



Climate Change Risk Management Tool for Queensland Households



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Climate change and extreme events affect all Australians. Globally much is being done to reduce carbon emissions and limit the extent and impact of climate change, but the need to adapt remains. Many Queenslanders are becoming concerned about how climate change may affect them, their families, their households and belongings. Increasingly the finance, mortgage and insurance sectors are taking a greater interest in how households may be impacted by a changing climate, and what households are doing to understand and reduce any associated risks. There is clear recognition that many households in Queensland do not have sufficient information, resources or time to proactively consider climate change risks, yet many are already exposed to extreme events.

This tool has been developed to help households start their adaptation journey. It contains information on climate change (what, where and how much) and checklists to assess risks. It is simple, quick to use, and provides links to other resources that can be accessed and used as required. In taking these first steps and determining risks faced by extreme events and a changing climate, households will be able to increase their awareness of future risks and will be better able to address present day extremes by updating their insurance policies or emergency preparedness plans.

This resource for households is matched by a similar resource for Queensland's small businesses, who face a similar lack of appropriate climate risk management tools for their needs. Development of the resource for small businesses is a recommendation under the Small and Medium Enterprise (SME) Sector Adaptation Plan for Queensland, which was developed under the Queensland Climate Adaptation Strategy.

This tool contains

- a rapid risk screening checklist ([page 6](#))
- a detailed risk management checklist ([page 11](#))
- a worked example illustrating the use of the detailed risk management checklist ([page 54](#))
- an information booklet for more information and supporting resources for climate change risk assessment ([page 30](#)).

It is recommended that you familiarise yourself with the contents of the booklet before you start using the checklists.

Frequently Asked Questions

How long will it take to complete this tool?

This depends on your prior knowledge about the problem, but typically the rapid risk screening can be done within 30 minutes and detailed risk management checklist can be completed within 1-2 hours.

What is the cost of using this tool?

This tool is free to use. However you have to bear your own cost to implement any identified action.

Who can assist me if I need help to get started?

There is enough information in the information booklet to get you started. However, if you think your risk is higher, you should consider getting some expert advice from a consultant.



Where to start?



I want some background information about climate change risks to households.

- **Why should I consider climate change risks to my household and what is the benefit?**
Go to [page 5](#)
- **What is climate change and sea-level rise?**
Go to [page 32](#)
- **What does the future climate look like in Queensland?**
Go to [page 35](#)
- **What are some of the impacts of climate change on households?**
Go to [page 38](#)
- **What options do I have for managing my future risks?**
Go to [page 41](#)



I want to do a rapid risk screening of my household

Go to [page 6](#)



I want to do a risk assessment and develop a management plan for my household

Go to [page 11](#)



I want to see a worked example of how to use these checklists.

Go to [page 54](#)

Why should I consider climate change risks to my household?

Weather and extreme events already affect households

Many Queensland households have been disrupted by extreme weather. Recent events include Cyclone Debbie (2016), Cyclone Yasi (2011), flooding throughout the state in 2011, recent drought in parts of Queensland and extreme heatwaves and bushfires in 2018. Extreme events can cause significant damage to property and infrastructure, impacting local communities and many businesses and industries.

Recovery of a household from a disaster is a complex process and dependent on many factors such as the household's socioeconomic circumstance before and after the disaster, governmental and nongovernmental aid structures, the physical condition of the neighbourhood around the household, and the household's own actions. Historically, recovery of households after disasters has been enhanced through the awareness of risks and being prepared for them well in advance. Being resilient helped residents in many ways such as reduction in insurance premiums and damage costs, increased thermal comfort within the house leading to improved living conditions, etc.

Apart from major natural disasters, many households have experienced the more subtle effects of weather on their lifestyle, including those from storms and heatwaves. This suggests that some households are not even well adapted to the current climate. Building resilience now will help households to reduce future damage costs, reduce negative impacts on their health, wellbeing and livelihood and maximise any opportunities arising from future weather and climate changes.

What is the benefit for me and my household if we adapt?

Like any other issue affecting your daily life, it is important to understand how extreme weather and climate change impacts could affect you. Planning ahead rather than responding reactively will help you in the following ways.

1. Save money

If you are a homeowner, understanding future risks to your assets will help you take necessary steps to minimise or alleviate future damage costs to your property. If you are developing a new home, understanding the risks ahead will help you choose an appropriate design. If you are planning to purchase a home, understanding the climate-related risks of your future property or the area where you are planning to buy, will help you make an informed investment decision. If you are renting, you can determine approaches to reduce possible impacts on your belongings and assets. Whatever the case, understanding future climatic risks of the place where you live, rent or invest will allow you to manage or lower costs in the long-term. It can also potentially help reduce insurance costs and lending costs in future.

2. Be healthier

Understanding the future climatic risks to your household, and preparing for them, will give you the best chance to be safe during rapid-onset natural disasters such as cyclones, bushfires, floods, etc. Additionally, a better understanding of slow-onset hazards (such as increased exposure to extreme heat) can help you improve the liveability of your house (e.g. improved ventilation or air conditioning to protect you during heatwaves).



Checklist for Rapid Climate Change Risk Screening



Rapid Climate Change Risk Screening

Has your household been affected by extreme events in the past?

Yes No

Has the health and safety of your family been impacted as a result of past extreme events (heatwave, flood, severe storms, cyclones etc.)?

Yes No

Have the structure of your home, contents and belongings been affected by extreme events in the past such as floods, cyclones, bushfires etc.?

Yes No

Have the household expenses and/or your income been affected during and/or after extreme events (including insurance costs)?

Yes No

Do you wish to understand and manage the potential for climate change to affect your household in the future?











Yes No

If you answered yes to any of these questions, then your household is sensitive to climate and might be affected again in future.

Queensland's climate is changing and sea levels are rising. As a result, extreme events such as heatwaves, floods, bushfires, droughts etc. are changing in their frequency and intensity (happening more often with more intensity). Therefore you should consider assessing climate change risks to your household.




How will climate change affect Queensland?


In the future, the state can expect:

- | | |
|--|--|
|  higher temperatures |  more intense downpours |
|  hotter and more frequent hot days |  less frequent but more intense tropical cyclones in the north |
|  harsher fire weather |  rising sea level |
|  fewer frosts |  more frequent sea-level extremes |
|  reduced rainfall in the south-east |  warmer and more acidic seas |

From [Queensland Government](#). For more information visit [Queensland Future Climate Dashboard](#).

Rapid climate change risk assessment checklist

Climate hazards	Has the hazard affected your household in the past?		How the hazard is likely to change in future	Potential future impacts (indicative)	Are future hazards likely to affect your household		What are you going to do about this? Are there any opportunities for your household? (see information booklet for some examples, page 30)
Heatwave 	Yes	No	In general, increased average temperatures. Increased number of hot days and nights and length of heatwaves.	Power failures, and the subsequent discomfort, may be more likely during extreme heat events.	Yes	No	
				Longer exposure to heat can impact health and wellbeing of vulnerable residents (elderly and young children). On the other hand, there may be less need to heat the home in winter.	Yes	No	
				Faster deterioration of concrete affecting building structure. Internal overheating of some buildings, particularly traditionally constructed high-rise flats.	Yes	No	
				The need for keeping your home cool during the summer months will be greater, particularly during extreme heat.	Yes	No	
				Extreme heat along with dry conditions can lead to the death of vegetation (vegetable gardens, flower gardens grass lawns etc.).	Yes	No	
				Extremely hot conditions can limit the ability to do exercise outdoors.	Yes	No	
Bushfire 	Yes	No	Increased average temperatures combined with dry conditions increases bushfire potential.	A significant increase in the number of very high, extreme or catastrophic fire danger days is expected. Homes close to bushfire prone areas will be at greater risk during dry conditions.	Yes	No	
Flood 	Yes	No	Coastal: Sea-level rise can cause increased flooding in low-lying coastal areas during high tides, cyclone and storm events. Inland: Extreme rainfall can cause inland flooding.	Flooding can be localised (due to excessive rainfall) or associated with a river or coastal system. Frequency of flooding may increase in some areas with possible impacts including water damage to the home and its contents, the undermining of foundations and the contamination from sewage or mud.	Yes	No	
				Chance of slope instability causing impact to building foundation.	Yes	No	
				Cyclone prone regions of Queensland are also susceptible to termite attack. Longer exposure of wooden frames to moisture due to flooding can increase the termite risk in some parts of Queensland.	Yes	No	

Climate hazards	Has the hazard affected your household in the past?		How the hazard is likely to change in future	Potential future impacts (indicative)	Are future hazards likely to affect your household		What are you going to do about this? Are there any opportunities for your household? (see information booklet for some examples, page 30)
				Increased moisture in the house after flooding or extreme rainfall can lead to mould development	Yes	No	
				As sea-levels rise, homes near low lying coastlines and estuaries may be more likely to flood and may have to cope with rising water tables (impacting building foundation).	Yes	No	
				As sea-levels rise, stormwater systems may be less able drain into the sea and therefore may cause flooding further inland.	Yes	No	
				Increased potential of flooding in coastal areas as a result of sea-level rise can increase the cost of insurance premiums for at-risk homes.	Yes	No	
Severe storm	Yes	No	Frequency and intensity of storm events may increase (including excessive rainfall, lightning, hail, etc.). At the same time, sea-level rise will increase the risk of flooding in coastal areas during severe storms.	An increase in high intensity rainfall events (including thunderstorms, hail, wind and tornados) can potentially lead to impact damage to the structure of a house and moisture penetration.	Yes	No	
				Hailstorm scenarios are very location-specific and there have been very limited studies exploring how climate change may impact hail events. Regardless of climate change, hail can damage the roofing, windows, sliding doors, etc. of certain types of homes, especially older homes. Large, multi-storey apartment buildings with concrete roofs are less likely to be impacted by hail events. However, depending on the angle of the impact from the hailstorm, windows or glazing may be damaged.	Yes	No	

Climate hazards	Has the hazard affected your household in the past?		How the hazard is likely to change in future	Potential future impacts (indicative)	Are future hazards likely to affect your household		What are you going to do about this? Are there any opportunities for your household? (see information booklet for some examples, page 30)
Drought 	Yes	No	Decrease in future rainfall can lead to drought. If increased hotter days are combined with drier conditions, bushfire risks will increase.	<p>In areas where rainfall will decline, droughts will be more severe. This will strain the livelihood of households of those areas.</p> <p>Chance of soil shrinkage and subsidence, particularly in clay soil areas which can affect the structure of the building.</p> <p>Less water for building maintenance and residential use</p> <p>Flows into water supply catchments will decrease and evaporation of water and transpiration from dams increase due to higher temperatures.</p> <p>Loss of livelihood due to drought conditions can stress the financial condition of a household leading to mental health issues for residents.</p>	Yes	No	
Coastal erosion 	Yes	No	Sea-level rise can increase erosion of low-lying erodible shores. Increased frequency of severe storms in coastal areas can also lead to more erosion in these areas.	Greater foreshore erosion could also expose more homes to the impacts of storm surges and sea-level rise (particularly for sandy coasts).	Yes	No	
Cyclone 	Yes	No	Increased available heat in the ocean may affect cyclone behaviour. The number of cyclones may reduce but their intensity may increase.	Extremely strong winds can place a great strain on buildings, especially on roofs; any damage to roofing or other parts of the home can cause subsequent damage to the interior. Roofs of older homes, specifically those constructed before 1985 in cyclone prone areas can be vulnerable to high winds.	Yes	No	
Acidic ocean 	Yes	No	Increased amount of heat and carbon dioxide (CO ₂) in the ocean can make ocean water acidic, which impacts bio-diversity in the ocean (e.g. corals, fishes).	Impact on marine and coastal ecosystem services can affect tourism businesses which can affect incomes of households that rely on tourism.	Yes	No	



Checklist for Climate Change Risk Assessment and Action Plan Development



Climate change related risks to households

Risks to the structure and contents of the house



Location and physical condition of the house is a critical element of household climate resilience. A resilient house should be able to withstand increased extreme events and provide safety to its residents.

- Extreme events can damage the internal and/or external structure of the building and reduce asset values.
- Extreme events such as floods, bushfires, etc. can also damage to household contents.
- Effects vary with location, different building types, construction and use.
- Higher potential of risks can increase insurance premiums, especially in flood prone areas.

Risks to the livelihoods of residents



Climate change impacts span across multiple sectors and can affect businesses and the broader economy, which in turn can damage livelihoods. For example, prolonged drought in a region can lead to a slowing of the local economy resulting in stress to livelihoods.

- Extreme events will have impacts on the livelihoods as they impact agriculture, tourism, small businesses, etc.
- Frequent extreme events can limit diversification of economic activities which, when combined with damage to infrastructure and other types of physical capital, can affect wider Queensland communities..
- Increased expenses related to retrofitting and climate proofing can put added financial pressure on vulnerable households.

Risks to the wellbeing of residents



Resident health and wellbeing is influenced by many factors, including living conditions. Increased extreme events such as heatwaves can affect the health and wellbeing of residents. Experiencing extreme events and associated damage to one's assets, livelihood and lifestyle can also impact mental health.

- Extreme weather events can impact physical and mental health, quality of life, ability to cope with stress, etc.
- For example, during heatwaves, buildings that are poorly designed, badly constructed or poorly maintained may aggravate the effects of heatwaves on vulnerable residents (elderly, young children, people with pre-existing health conditions, etc.).
- These risks are higher for renters as they have limited capacity to make changes to buildings.
- Older people who live in multi-occupancy apartments may be particularly vulnerable because of a tendency for the apartments to overheat and difficulty accessing cooler spaces.



A simple process to understand your current and future climate related risks





1. Past climate impacts

Past climate extremes in your area

List any previous extreme events in your area that affected you and your household in the time plot below. Write down the year and/or the name of the event (if you remember) in the boxes. Use local knowledge for this. If you are new in the area, discuss this with long-term residents from the area or conduct a brief internet search. [Hardenup Protecting Queensland](#) also provides links to some historical hazard information, flood maps, etc. for different areas in Queensland. Your local council also might have hazard information specific to your property.

Table 1: Past extreme events in your area

Heatwaves

Flood

Bushfire

Severe
storm

Drought

Coastal
erosion

Cyclone

Other





1. Past climate impacts









While answering this section you may want to revisit your answers in Table 1 on the previous page.

In the past, were your home and contents affected by extreme weather events? **Yes** **No**

In the past were your living conditions and/or health and wellbeing affected by any extreme events? **Yes** **No**

In the past, was your livelihood affected by extreme climate events? This may also include any financial stress as a result of extreme events, damage to your home and contents, increased insurance cost, etc.? **Yes** **No**

If any of the above answers are **Yes**, how did it impact your household?

	No Impact	Minor impact	Significant impact	Write down impacts
				
Heatwave				
				
Flood (coastal or inland)				
				
Bushfire				
				
Severe storm				
				
Drought				
				
Coastal erosion				
				
Cyclone				
				
Other (list climate hazard below)				
Climate Hazard:				



2. Current climate risks

Since the occurrence of weather events listed in Table 1, have you made any adjustments or taken any steps to minimise future impact on your household?

Yes **No**

If the answer is **Yes**, list actions that you have taken.

Determine **current climate related risks** to your household (Put ☒ mark)

Note: If you have been impacted in the past but have not made any plan to tackle that impact it in future, you have climate related risks to your household regardless of climate change.

No, there are no existing climate related risks to my household.

Yes, there are existing climate related risks to my household.

If you think that there are existing climate related risks to your household, which of these aspects are currently at risk:

structure of my home

health and wellbeing of me and my family

my livelihood

Some questions you should consider asking yourself to better understand your current risks:






Did the actions you took in the past reduce your risks? Also consider whether any adjustment is required for those actions. (Write not applicable if you have not taken any step to reduce your climate related risks).



3. Future climate change


Future climate outlook of your area

Using regional climate change projections for Queensland (see [page 36](#)), explore future climate hazards in greater detail for the area where you live or own property. For more information on future climate projections in your area, please visit "[Queensland Future Climate Dashboard](#)".

Hazards	How climate change can influence this hazard	Mark the ones that are relevant to you
	Heat and heatwaves In general, increased average temperature is likely to increase the number of hot days and nights and length of heatwaves.	
	Flood (coastal or inland) Coastal: Sea-level rise can cause increased flooding in low-lying coastal areas during high tides, cyclone and storm events. Inland: Extreme rainfall can cause inland flooding.	
	Bushfire Increased average temperatures combined with dry condition increases bushfire potential.	
	Severe storm Frequency and intensity of storm events may increase (including excessive rainfall, lightning, hail etc.). At the same time, sea-level rise will increase the risk of flooding in coastal areas during severe storms.	
	Drought Decrease in future rainfall can lead to drought. Increased hotter days combined with drier conditions will increase bushfire risk.	



3. Future climate change








Hazards	How climate change can influence this hazard	Mark the ones that are relevant to you
	Coastal erosion Sea-level rise can increase erosion of low-lying erodible shores. Increased frequency of severe storms in coastal areas can also lead to more erosion.	
	Cyclone Increased available heat in the ocean may affect cyclone behaviour. The number of cyclones may reduce but their intensity may increase.	
	Acidic ocean Increased amount of heat and carbon dioxide (CO ₂) in the ocean can make ocean water acidic, which can harm ocean-based livelihoods.	
	Change in seasonal patterns A slight change in average temperature is enough to impact seasonal patterns of climate. For example, growing seasons are shifting, spring is arriving earlier, winters are shorter, and the number of frost days are declining. These changes affect the timing of many life cycle events, such as when flowers bloom or when pollinators and pests emerge.	
	Other	



4. Future impacts

Using the information gathered from 'Future climate change' in Step 3, determine how future hazards may impact your household. Remember to think about all aspects of your household (building structure, the health and wellbeing of residents and livelihoods). (Put ✓ mark).

Write down potential impacts to your household in the spaces provided. See information in the booklet for some examples and sources of additional information.

	No Impact	Minor impact	Significant impact	Write down potential impacts to your household
				
Heatwave				
				
Flood (coastal or inland)				
				
Bushfire				
				
Severe storm				
				
Drought				
				
Coastal erosion				
				
Cyclone				
				
Other (list the name below)				



5. Household specific risks and opportunities

RISKS

If you have identified future risks (in the near-term and long-term) to your household, list them below.

Examples of the potential future risks to your household

Your home

- An increase in high intensity rainfall events including thunderstorms, hail, wind and tornados can potentially damage the structure, contents and belongings.
- A significant increase of very high, extreme or catastrophic fire danger days is expected. Homes close to bushfire prone areas will be at greater risk during dry periods.
- As a result of sea-level rise, homes near low lying coast and estuaries may be more likely to flood which can damage the structure and contents.

Your health and wellbeing

- During heatwaves, buildings that are poorly designed, constructed and maintained may aggravate the effects of heatwaves on vulnerable residents (elderly, young children, people with pre-existing health conditions, etc.).
- Wetter conditions in combination with poor air circulation within households can cause mould. This affects living conditions and can cause health complications in residents.

Your livelihood

- Exposure to extreme events such as flooding or drought can damage your assets (e.g. your home, business, investment, stocks, sales and services that you provide). Such loss to assets and revenue can reduce your capacity to recover, leading to significant financial strain (e.g. loans, mortgages). Losses like this can damage your ability to bounce back after an event, gain financing, mortgages and insurance, all of which may threaten your livelihood.



5. Household specific risks and opportunities

Near-term risks

(1-10 years)

Your home

Health and wellbeing of you and your family

Your livelihood

Description of risk

Longer-term risks

(more than 10 years)

Your home

Health and wellbeing of you and your family

Your livelihood



5. Household specific risks and opportunities

OPPORTUNITIES

Can you think of any opportunities or benefits from reducing risk to your household?

Opportunities can increase your resilience and improve your living conditions or reduce household expenses (in near-term and longer-term).

Examples of the potential opportunities for your household

Increasing resilience of your home

- If your home is damaged by extreme weather, there is an opportunity to rebuild it to a higher standard of resilience, to prevent the same physical damage and financial loss from happening again.
- It may be possible to get a reduced premium of home and content insurance if you make certain improvements to your home to reduce its future risks to a certain natural hazard. For example, roof improvement often leads to reduction in insurance premiums in cyclone prone areas.

Improving your living conditions

- Improving air circulation and ventilation and having green outdoor spaces may provide a more attractive living environment.
- Improving living conditions generally make it more attractive to renters or future buyers of the property.
- Improving living condition can lead to better health and wellbeing.

Increasing resilience of your livelihood

- A proactive risk assessment and implementation plan can limit the future risks to your home, which can lead to a reduction in insurance costs for your home and/or household content.



5. Household specific risks and opportunities

		Description of opportunities
Near-term opportunities (1-10 years)	Your home	
	Health and wellbeing of you and your family	
	Your livelihood	
Longer-term opportunities (more than 10 years)	Your home	
	Health and wellbeing of you and your family	
	Your livelihood	



6. Adaptation options

There are a range of options to reduce future climate related risks to the structure of the home. See the information booklet for some examples of adaptation options ([page 42](#)). For each of your identified risks list adaptation options that might suit your circumstances. Consider options that are fit for your purpose and within your capacity.

Description of available adaptation options

Near-term options
(1-10 years)

Your home

Health and wellbeing of you and your family

Your livelihood

Longer-term options
(More than 10 years)

Your home

Health and wellbeing of you and your family

Your livelihood



6. Adaptation options

Before you decide about your action plans there are some questions you should consider asking yourself in order to minimise your risks.

How well do your building and its services (e.g. power supply, water supply, sewerage system, etc.) cope with high temperatures?

Do you have appropriate resilience measures (e.g. sandbags or metal barriers for flood)?

Insurance can be challenging and the types of cover you have will vary between providers and your exposure to risk. Given this complexity, are you sure that you have appropriate cover for your needs and interests now and into the future? For example, are you aware of what you do NOT have insurance for?

If you are planning to invest in a property and/or getting into a long-term mortgage, have you considered long-term climate hazards to the property? It is particularly important to conduct a risk profile of properties that are in the coastal zone, as risks are likely to change with sea-level rise.

Do you have the skills and equipment to clean up after an extreme weather event?

If you are renting, have you considered moving to a less risky location or more resilient house?

If you are renting, have you discussed climate related risks with your landlord? Their actions and plans will have a material impact on your home and contents.

Have you considered developing a natural hazard preparedness plan for your household? Specifically preparedness for heatwaves will become increasingly important as our climate gets hotter. It is important to note that heatwaves kills more Australians than all other natural hazards combined.



6. Adaptation options

Have you considered taking a first-aid course or updating your certification?

If you have young children and/or elderly people at home, have you considered how they might cope during extreme heatwaves? It is important to note that these age groups are more sensitive to heat stress.

Do you or your partner work in a sector which is climate sensitive? Sectors such as agriculture, tourism, etc. are climate sensitive and can be affected by climate change impacts.

Do you live in an area or region which has been affected by extreme climatic events and also has the potential to be affected in future? Frequent damage from extreme events can make the recovery very expensive and can damage the local economy.

How would you fund additional costs arising from a severe weather event or a flood in the short term?

Do you have appropriate income protection or other type of insurance to support you/your household/business should you be affected by an extreme event?

If you have pets, have you considered risks to them during extreme events?



7. Action plan

Now we are going to think about your action plan.

List how you plan to manage your identified risks and make the most of opportunities. Where appropriate, indicate who is responsible for each action and how you may assess where the action is achieving its purpose.

	Description of action plan
Near-term action plan (1-10 years)	Your home Health and wellbeing of you and your family Your livelihood
Longer-term action plan (more than 10 years)	Your home Health and wellbeing of you and your family Your livelihood



7. Action plan

Summary of Actions to address climate change

Name:

Date:

Risks that I have identified

(copy the risks from [page 22](#).)

What can I do now?

(copy near-term action plans from [page 28](#))

What can I do in future?

(copy long-term action plans from [page 28](#))

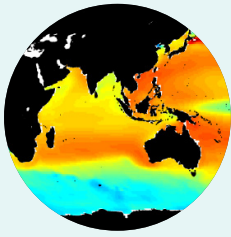
Determine a date when you need to revisit your risks in future. If you think your risk is higher, you should consider getting some expert advice from an expert.



Information Booklet



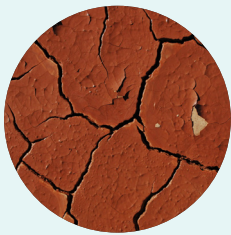
Some basic definitions



Climate change impacts

Changes that occur as a result of future climate.

This includes changes to the structure of the house and livelihood and wellbeing of the residents. For example, increased average temperatures will increase the intensity and frequency of heatwaves, which will impact living conditions.



Climate change risks

What a given climate change impact will mean for you.

For example, if you have elderly people or young children living in your house, then increased frequency of heatwaves will create health risks for them, as they are more sensitive to extreme heat.



Climate change adaptation

Steps governments, businesses, communities and individuals take to deal with risks from climate change impacts.

For example, if you improve the ventilation and insulation of your house and/or install an air conditioner, then your household will be more resilient to extreme heatwaves.



Relationship between climate change impacts, risks and adaptation

Climate change is likely to increase the frequency and intensity of extreme events (flooding, heatwaves, bushfires, cyclones, extreme rainfall, droughts etc.).

These changes create different impacts for different regions in Queensland. At an individual household scale, these impacts lead to household specific risks. These risks are based on factors such as how exposed a house is to extreme events, what are the likely consequences for the house itself or its residents if that risk eventuates and how capable the household is to deal with them.

This booklet contains background information to help you prepare a climate change resilience plan for your household. It sets out to answer the following questions:

What is climate change and sea-level rise?

What does the future climate look like in Queensland?

What are some of the impacts of climate change on households?

What options do I have for managing my climate change risks?

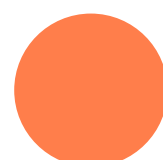
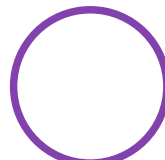
What is climate change and sea-level rise?

Climate and sea-levels change over timescales from decades to millions of years, in response to solar variations, changes in the Earth's orbit around the Sun, volcanic eruptions, movement of the continents and natural variability such as El Niño and La Niña events.

However, since the start of the Industrial Revolution, human activities have added significantly to greenhouse gases (e.g. carbon dioxide, methane, nitrous oxide, ozone, etc.) in the atmosphere. Greenhouse gases are transparent to much of the radiation from the sun and allow it to pass through the atmosphere to warm the Earth. Some of the outgoing radiation from the Earth is absorbed by the greenhouse gases, warming both the atmosphere and the Earth's surface. This is known as the greenhouse effect and it contributes towards global warming and potentially other effects on our climate such as changes in rainfall distribution and storm intensity.

Around 93% of the additional heat created by global warming has so far been absorbed into the oceans. As water warms, it expands. This expansion has been the major cause of sea-level rise, with a smaller contribution from land-based glacier and ice sheet melt. In the twentieth century, global average sea-levels increased by 19 cm.

A rise in sea level can provide storm surges a higher base and can allow it to come further inland causing inundation of low lying areas.



Over time, the contribution from melting ice is expected to increase substantially. Some of the additional carbon dioxide in the atmosphere (around 30-40%) dissolves into the oceans, where it decreases the alkalinity of the water (an effect known as *ocean acidification*). The effects have been minimal, but will intensify in the future unless action is taken to reduce carbon dioxide emissions. Ocean acidification has the potential to make it more difficult for some organisms that build shells, such as coral and some plankton, to form calcium carbonate, the material used for shell making. There are potentially knock-on effects for marine food chains and for tourism and fishing industries.



“Climate is what you expect – weather is what you get”

R.A. Heinlen, 1973

The difference between weather and climate



Weather is what we experience daily. It varies over the seasons and from year to year. It varies through the day.



Climate is the average weather over time – usually climate is determined by looking at weather patterns over long periods, 30 years or more. Trends are easier to spot and different parts of the country and world have different climates.

The weather is naturally variable but climate is now also changing as a result of greenhouse gas emissions. Although weather events are not in themselves evidence of climate change, exploring the business consequences of extreme weather events can help build an understanding of vulnerability to weather and climate. This is important in helping to inform efforts to adapt to future climate change.

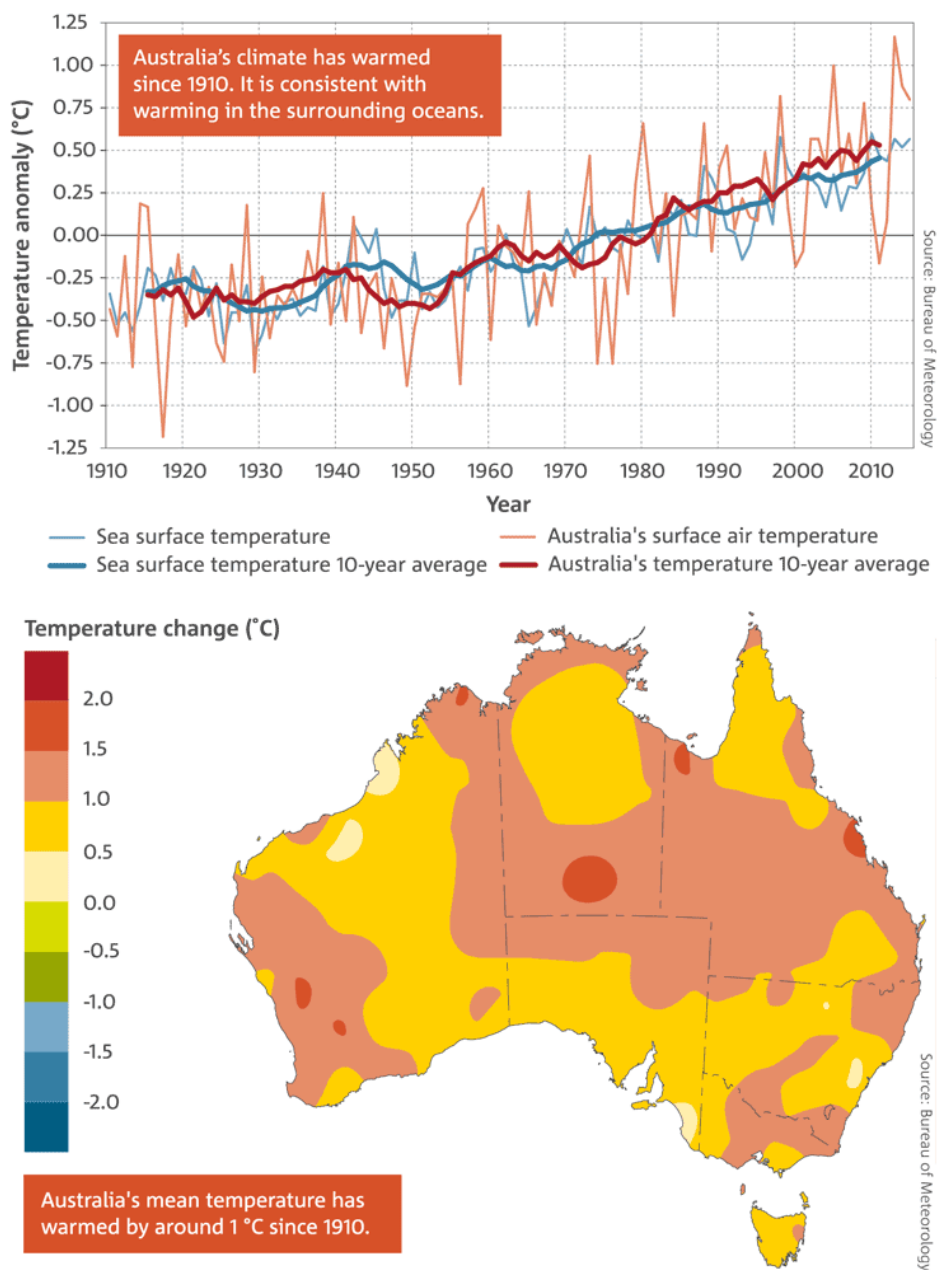


Figure 1: Top: Land and sea temperatures over Australia since the beginning of the twentieth century. Bottom: Map of annual average temperature change since 1910. Bureau of Meteorology and CSIRO Australia © 2017 Commonwealth of Australia and CSIRO.

What does the future climate look like in Queensland?

Recent climate trends in Queensland

The average surface temperature over Australia and the surrounding oceans has increased by around 1°C since the beginning of the twentieth century (Figure-1 Top). Seven of the ten warmest years on record have occurred since 2005.

Queensland's climate is incredibly variable. For example, in 2017, Queensland had its warmest year on record in terms of mean temperature, and mean maximum temperature. Large areas of central and western Queensland had below average annual rainfall. Parts of the northern interior, the Gulf Country and east coast south of Bowen received above average rainfall. Severe tropical cyclone Debbie made landfall near the Whitsunday Islands on 28 March, 2017. Recently in November 2018, extreme heatwaves in parts of northern Queensland resulted in record temperatures. This also coincided with unprecedented bushfire conditions.

Sea-levels have risen around Australia since the beginning of the twentieth century, with a faster rate (partly due to natural variability) since 1993. There are geographical variations, with higher sea-level rise observed in the north.

How will climate change affect Queensland?



Figure 2: Summary overview of climate change in Queensland. Source: Queensland Government, 2016: Climate change summary for Queensland

Thirteen climate regions of Queensland

Click on a region below to visit a website which has a climate change summary for that region.

- [Cape York](#)
- [Central Queensland](#)
- [Central West Queensland](#)
- [Eastern Downs](#)
- [Far North Queensland](#)
- [Gulf Region](#)
- [Maranoa and District](#)
- [Townsville-Thuringowa](#)
- [North West Queensland](#)
- [South East Queensland](#)
- [South West Queensland](#)
- [Whitsunday, Hinterland and Mackay](#)
- [Wide Bay - Burnett](#)



Figure 3: Thirteen climate regions of Queensland

Future climate outlook for Queensland

The impacts of climate change will vary across the State. Regional projected changes are available for thirteen climate regions across Queensland (Figure 3). Visit [this link](#) for an interactive map that will help you understand climate change projections for your region. Additionally, you can download the regional projections by clicking on the relevant links on Figure 3. If you are interested in further detailed climate change projections, you can visit [Queensland Future Climate Dashboard](#). A list of other relevant information sources are provided at the end of this booklet.

Future sea-level rise in coastal areas

Sea-levels are projected to rise by 0.8 m above present day levels by 2100. However this rise will vary locally. In order to find local variations in sea-levels and inundation hazard maps visit www.coastadapt.com.au or www.coastalrisk.com.au. Sea-level rise hazard information may also be available through your local council website.

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 emissions scenarios called representative concentration pathways (RCPs) to develop climate projections. These projections range from a lower emissions future, where greenhouse gas emissions are substantially reduced (this pathway is termed RCP4.5), to a high emissions future, where high levels of greenhouse gas emissions are set to continue (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.

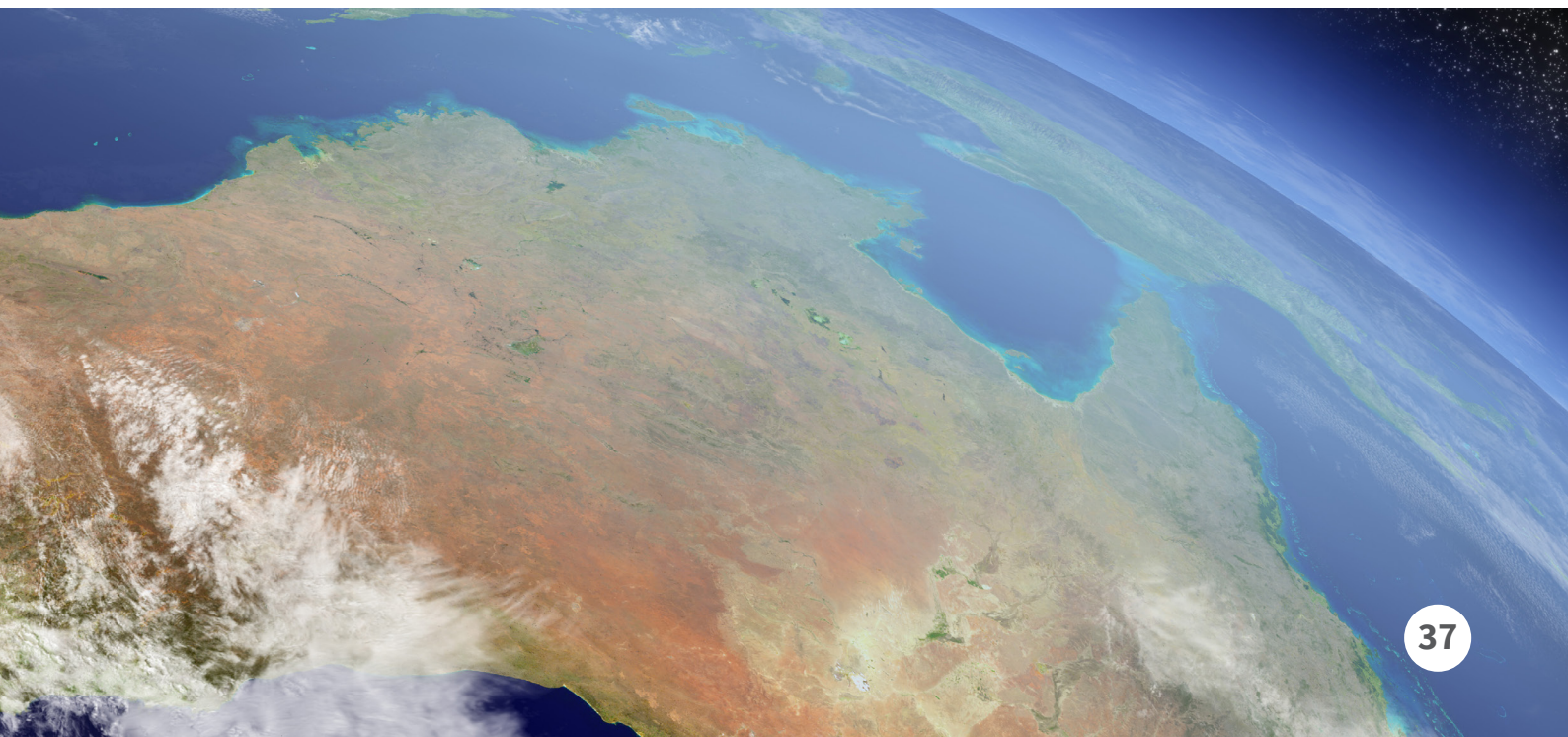


Table B1: Broad impacts of climate change on households (not an exhaustive list). Note that the extent of these impacts will vary depending on geographic location and context of individual households.

Hazards that will be influenced by climate change		Impacts of the changed hazards on households
	Temperature increase and heatwaves	<ul style="list-style-type: none"> • Power failures, and the subsequent discomfort, may be more likely during extreme heat events. • Longer exposure to heat can impact health and wellbeing of vulnerable residents (elderly and young children). On the other hand, there may be less need to heat the home in winter. • Faster deterioration of concrete structures. • Internal overheating of some buildings, particularly traditionally constructed high-rise flats. • The need for keeping your home cool during the summer months will be greater, particularly during extreme heat. • Extreme heat along with dry conditions can lead to the death of vegetation (vegetable gardens, flower gardens grass lawns etc.). • Extremely hot conditions can limit the ability to do exercise outdoors.
	Bushfires	<ul style="list-style-type: none"> • A significant increase in the number of very high, extreme or catastrophic fire danger days is expected. Homes close to bushfire prone areas will be more at risk during dry conditions.
	Severe thunderstorms and high intensity rainfall events	<ul style="list-style-type: none"> • An increase in high intensity rainfall events (including thunderstorms, hail, wind and tornados) can potentially lead to impact damage to the structure of a house and moisture penetration.
	Hail	<ul style="list-style-type: none"> • Hailstorm scenarios are very location-specific and there have been very limited studies exploring how climate change may impact hail events. • Regardless of climate change, hail can damage the roofing, windows, sliding doors etc. of certain types of homes, especially older homes. Large, multi-storey apartment buildings with concrete roofs are less likely to be impacted by hail events. However, depending on the angle of the impact from the hailstorm, windows or glazing may be damaged.
	Cyclones and extreme winds	<ul style="list-style-type: none"> • Extremely strong winds can place a great strain on buildings, specifically on roofs; any damage to roofing or other parts of the home can cause subsequent damage to the interior. • Roofs of older homes, specifically those constructed before 1985, in cyclone prone areas can be vulnerable to high winds.



Floods

- Flooding can be localised (due to excessive rainfall) or associated with a river or coastal system. Frequency of flooding may increase in some areas with possible impacts including water damage to the home and its contents, the undermining of foundations and the contamination from sewage or mud.
- Chance of slope instability causing impact to building foundation.
- Cyclonic regions of Queensland are also susceptible to termite attack. Longer exposure of moisture to wooden frames due to flooding can increase the termite risk in some parts of Queensland.
- Increased moisture in the house after flooding or extreme rainfall can lead to mould development inside the house.



Sea-level rise and storm surge

- As sea-levels rise, homes near low lying coastlines and estuaries may be more likely to flood and may have to cope with rising water tables (impacting building foundation).
- Greater foreshore erosion could also expose more homes to the impacts of storm surges and sea-level rise (particularly for sandy coasts).
- As sea-levels rise, stormwater systems may be less able to drain into the sea and therefore may cause flooding further inland.
- Increased potential of flooding in coastal areas as a result of sea-level rise can increase the cost of insurance premiums for at-risk homes.



Low rainfall and drought

- In areas where rainfall will decline, droughts will be more severe. This will strain the livelihood of households of those areas.
- Chance of soil shrinkage and subsidence, particularly in clay soil areas which can affect the structure of the building.
- Less water for building maintenance and residential use
- Flows into water supply catchments will decrease and evaporation of water and transpiration from trees increase due to higher temperatures.
- Loss of livelihood due to drought conditions can stress the financial condition of a household leading to mental health issues for residents.

Urban Heat Island (UHI) effect

Cities are prone to the Urban Heat Island (UHI) effect, meaning that temperatures in cities are generally higher than in the rural areas that surround them. The extent of these differences varies with weather conditions, season and time of day, often being most marked during the night and sometimes not been evident at all. During heatwave events, temperatures in city centres can be particularly high since the weather conditions associated with such events –e.g. low wind speeds and cloud-free conditions – also favor the development of the UHI effect.

The UHI benefits urban residents in winter but can increase the likelihood of heat-related illness and death in summer. Climate projections for the 2030s in some parts of Queensland suggest that the number of warm nights (minimum temperature more than 25°C) will double in comparison with current numbers. Such temperature increase will be felt most acutely in urban areas as UHI can amplify heatwave impacts on urban households.

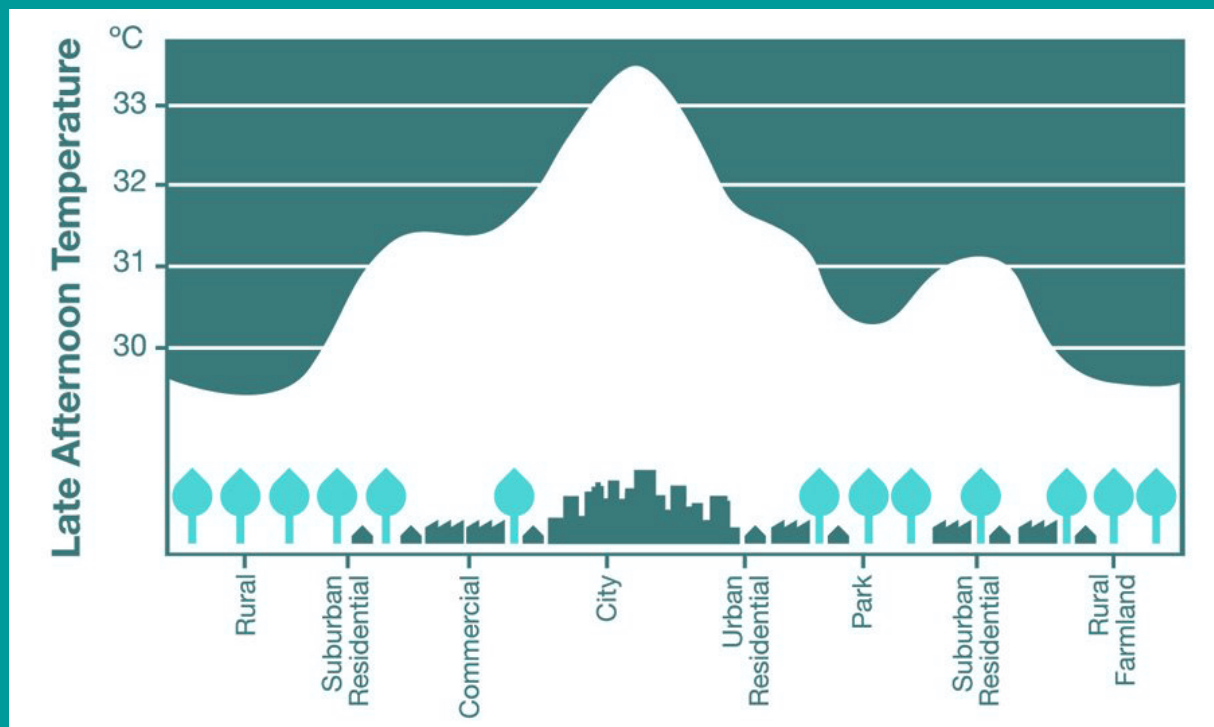


Figure 4: An illustrative diagram of urban heat island effect showing how temperature can vary between urban and rural land use.

What options do I have for managing my climate change risks?

Identifying risk management options is an important step in the adaptation process. This involves considering what your household is doing at present to manage climate-related risks (and other pressures), and investigating whether any changes or new management options are required to address future risks.

There are many potential options for adapting to climate change and it is important to identify a wide range of options that may suit your household's circumstances and resources. Some options may help to cope with present climatic extremes, while others will help once effects of climate change become greater.

At the early stage it is not necessary to consider detailed sequencing or the costs and benefits of possible actions, but it is an opportunity to build a list of possible options that may be useful, or would be acceptable to your own circumstances. Identifying a wide range of risk management options enables you to consider their interactions (i.e. how best to achieve multiple benefits) and to consider sequencing of actions which then can be linked to trigger levels (i.e. when to activate a given management option).

Selected options should match the broader goals of you and your family. It is important to consider any opportunities that might derive from the selected options and any co-benefits that can be achieved (e.g. installing solar panel with battery capacity will reduce your electricity bill in the long run and will also make you resilient against any power failure in the grid as a result of extreme events). In determining responses to address climate risk it is important that actions do not increase emissions and further exacerbate the issue.

In this tool we have focused on actions that are relatively easy for a household to achieve, focusing on issues that are within your control or influence.

However, for managing your climate risks, it is critical to engage and collaborate with other stakeholders (insurance providers, neighbours, landlords, etc.). For example, building strong relationships with your neighbours can help you manage climate risks by facilitating cost and resource sharing after disasters.

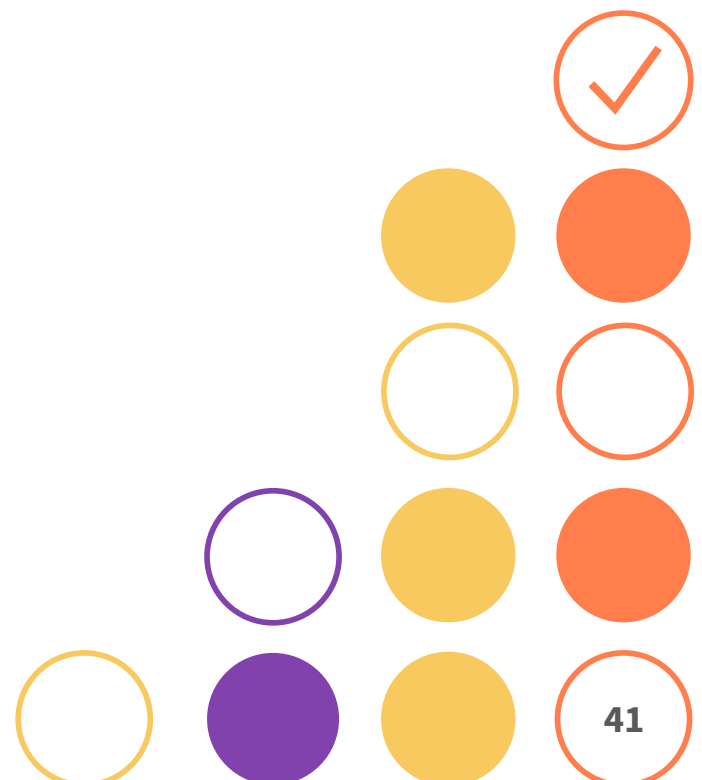


Table B2: A list of indicative adaptation options (this is not an exhaustive list).

High temperature and heatwave adaptation

Managing the temperature of your external microclimate i.e. areas surrounding your house



Plant trees strategically

Reduces external temperatures and improves shading. Care needs to be taken not to expose house to risk from storm related damage or bushfires.

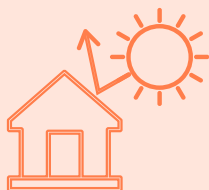


Create green roofs

Reduces the roof temperature by absorbing heat into the green roof's thermal mass

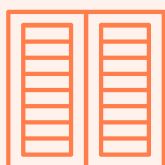
- Roof structure may need to be modified to improve stability and water-tightness
- Plants need to be carefully selected to avoid risks related to aeroallergens (pollen).

Minimising internal solar gains



Paint external walls and roofs a light color to increase their reflectivity

Particularly effective for dwellings with solid external walls and larger external wall areas (e.g. end-terraced house). Painted walls need to be kept clean.



Install external shutters

- Improves solar shading but potentially problematic in terms of cleaning and maintenance
- Offers increased security
- More effective than internal blinds or curtains, as solar radiation has already passed through the windows before being absorbed by the blinds or curtains, and transmits heat into the room
- However, good air ventilation is required to ensure that internal heat can be transferred outside.



Install external awnings for south and west facing windows

Benefits for rooms that tend to be heavily occupied during the daytime (e.g. living rooms)



Install windows with double glazed glass specifically with low-E coating, which reduces the amount of solar heat gain while still maintaining good levels of visible light transmission

Significantly reduces heat gain in summer as well as heat loss in winter.

Managing internal heat



External wall insulation

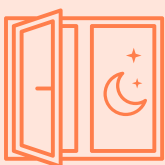
- Reduces heat loss through external walls at night; but the home must be ventilated at night
- Keeps homes cool in the summer and increase winter heating efficiency.



Internal roof insulation and outdoor exhaust fans

Very effective for the top floor. Outdoor exhaust helps to reduce thermal buildup in the area between the ceiling and roof tiles.

Managing ventilation



Increase natural ventilation at night

Increases heat loss in summer and provides a cooling benefit during the daytime

- Limitation: security issues and also high external temperature can reduce effectiveness of this strategy.



Install ceiling fans in each room

Improves circulation of air, reduces indoor temperature and allows direct evaporative cooling of individuals.



Open windows during the peak daytime hours

Effective for end-terraced homes with daytime occupancy (e.g. elderly people). Not effective for top floor flat with daytime occupancy. Safety/security issues as well as noise need to be considered. Open windows in the early morning if temperatures are low, and shut them if the outdoor temperature rises above indoor temperature during daytime.



Install air conditioning

Provides cooling comfort but increases CO₂ emissions unless renewable electricity is used. Increases outdoor temperatures in built-up areas.

Increased flooding adaptation (riverine, coastal or due to cyclonic activities)

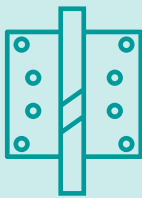
Adaptation of existing building stock



Identify and block all potential entry points

Block entry points such as doors, airbricks, sinks, toilets, and gaps in external walls around pipes and cables

- Prevents water from entering the building (resistance measures for short duration floods).
- Cannot prevent rise of groundwater which can occur through the floor.



Fit rising hinges so external and internal doors can be removed

In deep floods, this helps prevent structural damage by enabling water to enter the building, avoiding the imbalance between internal and external water levels.



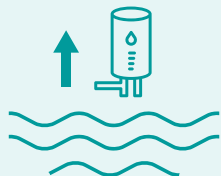
Use water-resistant paint for the lower portions of internal walls

Reduces mould growth.



Raise electrical points above flood level with wiring drops from above

Prevents electrical blackout.



Relocate meters and the hot water system above flood level

Prevents damage to meters and hot water system.



Replace carpets with vinyl, ceramic tiles and rugs

Reduces time for drying out.

Adaptation for new buildings



Build the house on high ground or on stilts, in flooding areas

Prevents houses from flooding.



Build strong walls and ensure roof construction is both glued and connected with nails, in the strongest pattern possible (in accordance with the design standard)

Improves resistance to strong winds and natural disasters.



Avoid cavity walls that generally take longer to dry out

Speeds up drying process and reduces potential for mould.



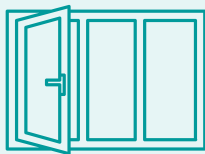
Raise door thresholds, service entry points and meters above predicted flood levels.

Avoid damage



Avoid the use of plasterboard and gypsum-based materials.

Reduces potential for mould



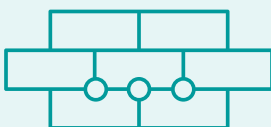
Avoid large areas of glass (e.g. glass patio doors, large windows and conservatories)

Avoids damage due to hydrostatic and hydrodynamic forces.



Where possible, choose construction materials that are expected to be damaged but are cheap and easy to replace

Reduces repair costs after flooding



Add additional weep holes at the bottom of cavity walls

Allows water to drain out and speeds up the drying process.

Hail event adaptation



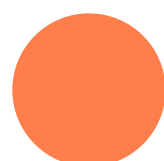
Ensure that roofing material can withstand higher wind and hail impact. Concrete and terracotta tiles generally perform well under hailstorms

Prevents damage to roof.



In areas that are prone to hailstorms, it may be worth installing appropriate window protection measures e.g. installing architectural window film

Prevents damage to windows and glass doors.



Cyclone adaptation



Ensure that your house design meets current building standards for your cyclone region

Prevents wind and rain damage to roof.



Check that all windows and external doors close securely and are strong enough to resist wind pressure. Use window protection if required (e.g. cyclone shutters or plywood covering)

Prevents damage to windows and glass doors.



Regularly clear gutters and downpipes of branches and leaves to avoid debris build-up and pest infestation

Prevents wind and water damage to roof.



Check your roof area for loose tiles or iron sheets; replace roofing nails with screws

Prevents wind damage to roof.



Install roller door bracing, shed bracing

Adds extra protection against strong winds. Prevents damage to doors, sheds etc.



Carry out cyclone preparation work ahead of each cyclone season

Allows you to revisit your situation every year which increases your resilience to future cyclones.

How do I adapt to climate change if I am a renter?

34.2% of households in Queensland are renters. Opportunities for renters to modify their houses to improve climate resilience is very limited and often they have to rely on the landlord or property managers. However it is important for renters to understand risks that climate change may pose to their household, so that if necessary they can take measures, which may include moving to a safer location. Therefore it is recommended that you use the checklists to understand future climate-related risks to the area where you live and make yourself aware of your options and rights.

It is also important to know the rights of tenants if the property is damaged by extreme events such as floods or cyclones. As per the Queensland Residential Tenancies and Rooming Accommodation Act 2008, renters are responsible for cleaning their premises after a flood or cyclone and also responsible for the loss of their own contents. Therefore it is important for renters living in flood and cyclone prone areas to have appropriate content insurance. For more information about tenancy issues related to floods, cyclones and natural disasters in Queensland see [Info for tenants affected by floods fact sheet](#).



Insurance and Risk Management

There is a considerable number (and value) of buildings at risk from natural hazards in Queensland. It is estimated that up to \$20 billion (2008 replacement value) of existing residential buildings are potentially at risk of inundation from a 1.1 m sea-level rise in Queensland, representing between 44,000 and 68,000 individual buildings. Therefore, having appropriate insurance to cover natural hazard risks to the home and content is a sensible way to manage future risk. However, it is important to understand what is covered by insurance and what is not. Many insurance companies operating in Australia do not cover storm surge or erosion in their residential property insurance, and none cover gradual sea-level rise. There are a number of websites where you can compare costs of insurance (see Figure 5 as an example)

As risks increase in future, so will the costs of insurance. Historically, the costs of building insurance claims following natural disasters were recouped by increasing premiums across a large client base. But now insurance companies are taking greater care in determining the vulnerability of assets they insure at a local level and set premiums based on that information. As new information, technology and data become available, insurance companies will eventually be able to estimate risk at an individual property level with greater accuracy and will begin to 'de-average' premiums. This will mean that rather than customers cross-subsidising each other substantially and paying an average price, a risk-based approach will price various segments based on property-specific risk. This type of pricing strategy will increase insurance premiums of homes that are located at high-risk areas.

Home and content insurance prices in North Queensland

Between July 2005 and June 2013, home and content insurance premiums in North Queensland increased by 80%. For the same period, premium increases across Australia averaged 25%. The Australian Actuary determined that the two main drivers of the increase in price in North Queensland were (i) insurer reaction to losses caused by natural disasters (such as cyclones Larry and Yasi that hit the region in 2006 and 2011 respectively and the Mackay storms of 2008), and (ii) increases in the cost of catastrophe reinsurance. The report differentiated between the nature of cyclone risk and other natural catastrophes, such as flooding. It noted that the impact of flooding can be largely localised, with higher premiums paid by those most at risk. Conversely, the geographical extent of cyclones means that while some policyholders are at greater risk than others, most policyholders are at some risk. This results in a much more significant upward impact on premiums across the region for all policyholders for cyclone related risks compared to flood related risks.

- Your comparison result is based on the following: Sum insured (\$550,000), property type (detached house), construction year (between 1980 and 2009 inclusive), roof type (iron), wall type (brick veneer).
- CAIRNS, 4870 is assessed as having a relatively high risk of flood and high risk of cyclones (based on Finity Consulting's natural peril assessment).
- There is a high variation in the risk of flood and/or cyclones within this location (based on Finity Consulting's natural peril assessment). As a result, premium quotes for properties in this location could vary widely.
- Intermediate includes basic cover and fusion cover, but not accidental damage cover. Additional features may also be available. Contact the relevant insurer(s) for more information.

	AAMI	Allianz	ANZ	Apia	Comminsure	NRMA	QBE	RACQ	Suncorp	Westpac	Youi
Key Features ?											
Cyclone	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Storm	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Flood	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Storm Surge	✓	✗	✓	✓	✗	✓	✗	✓	✓	✓	✗
Other Actions of the Sea	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Safety net	✗	✗	✗	✗	✓	✗	✓	✓	⓪	✓	✗
Total replacement cover	⓪	✗	✓	✗	✗	✗	✗	✗	✗	✗	✗
Other features (Click to expand)											
Excess											
Selected excess	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
Excess options available	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Annual Premium ?											
Lower premium ?	\$2,938	U	\$2,684	\$2,199	\$1,815	\$2,372	\$2,253	\$3,644	\$2,816	\$3,005	\$2,685
Medium premium ?	\$5,237	U	\$3,614	\$3,081	\$2,558	\$3,285	\$3,765	\$4,623	\$3,893	\$3,422	U
Higher premium ?	\$9,014	U	\$4,649	\$5,902	\$4,004	\$4,548	\$5,503	U	\$5,885	\$4,742	U
Key: ✓ Feature included — Tap/hover for more information											

Figure 5: Example insurance premium comparison. Source: Suncorp.



When to adapt?

It is sensible to assume that doing nothing increases the level of risk. Strategies that are set in place at an early stage through precautionary action will reduce the frequency of future intervention, including the extent to which there is a transfer of burden to future generations. Some locations which are at high risk to extreme events may even be appropriate for design solutions that are quickly demountable and replaceable, and hence more temporary in nature.

In general, it becomes more costly and difficult to retrofit a building the older it gets. Retrofitting also becomes less cost effective the closer a building is to the end of its life. So if a retrofit is worth doing, it is worth doing sooner rather than later, as being reactive simply incurs more expenses rather than deferring them.



Case study

Rebuilding Suzanne and Peter's home after the 2011 flood in Brisbane.

Peter and Suzanne Davies's home in the suburb of Chelmer in Brisbane was devastated by a flood in 2011. As they live in the flood plain, they wanted to ensure that while rebuilding their home they take necessary measures to ensure that they become more resilient to future floods.

Their rebuilt house has integrated resilient building principles such as a prototype modular kitchen that can be removed given 24 hours' notice and a specially conceived electrical wiring system that separates the upper and lower levels. This will allow them to continue living upstairs and generating power from roof-mounted solar panels should a future flood again disrupt the lower floor occupancy in future. Some other flood resilient measures implemented in their house include tiled floors, elevated power sockets and the positioning of the solar inverter and air-conditioning systems above historical flood levels. They also implemented some other environmentally friendly measures such as low-toxic paints, a solar hot water system to replace the old electric heater, tank plumbing to allow rainwater to flush toilets and insulation to reduce the house's energy requirements for heating and cooling.

It was initially recommended by the insurance company that if substantial changes were required in comparison with the initial condition of the house (i.e. before flood condition), an insurance payout could be arranged. Upon checking the cost of an insurance payout compared to the proposed rebuild, it became evident that working with the allocated insurance building contractors, greater value for money would be achieved in the rebuild process. Therefore they went ahead with their better rebuilding plan and implemented the above mentioned features in their house.



Source: Green Cross Australia.



Available relevant resources

Climate change related resources

[Climate change in Australia website for future climate change projection across Australia](#)

[Queensland Future Climate Dashboard](#)

[Queensland Government's Regional Climate Change Projections](#)

[NCCARF climate change and sea-level rise projections and maps for coastal councils](#)

[Queensland Government's Coastal Hazard Maps](#)

[CoastAdapt First-pass risk assessment guidelines and templates](#)

[Role of insurance in climate change adaptation](#)

[Reducing the risk of legal challenge](#)

Present day hazard related resources

[Australian Flood Risk Information Portal](#)

[Bushfire prone area - Queensland series](#)

Other resources to help you prepare for natural hazards

[Get Ready Queensland](#)

Queensland Government provides a range of guidelines on how to prepare for extreme events.

[Hardenup: Protecting Queensland](#)

Green Cross Australia has developed this website where you can see 150 years of local severe weather history in your area. After understanding the weather patterns in your area, you can use our planning tool

to prepare your home, pets, family and community for major weather events that lie ahead.

[Climate-ready communities](#)

The Australian Red Cross has developed Climate-Ready Communities: A Guide to Getting Started which supports communities as they explore how the things they value will be impacted by climate change, and what they can do to continue to thrive.

[Get Prepared app](#)

Developed by the Australian Red Cross in partnership with IAG, Get Prepared is an app that helps you connect with your key support people, accomplish simple tasks to make you and your loved ones safer, and protect the things that matter most to you.

[Prepare for bushfire season](#)

Queensland Fire and Emergency Services (QFES) provides guidance to prepare for bushfire season.

[Your home](#)

Your Home was developed by the Australian Government to guide you in the process of building, buying or renovating a home. It shows how to create a comfortable home with low impact on the environment – economical to run, healthier to live in and adaptable to your changing needs.

[Information for tenants affected by the floods and storms in Queensland](#)

Information on tenancy issues related to floods, cyclones and natural disasters in Queensland.

Worked example:

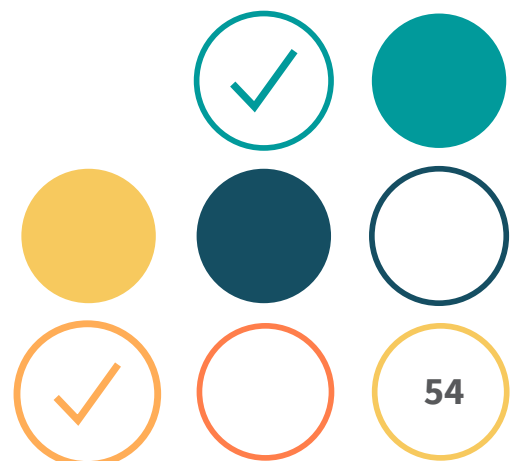
Climate Resilience of Jon and Kylie's household

Jon and Kylie live with their three kids (all under six years of age) in a five-bedroom, two-storey house built in 1981. The house is timber framed and brick veneered, located in a highly built up area close to an estuary. They bought the house in 2006 and moved in from another suburb.

In 2011 the estuary overflowed and affected many nearby homes but did not reach Jon and Kylie's house. They later found out from the newspaper that the flood was a 1 in 50 year event and caused much damage to nearby properties. Although they were not affected in 2011, their house is located within the 1 in 100 year floodplain, therefore they are worried about flood events that may reach their property. While visiting a neighbour who was affected by the 2011 flood, Jon learned that the neighbour had home and contents insurance, but hadn't known at the time that they were not covered for salt water flooding. They only found this out when their insurance claim was denied. Following that conversation, Jon and Kylie looked more closely at their own insurance. They discovered that they have home insurance but no contents insurance. They are unsure if they are covered for salt water flooding.

Last summer, Jon and Kylie noticed that the top floor of their house was becoming uncomfortably hot, especially during a four-day heatwave. They do not have an air conditioner and rely on fans and natural ventilation. Their windows have safety locks, which only allow them to open halfway. This creates a challenge for air ventilation. Kylie's 80-year-old mother came to stay with them last summer and became ill during the heatwave, and had to be hospitalised.

Jon and Kylie have heard a lot about climate change through the media and are concerned about how it may affect their household, especially the risk of flooding to their property. Also, if it gets hotter in the future, Kylie is not sure what that may mean for their household during the height of summer. Therefore, they decided to use this household climate change risk management tool.

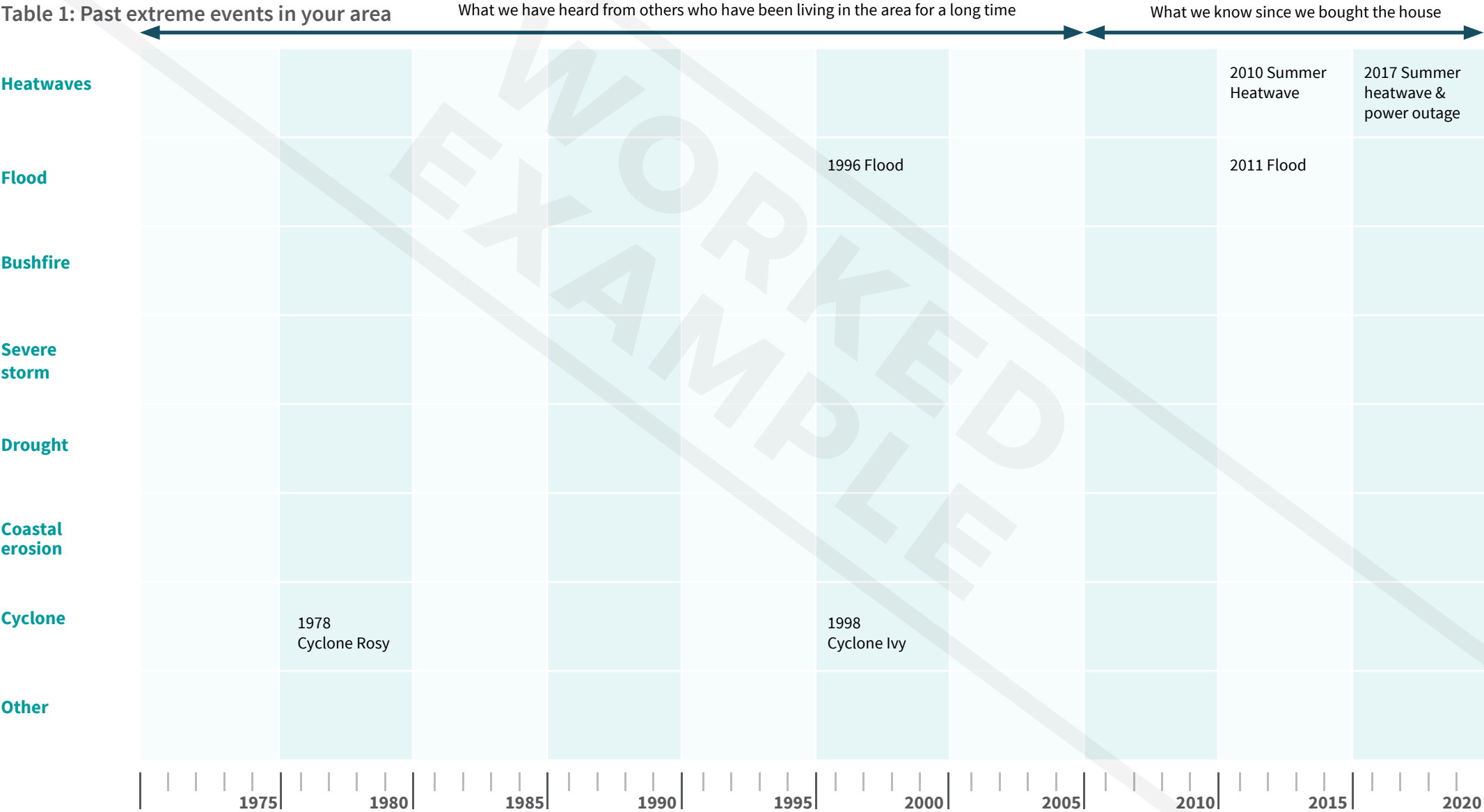




1. Past climate impacts

Past climate extremes in your area

List any previous extreme events in your area that affected you and your household in the time plot below. Write down the year and/or the name of the event (if you remember) in the boxes. Use local knowledge for this. If you are new in the area, discuss this with long-term residents from the area or conduct a brief internet search. [Hardenup Protecting Queensland](#) also provides links to some historical hazard information, flood maps, etc. for different areas in Queensland. Your local council also might have hazard information specific to your property.





1. Past climate impacts

WORKED
EXAMPLE

While answering this section you may want to revisit your answers in Table 1.

In the past, were your home and contents affected by extreme weather events?



Yes



No

In the past were your living conditions affected by any extreme events and negatively impacted your health and wellbeing?



Yes



No

In the past, was your livelihood affected by extreme climate events? This may also include any financial stress as a result of extreme events, damage to your home and content, increased insurance cost, etc.?









Yes



No

If any of the above answers are **Yes**, how did it impact your household?

	No Impact	Minor impact	Significant impact	Write down impacts
 Heatwave	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Kylie's mother was hospitalised during summer 2017 heatwave. Living condition upstairs was affected during the heatwave as it was too hot.
 Flood (coastal or inland)	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Our house was not affected, but during 2011 flood main access road connecting our neighborhood to the main road was inundated.
 Bushfire	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	
 Severe storm	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Severe storm along with the wet conditions during 2011 flood made everything damp in our house which resulted in mould growth in our toilet wall
 Drought	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	
 Coastal erosion	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	
 Cyclone	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	We have not had a cyclone in our area since we moved in 2006, but there was a cyclone in the area in 1981, but we don't know whether the roof was impacted at that time.
 Other (list climate hazard below)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Climate hazard:				



2: Current climate risks

Since the occurrence of weather events listed in Table 1, have you made any adjustments or taken any steps to minimise future impact on your household?

☐ Yes ☒ No

If the answer is **Yes**, list here any actions that you have taken.

Determine **current climate related risks** to your household (Put ☒ mark)

Note: If you have been impacted in the past but have not made any plan to tackle that impact it in future, you have climate related risks to your household regardless of climate change.

☐ No, there are no existing climate related risks to my household.

☒ Yes, there are existing climate related risks to my household.

If you think that there are existing climate related risks to your household, which of these aspects are currently at risk:

☒ Structure of my home

☒ Health and wellbeing of me and my family

☒ My livelihood

Some questions you should consider asking yourself to better understand your current risks:

Have the actions that you took in the past to reduce your risks worked? Also consider whether any adjustment is required for those actions (Write not applicable if you have not taken any step to reduce your climate related risks).






N/A



3. Future climate change






Future climate outlook of your area

Using regional climate change projections for Queensland (see [page 36](#)), explore future climate hazards in greater detail for the area where you live or own property. For more information on future climate projections in your area, please visit "[Queensland Future Climate Dashboard](#)".

Hazards	How climate change can influence this hazard	Mark the ones that are relevant to you
 Heat and Heatwaves	In general, increased average temperature is likely to increase the number of hot days and nights and length of heatwaves.	<input checked="" type="checkbox"/>
 Flood (coastal or inland)	Coastal: Sea-level rise can cause increased flooding in low-lying coastal areas during high tides, cyclone and storm events. Inland: Extreme rainfall can cause inland flooding.	<input checked="" type="checkbox"/>
 Bushfire	Increased average temperatures combined with dry condition increases bushfire potential.	<input type="checkbox"/>
 Severe storm	Frequency and intensity of storm events may increase (including excessive rainfall, lightning, hail, etc.). At the same time, sea-level rise will increase the risk of flooding in coastal areas during severe storms.	<input checked="" type="checkbox"/>
 Drought	Decrease in future rainfall can lead to drought. Increased hotter days combined with drier conditions will increase bushfire risk.	<input checked="" type="checkbox"/>



3. Future climate change








Hazards	How climate change can influence this hazard	Mark the ones that are relevant to you
 Coastal erosion	Sea-level rise can increase erosion of low-lying erodible shores. Increased frequency of severe storms in coastal areas can also lead to more erosion.	<input type="radio"/>
 Cyclone	Increased available heat in the ocean may affect cyclone behaviour. The number of cyclones may reduce but their intensity may increase.	<input checked="" type="radio"/>
 Acidic ocean	Increased amount of heat and carbon dioxide (CO ₂) in the ocean can make ocean water acidic, which impacts bio-diversity in the ocean (e.g. coral, fish).	<input type="radio"/>
 Change in seasonal patterns	A slight change in average temperature is enough to impact seasonal patterns of climate. For example, growing seasons are shifting, spring is arriving earlier, winters are shorter, and the number of frost days are declining. These changes affect the timing of many life cycle events, such as when flowers bloom or when pollinators and pests emerge.	<input type="radio"/>
 Other		<input type="radio"/>



4. Future impacts

Using the information gathered from 'Future climate change' in Step 3, determine how future hazards may impact your household. Remember to think about all aspects of your household (structure, health and wellbeing, and livelihoods). (Put ☒ mark).

Write down potential impacts to your household in the spaces provided. See information in the booklet for some examples and sources of additional information.

	No Impact	Minor impact	Significant impact	Write down potential impacts to your household
 Heatwave	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>All our bedrooms including our kid's rooms are located upstairs. Heatwaves make living on our top floor very uncomfortable, especially during hot afternoons (on weekends). As our area is highly built up and likely to become denser as new development works are in the pipeline, heat island effects can make our area even hotter, compared to less developed areas. Sometimes we get Kylie's elderly mother living with us for few weeks. Excessive heat exposure can become an issue for her health.</p>
 Flood (coastal or inland)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>As per flood mapping released by our council, our house is located in the 1 in 100 year flood plain. There is no record of such a high flood in our area in the recent past. However, sea-level rise will increase the water level in our nearby estuary. We have looked at the sea-level rise inundation map for our area through the CoastAdapt website, and it seems that our house might not be directly affected by sea-level rise, but increased water level in the estuary will increase the flood risk in our area.</p>
 Bushfire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>No risk – we are a long way from natural bushland</p>
 Severe storm	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>Increased rainfall intensity will increase the possibility of estuarine flooding. Severe storms and hail can damage our cars as we park them outside (i.e. not in the garage). But we have insurance for our car covering hail damage (although we have to pay an excess of \$500 for any claim).</p>
 Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>Although our area is not likely to experience drought, this can be an issue for Jon as he works for an agricultural business. Recent droughts in central Queensland have affected the company and if this continues, the company may suffer further losses and Jon's job could be at risk.</p>
 Coastal erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>No risk, we are away from coastline</p>
 Cyclone	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>Cyclone winds and rain can impact the roof of our house. Our house is built in 1981 and since then no upgrade has been made to its roof.</p> <p>Damage to infrastructure and loss of power could cause disruption to our day-to-day life.</p>
 Other (list below)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	



5. Household specific risks and opportunities

Near-term risks

(1-10 years)

Your home

Description of risk

1. Any future flood on our property could damage both external and internal parts of our house. We have carpet downstairs and if flooded we might experience water and mud damage. Longer exposure to water can cause moisture damage to the wooden frames of our house (including termite risk). Our garage is full of gardening equipment, Jon's home office computer, etc. and flooding could damage these.
2. As the risk of flood increases with sea-level rise, insurance cost may increase for our house.
3. We have not had a cyclone in our area since we moved in 2006, but there was a cyclone in the area in 1981, but we don't know whether the roof was impacted at that time.

Health and wellbeing of you and your family

1. Internal overheating in our house during future heatwaves can deteriorate the living condition in our upstairs room. It can damage the health and wellbeing of our kids and Kylie's elderly mother.
2. If our property is flooded in future, then moisture exposure can cause mould in our house, leading to unhealthy living conditions.

Your livelihood

1. During last year's heatwave, Kylie's mother got sick and Kylie had to take time off to take care of her. As Kylie works casually, it resulted in a reduction of our household income. In future heatwaves this could happen again.
2. Flood damage to our property can stress our financial capacity in future.
3. Insurance costs might increase, straining our family budget.
4. If drought conditions continue in central Queensland, Jon's company might struggle to make profit as they rely heavily on agricultural products from Central Queensland. It could affect Jon's job.

Longer-term risks

(more than 10 years)

Your home

If the hazard events persists, our insurance premium may rise.

Although we are not thinking about selling our property now, frequent natural hazards in our area can also affect the resale value of our property.

Health and wellbeing of you and your family

As we grow older, we will become more sensitive to heat

Your livelihood



5. Household specific risks and opportunities

Near-term opportunities

(1-10 years)

Your home

Description of opportunities

Undertaking some resilience measures such as improving roof, installing flood barrier underneath our door, etc. can reduce our insurance premium.

Health and wellbeing of you and your family

Undertaking some adaptation options such as improving insulation, increasing ventilation and/or installing air conditioner could improve the living conditions in our house, leading to a positive impact on the wellbeing of our kids. This can also increase the property value and potentially give us access to more finances.

Your livelihood

Longer-term opportunities

(more than 10 years)

Your home

Making our house flood resilient can improve the resale value of our property.

Health and wellbeing of you and your family

Improving heat insulation and having air conditioned house in the longer term will improve our living condition.

Your livelihood



6. Adaptation options

There are a range of options to reduce future climate related risks to the structure of the home. See the information booklet for some examples of adaptation options [page 42](#). For each of your identified risks list adaptation options that might suit your circumstances. Consider options that are fit for your purpose and within your capacity.

Description of available adaptation options

Near-term options

(1-10 years)

Your home

Flood Protection measures:

1. Identify and block all potential entry points (doors, airbricks, sinks, toilets, and gaps in external walls around pipes and cables)
2. Raise electrical points above flood level with wiring drops from above
3. Replace carpets with vinyl or ceramic tiles
4. Consider moving Jon's home office from garage to upstairs.

Cyclone:

1. Consult an experienced builder to understand current condition of the roof and discuss improvement opportunities and potential costs.

Health and wellbeing of you and your family

- Paint external walls a light colour to increase their reflectivity.
- Install external awnings for south and west facing windows.
- Install internal roof insulation and outdoor exhaust fans.
- Consider putting air conditioner in some of the upstairs bedrooms.

Your livelihood

Improve living conditions during summer to avoid unhealthy conditions for kids and elders.

Get better insurance cover to ensure any future damage will be covered and will not put stress on family finances.

Longer-term options

(More than 10 years)

Your home

If we get flooded again and need to rebuild, then we should consider raising the height of the living areas above flood level.

Health and wellbeing of you and your family

As new technologies and solutions arrive in future, we need to adopt them to improve living conditions during summer so that we can avoid unhealthy conditions for kids and elders.

Your livelihood

If drought conditions continue in central Queensland, Jon's company might struggle to make profit as they rely heavily on agricultural products from Central Queensland. It could affect Jon's job.

I need to talk to Jon about his longer-term career plan. It might be worth thinking about switching the job and move to other less climate sensitive industry. As Jon works in the administration department, his skills can be transferable to other sector.



6. Adaptation options

Before you decide about your action plans there are some questions you should consider asking yourself in order to minimise your risks.

How well do your building and its services (e.g. power supply, water supply, sewerage system, etc.) cope with high temperatures?

Not very well. It gets really hot upstairs during the summer, especially in the afternoon.

Do you have appropriate resilience measures (e.g. sandbags or metal barriers for flood)?

No.

Insurance can be challenging and the types of cover you have will vary between providers and your exposure to risk. Given this complexity, are you sure that you have appropriate cover for your needs and interests now and into the future? For example, are you aware of what you do NOT have insurance for?

We have home insurance but do not have content insurance. Also not sure what we are NOT covered for, need to check.

If you are planning to invest in a property and/or getting into a long-term mortgage, have you considered long-term climate hazards to the property? It is particularly important to conduct a risk profile of properties that are in the coastal zone, which is likely to change in future, as sea-level rises.

Not buying any property at this stage, but planning to do that next year. We will keep this in mind.

Do you have the skills and equipment to clean up after an extreme weather event?

Not really.

If you are renting, have you considered moving to a less risky location or more resilient house?

Not renting.

If you are renting, have you discussed climate related risks with your landlord? Their actions and plans will have a material impact on your home and contents.

Not renting.

Have you considered developing a natural hazard preparedness plan for your household? Specifically preparedness for heatwaves will become increasingly important as our climate gets hotter. It is important to note that heatwaves kills more Australians than all other natural hazards combined.

We have developed a flood and cyclone preparedness plan. Now we need to develop a heatwave preparedness plan.



6. Adaptation options

Have you considered taking a first-aid course or updating your certification?

Kylie did the first-aid course last year.

If you have young children and/or elderly people at home, have you considered how they might cope during extreme heatwaves? It is important to note that these age groups are more sensitive to heat stress.

Our kids do not cope very well during heatwaves at home. On weekends we need to take them to a nearby shopping centre to cool down in the air-conditioned environment. Sometimes we go to the beach but last year during the heatwave days it was too hot to go to the beach.

Do you or your partner work in a sector which is climate sensitive? Sectors such as agriculture, tourism etc. are climate sensitive and can be affected by climate change impacts.

Yes, Jon's company is in the agricultural business therefore droughts, floods and storms are not good for them.

Do you live in an area or region which has been affected by extreme climatic events and also has the potential to be affected in future? Frequent damage from extreme events can make recovery very expensive and damage the local economy.

We do not live in a drought prone area but Jon's company relies heavily on agricultural products and most of their suppliers are located in current drought prone areas.

How would you fund additional costs arising from a severe weather event or a flood in the short term?

Likely to come from our savings which is small. Hopefully we would be covered by insurance, although I am not sure what we are not covered for. We need to check.

Do you have appropriate income protection or other type of insurance to support you/your household/business should you be affected by an extreme event?

No.

If you have pets, have you considered risks to them during extreme events?

We do not have pets.



7. Action plan

WORKED
EXAMPLE

Now we are going to think about your action plan.

List how you plan to manage your identified risks and make the most of opportunities. Where appropriate, indicate who is responsible for each action and how you may assess where the action is achieving its purpose.

Description of action plan

Near-term action plan

(1-10 years)

Your home

This year we will explore how we might fund some of the identified flood protection measures.

We will discuss with our insurer about what reductions we might get if we invest in improving the roof.

Talk to our insurer to understand what we are not covered for.

Health and wellbeing of you and your family

We need to look at our finances to find out which of the adaptation options we can afford at this stage and which we should start saving money for.

We need to talk to that neighbour whose house was flooded a few years back to learn more about how to best prepare for this.

Your livelihood

I need to advise Jon to discuss with his employer about their plan to manage the drought situation (i.e. is it likely to impact Jon's job).

Longer-term action plan

(more than 10
years)

Your home

Although we are not thinking about selling our house now but we might consider in the longer-term. Therefore if flood sbecome more frequent in our area, I need to keep an eye on the moving market price of our house.

Health and wellbeing of you and your family

We need to save money for ducted air condition in the whole house.

Your livelihood

Need to talk to Jon about his long-term career plan and any possibility of switching to a less climate sensitive sector by using his transferable skills.



7. Action plan

WORKED
EXAMPLE

Summary of Actions to address climate change

Name: Kylie

Date: 8th March 2019

Risks that I have identified

(copy the risks from [page 22](#))

Any future flood on our property could damage both external and internal parts of our house. We have carpet downstairs and if flooded we might experience water and mud damage. Longer exposure to water can cause moisture damage to the wooden frames of our house (including termite risk). Our garage is full of gardening equipment, Jon's home office computer, etc. and flooding can damage those.

Internal overheating in our house during future heatwaves can deteriorate the living condition in our upstairs rooms. It can damage the health and wellbeing of our kids and Kylie's elderly mother.

If our property is flooded in future, then moisture exposure can cause mould in our house, leading to unhealthy living conditions.

During last year's heatwave, Kylie's mother got sick and Kylie had to take time off to take care of her. As Kylie works casually, it resulted in a reduction of our household income. In future heatwaves this could happen again.

Flood damage to our property can stress our financial capacity in future.

What can I do now?

(copy near-term action plans from [page 29](#))

This year we will explore how we might fund some of the identified flood protection measures.

We will discuss with our insurer about what reductions we might get if we invest in improving the roof.

Talk to our insurer to understand what we are not covered for.

We need to look at our finances to find out which of the adaptation options we can afford at this stage and which we should start saving money for.

We need to talk to that neighbour whose house was flooded a few years back to learn more about how to best prepare for this.

I need to advise Jon to discuss with his employer about their plan to manage the drought situation (i.e. is it likely to impact Jon's job).

Discuss with Jon about getting an income protection insurance.

What can I do in future?

(copy long-term action plans from [page 29](#))

Although we are not thinking about selling our house now, we might consider in the longer-term. Therefore if floods become more frequent in our area, I need to keep an eye on the moving market price of our house.

We need to save money for ducted air conditioning in the whole house.

Need to talk to Jon about his long-term career plan and any possibility of switching to a less climate sensitive sector by using his transferable skills.

Determine a date when you need to revisit your risks in future. If you think your risk is higher, you should consider getting some expert advice from an expert.

