance

GUIDELINES

November 2019

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Climate change adaption planning guidance Guidelines

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Foreword

This Guidance provides the information you need to develop a Climate Change Risk Management Plan for your Hospital and Health Service (HHS), Department of Health (DoH) Division or Queensland Ambulance Service (QAS). It has three components, the Guidelines, the Templates and the Almanac.

The Guidelines, Template and Almanac have been developed to support Queensland Health to:

- manage the risks associated with a changing climate, and
- take advantage of opportunities that may emerge.

The Guidance builds on existing risk management practices including disaster management arrangements within Queensland Health as well as other relevant state government planning in Queensland. It is consistent with Queensland Government's *Climate Change Adaptation Plan for the Health and Wellbeing Sector* (Armstrong, Cooke et al. 2018).

The purpose of the Guidance is NOT to remove any existing risk or disaster management arrangements within Queensland Health. Rather it is to build the capacity of Queensland Health internal stakeholders to understand and plan for how climate change might impact the sustainability of operations, human resources and infrastructure. Its aim is to help Queensland Health employees and stakeholders to access, interpret and use climate change information in order to identify and manage relevant risks as a part of their day to day business. The risk frameworks used are consistent with State-endorsed risk management approaches identified under the Queensland Emergency Risk Management Framework (QERMF) (QFES,2017).

This Guidance seeks to deliver an approach which, when implemented, will allow identified climate change-related risks to be incorporated into existing risk management approaches (e.g. risk registers) which have been developed under the risk management policies of Queensland Health.

Part 1

Introduction

What is in this Guidance?

This Guidance provides the information you need to develop a Climate Change Risk Management Plan for your organisation or other areas within Queensland Health.

The Guidance has three components:

- Step-by-step Guidelines for developing a Climate Change Risk Management Plan (Part 2 of this document)
- A set of Templates for conducting a climate change risk assessment.
- An Almanac describing the fundamentals of climate change and its related impacts that are relevant for HHS service areas.

In this Introduction to the Guidelines, we cover the following topics:

This introduction is followed by a five-step process which should provide you with comprehensive information on how to create your Risk Management Plan for climate change.

The Guidance to develop a Climate Change Risk Management Plan has three components

Policy context and intended audience of this Guideline

The Guidelines, Template and Almanac have been developed to support Queensland Health to:

- manage the risks associated with a changing climate; and
- take advantage of opportunities that may emerge.

The Guidance builds on existing risk management practices including disaster management arrangements within Queensland Health as well as other relevant state government planning in Queensland. It is consistent with the Queensland Government's Human Health and Wellbeing Climate Change Adaptation Plan for Queensland (Armstrong, Cooke et al. 2018).

The purpose of the Guidance is NOT to remove any existing risk or disaster management arrangements within Queensland Health. Rather it is to build the capacity of Queensland Health internal stakeholders to understand and plan for how climate change might impact the sustainability of operations, human resources and infrastructure. Its aim is to help Queensland Health employees and stakeholders to access, interpret and use climate change information in order to identify and manage relevant risks as a part of their day to day business. The risk frameworks used are consistent with state endorsed risk management approaches identified under the Queensland Emergency Risk Management Framework (QFES, 2017).

This Guidance seeks to deliver an approach which, when implemented, will allow identified climate change-related risks to be incorporated into existing risk management approaches (e.g. risk registers) which have been developed under the risk management policies of the Queensland Health.

Frequently Asked Questions (FAQ)

Why does Queensland Health need this Guidance?

There is a variety of ways in which climate change can affect Queensland Health, the people who depend on us, and those who work here – from increased health risks through to long term sustainability impacts on supply chains and building functionality. Knowing the possible risks means managers can make plans to be prepared and adapt in the future.

What is the scope of this Guidance?

This Guidance focusses on climate change risks to Queensland Health and the management of those risks. Reduction of Department of Health, QAS, and HHS greenhouse gases are also considered (the health sector contributes 7 per cent of Australia's total emissions) but are not the primary focus of the guidelines. However, it is important that climate change adaptation activities should not increase greenhouse gas emissions and wherever practicable they should contribute to reductions.

How does the Guidance fit within existing risk assessment processes in Queensland Health?

This Guidance seeks to help integrate climate change risks into existing plans or processes within Queensland Health – it is not intended as a replacement. It is recommended that you use the three components of the Guidance (Guidelines, Almanac and Template) to help understand the climate change risks faced by your organisation and consider how best to implement adaptation solutions. Often this is achieved by integrating the climate change-specific process within your existing management approaches and plans. For example, your organisation might already have an energy management or sustainability plan which can be updated or modified to address climate change-related risks identified through using this guideline.

What can I achieve by using this Guidance?

By following the process in the Guidelines, completing the Templates and using the resources in the Almanac you can expect to:

- get a better understanding of climate change and its likely impact on your organisation and relevant services over a range of future timescales
- use available information in a systematic manner to assess your climate change risks
- better understand how you might manage your climate risks
- identify your broad risk management options
- record information and decisions as you go through the risk management process
- assign accountabilities.

Do I have enough information to complete the Guidelines and develop a Climate Change Risk Management Plan?

Recognising that there may be limitations to the data available (as well as appetite and need for exploring climate risk in detail), the Guidelines look at two levels of risk exploration: a **Scan Cycle** and a **Detailed Cycle**. The Almanac and the Guidelines together can help you get started and provide much of the supporting information needed to complete a **Scan Cycle**. Your organisation is staffed by many people expert in managing risks to staffing, supply and facilities and all can usefully contribute knowledge to the Scan Cycle. In undertaking a **Detailed Cycle**, you may require data or information specifically related to existing processes in your organisation and/or more detailed climate data (available through the Department of Environment and Science and listed in Step 2 of the Guidelines). You will determine if and when you need external expertise to help identify, interpret and apply more technical information.

What is the difference between a 'Climate Change Risk Management Plan' and a 'disaster management plan'?

A disaster management plan deals with the arrangements for managing the potential adverse effects of an extreme event (which may or may not be weather related), including, for example, arrangements for mitigating, preventing, preparing for, responding to, and recovering from a disaster. A Climate Change Risk Management Plan takes a longer-term view, investigating the multiple pressures that an organisation may face as a result of changing climate. This includes risks related to changes in the mean climate, as well as increases in the frequency and intensity of extreme events. The difference is highlighted by the question at the core of this guidance – *how will we build and staff our hospitals and health organisations, and define their capacity and operations under the expected changes?* The Almanac has a list of the broader and longer-term climate change risks relevant to HHS, QAS and DoH. These include warmer temperatures, reductions in water availability and more frequent episodes of flooding and related risks, including from communicable diseases.

Where to start

Box 1 will help you to navigate between the step-by-step Guidelines (Part 2 of this document), the set of Templates and the Almanac.

Box 1: Using the Guidelines

I want some background information about climate change risks to Hospital and Health Services (HHSs).

- Why should I consider climate change risks to my HHS? Go to Page 8 of Guidelines
- What is climate change and sea-level rise? Go to Page 4 of the Almanac
- What does the future climate look like in Queensland? Go to Page 6 of the Almanac
- What are some of the potential impacts of climate change on HHSs? Go to Page 68 of the Almanac
- What are the benefits of adapting to climate change? Go to Page 13 of Guidelines
- What are some examples of management (adaptation) options to address climate change risks? Go to Page 73 of the Almanac

I want to do a rapid assessment of the climate change risks facing my HHS. Follow the 'Scan cycle' instructions in the Guidelines.

Go to Page 20

I want to do a detailed climate change risk assessment of my HHS. Follow the 'Detailed cycle' instructions in the Guidelines.

Go to Page 20

I want to see what a best practice climate change risk assessment within the health sector might look like.

Go to Page 81 of the Almanac

Climate change effects on Queensland Health

Future climate change and its impacts

Queensland Health activities are adjusted to the present-day environment within which they operate, including the present-day climate. Climate change is expected to place unusual demands on our organisation and building resilience and sustainability in operations and managing risk will be required to ensure that your organisation continues to deliver effective and high-quality health care to Queenslanders.

Changes in the mean climate: The impacts of climate change on Queensland Health include the health consequences of gradual climate-related environmental changes, for example rising average temperatures, longer aeroallergen seasons and air pollution exposure, increasingly variable rainfall patterns affecting water quality and availability and food production, changes in patterns of infectious diseases (vector-borne and food and water related), and rising sea levels. Under predicted climate changes, disturbances in water quality, food security, and the prevalence of infectious agents will have knock-on impacts on the functioning of Queensland Health and our standards of service.

Changing environmental conditions also affect livelihoods, social cohesion and mental health. Torres Strait Islanders for example are already experiencing cultural, property and land loss due to rising sea levels. These changes will have implications for the effective and safe operation of Queensland Health.

Extreme events: Changes in the mean climate will lead to changes in the frequency and severity of extreme events. This includes heatwaves, storms, floods and bushfires. Heatwaves have impacts on the general population through increased rates of heat stress and heatstroke and by exacerbating chronic conditions (e.g. cardiovascular, renal, respiratory and mental illnesses) leading to increased rates of hospital admissions on excessively hot days. Surges in demand may be complicated by disruptions to supply chains (e.g. pharmaceuticals, food) and reduced staff availability. Floods affect the operations, services and infrastructure of HHS, for example by preventing staff from getting to work and through damage to low-lying hospital buildings.

Coincident events: Climate change increases the likelihood of multiple hazards occurring at the same time (e.g. coincidence of heatwave and bushfire, and of storm surge in the coastal area and catchment flooding from upstream), putting further pressures on service delivery capacity. While emergency response plans are in place to deal with emergencies, the increased frequency, severity and rapid succession of hazards may test the resilience and sustainability of Queensland Health operations.

The role of vulnerability: Socio-economic factors such as age, gender, social capital and access to public infrastructure can influence or mediate the community's vulnerability to climate change-related hazards, and the vulnerability of our health system. Vulnerable populations (e.g. the elderly, children, disabled, outdoor and emergency workers, those with existing conditions including mental health problems, the homeless, isolated and poor) are likely to face increasing hardship and suffering.

Climate change is a health risk multiplier which acts to exacerbate existing pressures and therefore increase levels of community and service vulnerability.

For Queensland Health, all of these effects are likely to cause changes to existing risk profiles as assets, operations, staff and supply chains are impacted. By understanding how climate will change the potential of risks to your organisation, you will be able to take the necessary steps to build resilience to a changing climate.

Where do the vulnerabilities lie?

Climate change will impact on Queensland Health through changes in the mean climate (warmer temperatures, changes in annual rainfall) and through changes in the intensity and frequency of extremes such as floods and heatwaves. We are already experiencing some of these changes, and they can be expected to become increasingly severe into the future.

Three areas of Queensland Health activities are expected to be affected:

- Planning and operations, for example through impacts on estate management, infrastructure and human resources.
- Health service demand, for example changed volumes and seasonal patterns of patient admissions.
- Indirect impacts, for example on water and power supply.

Figure 1 gives an overview of the links between greenhouse gas emissions, climate change and human health services.

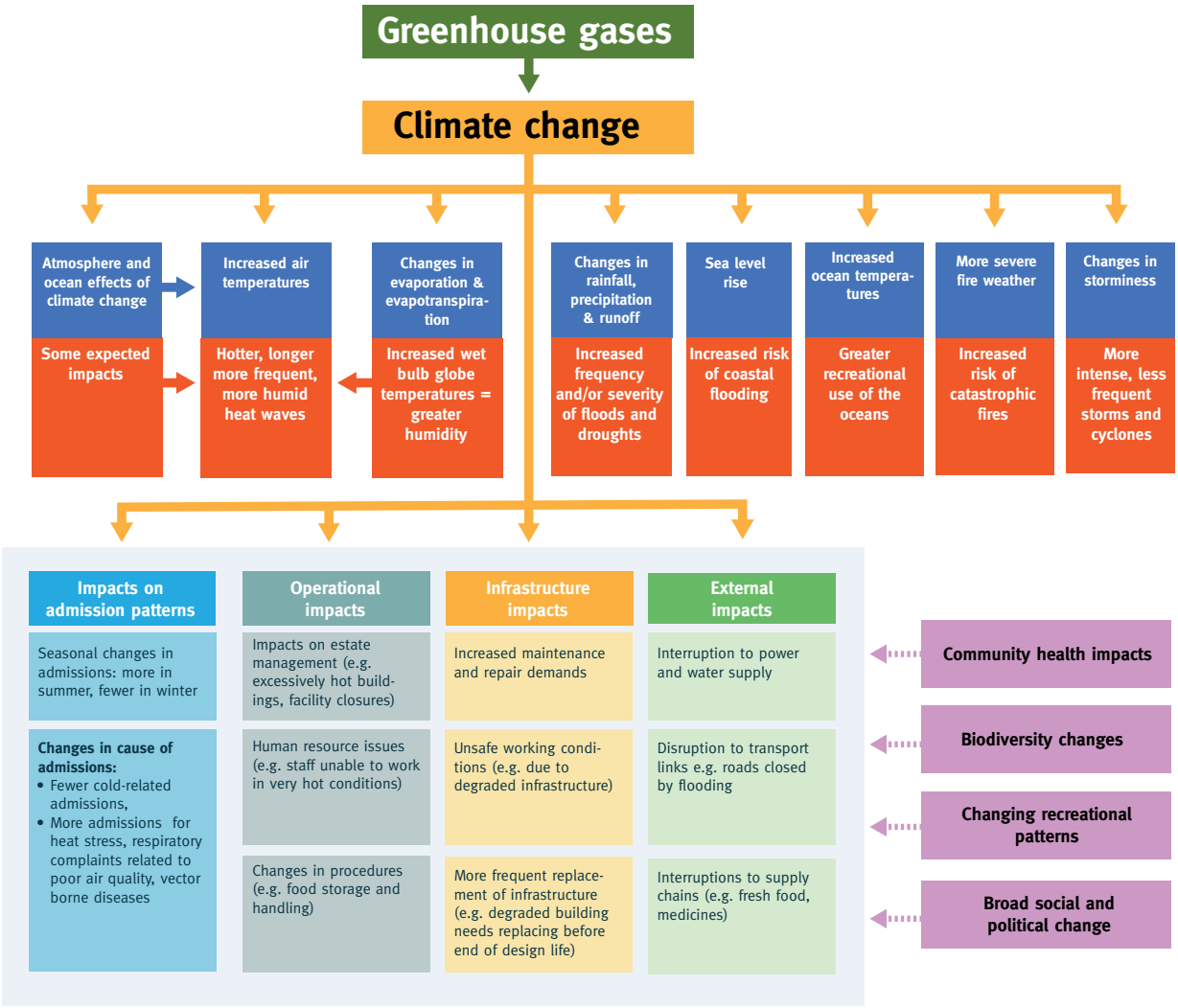


Figure 1: Overview of the links between greenhouse gas emissions, climate change and impacts on human health and wellbeing.

What are the benefits of managing climate change risks?

There are substantial benefits from understanding climate change risks, and from taking appropriate action at the right time. These benefits are described briefly below.

Business continuity

Health services are critical for Queensland communities and their continuous operation is immensely important. By addressing your exposure to climate risks and incorporating adaptation actions into business continuity and other operational and strategic planning, the organisation will be better equipped to continue to operate and meet community service demands under a changing climate. By planning now, you will minimise the degree and duration of future impacts related to climate risks.

Better understanding of future service demands

Climate change has the potential to increase service demands on health care facilities. For example, increased frequency and intensity of heatwaves can permanently affect admission profiles, with the elderly and other vulnerable members of the community (e.g. outdoor workers, the very young, chronically ill) particularly at risk in extreme heat, leading to increased ambulance call-outs and hospital admissions (Turner, Connell et al. 2013). Health professionals and other HHS personnel can also be affected by climate-related events, impacting the workforce through workforce fatigue often independently of specific heatwave events.

Demand on health care services is influenced by a number of factors that determine vulnerability (e.g. changes in demographic profile — age, education, income etc., land use patterns, rate of urbanisation, cost of care), and that can themselves be influenced by climate change. Scenarios might include reduced demand for services due to population declines in western Queensland communities experiencing increasing heat. At the same time, it might become increasingly difficult to attract high quality staff and health care professionals to these areas due to the adverse climate. Sea-level rise and displacement of vulnerable populations may permanently increase patient loads on HHSs that failed to include population shifts in their service planning.

By developing an understanding of potential climate change risks, Queensland Health will be able to identify adaptation actions, and take necessary actions if and when required.

Financial considerations

Increased frequency and intensity of climate-related events can result in long-term damage to critical assets and services (e.g. water supply, power supply, sewage and waste management) resulting in unpredictable service disruption and costly repairs or even replacement. Increased costs might also be seen in increased maintenance (e.g. rapid deterioration of assets), rising prices of fresh produce and medications (e.g. due to reduced agricultural productivity), increased utility costs (e.g. increased use of air-conditioning and cooling) and from increased service demands (e.g. increased disease loads). Without foresight and adaptation, cumulative impacts and costs will rise unsustainably.

Planning for expected future local climatic conditions (e.g. in 2030, 2050, 2070) and investing in retrofitting and more resilient construction design can prevent or reduce future damage and potential for disruption. As a part of this process the sustainability of investment decisions also needs to be considered. This includes consideration of whole of life cycle costs such as where your materials are sourced, how they are manufactured, and where they will eventuallty be disposed. This approach can help in other ways, such as by reducing insurance premiums, and increasing workplace satisfaction and staff retention.

Looking more broadly to the private sector in Australia, credit rating companies such as Moody's are beginning to assess the credit rating of organisations in relation to their climate risks. A recent report by Moody's working with the Queensland Treasury advised that health-related expenditure in Queensland is likely to increase in future as a result of climate change, which will put Queensland's AAA credit rating at risk (Moody's 2018). Should that happen, then the health sector, including Queensland Health, is likely to face tougher financial regulation and cuts in spending.

Sustainability

Measures to reduce greenhouse gas emissions can increase the resilience and sustainability of Queensland Health facilities. For example, installing solar panels with sufficient battery capacity can reduce electricity costs, greenhouse gas emissions and reliance on transmission systems. Similarly, on-site water retention and water recycling can reduce water transport and pumping costs. The Global Green and Healthy Hospitals (GGHH) initiative provides health sector-developed guidance across ten interconnected sustainability goals to enable hospitals and the health sector to reduce their environmental footprint and promote public and environmental health[1].

It is important that adaptation actions should not contribute to additional greenhouse gas emissions. For example, additional air conditioning to reduce heat stress among workers and patients should be powered by renewable energy as much as possible. A recent study published in The Lancet Planetary Health indicated that the health sector contributes 7 per cent of Australia's greenhouse gas emissions (Malik, Lenzen et al. 2018). Considering sustainable options (e.g. energy efficiency, renewable energy, electric vehicles) could help organisations to reduce emissions, contributing to keeping climate change below dangerous levels and demonstrating community leadership.

Integrating life-cycle cost assessment into purchasing and infrastructure investments is expected to further reduce costs over the lifetime of a facility or supporting equipment. Understanding your purchase costs in the context of operations, maintenance and repair, replacement and residual value, the impacts of climate change on each of these elements as well as embedded carbon costs and broader social and environmental consequences of all expenditures, will require a cultural shift in policy and how we account for our expenditures.

Reputational benefits (leading by example)

The health profession is seen as a highly trusted source of credible information in the community. It is in a unique position to help advance community understanding of climate change and its health impacts and convey the message that climate change adaptation is a health priority and will provide health benefits.

1 GGHH is an international network of hospitals, health care facilities, health systems, and health organisations with more than 1,185 members in 58 countries who represent the interests of over 36,000 hospitals and health centres.

Considerations of legal liability

Legal opinion by Noel Hutley QC in 2016 (recently updated in 2019) indicated that directors who fail to consider the impact of foreseeable climate change risks on their business could be held personally liable in a court for breaching their duty of due care (Hutley and Davis 2016, 2019). This decision, which has been endorsed by the Australian Prudential Regulation Authority (APRA) and the Australian Institute of Company Directors, has implications for HHS board members.

HHS also have legal and contractual requirements to meet under their service agreements and associated performance frameworks. Climate change can affect the ability of HHS to meet those obligations.

Some basic definitions

Climate change hazard: In the context of climate change, hazard refers to any potential occurrence of a natural or human-induced physical event that may cause damage to property, infrastructure, livelihoods, human health, service provision, environmental resources etc.

Exposure: The degree to which a system such as an HHS is exposed to a given hazard (e.g. sea-level rise).

Sensitivity: In the context of a risk assessment, the term sensitivity refers to the degree to which a system is affected by, or responsive to a hazard.

Adaptive capacity: The ability of systems, institutions, humans, and other organisms to adjust to change, to take advantage of opportunities, or to respond to consequences.

Vulnerability: The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

> **Relationship between climate change hazard, exposure, sensitivity, adaptive capacity and vulnerability:** A system (e.g. an HHS, an asset component, a business operation) can be exposed to a climatic hazard (e.g. heatwave) and if that system is sensitive to the hazard (e.g. a component can malfunction under extreme heat, therefore it is sensitive to heatwave) or has less capacity to adapt to the hazard (e.g. a facility without an air conditioner has limited capacity to adapt during a heatwave), then the system can be considered as vulnerable to future heatwaves which are likely to increase in intensity and frequency as a result of climate change.

Resilience: The capacity of a system (social, economic, environmental, infrastructure) to cope with a hazardous event or trend or predictable change, responding or reorganising in ways that maintain its essential function, identity, and structure, while also maintaining the capacity for further adaptation, learning, and transformation.

Climate-related risk: The potential for consequences where something of value is at stake and where the outcome is uncertain. The risk to a system can be assessed qualitatively or quantitatively and, in this guideline, we explain how this can be done by combining consideration of the likelihood of a climate hazard, its consequence should it occur, and the vulnerability of the system to the hazard.

Climate-related impact: The effects on natural and human systems of climate events and of climate change. As an example, if higher average temperatures associated with climate change leads to more frequent and more intense heatwaves, such that a greater number of people suffer from heat stress for longer periods, this would be a climate-related impact.

Climate change adaptation: The process of adjustment to actual or expected climate and its effects. Adaptation in human systems such as HHS, seeks to moderate or avoid harm or exploit beneficial opportunities. An example of adaptation in the HHS would be to use heat reflective coatings on roofs to reduce heat transmission and air conditioning requirements or to develop sustainable energy options to offset increasing energy demands and provide long term savings.

Relationship between climate risks, impacts and adaptation: Climate change is expected to cause incremental changes in our climate as well as to increase the frequency and/or intensity of some extreme events (e.g. heatwaves, bushfires, extreme rainfall, drought). These changes create different ***risks*** for different regions in Queensland. Of relevance to HHS, heatwaves may become more severe and more frequent, leading to the risk that admissions to hospitals may increase. Where the risk eventuates, i.e. admissions during heatwaves do increase due to increasingly severe conditions, then this becomes a region — or facility-specific ***impact***. The scale of these risks/impacts depends in part on how well ***adapted*** a service or system is, taking into account factors such as its exposure, the likely consequences of identified risks, and the HHS capacity to manage the impacts.

Climate change mitigation: Mitigation is the reduction of greenhouse gas emission by society. It can include reducing or preventing emissions from sources (e.g. replacing coal fired energy with renewables) or enhance the uptake of greenhouse gases (e.g. planting trees, carbon farming).

Relationship between adaptation and mitigation: Mitigation is to adaptation what prevention is to disease management — one is needed to support the success of the other. Wherever possible, adaptation and mitigation actions should have co-benefits and should be mutually reinforcing. For example, installing rooftop solar on buildings can reduce emissions of greenhouse gases (mitigation) and build resilience to climate change through increased energy security at the facility level (adaptation).

Introduction to the Guidelines

The following Guidelines are designed to help all parts of Queensland Health to assess their future climate risks and create a plan to manage those risks (a Climate Change Risk Management Plan). The Guidelines use **a risk management framework** (Figure 2) that is consistent with leading practice in Queensland Health, Australia and globally. They are aligned with the Queensland Emergency Risk Management Framework (QFES 2017) and international and Australian best practice risk management guidelines (ISO31000:2018, AS5334:2013), and are guided by the strategic direction of the Sendai Framework (UNISDR 2015). The Guidelines should permit users to integrate identified climate change risks into existing risk registers.

The Guidelines incorporate a best practice multi-cycle approach which is consistent with leading adaptation practice in both Australia e.g. Climate Compass (CSIRO 2018), C-CADS (NCCARF 2017) and internationally e.g. UKCIP's Adaptation Wizard (Willows and Connell 2003). The aim of these multi-cycle approaches is to support the learning journey that is essential for adaptation and enables organisations to optimise their resources, systematically increase their climate change knowledge base and develop targeted engagement strategies and adaptation actions.

Queensland Health has risk assessment and reporting approaches for managing business risks embedded in the organisation's management processes. Ensuring that outcomes from a climate risk assessment are incorporated into an organisation's existing risk registers, plans, procedures and reporting processes facilitates the process of seeking support to implement climate change adaptation actions.

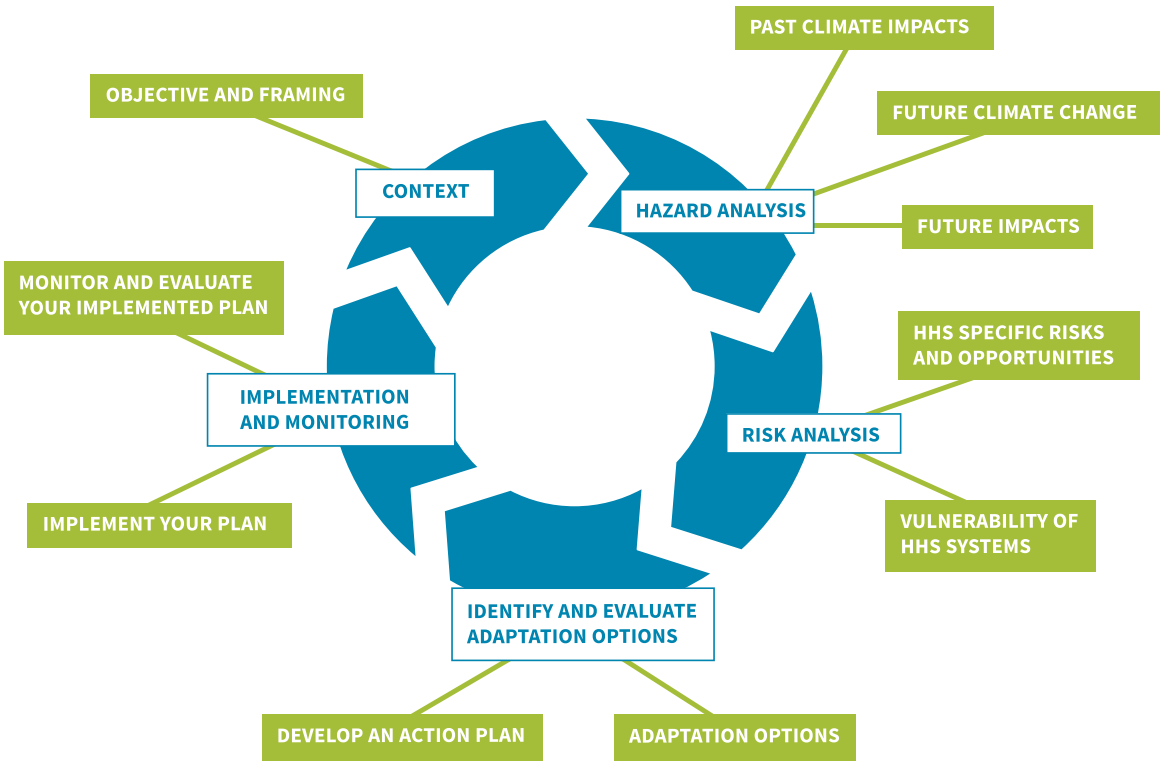


Figure 2: Climate Change Risk Management Framework developed for Queensland Health.

How to use these Guidelines

There are two cycles of development to the Climate Change Risk Management Plan described in these Guidelines:

- **Scan Cycle:** includes a first-pass risk screening/check and creation of a preliminary Climate Change Risk Management Plan.
- **Detailed Cycle:** includes a focused risk assessment and development of a detailed Climate Change Risk Management Plan.

Table 1 outlines the steps in detail.

This two-level approach allows users to start with a low knowledge base and minimal resources (using existing national and regional datasets and resources) and incrementally progress towards more detailed processes that require a larger knowledge base and more resources. Note, however, that in the case where the Scan Cycle suggests that the risks are low, it may not be necessary to proceed to the Detailed Cycle – it would be sufficient to set a date when the process will be revisited to understand whether the risks have changed.

Within each cycle, there are five steps as described in this guideline:

- Setting the context
- Hazard analysis
- Risk analysis
- Identification and evaluation of adaptation options
- Implementation and monitoring.

The Scan Cycle

The Scan Cycle will help you to:

- better understand future climate risks broadly across your business
- identify any elements of your business that are exposed to climate risks
- decide whether a more detailed assessment is required for specific areas of your operation (e.g. assets, services, human resources)
- identify a range of adaptation options
- identify relevant internal stakeholders, get stronger buy-in and build the business case for further planning and action.

At the end of the Scan Cycle you will have shortlisted specific areas of operations, assets, systems or locations which are at high risk and require more detailed assessment and planning. These will be the focus of the Detailed Cycle.

Use the *Scan Cycle template* to capture information and discussions to feed into your business risk register and operations. Note that the template can be modified to suit your own requirements.

Build a Climate Change Risk Management Plan with the Detailed Cycle

The Detailed Cycle is designed to help you consider high priority risks in greater detail and to build a Climate Change Risk Management Plan. If your Scan Cycle suggested that the risks from climate change are low across all areas of activity, then it may not be necessary to perform the Detailed Cycle.

The Detailed Cycle will help you to:

- broaden the discussion about climate change and associated risks among stakeholders inside and outside of Queensland Health
- develop a detailed understanding of any critical future climate risks to Queensland Health, including interdependencies between functions that can lead to cascading failure
- understand the organisational capacity to adapt
- identify, evaluate and prioritise adaptation options to manage these risks
- develop a plan to implement actions including future actions
- identify accountabilities across the organisation
- understand when to act
- build a monitoring program to track changes to risks and progress.

Use the *Detailed Cycle template* to capture information and discussions to feed into your business risk register and operations. Note that the template can be modified to suit your own requirements.

Before you start

Start broad and then focus in. Before following any of the steps of the Guidelines in any detail, you should first become familiar with the whole by reading through the entire process. It is important to know how the various pieces of information fit together.

How you use the Guidelines will depend on your needs, experience, prior knowledge of climate change risk, and the previous work your organisation has done in adaptation. You should consider the following points in determining how to meet your needs:

- **The context:** What is the prior knowledge and experience of climate change and adaptation within your organisation, including what has already been done? For example, is a climate related risk management strategy already in place?
- **The goal of the exercise:** What are you trying to achieve? Is this a first foray into adaptation, with the goal of simply understanding the risks and whether action is necessary in the short-term? Or are the risks known so that the goal is to identify and implement actions?
- **Available resources:** What resources are available (both human and financial capital)? It may be necessary to initially deliver low cost (and wide exposure) demonstration projects in areas such as waste reduction in order to demonstrate how benefits can be achieved and to build support within your area. Remember it is not about doing everything at once.
- **Evaluation of risk:** Beginning with the 'Scan Cycle' will allow you to quickly evaluate the level of risk that your organisation may face. If moderate to high risks are identified, then a detailed assessment of risks along with evaluation of adaptation options is likely to be required, together with an implementation plan – a 'Detailed Cycle'.

Answering these questions will help you understand what you might get from each cycle. For example, an HHS which is planning to start its climate change adaptation journey may have limited in-house knowledge of climate change risks and will probably have limited resources available to do the work. The objective is likely to be to get familiar with potential climate change hazards in the region and hence understand the risks that the organisation faces. A Scan Cycle will suit that need. On the other hand, an HHS that has already started its adaptation journey and has a broad understanding of its risks might want to focus on the major risks to better understand the consequences, when it will be necessary to act, and what actions are likely to be required. It might use the Scan Cycle as a checklist before undertaking a Detailed Cycle.

Table 1: Summary of tasks across the Scan and Detailed Cycle

	Scan Cycle	Detailed Cycle
Step 1: Establish the context	At the beginning of both Scan Cycle and Detailed Cycle you will establish the: • objective/goal and framing of the Plan • relevant time frame (e.g. 2030, 2050) and climate change scenario (e.g. high emissions scenario, low emissions scenario) • scope of analysis (e.g. systems such as infrastructure, operations, stakeholders, patients, staff; geographic scale such as entire HHS or a single facility) • identify relevant stakeholders and establish mechanisms to involve them in the process. The basic process in Step 1 is the same in the Scan and Detailed Cycle, however the amount of required information and assessment is greater in the Detailed Cycle (see details in the description of Step 1 in Part 2 of these Guidelines).	
Step 2: Hazard analysis	**Understand your past hazards** • Identify whether there is any record of previous climate related hazards in the area. • Are there any risk management strategies already in place to tackle any future occurrence of that hazard? **Identify your future potential hazards** • Explore the climate change projections for the selected time frame/s and emissions scenario/s to identify how climate-related hazards will change in the future.	**Understand your past hazards** The Detailed Cycle is performed where changes in particular climate variables (for example increasing temperature or lower rainfall) have been identified in the Scan Cycle as posing urgent or high risks, or where aspects of the organisation have been shown to be vulnerable to that climate change (i.e. at high risk). The goal in the Detailed Cycle at this Step is to explore the relevant hazards in greater detail than was done in the Scan Cycle. This will involve re-visiting existing risk management strategies to understand their detail, and a further evaluation of any residual risk after these strategies have been implemented. More detailed future climate change scenarios for the relevant climate variables will be required.
Step 3: Risk analysis	**Identify the risks** • Identify how climate change might worsen or alleviate any existing risks. • Identify any new risk emerging under future climate. • Identify whether the risks identified are of sufficient magnitude or urgency that a Detailed Cycle of risk assessment may be required for all or part of the Queensland Health area under consideration. • Conduct a broad risk screening where you identify broad risks across your whole area highlighting any assets and systems that might be affected. • Conduct a system risk screening where you further investigate system-specific climate change risks (e.g. risks to water supply).	**Identify the risks** • Investigate whether any existing risk (from Step 2) is likely to increase under future climate change projections. • Identify new risks that may emerge under future climate change projections. **Evaluate consequence** • Identify possible consequences of a given risk (also consider system interdependencies). • Identify your risk evaluation criteria. What are your principal goals? (e.g. extract the longest service life for infrastructure, maintenance of a high level of care, ensure business continuity, avoid unpredicted costs etc.). • Rate possible consequences against risk evaluation criteria. **Evaluate likelihood** • Identify and rate the likelihood of each consequence. **Evaluate vulnerability** • Understand how sensitive your systems are to the identified risk exposures. You should also explore and understand the capacity of your systems and management to respond to any future exposures (e.g. Is existing policy and procedures up to the task). • Using information generated above determine and rate vulnerability of your systems. **Bring the three together to assign a risk rating** • By combining these ratings (consequence, likelihood and vulnerability), obtain a final risk rating using a risk matrix (see Table 8). These risk ratings will help you to prioritise your risks. • Using the risk rating, identify the risks that may cause you most problems in future and which should therefore be investigated further.

Step 4: Identify and evaluate adaptation options	• Identify adaptation options for each risk identified in Step 3. • Identify whether the risk assessment needs to proceed to the Detailed Cycle, or whether a watching brief is sufficient. • Develop a brief to the Executive and Board outlining the Scan Cycle results and the Detailed Cycle priorities.	• For each prioritised risk, investigate and identify potential adaptation or risk reduction options. • Evaluate identified options based on their effectiveness and affordability for your organisations. • Estimate when the identified option might need to be implemented.
Step 5: Implementation and monitoring	• Identify stakeholders that are relevant for communicating and managing the identified climate change risks. • Implement your identified option and set up a monitoring system to track its performance and usefulness in reducing future risks.	• Develop a business case for adaptation. • Identify potential financial mechanisms for implementing your identified options. • Consider how to develop a monitoring system to track adaptation performance.

Part 2
The Guidelines

Step 1 Establish the context

1

In this step you will clarify what you are trying to achieve with your Climate Change Risk Management Plan and understand how climate change might affect your organisation and its clients.

Which templates should I use at this step?

For the Scan Cycle: Use the "Scan Cycle-Setting your context" worksheet of the Scan Cycle Template.

For the Detailed Cycle: Use "Step 1 Setting your context" worksheet of the Detailed Cycle Template.

Summary of Step 1 - Establish the context

At the beginning of both the Scan and Detailed Cycle you will establish the following:

- Objective/goal and framing of the plan.
- Relevant time frame (e.g. 2030, 2050) and climate change scenario (e.g. high emissions scenario, low emissions scenario).
- Scope of analysis. Is it:
  - systems (infrastructure, operations, patients, staff), or
  - geographic scale (entire HHS, single facility or something in-between).
- Identify relevant stakeholders and establish mechanisms to involve them in the process.

The basic process in Step 1 is the same in the Scan and Detailed Cycles. The difference between the two lies in the levels of information and assessment required. Rather than repeating information, this section describes the overall process of Step 1 and highlights any differences.

1. Objective and framing

At the outset of developing a Climate Change Risk Management Plan, it is crucial to state the scope and purpose of the exercise and to be clear about which factors are included in the analysis and which are not.

Scan Cycle

In the Scan Cycle, while setting your objectives you should clearly answer these important framing questions:

- Why are you doing this Climate Change Risk Management Plan?
- Do you need to make decisions with long-term implications e.g. for planning a new hospital, or is this for the shorter term e.g. the maintenance schedule for a piece of infrastructure to be replaced in 20 years?
- Is there an immediate sense of risk and urgency to address your climate risks because the effects of climate change are already reducing the effectiveness of policies, programs, projects or assets that your organisation is responsible for?
- Do you want to identify opportunities in the changing climate? (And not just look at negative impacts)

Detailed Cycle

In a Detailed Cycle you should revisit the objective and purpose of the process set out for the Scan Cycle and also:

- Identify the areas, system/s or assets (after this, collectively referred to as systems) to be included in the Climate Change Risk Management Plan. Is it an infrastructure system (e.g. water supply system), changes in services demand and capacity, an element of the supply chain?
- Understand whether there are any framing policies, practices, legal or legislative considerations that need to be taken into account in your assessment of risks?
- Use the shortlisted hazards from the Scan Cycle to start a discussion among stakeholders about future climate risks.

2. Timeframe for your risk screening

The extent and scale of climate change will shift over time. It is important you look at climate change projections appropriate to your objectives and planning horizon. For example, the design life of a hospital is over 50 years (although in reality hospital buildings are in use for a lot longer than that) and so at a minimum you will want to explore risks over the current century. You should look at multiple time frames within the period of interest, for example:

- near-term (2030)
- mid-term (2050)
- long term (2070, 2100).

In general, as a minimum, two timeframes (e.g. mid-term or long-term) plus the present-day, should be considered.

3. Climate change scenario for your risk screening

Once the timeframe is established, you will need to look at climate change scenarios for those timeframes. Scientific research has provided a body of greenhouse gas emissions scenarios to describe possible future climate change depending on whether the global community does or does not succeed in reducing greenhouse gas emissions (see Box 2). Under each scenario, climate models produce projections of different climate variables and sea levels. Currently, we are tracking closely to a high emissions scenario (e.g. closest to RCP 8.5) although commitments to the Paris Agreement (if met) would put us on a more moderate emissions pathway (e.g. RCP4.5 or 6.5).

There is little difference between the climate projections generated by the high and moderate emissions scenarios up until about 2050 and so the choice of emissions scenario is less important.

After the mid-century, however, differences emerge and planning for these longer time frames requires a reasoned choice of scenario.

Scan Cycle

As you are taking a first-pass high-level review, it is appropriate to consider the scenario of future climate change with greatest plausible change. By this we mean a scenario that is at the upper end of the range of climate projections (e.g. a high-emissions or 'RCP8.5' scenario). By starting with the upper end of climate change you can consider a broad range of risks. You may determine that some of these risks can be tolerated, will have low impacts or are highly unlikely and so can be ignored, but at this stage it is best to consider the full range.

At this stage, consider the full range of climate variables (e.g. temperature averages and extremes, changes in rainfall, sea level rise etc.). Qualitative descriptions of climate change should be sufficient for the Scan Cycle. Suitable descriptions of the changes in these climate variables for each of the HHS regions can be found in the Almanac, Section 4. Links to more information can also be found in the Almanac, Section 4.

Detailed Cycle

Consider in greater detail, the specific climate variables identified as a high risk in the Scan Cycle. Then, using the projection data for the selected timeframes, respond to the question:

> 'How is a given variable (e.g. temperature, precipitation, sea level etc.) projected to change (decrease, increase or no change) during the selected time scales (e.g. near- to mid-term, long-term)?'.

Include a moderate emissions scenario (e.g. RCP 4.5) to consider how a lower emissions scenario changes the response or risks to your system under different scenarios of future climate change.

Links to detailed climate projections and how to use them can be found in the Almanac, Section 4.

Box 2: Making sense of climate change information

To determine what our future climate might be, scientists use global climate models to simulate the Earth's climate system. The models use a set of mathematical formulae that describe the physical processes of the atmosphere, ocean, land and ice. Population, the economy, policy decisions and technology will all affect future emissions of greenhouse gases. We do not know exactly what these effects will be, so to cover a range of possibilities, scientists use **greenhouse gas emissions scenarios** (i.e. the amount of greenhouse gas emitted in a given period) to develop climate projections.

The Intergovernmental Panel on Climate Change (IPCC) has produced four of these greenhouse gas emissions scenarios referred to as representative concentration pathways (RCPs). These include a lower emissions future, where greenhouse gas emissions are substantially reduced (this pathway is termed RCP2.6), two moderate emissions scenarios, where greenhouse gas emissions are reduced to moderate levels (these pathways are termed RCP4.5 and RCP6.5), and a high emissions future, where high levels of greenhouse gas emissions are set to continue much as they are now (this pathway is termed RCP8.5). These scenarios allow us to consider a range of climate futures when thinking about how climate change may affect us.

4. Scope of analysis

A facility's operation depends on multiple management and planning systems including those for energy, emergency and disaster, water, human resources, purchasing, waste, asset delivery and maintenance, transport and access. All of these can be affected by climate change, and some examples are provided in Table 2.

Scan Cycle

The Scan Cycle is intended to explore risks across the board to all aspects of your services. This will help you identify what aspects of your organisation (e.g. sites, services, infrastructure, at-risk communities etc.) need further detailed analysis.

Detailed Cycle

The Detailed Cycle will focus on those aspects of your business that have been identified in the Scan Cycle as being at higher risk, or on hazards that present particularly high risk to business. As a first step, then, clearly identify the systems/hazards to be included in the analysis, and the reasons for your choice.

Next, collect relevant contextual information: about the site, and any legislative or policy obligations. (It's likely that this information has already been collated as part of a wider risk assessment process.) This should include information about key assets and dependencies (e.g. facility access) necessary to meet service needs.

Table 2: Example of systems and sub-systems within an HHS that may be affected by climate change

Major system	Sub-system
Structural system	Materials and structural systems used in the building
Existing service Systems	Electrical system
	Telecommunication system
	Water supply and disposal system
	Waste management system
	Fuel storage facility
	Medical gases storage and distribution system
	Heating, ventilation and air-conditioning (HVAC) system
	Transport and access to hospital
	Office, storeroom furnishings, and equipment (fixed and movable) including computers, printers, etc.
	Medical/laboratory equipment and supplies used for diagnosis and treatment
Planning systems	Human resource such as staff and volunteers
	Demand planning
	Policy and procedure development
	Capability and service planning
	Energy planning
	Water planning
	Procurement planning
	Hospital disaster committee and emergency operations centre
	Availability of medicines, supplies, instruments, and other equipment

5. Identify relevant stakeholders and establish ways to involve them in the process.

It is important to get support from leadership and management to act on the climate change risks identified through this process. Without this, it is very difficult to get traction within a busy organisation. To build buy-in, you should involve colleagues in different areas of your organisation to make them aware of the importance of this work.

Climate change does not recognise organisational boundaries, therefore external stakeholders are also critical for your climate change risk management. For example, in regional areas local councils often manage utilities (e.g. water supply, road, waste management) which are critical for HHS operation and are vulnerable to climate risks. In such cases, local council should be a key stakeholder for your risk management. See Box 3 for a classification of relevant stakeholders which may help to guide your selection.

Stakeholders are generally time poor, and therefore you need to be focussed in your engagement. At the outset, consider the following questions. What is the purpose of the engagement (e.g. inform stakeholders, seek input)? How do you intend to involve stakeholders (e.g. meeting, workshop, fact sheets)? When do you plan to involve them (i.e. at what stage of your risk management process)?

Selecting the appropriate framing and scope early in the process will enable you to identify who should be involved in developing, owning and implementing the plan.

- Is it only people in your organisation?
- Should other organisations be involved, e.g. local council?
- What other stakeholders should you be involving?
- What role will your stakeholders play and how will you facilitate that?

Once identified, consider how you might engage with your stakeholders. For example:

- How will you keep managers, senior executives and your Board engaged to ensure the significance of the proposed actions is understood and supported?
- If adaptation actions do not need to be implemented until a time in the future, how will you share that knowledge and ensure that corporate memory is created?

Scan Cycle

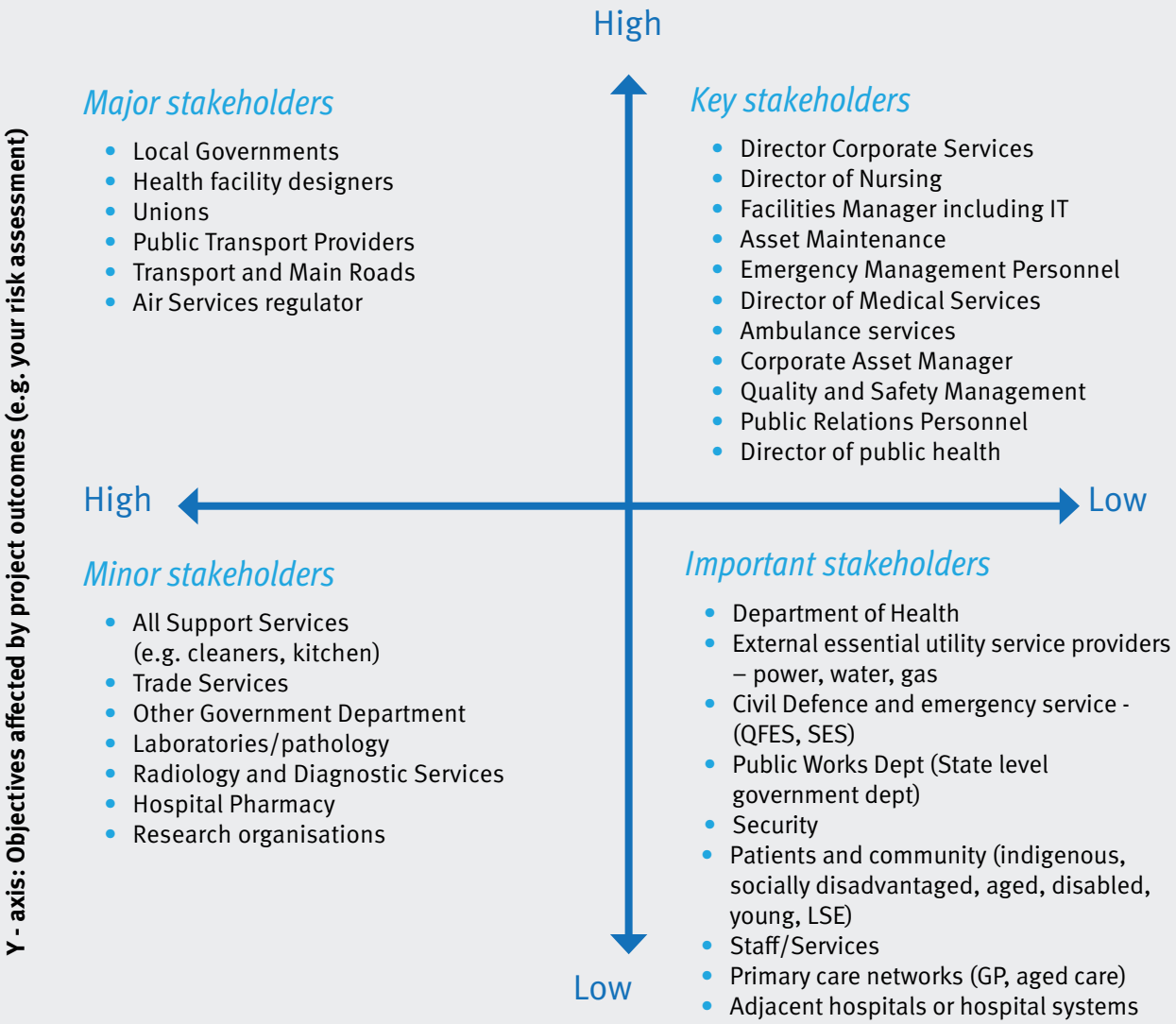
In the Scan Cycle you might limit engagement to in-house expertise and knowledge. Consider if they can be consulted on a one-on-one basis or if there is value in bringing them together in a workshop as part of Step 2 and Step 3 (Table 1).

Detailed Cycle

In the Detailed Cycle, consider whether additional expertise or stakeholders should be involved, over and above those you engaged with in the Scan Cycle. This may include stakeholders external to your organisation (e.g. from utility companies). Think about:

- Who might have further information or expertise beyond the core working team e.g. in climate change science, others in similar roles with prior experience?
- Who might affect or be affected by identified risk management actions, e.g. frontline staff, suppliers, utility operators?
- Who might need to endorse the Climate Change Risk Management Plan, or who can facilitate further action?
- Who do you expect to take action or continue the process of assessing risks and implementing adaptation options?

Box 3: Examples of potential stakeholders. Based on a stakeholder analysis framework initially proposed by Freeman 1984 and adapted from Loosemore, Carthey et al. 2011.



At the end of Step 1, answer the following questions. If you are not satisfied with your responses, consider revisiting the step.

- Have you developed a clear understanding of what you are trying to achieve (i.e. clear objectives) and the challenges involved?
- Have you framed your analysis in terms of timescales and emissions scenarios?
- Have you identified or established organisational and/or governance structures that will help you achieve your goals?
- Related to the previous bullet point, have you identified stakeholders (internal, external) to involve in the risk assessment and adaptation planning and to gain their support?
- Have you collated contextual information around policies, site information, strategic planning information, any relevant urban or regional plans, advocacy and education needs, and pertinent health research?

Step 2 Hazard analysis: past and future

2

- The second step in building your Climate Change Risk Management Plan is to identify and analyse climate-related hazards that your organisation may have experienced in the past and to understand how the characteristics of these hazards may change in the future as the climate changes.
- When we talk about hazards, this is in the broadest sense – it may be characteristics of the mean climate that affect a specific HHS (for example episodes of high aeroallergen loading, spells of persistent rainfall that ultimately lead to flooding, persistent hot conditions that affect staff and patient health and effectiveness) as well as extreme events (e.g. cyclones, flash floods) that may change in their frequency and severity as a result of climate change.
- At this Step, you will also explore 'residual risk' as a precursor to looking at your climate change-related risks at Step 3.
- We provide guidance for the Scan Cycle first, followed by additional steps for the Detailed Cycle.

Which templates should I use at this step?

For the Scan Cycle: Use the "Scan Cycle-Risk Screening" worksheet of the Scan Cycle Template

For the Detailed Cycle: Use the "Step 2 Hazard Analysis-Past" and "Step 2 Hazard Analysis-Future" worksheets of the Detailed Cycle Template

Summary of Step 2: Hazard Analysis: past and future

Scan Cycle:

In the Scan Cycle you will:

Understand your present-day climate hazard environment

- Identify whether there is any record of past climate hazards in the area
- Identify any risk management strategies already in place to tackle these hazards

Identify your future potential hazards

- Explore the climate change projections to identify how climate-related hazards (due to both the extremes and the mean climate) will change in the future.

Detailed Cycle:

The Detailed Cycle is performed where particular hazards have been identified in the Scan Cycle as posing urgent or high risks, or where aspects of the organisation have been shown to be vulnerable to climate change (i.e. at high risk). Thus, the goal in the Detailed Cycle at this Step is to explore the relevant hazards in greater detail than was done in the Scan Cycle. You should re-visit existing risk management strategies to understand their detail, to make a further evaluation of residual risk. More detailed future climate change scenarios for the relevant climate variables will be required.

Scan Cycle

1. Understand your past hazards

In order to get a clear idea of the risks posed by climate change, it is necessary to set a baseline of understanding by exploring the relationship between present-day 'normal' climate and your organisation. For instance, is your HHS well-adjusted to present-day climate – both the mean and the extremes? For example, are individual hospitals able to manage high numbers of heat stress admissions during and following extended hot periods? Once the baseline is established, it is possible to move to understand how the relationship will be affected as a result of climate change.

What climatic hazards have occurred in the past in your area?

- Explore climate hazards (mean and extreme) in your area in the past 50 years (e.g. hot summers, dry dusty conditions, seasonal smoke haze, drought, floods, bushfire, cyclones, extreme rainfall events, hail, heatwave).
- Identify whether your business and its operations have been directly or indirectly impacted by climate in the past (how, when and what?).

You can use local knowledge for this e.g. discuss with long-term residents or employees from the area or conduct a brief internet search. Other potential sources are suggested in Box 4. Table 3 provides some examples of climatic hazards that can affect your assets and operations. The list is not exhaustive but provides a good starting point. Section 5 in the Almanac provides a broad description of how different systems of the HHS can be impacted by climatic hazards. You can use qualitative terms (e.g. 'high' medium', 'low') for analysing the impacts of past events.

Table 3: Examples of some climate-related hazards that can be influenced by climate change.

Broader hazard category	Specific hazard examples
Heat related hazards	• Prolonged summer heatwaves (as measured by both daytime and night-time temperatures • Dust storms • Forced animal and pest migration • Large scale animal deaths
Rainfall related hazards	• Surface water flooding and spread of soil and water borne pathogens • Sewer flooding and overflows contaminating water supply • Flood leading to reduced water quality requiring on site treatment • Flooding leading to damage/preventing transport access • Drought leading to reduced water supply security • Impacts on power supply and communications • Occurrence of vector-borne diseases • Reduced access to healthy food • Long droughts can cause excessive shrinkage in soil leading to additional stress and potential damage to building foundations and underground pipes. • Long droughts can cause trees roots to penetrate underground pipes in search of water leading to physical damage to water supply and sewage systems.
Bushfire related hazards	• Extreme fire weather due to prolonged dry condition and excessive heat • Increase in air particulates during bushfires • Impacts on water supply as burnt sediments make their way to water bodies. • Extreme bushfire nearby to built structures can expose outdoor equipment to extreme temperature leading to potential damage or malfunction.
Coastal hazards	• Erosion of the coastal margin • Storm surge inundation of beach, estuary and surrounding areas • Tidal inundation of beach, estuary and surrounding areas • Coincident flooding caused by tidal waters interacting with catchment floodwaters • Extreme winds from cyclones and coastal lows (can also affect inland areas) • Saltwater intrusion into coastal groundwater water supplies • Saltwater intrusion into groundwater can damage building foundations if these are not designed for saltwater environment.

Box 4: Sources of past climate hazard information

Flood

1. Contact local government offices and Fire and Emergency Services in your area.

2. Information on past flooding can be accessed through Water Observations from Space (WOfS), which is a dataset developed by Geoscience Australia showing surface water observations derived from satellite imagery for all of Australia from 1987 to 2014. WOfS is available from CoastAdapt at Shoreline Explorer. It is an indicator of probability of flooding.

3. The Australian Flood Risk Information Portal provides access to Australian flood data, mapping and reports.

4. Hardenup Protecting Queensland provides links to some historical hazard information, including flood maps for different areas in Queensland.

Heatwaves

1. Queensland Government's state-wide heatwave risk assessment study report

2. State of the Climate 2018 report by Bureau of Meteorology

3. The Bureau of Meteorology (BoM) provides historical weather observations and statistics.

Average climate

1. The Bureau of Meteorology (BoM) provides historical weather observations and statistics

Are there any risk management strategies in place to protect previously affected systems from future occurrence of a climate hazard?

According to AS/NZS-ISO31000 (2009), residual risk is 'the risk remaining after risk treatment'. Residual climate risks are the risks that your system faces currently. If your HHS facility (systems, assets and/or operations) has suffered consequences in the past from climate-related hazards, then you should identify what has been done since then to lessen vulnerability. This will allow you to understand the residual risk, if any, to your system. In general, if your organisation has been affected by climate in the past, and there is no risk reduction strategy in place, then some climate-related risk already exists in your business operations. Categorise this risk simply as high, medium or low.

2. Identify your future potential hazards

Explore climate change projections and, if you are on the coast, sea-level rise projections for the selected timeframe/s and emissions scenario/s

So far you have investigated hazards that your organisation has faced in the past. Now you need to consider possible future hazards. Scientists have constructed climate change projections under different emissions scenarios (see Box 2). The Queensland Government has developed data products which can be used to understand how future climates might change in your area. Below is a list of sources for accessing climate change and sea-level rise projections for Queensland.

1. Regional summaries of climate change projections for each HHS region in Queensland are available in the Almanac (Section 4) – these are suitable for the Scan Cycle (Figure 3).
2. Detailed climate change projections for different regions of Queensland are available from Queensland Future Climate Dashboard – these are suitable for the Detailed Cycle.
3. The Queensland Government has developed Coastal Hazard Areas Maps for erosion prone areas and areas that are at risk of storm tide inundation. In these maps a state-wide benchmark of 0.8 m sea-level rise by 2100 is adopted across the State.
4. www.climatechangeinaustralia.gov.au is a CSIRO and BoM resource which provides data and reports on climate change for all regions in Australia.

5. Contact your local government. Many local governments (particularly along the coast) are undertaking climate change adaptation planning and have useful and relevant information.
6. Other sources of sea-level and inundation hazard maps include the CoastAdapt website and the Coastal Risk Australia website. CoastAdapt provides sea-level rise projections under four different climate change scenarios for each coastal council around Queensland, and maps of possible inundation. For each coastal council three inundation maps are available (a mid and high emissions scenario towards the end of the century and a high scenario for mid-century). Coastal Risk Australia also provides interactive maps of inundation extent for a wide range of future sea-level rise scenarios. For example, it can be explored for high-level risk identification by inputting sea levels higher than those projected for RCP8.5.

More information on understanding and using climate change scenarios is provided in the Almanac – Section 3.

Scan Cycle

Avoid looking in too great detail at the climate change projection data. Rather, focus on the regional climate change summary for your area (provided in the Almanac) and the likely impacts on your organisations services and operations.

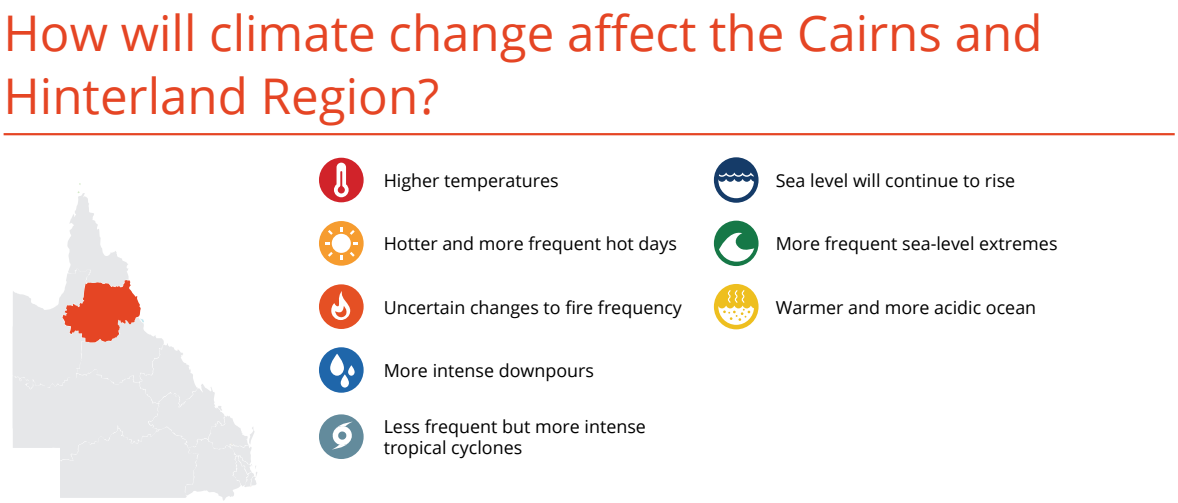


Figure 3: Example of climate change summary for the Cairns and Hinterland region from the Almanac.

Detailed Cycle

1. Understand your past hazards

Using the past hazard data collected in the Scan Cycle, list the impacts of those hazard events (i.e. identify the extent of damage to systems or interruption of service).

In the Scan Cycle, you will have narrowed the list of systems/hazards to be considered. For example, the Scan Cycle may have identified that coastal inundation has previously affected some of your infrastructure but ruled out any serious issues from heatwaves, inland flooding or bushfires. The Detailed Cycle can therefore restrict itself to considering coastal flooding. The goal is to go into greater detail to understand the exact nature of the hazard and how it affected the system under consideration. For example, where operations are the system under consideration, access by patients or suppliers to your facility might have been impacted, or patient load may have increased or reduced noticeably.

This step enables you to determine how well your organisation coped in the past, what was done in response, why, and what the outcomes were. By doing this you can determine whether you face further risk if similar events should become more frequent, or more severe, in the future.

Detailed Cycle

In the Detailed Cycle, aim to use quantitative information if available e.g. estimated costs or losses due to disruption in service provision as an indicator of the hazard impacts.

Are there any risk management strategies in place to protect previously affected systems from a future occurrence of that hazard?

If your system has suffered some degree of impact in the past from climate related hazards, then you should identify whether risk management strategies have been put in place to address future occurrences. Undertake a more careful evaluation of residual risk that was appropriate for the Scan Cycle, for example through discussion with relevant stakeholders, you should be able to evaluate whether any residual risk remains. Questions you might ask are:

- What were the features of the system that made it vulnerable in the past?
- Has anything been done to reduce the vulnerability?
- If the same hazard occurred tomorrow, what do you think the outcome might be?
- If the same circumstances occurred tomorrow, what do you think the outcome might be?

Rate your residual risk as high, medium or low, and carry this knowledge forward into your assessment of future climate risks to your HHS (Step 3).

Figure 4 shows an example of how you might enter the information about residual risk into the Detailed Cycle template.

First two rows provide examples. Update them as appropriate for your organisation.				
List of systems, assests and operation	Relevant past climate conditions or hazards affecting this system, asset or operation	What was the consequence of this hazard to your business? (short qualitative description)	Is there any existing risk management strategy in place to tackle this hazard?	Is there any residual risk? (rate as 'high', 'medium' or 'low')
Energy management	e.g. heatwave	e.g. Increased public visits to hospital to take advantage of air conditioning	e.g. no future risk mitigation	e.g. High
Water management	e.g. drought	e.g. reliability of supply placed at risk impacting hygiene practices	e.g. some limited on-site storage tanks installed	e.g. High
Waste management				
Asset management				
Emergency and disaster management				
Human resources				
Transport and access to premises				
Procurement				
Health care services				

Figure 4: Example of identifying residual risk using the Detailed Cycle template.

2. Identify future hazards

Explore climate change and, if you are on the coast, sea-level rise projections for the selected timeframe/s and emissions scenario/s.

So far you have investigated climate hazards that your organisation has faced in the past. Now you need to consider possible future hazards. In the Scan Cycle, you identified appropriate sources of climate change information for your area. You can use the same information sources to access further climate change and sea level data. But, in this case, you should list the specific variables (i.e. temperature, rainfall etc) relevant to each system you are considering for the specific timeframes appropriate to that system (50 years, 70 years, 100 years in the future). Then, using the projection data, you should aim to respond to the question: How is a given variable (e.g. temperature, precipitation, sea level etc.) projected to change (decrease, increase or no change) during the selected time scales (e.g. near- to mid-term, long-term)?

Detailed projections for your local government area are available through the Queensland Future Climate Dashboard (Figure 5).

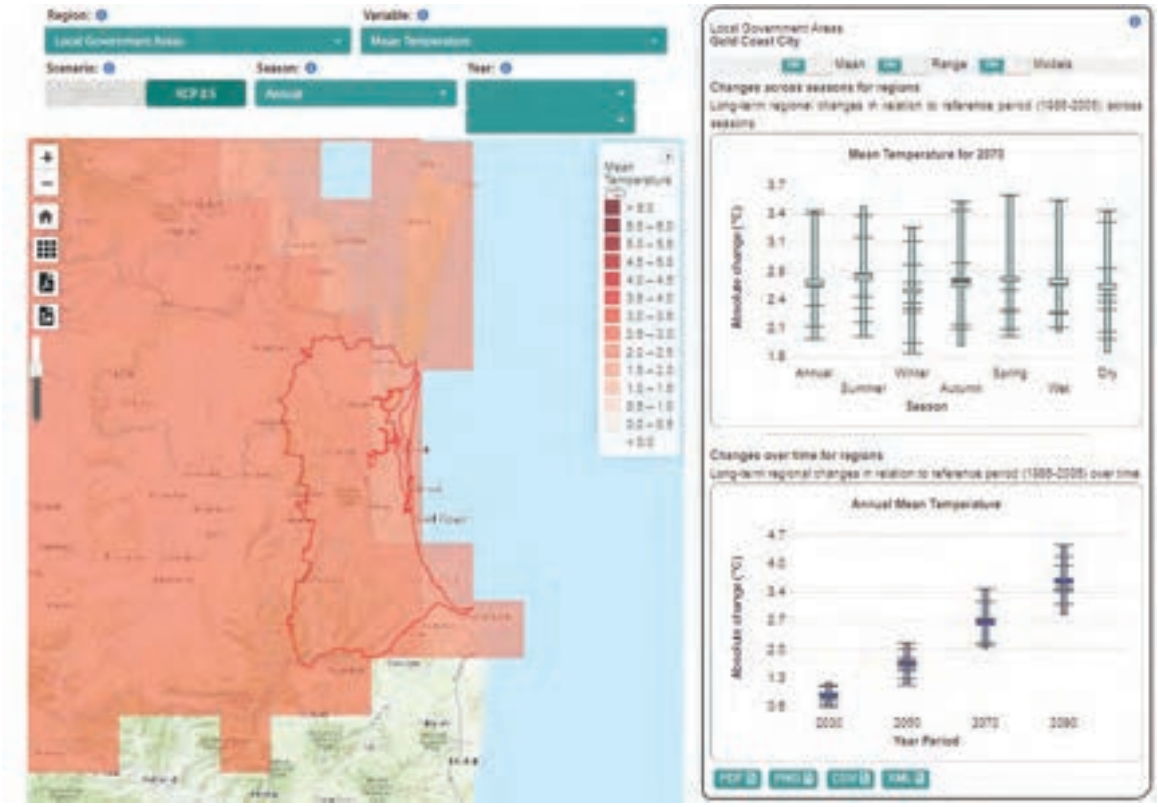


Figure 5: Example of detailed climate change projections for the Gold Coast (Annual mean temperature under a high emissions scenario, RCP 8.5) provided by the Queensland Future Climate Dashboard.

At the end of Step 2 you should be able to answer the following questions. Revisit Step 2 if you are unable to answer them.

- Have you gained an appreciation of how climate hazards in the past have affected your organisation?
- Have you gained an understanding of how future climate may change in your area of operation?
- Have you developed an understanding of how future climate changes might lead to changes in hazard occurrence with the potential to affect the systems that make up your organisation?

Step 3 Risk analysis

3

- Having completed Step 2, you now understand the present-day context for analysing risks that your organisation may face in the future as a result of climate change.
- The hazards that you identified in Step 2, together with your analysis of residual risk, will be explored further to understand how they might create risks to your organisations assets, systems and operation.
- Here we are primarily concerned with change – how climate-related risks are changing and will continue to change into the future and how this affects your organisation.
- Although risk assessment often tends to focus on extreme events, climate-related risks will also change as a result of changes in the mean climate. For example, the likelihood of outbreaks of vector-borne diseases (and the risk of these becoming endemic) is affected by changes in mean rainfall and temperature.
- We provide guidance for the Scan Cycle first, followed by additional steps for the Detailed Cycle.

Which templates should I use at this step?

For the Scan Cycle:

- Use the “Scan Cycle-Risk Screening” worksheet of the Scan Cycle Template
- If you also undertake a system specific risk screening, use the “Scan Cycle-System Screening” worksheet of the Scan Cycle Template

For the Detailed Cycle:

- To consider risks, consequences and likelihood (Steps 1 to 5 of this section): Use the “Step 3 Risk Analysis-2” worksheet of the Detailed Cycle Template
- To consider vulnerability (Section 6 of this step): Use the “Step 3 Risk Analysis-1” worksheet of Detailed Cycle Template”
- To assign an overall risk rating (Section 7 of this step): Use the “Step 3 Risk Analysis-2” and “Step 3 Risk Analysis Results” worksheets of the Detailed Cycle Template

Summary of Step 3: Risk analysis

In the Scan Cycle you will:

- Identify how climate change might worsen or alleviate any existing risks.
- Identify any new risk emerging under future climate.
- Identify whether the risks identified are of sufficient magnitude or urgency that a Detailed Cycle of risk assessment may be required for all or part of the organisation under consideration.
- Conduct a risk screening where you will identify risks across your whole organisation and highlight assets and systems that might be affected.
- Conduct a system risk screening where you will identify system specific climate change risks (e.g. risks to your water supply system).

In the Detailed Cycle you will:

Identify the risks

- Identify how climate change might worsen or alleviate any existing risks.
- Identify any new risk emerging under future climate.

Evaluate consequence

- Identify risk evaluation criteria using the goals of your assessment (e.g. maintain infrastructure, minimise impact on operations).
- Identify possible consequences of a given risk including system interdependencies
- Rate possible consequences against risk evaluation criteria.

Evaluate likelihood

- Identify and rate the likelihood of each risk occurring.

Evaluate vulnerability

- Understand how sensitive your systems and management currently are to the identified risk.
- Explore and understand the capacity of your systems or management to respond to future exposure to the risk.
- Using information generated above, determine and rate the vulnerability of your systems.

Bring the three together to assign a risk rating

- Combine ratings of consequence, likelihood and vulnerability to evaluate the final risk (a risk rating).
- Using the risk rating, identify and prioritise the risks that may cause you the most problems in the future.

Scan Cycle

1. The risk screening worksheet

Identify how climate change might worsen or alleviate any existing risks

Using information on the change in direction (increase, decrease or no change) of future climate variables and other risk-related data (on, for example, erodibility of the coast) build your understanding of how existing residual risks, identified in the previous step, may change in the future. For example, if sea level is projected to increase during your planning horizon and there have been past events of coastal inundation, then there is increased risk of flooding in the future. Some of these risks (those related to extreme events) may already be addressed under existing disaster risk management plans. In this case review whether your current planning will be sufficient to meet any additional risk under the projected timeframes for this century.

Identify any new risk emerging under future climate

Consider whether future change in a given climate variable could give rise to a new risk (or even whether an opportunity may arise) which has not been realised in the past. For example, prolonged summer heatwaves may not currently be an issue in some urban areas, but climate change together with rapid urbanisation, creation of heat sinks, and growth in vulnerable populations may increase the risk of heat stress and heatstroke occurrence, and may lead to an ongoing rise in hospital admissions. Absence of a previous record of a hazard in your area does not mean that it will not happen in the future.

Consider which assets, systems and operations may be exposed to climate-related hazards in future, and what the resulting risks may be. Then, use the template to record the future risks against each of the relevant hazards. In this way, you should be able to identify the most problematic hazards under each timeframe and climate change scenario.

At this stage you do not need to identify the likelihood and consequence of risks, rather just use the direction of change in climate (e.g. it will get warmer) to indicate whether risks are likely to increase, decrease or remain the same in the future. This will help you to keep things simple and help you manage the limited resources that you might have available for your Scan Cycle.

2. The system screening worksheet

The screening in the Scan Cycle can be done in two parts. The first (described above) uses the Risk Screening worksheet (see Figure 6). Undertaking this general risk screening helps you to familiarise yourself with the climate change projections, related terminologies and the risk management process. When completed, it provides you with a broad overview of the risks you face from the present-day climate and future climate change.

Completing the Risk Screening worksheet may highlight risks to specific systems within your HHS that you consider worthy of further investigation – perhaps because they are identified as being particularly vulnerable or are of high strategic importance. If this is the case, you can proceed to complete the System Screening worksheet in the Scan Cycle Template. This will help you to think through specific risks to your systems before deciding whether to move into the Detailed Cycle.

As an example, you may identify in your initial risk screening that sustainability of water supply is likely to be a risk for your HHS under climate change. Then in the system screening you can investigate in greater detail what aspects of the water supply system are likely to be affected by climate change, in what ways, and how these risks may be addressed through adaptation.

Scan Cycle

There are two worksheets for risk assessment in the Scan Cycle, for risk screening (a more general overview) and system screening (system specific). Here we have described each of these in detail. In the sections that follow, only the risk screening worksheet is described – if you are undertaking a system screening, just follow the same instructions.

3. Where to next?

If you have identified risks that are of sufficient magnitude or urgency that a Detailed Cycle of risk assessment may be required for all or part of the organisation under consideration, then you may wish to stop the Scan Cycle evaluation and return to Step 1 to commence a Detailed Cycle. Or you may wish to complete the Scan Cycle by considering adaptation options and how these might be implemented (Steps 4 and 5) before undertaking a Detailed Cycle. How you proceed from this point is something that you will decide bearing in mind what you have found so far in terms of exposure to risk, and what your available resources are.

Number listed in the column heading indicate the task number that are described in the ReadMe page

8. Climatic hazards	9. Has the hazard affected your HHS in the past?	10. General description of the damages or inconveniences that resulted from the historical past event	11. Describe any present controls in place	12. Residual risk, if any	13. How the climate is likely to change in future	14. Is climate change likely to impact your HHS	15. HHS specific risks that may arise due to the projected changes	16. Assets/systems that may be affected due to future changes	17. What could you do about this (likely adaptation options)?	18. Are there any opportunities for your HHS?
Increased temperature	Yes	e.g. heatwaves have led to Increased hospital admission of vulnerable people (homeless, elderly, outdoor workers etc.)		Low	Average temperatures will be higher (warmer winters, hotter summers) and there will be more, and more intense, heatwaves	Yes	e.g. Changes in admissions (more cases of heat stress, vector-borne disease, respiratory distress; changes to seasonal demand)	e.g. Operations (service delivery) and human resource management (staffing levels and type)	e.g. monitor staffing levels and type to ensure demand can be met; temporary on-site staff accommodation may be necessary	
							e.g. Degradation of buildings creates an unattractive working environment for staff	e.g. Building maintenance	e.g. ensure building fabric is regularly monitored for signs of degradation; adjust budgets to ensure adequate resources for repair	e.g. regular maintenance regimes may provide opportunities to upgrade facilities
							e.g. Increased cost of electricity due to higher cooling requirement, resulting in financial stress to organisation	e.g. Energy management, asset maintenance	e.g. consider installing solar power with battery backup to reduce electricity cost	e.g. installing solar with battery backup can help reduce energy cost
							e.g. More frequent power outages could lead to risks of contamination of food supply for patients	e.g. Asset management and operation	e.g. consider installing solar power with battery backup to get sufficient backup, check if current arrangement of generators are sufficient to meet future needs	e.g. having sufficient off grid backup of power supply can increase the resilience of the organisation
Increased rainfall										
Increased occurrence and severity of drought										
Fewer, but more intense, cyclones. Will they track further south?										
Occurrence of extra-tropical storms: the predictions are uncertain										
Increase in number of severe fire weather days										
Sea-level rise and enhanced coastal erosion										

Figure 6: Example of Scan Cycle template for risk screening

Detailed Cycle

The analysis of risk in the Detailed Cycle uses the ISO31000:2018 definition of risk as a function of consequences arising from a hazard and the likelihood of the risk happening.

1. Identify the risks

Identify how climate change might worsen or alleviate any existing risks

Existing risks may worsen (or be alleviated) under climate change. To evaluate the likelihood, you should consider future projected climate change, and how your existing risk management strategies may perform under those new conditions. If you have identified a residual risk for a given system (in Step 2), you should now explore the possibility of this risk being compounded by future climate change.

Identify new risks and opportunities that can emerge under future climate change projections.

You should investigate whether the change in a given climate variable in the future can result in new risks for your system. Table 4 provides some examples of future risks to a hospital under climate change. A more comprehensive set of possible climate change risks to hospitals and health systems is also provided in the Almanac (Section 5). Look at these examples in considering the ones relevant to you.

Along with posing significant risks to HHSs, climate change also presents opportunities to rethink the way health infrastructure could enhance the delivery of healthcare services in future. How these opportunities might be realised is discussed under Step 4. Table 5 provides some broad examples.

Table 4: Example future climate change risks to HHS assets and operation in Queensland.

Broad category of risks	Example risks
Disruption to essential services	Structural damage to the facility
	Failure or poor functioning of water supply system
	Failure of power supply system
	Failure of council services (e.g. waste collection)
	Lack of back-up supply of essential services
	Delays to maintenance work due to service disruption
Risk to safety and availability of staff to support continuity of service delivery	Staff remain at home due to property damage or family health issues
	Staff unable to travel to work due to failure of supporting services e.g. road closures, closure of day care or schools, failure in transportation and communication system
	Limited pool of staff or staff fatigue in more frequent high demand periods
	Lack of appropriately skilled staff to fill vacancies as required
	Lack of equipment redundancies including computer backups to ensure continuity in service delivery
Risk to access and transportation	Closure of the single-access routes to hospital
	Insufficient fleet and appropriate transport sources to transfer patients to and from hospitals during high demand periods
Risk to communication and coordination in responding to future events	Communication system failure (communication tower failure, lines flooded, no mobile phone coverage, loss of power supply)
	Failure in the flow of information internally and to and from external sources (e.g. early warning)

Table 5: Example opportunities to increase future resilience

Broad category of opportunity	Example opportunities
Opportunity to increase staff safety and availability	Developing adequate facilities and arrangements such as on-site accommodation for staff during climatic events
Opportunity to increase sustainability of services	Increasing sustainability of essential services such as power supply through installation of solar power and battery storage systems
Opportunity to maintain uninterrupted access and transportation	Alternative access routes identified/created so that access can be maintained during road closures Working relations and agreements established with other hospitals and relevant stakeholders for support when risks eventuate
Opportunity to increase service continuity and capacity	Develop sustainable systems for management of surge conditions for protracted time periods Identification/creation of alternative (backup) communication systems can improve coordination and management during surge conditions

Detailed Cycle

In the previous steps you identified broad risks to your organisation from climate change occurring now and in the future. Continue to bear in mind that we are talking about changes in the risk profile of organisations due to climate change and sea-level rise, and not the existing risks from the 'normal' climate (e.g. the consequences of current average temperatures may be quite different to averages 2

2. Evaluate consequences

In this step you need to identify the **consequences** of the identified risks to your HHS, including system interdependencies. While 'risk' can be a broad description i.e. risk to water supply system, 'consequence' will be a specific description outlining the likely outcome of the risk i.e. non-retention of chlorine residual under predicted warmer conditions.

Evaluating consequences is best done in a risk workshop (see Box 5). At the workshop the participants will:

- develop risk evaluation criteria for assessing the risks
- take one risk at a time and rate how much each of the assessment criteria will be affected by the consequences of that risk
- repeat the two dot points above for each system under consideration.

The workshop participants can also be asked to evaluate the likelihood of risks occurring so that a risk rating can be developed – more information on this is provided in the next sections.

3. Identify risk evaluation criteria using the goals of your assessment

Climate change risks need to be evaluated against some criteria (e.g. maintain HHS infrastructure, minimise impact on HHS services, ensure business continuity) in order to assess their severity. In general, these criteria should be based on the objectives of the risk assessment (defined in Step 1), as well as addressing long-term corporate objectives.

It is a good practice to develop these criteria in consultation with stakeholders (see Box 5) and/or by adopting organisational objectives or existing risk evaluation criteria. They should be kept as close as possible to the organisation's existing corporate risk evaluation criteria, to ensure that terminologies remain consistent and outcomes can be easily incorporated in existing corporate risk registers. Therefore, you should study your

corporate risk evaluation criteria to see if/how they can be adopted for your climate change risk evaluation.

Some example risk evaluation criteria relevant to HHS are:

- Will assets and operations be sustainable in the long-term in a changing climate?
- Will the essential services of your facility (electricity, water, waste, gas etc.) be sustainable in the long-term in a changing climate?
- Will staffing levels and expertise match organisational needs in a changing climate? Will the health of staff be adequately maintained?
- Will your organisation's finances be impacted in a changing climate?
- Is there a risk to your organisation's reputation?
- Will patient health be put at risk?

4. Rate possible consequences against risk evaluation criteria

Taking one risk at a time, evaluate how much each of the assessment criteria will be affected by the consequences of that risk. Table 6 shows some example risk evaluation criteria and consequence scales which you can use or modify as required. The first column is an example of a consequence rating scale while the first row shows example risk evaluation criteria. The rest of the table provides definitions of the consequence scale for a given risk evaluation criteria. These definitions should be discussed with stakeholders to ensure their views are reflected.

Detailed Cycle

Try to select your risk evaluation criteria to match, as closely as possible, your existing organisational risk management criteria. This will allow you to communicate your identified climate change risks to your Board effectively and will facilitate incorporating climate change risks into your business risk register.

Box 5: Organising a risk workshop

At this stage you should arrange a risk workshop with key stakeholders to discuss the consequences of your identified risks. In the workshop:

- develop risk evaluation criteria for assessing the risks
- take one risk at a time and rate how much each of the assessment criteria will be affected by the consequences of that risk
- repeat the previous two steps for take each system under consideration
- aim to determine the likelihood of risks occurring.

Points to consider in the risk workshop:

Flexibility: Can your system already accommodate some degree of climate change? Examples include infrastructure that is designed to accommodate a range of future climate conditions, such as a water supply system that has been expanded with reclaimed water, or a power supply supplemented by solar and battery storage etc. If your system has flexible characteristics, then its adaptive capacity is high, and it is likely to suffer fewer consequences.

Interdependencies: Think about primary and secondary impacts of a risk by identifying interdependencies among different parts of your business or infrastructure. These interdependencies may affect supply chains and business continuity. For example, infrastructure systems (water, electricity, transport, telecommunications) are often interdependent and the performance of one system (e.g. electricity) can affect the rest (e.g. water supply, air-conditioning, patient management etc.). These interdependencies are often not clear under normal circumstances but may become evident when a key system fails.

Vulnerability: You can also consider vulnerability, although this will be formally evaluated at a later step. Vulnerability looks at climate change from the perspective of the asset or system under consideration. Does a building, or a piece of infrastructure (or even an organisational procedure) have particular attributes that make it vulnerable to future climate change? For example, is a health service building located close to a low-lying coast? Then it may be vulnerable to sea-level rise: in future it may be damaged, or its operational capability affected more frequently, by coastal flooding. This vulnerability may be enhanced by design factors, e.g. if key equipment such as power supply is located in the basement. If retrofitting by raising key electrical systems is considered too expensive or disruptive (indicating low organisational capacity), then during future flooding events power outages may occur, with 'high' consequence since power supply is a critical service. While thinking about organisational capacity (one aspect of adaptive capacity) it is worth exploring any specific barriers to adaptation (e.g. legal, policy, design standards, financial).

Table 6: Example of consequence scales for a new hospital building and service in a regional location. Build your own consequence scale together with your stakeholders. We recommend staying as close as possible to your corporate risk evaluation criteria to ensure consistency of language and outputs.

	Criterion-1 Sustainability of buildings and maintenance regimes Q: will buildings remain serviceable for planned design-life of 80 years?	**Criterion-2: Sustainability of service delivery from the supply side** Q: can the hospital deliver required services to clients (including medical care, catering, laundry etc.)?	**Criterion-3: Sustainability of service delivery from the demand side** **Q:** can the hospital meet the changing patterns and volumes of admissions caused by climate change?	**Criterion-4 Staff availability and safety** Q: will the hospital continue to be able to attract staff and provide attractive and safe working environments?	**Criterion-5: Sustainability of external services and infrastructure** Q: will external services and infrastructure remain fully operational and able to meet any changing demands of the HHS?	**Criterion 6: Sustainability of HHS finances** Q: will the HHS retain good budgetary control while managing the risks of climate change?
Catastrophic	e.g. Building becomes significantly degraded/ unsafe and must be replaced several years before end of planned design life	e.g. Significant deterioration in service delivery (virtually dysfunctional) because of supply-side issues e.g. staff shortages, interruption to supply, poor performance of buildings and equipment. 25% of client needs cannot be met after 25 years.	e.g. Significant deterioration in service delivery (virtually dysfunctional): increased numbers of presentations for heat stress, vector-borne diseases, respiratory ailments etc. cannot be treated because of lack of expertise and appropriate equipment. 25% of client needs cannot be met after 25 years.	e.g. Extreme difficulty in attracting sufficient numbers of high calibre staff because: • Region has become unattractive (declining population and services) • Degradation of buildings creates an unattractive working environment Degradation of buildings creates significant health and safety issues	e.g. Significant deterioration in performance of external supplies and services (catering, laundry, utilities etc.) due to climate change, e.g. road transport links frequently disrupted, frequent load shedding or unplanned power outages, extreme water restrictions etc.	e.g. Budget exceeded by 25%
Major	e.g. Extensive structural damage to the building, e.g. through degradation of concrete, requiring expensive on-going remedial measures. Major disruption to service through closure of part of the facility.	e.g. Major deterioration in service delivery (ward closures, patients sent elsewhere) because of supply-side issues e.g. staff shortages, interruption to supply, poor performance of buildings and equipment. 10% of client needs cannot be met after 25 years.	e.g. Major deterioration in service delivery: HHS often has difficulty meeting changing patterns of admissions due to climate change because of lack of expertise and appropriate equipment. 10% of client needs cannot be met after 25 years.	e.g. Major difficulty in attracting sufficient numbers of high calibre staff because: • Region has become unattractive (declining population and services) • Degradation of buildings creates an unattractive working environment Degradation of buildings creates major health and safety issues	e.g. Major deterioration in performance of external supplies and services (catering, laundry, utilities etc.) due to climate change e.g. road transport links frequently disrupted, regular load shedding or unplanned power outages, high water restrictions etc.	e.g. Budget exceeded by 10%
Moderate	e.g. Moderate damage/ degradation to some part of the building on-going remedial measures or major refurbishment. Moderate disruption to service.	e.g. Considerable deterioration in service delivery (cancellation of admissions, early patient discharges) because of supply-side issues e.g. staff shortages, interruption to supply, poor performance of equipment. 5% of client needs cannot be met after 25 years.	e.g. Considerable deterioration in service delivery: HHS sometimes has difficulty in meeting changing patterns of admissions due to climate change because of lack of expertise and appropriate equipment. 5% of client needs cannot be met after 25 years.	e.g. Considerable difficulty in attracting sufficient numbers of high calibre staff because: • Region has become unattractive (declining population and services) • Degradation of buildings creates an unattractive working environment Degradation of buildings creates moderate health and safety issues	e.g. Moderate deterioration in performance of external supplies and services (catering, laundry, utilities etc.) due to climate change, e.g. road transport links occasionally disrupted, occasional - regular load shedding or unplanned power outages, moderate water restrictions etc.	e.g. Budget exceeded by 5%
Minor	e.g. Increased maintenance requirement or minor repairs.	e.g. Minor deterioration in service delivery (e.g. seasonal bed shortages). Disruption can mostly be managed through standby or alternate options.	e.g. Minor deterioration in service delivery: HHS occasionally has difficulty in meeting changing patterns of admissions due to climate change because of lack of expertise and appropriate equipment. Disruption can mostly be managed through standby or alternate options.	e.g. Minor difficulty in attracting sufficient numbers of high calibre staff because: • Region has become unattractive (declining population and services) • Degradation of buildings creates an unattractive working environment Degradation of buildings creates minor health and safety issues	e.g. Minor deterioration in performance of external supplies and services (catering, laundry, utilities etc.) due to climate change, e.g. road transport links occasionally disrupted, occasional load shedding or unplanned power outages, occasional water restrictions etc.	e.g. Budget exceeded by 2.5%
Insignificant	e.g. building degradation create minor inconvenience for staff or clients.	e.g. Little impact on HHS operation, most performance indicators met.	e.g. Little impact on HHS operation, most performance indicators met.	e.g. Little impact on recruitment; few health and safety issues related to building degradation	e.g. Little deterioration in performance of external supplies and services (catering, laundry, utilities etc.) due to climate change, e.g. road transport links infrequently disrupted, infrequent load shedding or unplanned power outages, minor water restrictions etc.	e.g. Budget exceeded by 1%
No risk	e.g. Building not at risk.	e.g. No impact on HHS operation	e.g. HHS continues to be able to manage volume and type of admissions	e.g. No impact on HHS operation	e.g. No impact on HHS operation	e.g. No financial loss

5. Evaluate likelihood

Identify and rate the likelihood of each risk occurring

Now you need to adopt a scale to estimate the likelihood of the risks that you have identified. A likelihood scale should assign qualitative descriptions to the likelihood of a risk occurring. For example, 'almost certain' may describe 'could occur several times per year' (Table 7). These descriptions mean that when likelihood is discussed and rated by your organisation, all participants in the risk workshop will have a similar understanding of what each rating means. This selection of likelihood will be used in the later steps for rating future risks.

In thinking about likelihood, it is vital to be clear about your time period of interest – the likelihoods will of course change as you move out into the future.

Table 7: Example likelihood scale (adapted from AGO 2006)

Likelihood Level	Definition
Almost Certain	Could occur several times per year
Likely	Likely to occur in most cases
Possible	Might occur in most cases
Unlikely	Not expected to occur in most cases
Rare	Will only occur in exceptional circumstances and has not occurred in most cases

Detailed Cycle

In general, you should use existing risk assessment scales (consequence and likelihood) that your organisation uses for evaluating its business risks. If you find that existing scales are not useful, you can choose the examples provided in Table 6 and Table 7. These should be discussed and agreed among your stakeholders. It is advisable to stay as close as possible to your existing risk management procedures and scales, so that output generated from your climate change risk assessment can be readily integrated into your organisations existing business or enterprise wide risk register.

6. Evaluate vulnerability

The next step is to think about the vulnerability of a system/asset, or the organisation as a whole, to future climate change risks. Vulnerability is determined through a combination of sensitivity and adaptive capacity. Are there particular aspects of the organisation that make it more, or less, vulnerable?

Example 1: A hospital located close to the coast on low-lying land will be more sensitive to sea-level rise. If critical services and infrastructure are located on the higher floors, then the hospital has adaptive capacity.

Example 2: A hospital located in an area with a high proportion of elderly people is sensitive to warming due to climate change, because of the increase in admissions during more frequent and more intense heatwaves. If there is the potential to increase staffing levels during peak admissions periods, then the hospital has adaptive capacity.

Answering some of the following questions can be useful in this regard.

Q: To what extent are the physical characteristics of your system able to accommodate changes in climate at minimum disruption or cost?

Example questions include:

Are there sufficient facilities or space to allow for increased hospital admissions under the predicted temperature increase under the 2050 climate scenario for your region?

Can you make an estimate of what vulnerable populations will be located in your catchment during the future time period under consideration?

Q: What is the capacity of your organisation (or community) to deal with the identified risks?

Are there any specific barriers (e.g. legal, policy, design standards, financial) that the organisation may face while addressing any climate change risks in future?

Q: Is your system already able to accommodate changes in climate?

Consider whether your system is already designed to accommodate some degree of flexibility in managing climate change, such as a purple pipe system able to incorporate reclaimed water or alternative power supply options such as solar power or heat storage.

Answers to these questions will help you to determine the vulnerability of your system. As an example, if you are assessing vulnerability of your hospital in terms of managing higher service demand in the longer term and you find that your hospital has enough space to accommodate any future greater demand in service resulting from climate change (low sensitivity), and you also have sufficient funds to make any necessary purchase to make this happen (high adaptive capacity), then overall vulnerability of your system is low. Figure 7 provides an example of a vulnerability assessment using the template.

Explore the future exposure of your listed systems and identify their vulnerabilities (1st row provides an example. Please update this as appropriate for you organisation)					
Systems, assests and operations at risk (exposure)	Past or existing risk	How this risk may change in the future as a result of climate change	Sensitivity of your system, asset, operation to future risk	Adaptive capacity	Vulnerability rating
Water management	e.g. Hospital has high demand for water due to nature of the business; on-site laundry has very high water consumption. Water restrictions have been imposed in the past forcing the hospital to out-source bed linen laundry urgently and at high cost.	e.g. Queensland is expected to experience generally drier conditions as a result of climate change, meaning that risks to the hospital water supply are likely to increase in the future.	e.g. Hospital operation is highly sensitive in diverse areas - kitchens, wards, laundry etc.	e.g. We have established one on-site water retention facility but it needs expansion. Other possible strategies include out-sourcing laundry as a permanent strategy, and costs of this should be expected.	Moderate
Energy management					
Waste management					
Asset management					
Emergency and disaster management					
Human resources					
Transport and access to premises					
Procurement					
Health care service					

Figure 7: Example of vulnerability assessment using the Detailed Cycle template

7. Bring consequence, likelihood and vulnerability together to assign a risk rating

Combining the three ratings (of consequence, likelihood and vulnerability) provides a final risk rating using a risk matrix. The risk rating helps you to prioritise your risks.

Once ratings have been assigned for likelihood, vulnerability and consequence, an overall level of risk can be determined. The Risk Matrix used in this process inputs the likelihood (X), vulnerability (Y) and consequence (Z) levels (each ranked 1-5) to output an overall risk severity rating (1-13). The risk severity rating is then broken down across five levels of risk which range from Very Low (dark green in Table 8) to Extreme (red in Table 8).

For example, if a risk (e.g. losing access to an HHS) arising from a hazard (e.g. increased flooding due to sea-level rise) has a consequence rating of 'major', a likelihood rating of 'rare' and a vulnerability rating 'high' (as there is no capacity to provide alternate access), then using Table 8 the risk should have a 'medium' rating. Table 9 provides the risk prioritisation scale.

Detailed Cycle

Adopting and using a risk rating scale for the Detailed Cycle may seem daunting if you have not undertaken the process before. Look within your HHS or other HHSs for those with experience of using a risk rating scale.

Table 8: Example risk rating scale. Source: QFES 2017.

Likelihood (X)		Rare (1)					Unlikely (2)					Possible (3)					Likely (4)					Almost Certain (5)				
Vulnerability (Y)		V.Low (1)	Low (2)	Mod (3)	High (4)	Extr (5)	V.Low (1)	Low (2)	Mod (3)	High (4)	Extr (5)	V.Low (1)	Low (2)	Mod (3)	High (4)	Extr (5)	V.Low (1)	Low (2)	Mod (3)	High (4)	Extr (5)	V.Low (1)	Low (2)	Mod (3)	High (4)	Extr (5)
Consequence (Z)	INSIGNIFICANT(1)	VL1	VL2	VL3	L4	L5	VL2	VL3	L4	L5	L6	VL3	L4	L5	L6	M7	L4	L5	L6	M7	M8	L5	L6	M7	M8	H9
	MINOR (2)	VL2	VL3	L4	L5	L6	VL3	L4	L5	L6	M7	L4	L5	L6	M7	M8	L5	L6	M7	M8	H9	L6	M7	M8	H9	H10
	MODERATE (3)	VL3	L4	L5	L6	M7	L4	L5	L6	M7	M8	L5	L6	M7	M8	H9	L6	M7	M8	H9	H10	M7	M8	H9	H10	H11
	MAJOR (4)	L4	L5	L6	M7	M8	L5	L6	M7	M8	H9	L6	M7	M8	H9	H10	M7	M8	H9	H10	H11	M8	H9	H10	H11	E12
	CATASTROPHIC (5)	L5	L6	M7	M8	H9	L6	M7	M8	H9	H10	M7	M8	H9	H10	H11	M8	H9	H10	H11	E12	H9	H10	H11	E12	E13

Key: V.Low = Very Low; L = Low; M = Medium; H = High; E = Extreme

Scale: 1 (lowest) to 13 (highest)

Table 9: Example risk prioritisation scale, Source: QFES 2017.

Risk Level	Rating
Very Low	1-3
Low	4-6
Medium	7-8
High	9-11
Extreme	12-13

Using the risk rating, identify the risks that may cause you most problems in future and which therefore should be investigated further

The risk rating will determine the type of response required. If some of your risks are high or extreme, consider if you need a further detailed risk assessment, for example by engaging experts and/or consultants. Or you may consider you have sufficient knowledge of the risks to move to the next step, which is evaluation of the adaptation options. Information generated as part of a detailed assessment provides the basis for making critical adaptation decisions about a specific project, or system. These detailed studies should indicate, for a specific climate change and sea-level rise scenario, when the risk will pass a tolerable limit and implementation of your planned action will be necessary.

Simple examples of the level of response that might be required for different risk types include:

- Extreme risk: Urgent attention is required at a senior level. Further detailed risk assessment is needed to identify specific risks to prioritise. Action plans and management responses are required.
- High risk: May need further detailed assessment to prioritise risks for treatment. Or it may be possible to proceed directly to the identification of adaptation options.
- Medium risk: Proceed to next step. Keep a watching brief and revisit next year.
- Low risk: Proceed to next step. Keep a watching brief and revisit in five years.
- Very Low risk: Proceed to next step. Keep a watching brief and revisit in the future.

At the end of Step 3 you should consider answering the following questions. If you cannot fully answer these questions, revisit Step 3 as necessary.

- ☑ Do you have a clear understanding of the risk assessment and reporting process?
- ☑ Do you have enough information on climate change risks to your asset(s) and operation?
- ☑ Do you have a good understanding of risk prioritisation for your organisation (i.e. whether and when to act)?
- ☑ Have you determined which climate risks to prioritise for treatment and/or further investigation?
- ☑ Do you understand the sensitivity and adaptive capacity of your organisation for managing climate change risks?

Step 4 Identification and evaluation of adaptation options

4

- Once you have identified and prioritised your risks, the next step is to identify relevant adaptation options and evaluate them to understand how they match your requirements.
- In this section we provide guidance for the Scan Cycle first, followed by additional steps for the Detailed Cycle.

Which templates should I use at this step?

For the Scan Cycle:

- Use the "Scan Cycle-Risk Screening" worksheet of the Scan Cycle Template
- If you are carrying out a system specific risk screening, use the "Scan Cycle-System Screening" worksheet of the Scan Cycle Template

For the Detailed Cycle: Use the "Step 4 Evaluate Options" worksheet of the Detailed Cycle Template

Summary of Step 4: Identification and evaluation of adaptation options

In the Scan Cycle you will

- Identify adaptation options for each risk identified in Step 3.
- Identify whether the risk assessment needs to proceed to the Detailed Cycle, or whether a watching brief is sufficient.

In the Detailed Cycle you will conduct following steps

- For each prioritised risk identified in Step 3, investigate and identify potential adaptation options.
- Evaluate identified options based on their effectiveness and affordability for your organisation.
- Estimate when the identified option might need to be implemented.

Scan Cycle

1. Identify adaptation options for each identified risk

For each future risk identified in the previous step (Step 3), think about how it may be minimised by adaptation actions (or, if opportunities have been identified, how these may be realised).

List your identified adaptation options in the template for further investigation in the Detailed Cycle in terms of their cost, time to implement, regulatory requirements etc.

Although in the Scan Cycle you are not doing any detailed option assessment, it is important to gain a broad understanding of possible adaptation options, their strengths and weaknesses. This eventually can lead to some broad, high-level adaptation decision making.

If you do not feel confident that you can comprehensively identify the full suite of risks and adaptation options relevant to your organisation, then a useful strategy is to convene a workshop with a group of colleagues from across the organisation, or even other partner organisations advanced in their climate adaptation, with the goal of completing the template through discussion. This is also a good way to facilitate the process of organisational buy-in. A major goal of the Scan Cycle is to understand whether risks have been identified which are sufficiently large and/or urgent that a Detailed Cycle of Risk Assessment and Management is required.

If your conclusion, or that of the workshop, is that the risks are moderate to low, there is no need for immediate action, and it may be appropriate to stop the risk assessment process at this point. It will be appropriate to inform management of the steps that have been taken and the conclusions reached. A future time point should be identified, when the climate change-related risk assessment should be re-visited, and this should also be communicated to management and in some way locked into corporate memory, for example by incorporation in mainstream risk registers.

2. Identify whether the risk assessment needs to proceed to the Detailed Cycle, or whether a watching brief is sufficient

The results from the Scan Cycle can be used to:

- decide whether any further assessment of risk is required through a Detailed Cycle
- communicate to relevant stakeholders as a basis for discussion around any proposals for adaptation planning.

These discussions should help identify which stakeholders need to be engaged with, if a more detailed assessment proves necessary.

Scan Cycle

The information from a Scan Cycle will support discussion with senior management and decision makers within the organisation around allocation of financial and human resources for more detailed climate change adaptation planning.

Detailed Cycle

1. For each prioritised risk, investigate and identify potential adaptation options

For each risk identified in Step 3, think about how it may be minimised or alleviated to increase organisational resilience. If you have identified any opportunities that may be created by climate change, consider how those opportunities might be realised. This will lead you to adaptation options for each of your identified risks.

For each risk, identify what level of risk is tolerable to your organisation through discussion with your stakeholders. Knowing the risks that your organisation is willing to bear is an important component of option selection. Your organisation may have already defined what risks are acceptable or unacceptable in an organisational risk register or similar document. If so, incorporate this information in your analysis of climate change-related risks. Although an organisational risk register tends to be broad in scope (i.e. not specific to climate change) it might provide you with a general understanding of the risk tolerance of your organisation.

Adaptation actions typically comprise both short- and long- term strategies to address climate change risks. There are many potential approaches and it is important to identify a wide range of options that can be considered by your stakeholders. A good way forward is to develop a sequence of options that can be implemented as the effects of climate change become more apparent.

First, consider what your organisation is doing at present to manage climate-related risks, and then investigate whether any changes are warranted, or any new management options are required to build resilience. An indicative list of options is provided in the Almanac (Section 7). Options can be of different types, such as:

- planning options e.g. developing a long-term plan for process improvements within hospitals so that increased service demands from climate change can be met
- engineering options e.g. installing alternative power sources such as solar power supported by battery storage to reduce the risk of future power disruption, increasing the capacity of Heat Ventilation Air Conditioning systems to reduce over-heating of the facility during heatwaves, and improving building insulation to reduce heat transfer from outside
- social, community and education options e.g. staff education and training to deal with predicted changes in operating circumstance or changing drivers and priorities.

The selected options should match the broader goals of the organisation and its stakeholders. It is important to consider any additional opportunities that might be derived from the selected options and any co-benefits that can be achieved. Environmental outcomes should be explored and taken into account, and options that deliver poor outcomes either discarded or given a low priority. In determining responses to address climate risk, it is important that actions do not increase emissions and further exacerbate the issue.

When identifying management options, it is also important to consider actions and approaches that are being taken by your organisation to address non-climate change related issues. This is mainly because any existing action or approach may intersect with your selected adaptation, leading to co-benefits or to some unintended negative consequences. In other words, these options cannot be considered in isolation but as a part of the overall organisational priorities, and weighed against these or integrated with them, to achieve the best results.

Outputs from a Detailed Cycle provide the basis for making critical adaptation decisions. Additional detailed hazard studies may be required if risks are shown to be very high. Such studies should indicate, for a specific climate change and sea-level rise scenario, when the risk will exceed a tolerable limit (or threshold) and implementation of your planned action will be necessary. The uncertainties in projections of future climate change are such that it is impossible to identify a specific time when action should commence. By setting thresholds which are event dependent rather than time dependent (see Almanac Section 8 about this adaptation pathways approach) some of these uncertainties can be overcome.

2. Evaluate identified options based on their effectiveness and affordability to your organisation

Having identified a suite of adaptation options, you now need to select the ones to include in your risk register, and discard those that may create negative consequences (i.e. are maladaptive) or which are not suitable for the purposes of your organisation and stakeholders. It is important to engage with your stakeholders at this stage. Integrating their views into your formal decision-making process will help them to understand and engage in the option selection process and, if this is done transparently, will help to reduce any issues with stakeholders down the track.

There is a range of quantitative methods that can be used for comparing your options, including *cost-benefit analysis*, *cost-effectiveness analysis*, *cost-minimisation* and *multi-criteria analysis*. There are guides and tools for using these methods, but they often require significant expertise and a consultant may be required. *CoastAdapt* provides more information on these methods, their strengths and weaknesses. See the Coast Adapt Information Manual 4.

for more information.

A simple process for evaluating your adaptation options is described here. First, it is important to discuss and finalise decision criteria that will be used in the evaluation process. These criteria can be selected in different ways. They can be choices made by a single person, by a committee, or through wider engagement with internal and external stakeholders. The approach will largely be determined by its suitability for your organisation in terms of the time and resources available. Whichever approach is adopted, the rationale for the choice should be well documented.

In general, the criteria chosen to evaluate adaptation options will reflect the values of the organisation and/or stakeholders involved. Some example criteria include:

- the extent to which the proposed action fully addresses the risk
- benefits across different time scales—are there immediate as well as long-term benefits
- potential co-benefits derived from the option (including opportunities)—will the option achieve outcomes in other areas apart from climate change (e.g. improving sustainability)
- extent to which negative impacts on other activities can be minimised
- impacts on greenhouse gas emissions—will the option decrease emissions or possibly increase emissions and thereby have a long-term negative impact
- the time required to implement the action
- the lead-up time required to plan, seek planning approvals, and obtain approvals
- a cost estimate of the action (which helps to develop an indication of the time that may be required to obtain the funding)
- the necessary form and length of engagement with the community and other stakeholders (this is important because some actions may be highly controversial, and may require lengthy periods of consultation in order to get a social licence to act)
- other risks, including the implementation risks, that may accompany the selection of the option.

The information gathered about the performance of each option against the criteria can then be used for comparison and selection of preferred adaptation options (see Figure 8).

In reviewing adaptation options, be sure to do the following:

- Capture the decision criteria that you or your organisation have selected to use when evaluating options. It is also useful to keep a record of which internal and external stakeholders were engaged while determining these criteria.
- Document the option evaluation method you have selected and keep notes to justify your selection.
- Document the process and the stakeholder engagement undertaken at this stage.

3. Estimate when the identified option might need to be implemented

Once you have selected the adaptation options that perform well against the decision criteria, and therefore should be incorporated into your management plan, you can identify and sequence the specific tasks necessary for implementation.

Create a task list. While listing each task, think about the sequencing — when will each task need to be done relative to the full suite of tasks required to achieve the adaptation outcome and how do these fit in with existing priorities and actions within your organisation? What are the costs likely to be?

The uncertainties in projections of future climate change are such that it is impossible to assign precise absolute timings. To overcome this uncertainty, the adaptation pathways approach allows you to set trigger points which are event dependent rather than time dependent (see Almanac Section 8, for further discussion on this adaptation pathways approach). You can create a 'pathway' of sequenced tasks, each of which is triggered by a threshold event, and which together realise an adaptation outcome.

Monitoring your identified trigger points will help you to understand at which point further decisions or actions will need to be undertaken. This should help remove the pressure of making all decisions now. It also creates time to build strategies for funding, gain stakeholder support and generate the necessary knowledge to implement future decisions. Importantly, it can help identify the first steps that can be taken.

At the end of Step 4 you should consider answering the following questions. If you cannot fully answer these questions, revisit Step 4 as necessary.

- Have you identified a suite of adaptation options that can address your identified climate change risks?
- Have you considered the sequence of actions required to achieve your adaptation goals? This includes identification of thresholds at which your identified adaptation tasks will be implemented.
- Have you identified barriers to action and established mechanisms to overcome these?
- Have you communicated the results of your risk assessment to senior management?
- Have you adequately integrated your identified climate change risks into the existing business risk register, so that climate change risks can be mainstreamed within your organisation?

List your systems (this will be automatically populated using your previous inputs)	Identified risks (this will be automatically populated using your previous inputs)	Adaptation options			Adaptation options		
		Adaptation option-1			Adaptation option-2		
		What?	When?	Tentative cost	What?	When?	Tentative cost
Water management	e.g.Queensland is expecetd to experience generally drier conditions as a result of climate change, meaning that risks to the hospital water supply are likely to increase in future	e.g. outsource laundry	e.g. requires cost-benefit analysis to identify optimal installation point, but likely no later than 2030	See previous column	e.g. install rain water tanks	e.g. beyond 2030	e.g. $100,000 at current prices
Energy management	0						
Waste management	0						
Asset delivery	0						
Asset maintenance	0						
Emergency and disaster management	0						
Human resources	0						
Transport and access to premise	0						
Procurement	0						
Health care service	0						

Figure 8: Example of Detailed Cycle template for recording adaptation options

Step 5 Implementation and monitoring

5

Once you have identified and prioritised your adaptation options, the final step is to investigate how you may be able to implement some of your preferred adaptation options.

In this section we provide guidance for the Scan Cycle first, followed by additional steps for the Detailed Cycle.

Which templates should I use at this step?

For the Scan Cycle:

- Use the "Scan Cycle-Risk Screening" worksheet of the Scan Cycle Template
- If you are carrying out a system specific risk screening, use the "Scan Cycle-System Screening" worksheet of the Scan Cycle Template

For the Detailed Cycle: Use the "Step 5 Implement and Monitor" worksheet of the Detailed Cycle Template

Summary of Step 5: Implementation and monitoring

In the Scan Cycle you will:

- Identify stakeholders that are relevant for communicating and managing climate change risks.
- Investigate an implementation strategy.

In the Detailed Cycle you will:

- Develop a business case for adaptation.
- Identify potential financial mechanisms for implementing your identified options.
- Implement your identified option and set up a monitoring system to track its performance and usefulness in reducing future risks.

Scan Cycle

1. Identify stakeholders that are relevant for communicating and managing climate change risks

The information from the Scan Cycle will support discussion with senior management and decision makers within the organisation around allocation of financial and human resources to undertake a Detailed Cycle. Potential cost areas could include:

- **Data and modelling**. For example, for a hospital located on a low-lying coastline, it may be necessary to commission modelling to understand where flooding from the sea is likely to occur, and at what point in the future (given scenarios of sea-level rise).
- **Cost-benefit analysis of adaptation options**. It is necessary to understand what the costs of the impacts of climate change are compared to the costs of adaptation options.

2. Investigate an implementation strategy

At the Scan Cycle stage, you are unlikely to implement any identified adaptation options. However, you should do research to determine the barriers to implementation (e.g. lack of leadership and resources, poor access to or no availability of information and knowledge, lack of communication and engagement within and outside of organisations).

The final Scan Cycle Climate Change Risk Management Plan should include consideration of potential or actual barriers to action or implementation and how these can be addressed. Most organisations have excellent experience and capacity in delivering a variety of strategic and management plans that fit their needs. Identifying any barriers to implementation at the Scan Cycle stage will help you to plan to overcome them when it is time for implementation.

Detailed Cycle

1. Develop a business case for adaptation

A business case should be prepared seeking endorsement and associated support (i.e. funding) for your selected adaptation options. Building a business case for adaptation is an effective way to respond to the risks and opportunities that climate change represents to your organisation. However, the process can be challenging because outcomes may not be achieved for long periods of time, and the benefits may be complex and non-monetary (i.e. difficult to demonstrate to time-poor management). Detailed guidance on building a business case for adaptation can be accessed via the Coast Adapt website.

Detailed Cycle

You should aim to integrate the business case for climate change adaptation into existing overall business decision-making frameworks. For example, a strong business case for climate change adaptation can be made by linking to existing sustainability systems and practices in an organisation.

2. Identify potential financial mechanisms for implementing your identified options

Implementing Climate Change Risk Management Plans can be resource intensive (in terms of both finances and staffing). At this stage you should investigate whether funding or financing is available for implementation. If not, what is required to obtain financing? Many low-regrets actions—particularly those identified in existing plans or linked to high priority risks—will generally be easier to fund. Actions that are expensive, complex, controversial, or that may only realise benefits in the longer term are likely to prove more difficult to finance. Are there staff available who can be dedicated to the task of implementation and, if not, is there any possibility for support utilising collaborations or partnerships from internal or external organisations?

It is important that opportunities for collaboration are considered in implementing your Climate Change Risk Management Plan. Collaboration between government and the private sector can result in access to and use of good information and guidance, and open up opportunities for financing. Collaboration can also support sharing of resources, costs and risks. Collaborating organisations can share costs of data collection to enable understanding and/or monitoring of climate risk or generation of new knowledge through research. For instance, there also collaboration opportunities between HHSs with some existing mechanisms already in place to do this.

3. Implement your identified option and set up a monitoring system to track its performance and usefulness in reducing future risks

If you have identified any extreme risks, then it is likely you will implement your adaptation response action.

As part of the implementation, you need to set up a process to understand its effectiveness (i.e. whether the option is successfully reducing the identified risk(s) and helping to capture any opportunities). It is important to be able to report on what has happened because of the action and whether the desired outcomes have been achieved. This supports the needs of high-level decision makers such as boards who want to know if funds have been expended wisely. It is also important to be able to consider whether the actions are working and whether any changes are required to ensure outcomes will be achieved and the identified risk addressed.

Risk Management Plans should be living documents which are revisited regularly. As new information becomes available or you expand or change your business processes and operations, the risks need to be reassessed with action lists updated accordingly. Some examples of things that should be monitored and evaluated over time are listed below:

- The performance of activities undertaken during the development of a Climate Change Risk Management Plan (e.g. stakeholder engagement activities).
- Pre-identified risk thresholds/trigger levels which identify the point at which to undertake new adaptation actions. Have these been reached and, therefore, is it time to take action? Do they remain appropriate or do new thresholds/trigger points need to be assigned?
- Goals. Have the planned outputs and outcomes from adaptation actions been achieved?

Your plan should include performance indicators for each adaptation option. This is important as without these it is impossible to monitor performance effectively. When selecting indicators, think about how they will be monitored and what resources are required. Consider partnerships and approaches that can be developed to make this step more cost effective

At the end of Step 5 you should consider answering the following questions. If you cannot fully answer these questions, revisit Step 5 as necessary.

- ☑ Have you developed a business case for implementing your priority actions (including identifying adequate funds to implement risk management plans)?
- ☑ Have you considered the monitoring and evaluation needs of your Climate Change Risk Management Plan?

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