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TORRES STRAIT
Regional Adaptation and Resilience Plan
2025-2030

Yumi Create Our Future: Stronger Together

Acknowledgements

The Torres Strait Adaptation and Resilience Plan has been developed by the Torres Strait Regional Authority (*in collaboration with the Torres Strait Island Regional Council, Torres Shire Council, Gur A Baradharaw Kod (GBK), the Department of Climate Change, Energy, the Environment and Water and the Queensland Department of Environment and Science).*

The Torres Strait Regional Authority (TSRA) pays respect to the Traditional Owners and Custodians of the lands and waters on which we work.

We honour the resilience and continuing connection to land and sea country, culture and community of all Torres Strait Islander and Aboriginal peoples across Australia.

We recognise the decisions we make today will impact the lives of generations to come.

We would like to acknowledge the Torres Strait leaders and community representatives who have contributed their valuable direction and insights over many conversations, meetings and workshops. We also acknowledge the valuable input of other researchers and government and community group representatives who attended workshops and provided comment.

TSRA would also like to acknowledge the substantial contribution of the following people in helping to shape this Plan: Dr Rod Griffith who played a very significant role in development of the resilience framework and Plan structure, Miya Isherwood, Dr Nina Landsbury, Bob Spiers, David Putland and Kate Hodge for her wonderful design work and graphics.

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Foreword

Since time immemorial, Aboriginal and Torres Strait Islander communities have observed and responded to the changing seasons, winds and tides – the patterns that shape our traditional ecological knowledge and relationship to our islands and seas. Those patterns are now changing, causing great disruption to our environment, traditional knowledge systems, our culture, our communities, our wellbeing and livelihoods.

In spite of these challenges, our people remain committed to staying on their islands and are prepared to face the future with courage and hope. We have formed partnerships with scientists and government agencies to better understand climate related changes in our region and the projected future impacts. We have considered those impacts and opportunities and worked with our partners and communities to identify strategies to help us to prepare for the future and respond to the changes ahead. Our aspiration is for our region to be a leading example of how to respond to this great challenge that confronts all of humanity, and to respond in ways that strengthen our culture, our empowerment as well as sustainability and our wellbeing.

Our response will build on the wisdom and lessons from our past – acknowledging our lived experience of successfully adapting to change – and combine this with contemporary science and innovative approaches that build community and regional resilience. A human rights approach, grounded in principles of self-determination, is embedded in this Plan and must underpin its successful delivery. Our response to climate change will not just be a focus on minimising impacts, but also on building our strengths and addressing the issues that underpin Indigenous disadvantage to create a stronger, more resilient Torres Strait. We appreciate that to be adaptable we must embrace change and remain flexible whilst keeping our core values and identity. We understand that responding to climate change is not just about seawalls and solar panels, but also about our mindsets and governance systems.

This Plan provides a roadmap for a climate resilient future for this region. It builds on earlier plans – including the Torres Strait Climate Change Strategies prepared in 2010 and 2014 – and updates the first Regional Adaptation and Resilience Plan prepared in 2016. Our Plan reflects contemporary community aspirations, and incorporates the best-available science, traditional knowledge, and innovations from around Australia and the world, across a wide variety of sectors. It seeks to take a holistic, interdisciplinary, system-wide approach that builds regional and community resilience, recognising that climate change affects all aspects of life in the region, at many levels.

Maintaining focus and coordinating our collaborative efforts to implement our Plan will be critical to its success. Strong governance arrangements that support self-determination, change management, local and regional capacity building, resourcing and accountability mechanisms are essential. The Plan outlines the key foundations, structural elements, transformational goals, partnerships and enabling mechanisms needed to ensure its effective implementation.

Delivering this Plan will require unprecedented levels of cooperation between all organisations and people who live in, or have influence over, the region. Our joint endorsement of this Plan reflects the level of cooperation and commitment we are prepared to make to ensure this Plan is successful in achieving the outcomes we need to ensure our region can continue to survive and thrive into the future. Torres Strait communities call on Australian and Government governments to walk beside them and support them in their efforts to implement this Plan. Other partners with different skills, perspectives and knowledge systems will also be invited to join us in our collective efforts to prepare our region for the future.

Torres Strait Islander and Aboriginal people of our region are ready to face what the future holds. We are prepared to lead the way in terms of shaping our response to climate change, sharing our learnings and showcasing our approach for the benefit of other Indigenous communities in Australia and the world – and for the future of our region, our culture, our communities and our children.

Plan summary

The people of the Torres Strait aspire to lead the region's response to climate change and for that response to be a leading example of Indigenous led adaptation and resilience.

Driving aspirations (what are we all working towards?)

The Plan aims to address the multiple and substantive risks posed by the shifting climate in a manner to strengthen four key Torres Strait aspirations, namely healthy people and healthy country; greater sustainability; enhancing and maintaining cultural identity and empowering the region and its people. It does so through a focus on building local and regional climate resilience.

Possible futures

There are many possible futures for the regions, but in the words of Peter Drucker, the best way to predict the future is to create it. Taking a creative proactive approach to building a better future is more powerful than a just a focus on fixing problems. Climate change is going to intensify many existing challenges such as access to resources and health risks, as well as bring new challenges. The future for the region will depend upon how well its people can collaborate, negotiate, innovate and be resourceful, be adaptive and flexible, anticipate, plan and implement actions to reduce vulnerabilities, strengthen resilience and seize and create new opportunities.

This Plan exists to support the region to achieve the best possible future, but plans don't implement themselves. If you live in the Torres Strait or you work for an organisation that supports the Torres Strait, you have a role to play in implementing this plan.

The primary functions of this Plan are to:

1. *Provide an up-to-date climate outlook and likely impacts for the Torres Strait region based on best available scientific information so that decision makers at all scales can understand and prepare for these changes.*
2. *Provide the frameworks, thinking, priority actions and coordination required to transition to a climate resilient Torres Strait.*
3. *Operationalise the aspiration of Torres Strait people working together and with governments and other organisations to become a leading example of Indigenous led climate change adaptation consistent with the outcomes of the 2022 regional climate change workshop: Stronger Together and the establishment of the Torres Strait and Northern Peninsula Area Climate Resilience Center.*

The plan sets out to:

1. Achieve buy-in, ownership and participation in creating a positive future for the region despite the climate risks through coordinated, proactive and strategic actions;
2. Inform and educate about predicted climatic change risks and opportunities;
3. Propose concepts that provide a pragmatic framework for assessing and delivering climate resilience;
4. Identify and prioritise strategies, Adaptation Actions that will strengthen climate resilience in a timely manner;
5. Foster governance settings that will enable and empower the transition to a climate resilient future.

Key messages

This is not a business-as-usual plan. The unfolding challenges ahead require new ways of thinking, doing and being to ensure a strong future for the Torres Strait. The Plan is built around a 6-part Torres Strait resilience framework.

Change is coming regardless of action to reduce emissions due to change already locked into the climate system. Adaptation is essential.

Climate will impact all facets of life and environment, but the most at-risk areas are coastal settlements and ecosystems; health and wellbeing; and marine environment and fisheries.

Adaptive measures must occur across all three domains:

Hardware (Infrastructure, material change)

Orgware (Institutional settings, policy, regulations)

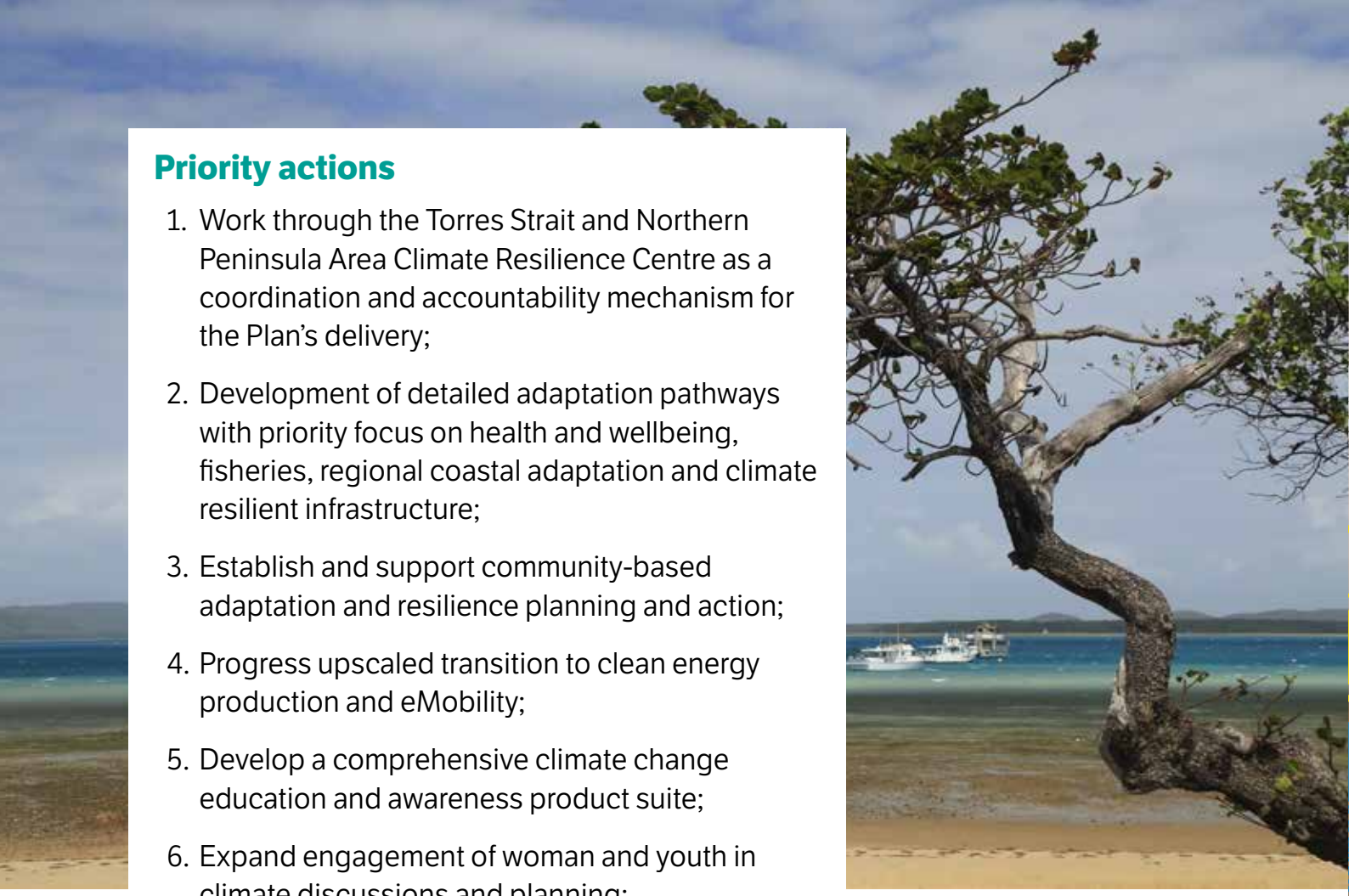
Software (Mindsets, skills, behaviour, culture)

The longer we delay responding to climate change, the fewer our options for response become.

Building deeper awareness and understanding of climate change is an important part of being able to adapt.

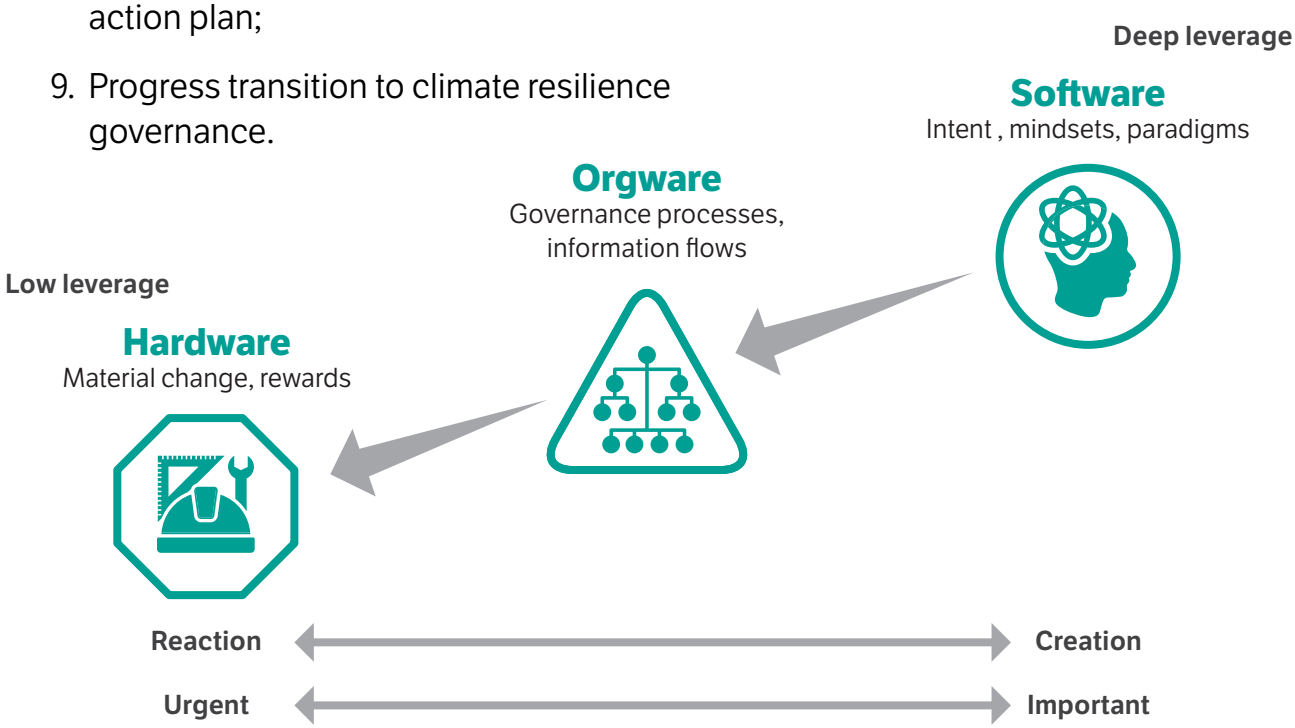
There is a need to focus on the important as well as the urgent.

Everyone has a role to play.



Priority actions

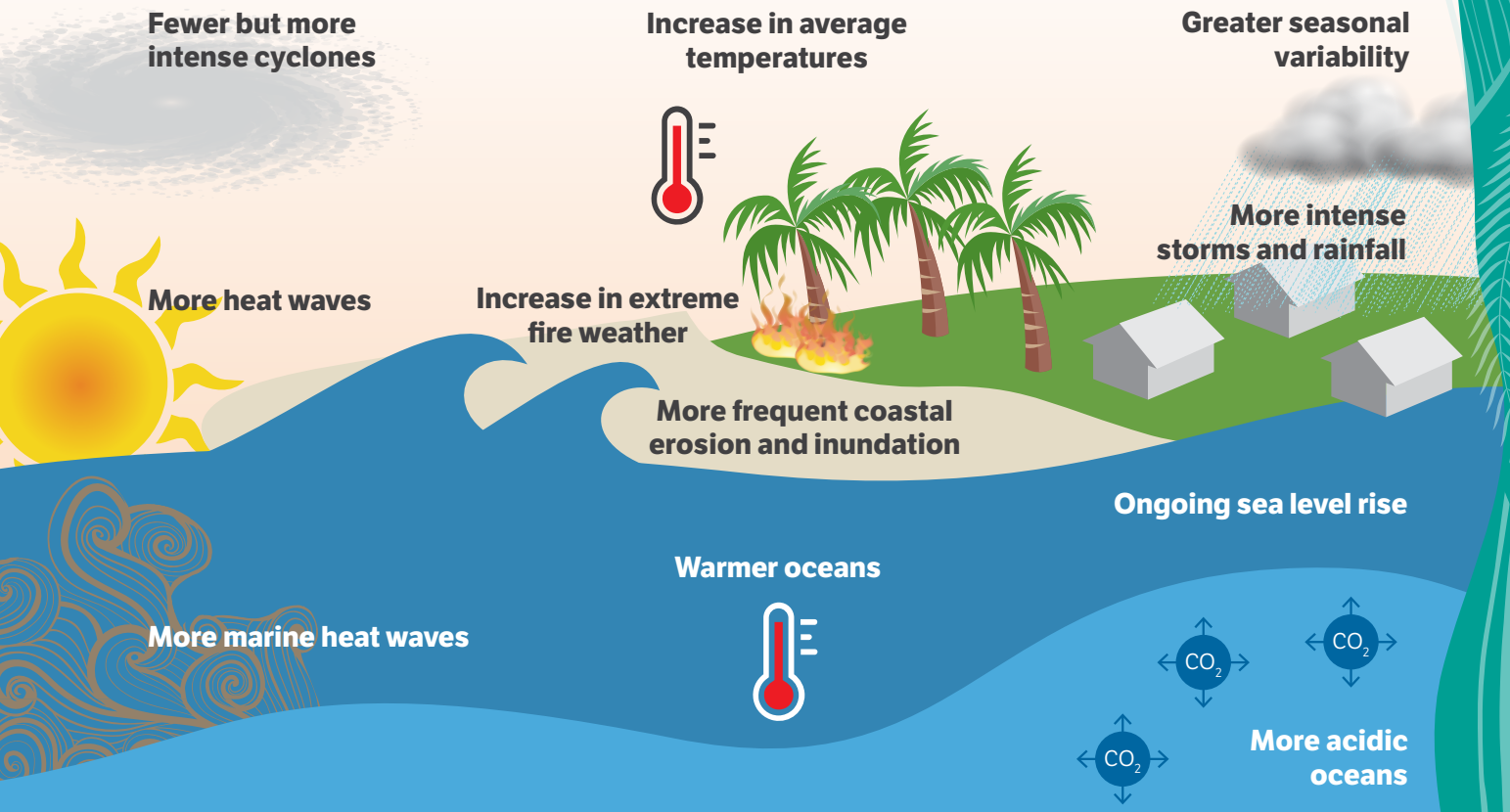
1. Work through the Torres Strait and Northern Peninsula Area Climate Resilience Centre as a coordination and accountability mechanism for the Plan's delivery;
2. Development of detailed adaptation pathways with priority focus on health and wellbeing, fisheries, regional coastal adaptation and climate resilient infrastructure;
3. Establish and support community-based adaptation and resilience planning and action;
4. Progress upscaled transition to clean energy production and eMobility;
5. Develop a comprehensive climate change education and awareness product suite;
6. Expand engagement of woman and youth in climate discussions and planning;
7. Progress culture and climate change dialogues;
8. Develop and implement a heat risk reduction action plan;
9. Progress transition to climate resilience governance.



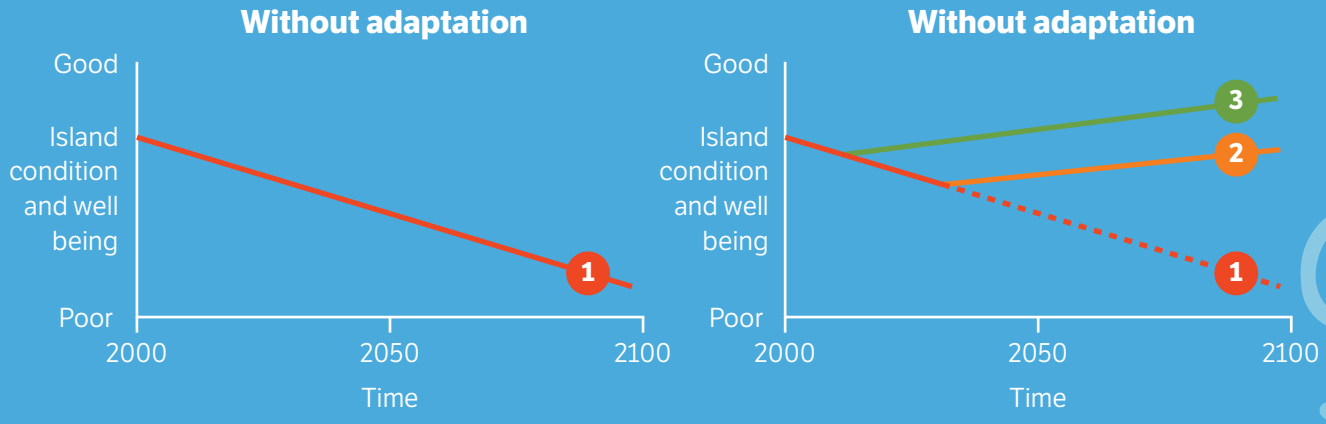
Where should we focus our actions? Good adaptation planning includes actions across this scale. Some actions of adaptability are less tangible than physical assets or land use planning. They include shifts in behaviour, mindsets, and decision-making processes. The actions can get harder to implement as we move up the scale, but those actions can have bigger impacts on resilience and adaptability.

Climate change predictions and risks (why is the plan needed?)

These are the key expected climate driven trends for the region. Some climate impacts occur as sudden events, others are "slow burn" processes over time. Over time we expect more variability and greater intensity of events.



Future impacts on bio-geo-physical conditions and socio-economic well being of small islands



Early proactive adaptation provides greater benefits and reduces impacts compared to delayed and reactive adaptation.

Source: IPCC

What you need to know about climate change

The world is going to continue to experience increasing climate change impacts regardless of our efforts to reduce emissions due to past greenhouse gas emissions[1]. The speed and scale at which we reduce emissions will determine how extreme the impacts might get and the timeframe before the earth's climate can stabilise.

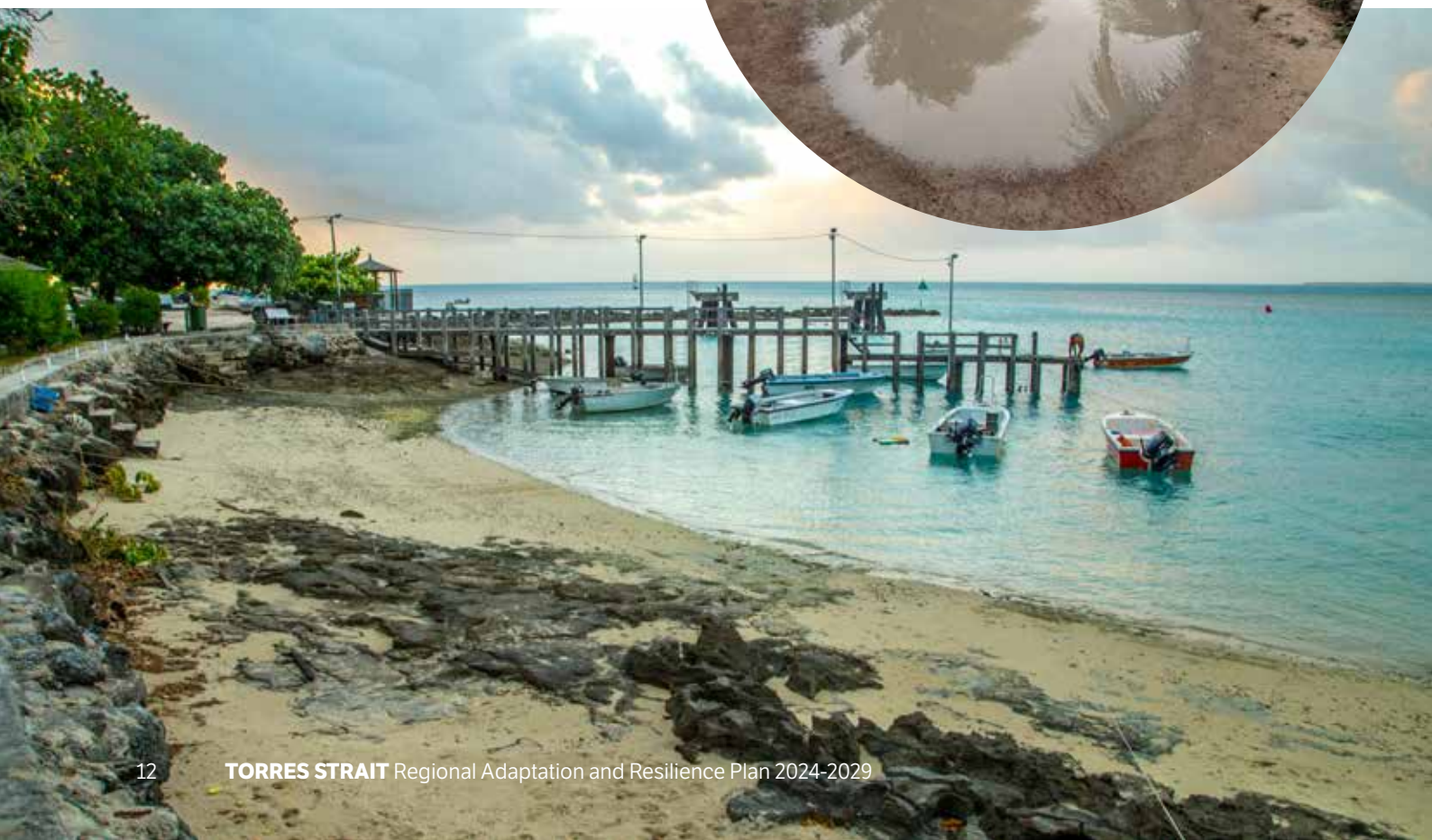
Some impacts from climate change are due to slow changes in conditions (e.g. shifts in the flowering and fruiting times of plants or length of the wet season), others are due to extreme events (e.g. marine heat waves, cyclones, floods).

It is possible and likely for an area to experience more than one type of impact at the same time (e.g. a heat wave and a flooding event), compounding their impacts.

Consequences to the Torres Strait can occur from climate change impacts that happen outside the region (e.g. availability of fresh produce, impacts on telecommunications services).

Cascading consequences are impacts that ripple through the system and continue beyond the time and place of an event. It is possible that some flow on impacts can be as severe as the initial impact. Resilience helps to reduce the reach and scale of these flow-on impacts.

The climate system has tipping points or critical thresholds, that when exceeded can lead to a significant and irreversible change in the state of the system. We want to avoid reaching these tipping points, but we don't know we've reached them until after they have been crossed.



Regional resilience framework

The plan highlights 6 areas to build climate resilience that are informed by 4 regional aspirations. They are embedded in a framework with 3 main focus areas – planning, institutional and design.

Resilience and adaptation overlap as concepts but are different. Adaptation is essentially being able to respond to change in a way that allows you to keep going. Resilience is about being able to recover from impacts and return to a certain state or identity. In this plan the resilience approach embraces the principals of adaptation within a resilience framework. Adaptation itself does not explicitly highlight the idea of maintaining identity, but that idea is inherently part of resilience. Maintaining cultural identity is a primary aspiration of the people of the Torres Strait.

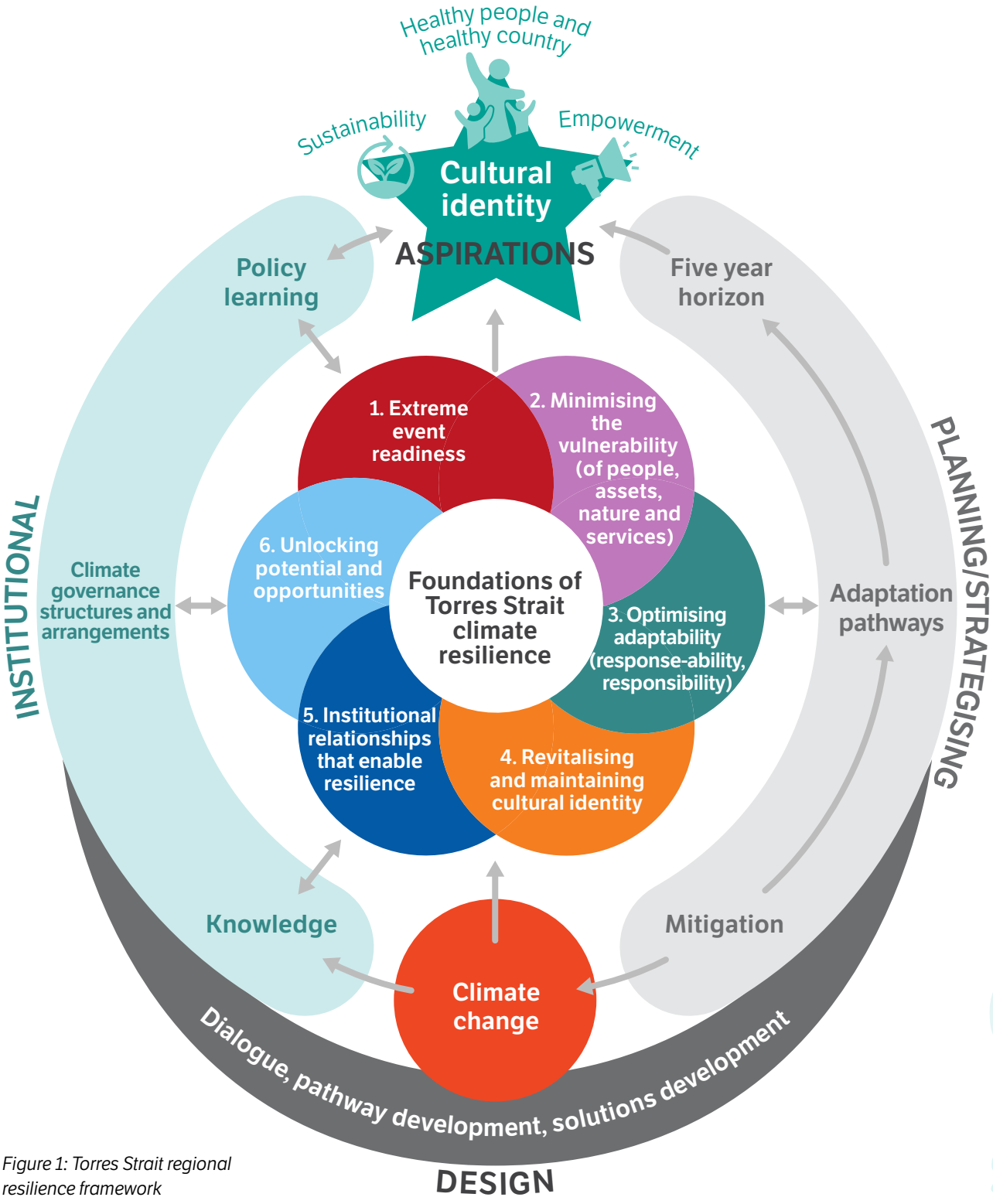


Figure 1: Torres Strait regional resilience framework

Roles and responsibilities

Everyone has a role in implementing this plan, from personal choices and participation that build health, resilience and are more environmentally sustainable through to the Australian Government's role in funding, policy and legislation to support adaptation and to reduce emissions.

Individual/ Family
Personal activities and choices

Community groups and organisations
Community activities and planning

Local government
Service delivery, planning, coordination

Regional organisations and NGOS
Service delivery

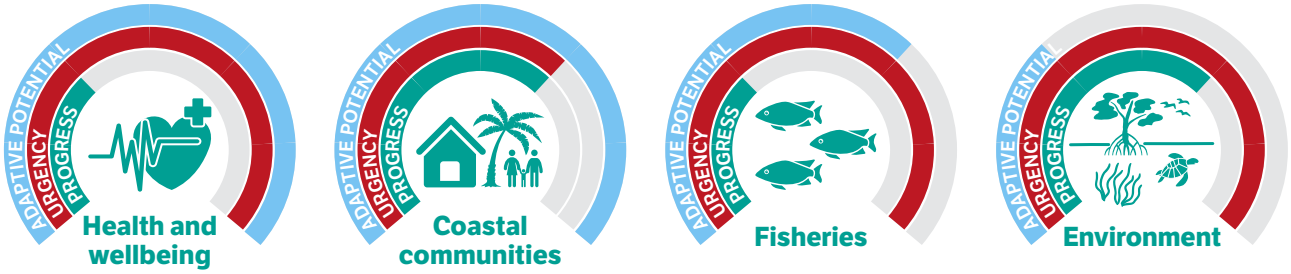
State government
Planning, service delivery, policy and funding

TSRA
Coordination, planning, funding, service delivery

Other Commonwealth
Funding, policy, legislation

TSNPACRC
Coordination and alignment

Summary diagram based on detailed risk assessment done for the 2016 Plan, of highest at risk sectors showing approximate relative values for progress, urgency and adaptive potential in responding to climate change. Progress relates to how much has been done to date to assess the risks and respond so far. Urgency relates to how long until severe impacts are common. Adaptive potential relates to the potential to respond adequately to reduce the risks brought by climate change (note this is not the same as adaptive capacity, which is usually limited by a range of factors such as access to resourcing, skills etc).



Ingredients that help enable effective implementation of this plan:

- ✓ Cooperation and collaboration
- ✓ Clarity and vision
- ✓ Flexibility and innovation
- ✓ Accountability
- ✓ Resources
- ✓ Empowered mindset and empowered people
- ✓ Top down and bottom-up decision making
- ✓ Traditional and western knowledge
- ✓ Access to good information

Ingredients that won't help obtain good outcome:

- ✗ Unhealthy competition and silos
- ✗ Confusion
- ✗ Rigidity and risk aversion
- ✗ Lack of accountability
- ✗ Lack of resources
- ✗ Lack of integration of traditional and western knowledge
- ✗ Top-down decision making
- ✗ Lack of good information

What might success look?

1. Communities and organisations understand climate change and its risks.
2. Empowering, coordinating and enabling climate resilience governance structures are in place and working.
3. People have a sense of hope and optimism about the future.
4. Strategies are on track for implementation.

What is the intent of this Plan?

This Plan sets out a response to climate change over the next five years and beyond for the Torres Strait Region. It seeks to raise the bar compared to previous climate change plans that have guided the journey so far. In particular around how a focus on climate resilience can open pathways to more hopeful futures, but also by embracing the aspiration of Torres Strait people to lead the response and by greater attention to improving implementation success.

It is built on many years of conversations and actions in the region between communities, leadership, researchers and government agencies, and in particular the outcomes of the 2022 Torres Strait Regional Climate Change Workshop, Stronger Together. The key proposals to come from that workshop included:

1. Establishing a 'Centre of Climate Resilience', with a range of purposes and functions including as a voice for Torres Strait, a place for traditional knowledge, research into climate change options, training, technology development and so on.
2. Establishing a process for community-owned, community-scale adaptation plans and the employment and training of community officers (some groups mentioned resilience, others sustainability, others community champions) however they are all for driving locally owned solutions.
3. Local energy, water, housing design and food production shifts that have mitigation and adaptation dimensions as well as making health and economic sense.
4. Changes to the funding model and current agency/service delivery approach, establishments of trusts and of reinvesting compensation and other income into solutions – creating better partnerships so that agencies help us to adapt and implement local ideas.

The risk and opportunity space

Islands and the Indigenous communities that inhabit them are increasingly susceptible to global environmental, economic and social changes – perhaps more so than anywhere else on earth.

Climate change adds another layer of complexity to an already challenging situation. It is an existential threat to every aspect of life through sea level rise and coastal erosion, increases in air temperature and heat waves, acidification of marine waters and marine heatwaves that bleach coral reefs, rainfall variability affecting food security and water supplies and changes in vector transmitted diseases.

It's important we understand how climate change will affect the region including the uncertainties involved, and that we will be unable to stop many of these impacts. **Section 1** of this plan sets out the latest climate change science and how shifts in the climate, which has been relatively stable for the past few thousands of years, are predicted to unfold. This knowledge will assist families, communities, agencies, and support organisations to better understand the outlook for the future and take proactive action to adapt. The urgency of global action on this issue cannot be overstated given that risks and projected adverse impacts and related losses and damages from climate change are expected to escalate with every increment of global warming[1].

Torres Strait Islander and Aboriginal people living in the region have called for their voices to be heard and amplified in terms of stronger advocacy around climate mitigation internationally and nationally. While this is not the primary focus of this Plan, we recognise their contribution to the global effort to avoid dangerous climate change. **Section 2** of this plan introduces and explains the role of climate resilience and adaptation in developing hopeful futures and sets out its key influences. **Section 3** of this plan identifies some opportunities for regional and local scale mitigation and the importance of continuing to advocate for global policy shifts.

At the same time, it is important to provide a hopeful basis for the future and to focus as much on opportunities that may arise as on the risks involved. **Section 4** of this Plan is about where we can minimise the impacts and build on the opportunities associated with climate change by adapting (structurally, institutionally, behaviourally, and mentally) in ways that strengthen climate resilience consistent with the aspiration of Torres Strait people to continue to occupy their traditional land and sea country wherever possible and to apply their cultural values to new solutions.

Climate change has been identified as a strategic issue in this country and around the world since the 1980s. There has been a realisation that deeper adaptation will be required and that governing structures and efficiencies set up during periods of climatic stability are probably inadequate and unsuited to dealing with climate change as an issue that effects all aspects of life. Examples of improved governance include reducing barriers to data and information sharing across agencies; expanding community level-decision making and implementation capacity and expanding the use of trials to test new ideas and innovations. **Section 5** of this plan draws attention to some structural and functional shifts needed in the region to effectively adapt and raises a case for a focus on the underlying human capacity to drive and manage adaptation in the direction of agreed aspirations, the need for reflexive and adaptive institutional structures and arrangements around climate change designed to unlock opportunity, potential and a realistically hopeful future.

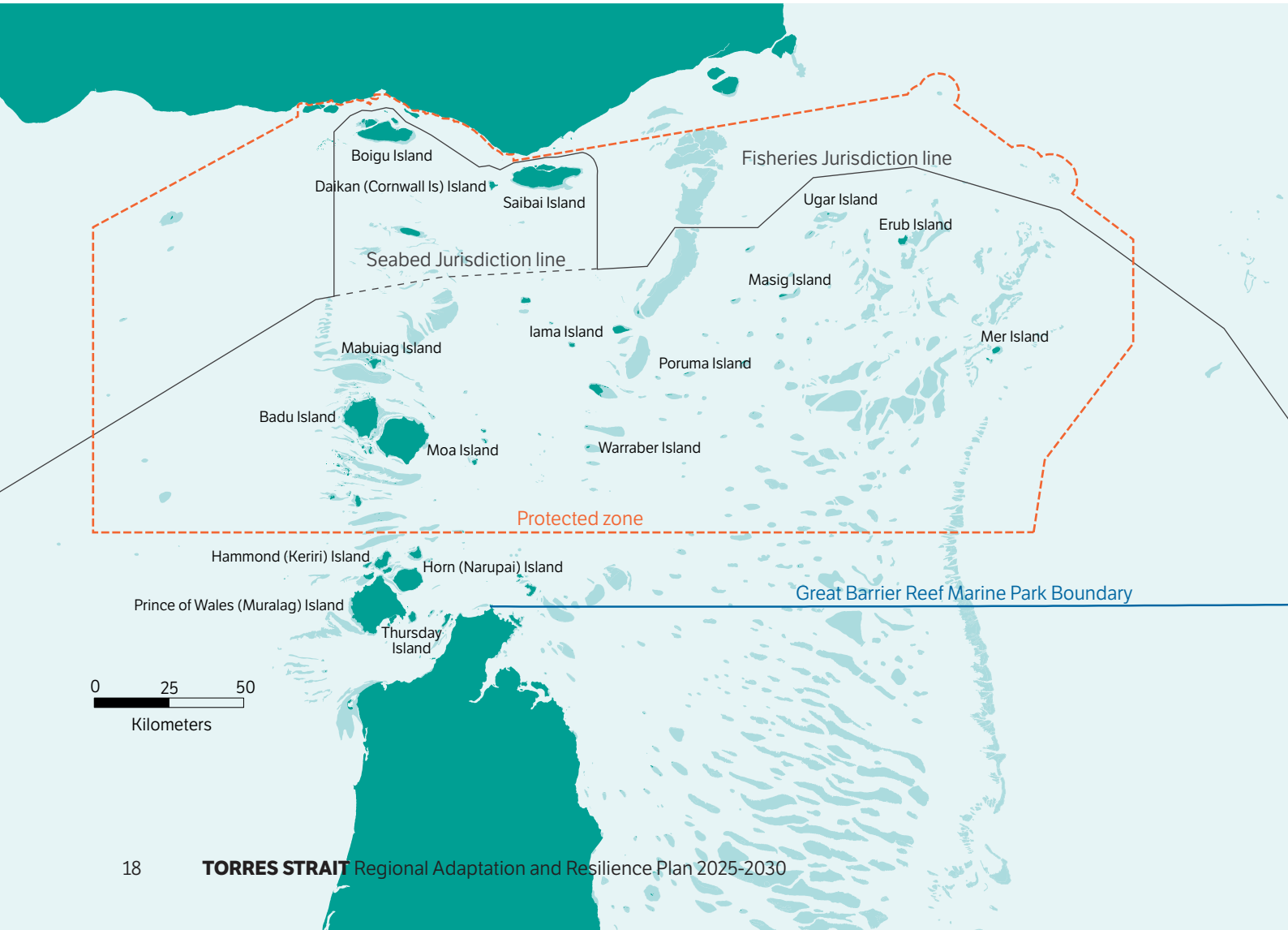
The Torres Strait Region

The Torres Strait is a unique and globally significant biocultural region located between the tip of Cape York Peninsula and Papua New Guinea (PNG). It is the only region in Australia adjacent to an international border and subject to its own treaty (with PNG). The region is of enormous strategic significance to the nation in terms of border security, international shipping and biosecurity. It is also at the frontline in terms of exposure and vulnerability to climate change.

Since time immemorial, Torres Strait Islander people have lived according to Ailan Kastom, the traditional knowledge, practices, and laws that govern daily life and the use and ownership of lands and waters. The region has a population of about 9,530[2] mostly Aboriginal and/or Torres Strait Islander people who live in 20 culturally distinct and geographically dispersed Indigenous communities on 17 of the region's 300 or so islands. Exclusive native title rights have been recognised over all of the inhabited islands and numerous uninhabited islands. Non-exclusive native title rights have been recognised over approximately 44,000 square kilometres of sea country in the region.

There are four main island types – western continental islands, northern alluvial islands, central coral cays and eastern volcanic islands. These roughly correspond with the island clusters, or nations, from a cultural perspective – Maluilgal (Western Islands), Guda Maluilgal (Top Western Islands), Kulkalgal (Central Islands), Kemer Kemer Meriam (Eastern Islands) and Kaiwalagal (Inner Islands).

The Torres Strait is a pivotal point of connection for Australia. It is the confluence of the Arafura and Coral Seas and between the Pacific and Indian Oceans. The Great Barrier Reef reaches its northernmost extent here, and the Coral Triangle, a center of coral biodiversity globally, sits directly to the north. The Torres Strait remains one of the world's most intact and diverse marine environments, with the world's largest population of dugong, extensive seagrass meadows and mangroves, and over 1,200 coral reefs. The region's deeper eastern waters and reefs are increasingly recognized for their value as global climate refugia for some coral species.



The institutional landscape around climate change

Because the effects of climate change are felt across multiple sectors operating from the global to the local scale, a coordinated response - from all levels of government right down to the grassroots level will deliver far better outcomes. This presents a challenge for the current system of governance and its institutions and organisations which has yet to adequately adapt to new demands of another level of complexity imposed by climate change whist carrying out business through existing channels and arrangements.

Governance arrangements in the region are complex with a wide mix of government and non-government entities servicing this remote strategically important region with a relatively small population distributed across 17 islands and the tip of Cape York. Local government amalgamations in 2010 led to many community members reporting feeling disempowered and remote from the decision-making process. Each community also practices traditional governance and has a Registered Native Title Body (RNTBC) to represent traditional landholders which sit regionally under the umbrella of GBK Land and Sea Corporation. Malu Lamar is a the peak RNTBC for sea country native title considerations.

All these organisations as well as many agencies and NGOs beyond the region are now working in some way on aspects of climate change in the Torres Strait. These efforts are mostly directed at specific climate risks and physical adaptations and these efforts remain largely siloed and uncoordinated. This Plan embeds these actions within larger context of building regional and local climate resilience and identifies a number of important actions towards that end that are not yet captured by current adaptation efforts.

The Plan provides a coordination and accountability mechanism and helps to clarify regional priorities and responsibilities. There is a need for improved coordination and collaboration and support for greater planning and response capability at the community level.

Without an effective mechanism to improve coordination and capacity building, in itself a sign of improved resilience, the region will struggle to achieve optimal adaptation and resilience outcomes. If such a mechanism can be established, it should be a model of the governance principles and practice that typify climate resilient governance. The TSNPACRC will be an ideal vehicle to test the development of climate resilient governance in practice.

Goals and objectives

The climate of the Torres Strait Region is changing and will continue to do so into the foreseeable future. As humans have always been adapted to their climatic regime, it's the pace and scale of the current climatic shifts that are cause for concern. Adaptation will occur, the question is how well will it be planned and delivered and effective it will be. The choice facing communities and leaders is either to wait and react to severe events and slower shifts after they occur and when the options are limited, or to plan ahead and proactively guide adaptation in a direction that provides hope and opportunity and resilience. Of the three fundamental options, reactive adaptation, uncoordinated local ad hoc adaptation or regionally planned and coordinated adaptation, the latter will give the region the best chance of meeting the new future on its own terms.

The primary goals of this Plan are to:

1. Provide the frameworks, thinking priority actions and coordination required to transition to a climate resilient Torres Strait.
2. Operationalise the aspiration of Torres Strait people leading and working together with governments and other organisations to become a shining example of Indigenous led climate change adaptation.

To achieve these ambitious goals the following objectives have been adopted:

1. Achieve buy-in, ownership and participation in creating a positive future for the region despite the climate risks through coordinated, proactive and strategic actions;
2. Inform and educate about predicted climatic change risks and opportunities;
3. Propose concepts that provide a pragmatic framework for assessing and delivering climate resilience;
4. Identify and prioritise strategies, adaptation pathways and actions that will strengthen climate resilience in a timely manner;
5. Foster governance settings that will enable and empower the transition to a climate resilient future.

The Plan has been prepared by the TSRA on behalf of all Torres Strait people. The Plan covers a nominal five-year period. However, the intent is to undertake annual reviews and report annually on progress with implementation.

Success will depend on every person and organisation playing a positive role. Everyone has a role to play.

An annual high-level report card will track progress on how well the actions and strategies in the Plan are being implemented. A high-level evaluation process is outlined at the end of this Plan.

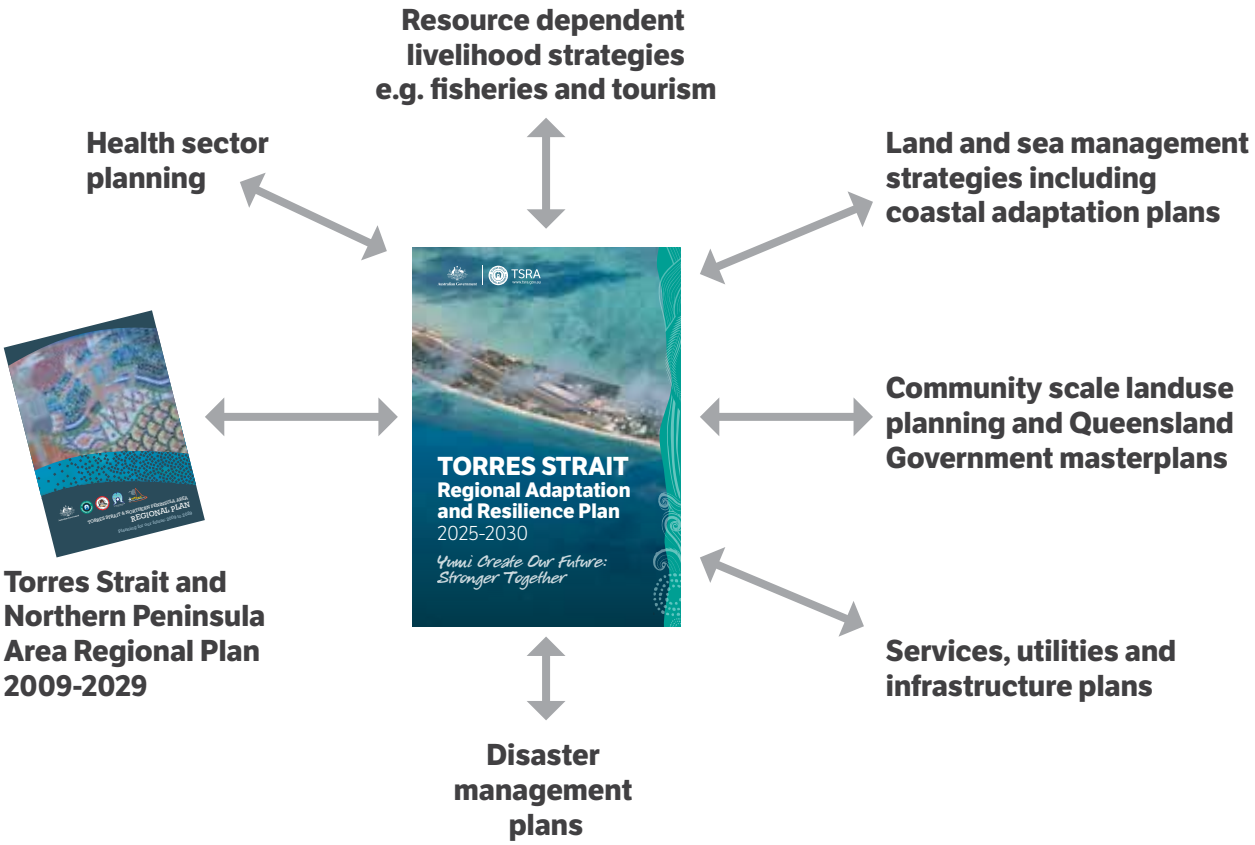
How does this Plan relate to other plans?

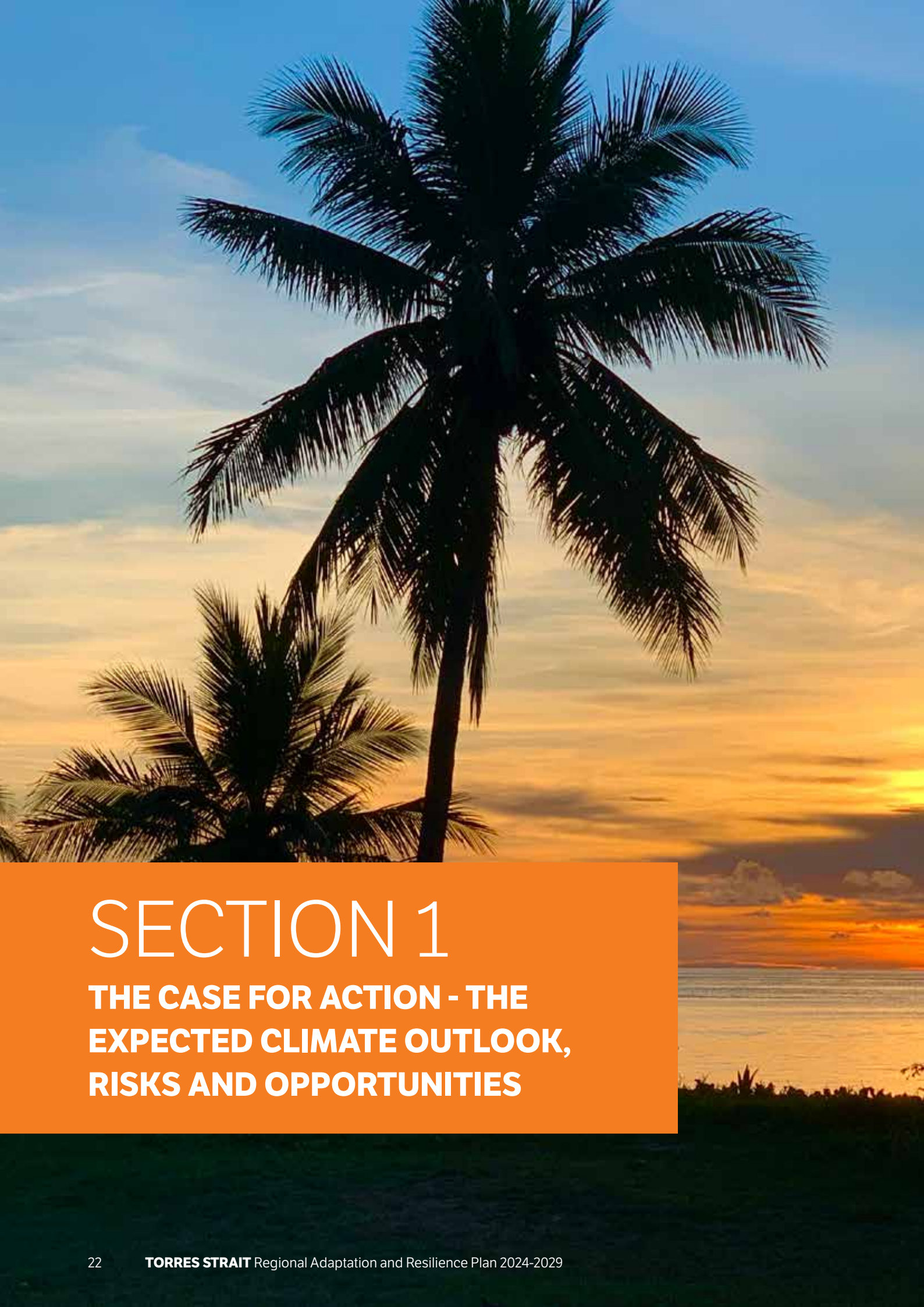
This Plan complements other regional strategic documents including the Torres Strait and Northern Peninsula Area Regional Plan, the Land and Sea Management Strategy for Torres Strait, the Torres Strait Development Plan, the Torres Strait State of Environment Report, the Torres Strait Renewable Energy Transition Plan, and the TSIRC, TSC and NPARC Coastal Hazard Adaptation Plans.

This Regional Adaptation and Resilience Plan also supports local community-level plans, including Ranger Working on Country Plans, Indigenous Protected Area Plans of Management, and Local Adaptation and Resilience Plans.

Ideally, this Plan will drive and underpin an integrated approach to future planning and implementation efforts, and drive stronger collaboration between the region's Traditional Owners, communities, agencies and partner organisations to address all aspects of climate change and adaptation efforts across the region at various scales. The TSNPACRC is the ideal vehicle to coordinate this activity across the region. The success of the Plan will rely on the effectiveness of transferring its strategies and pathways into established and new funding streams, programs, more specific plans and detailed work plans of agencies, service providers, sector groups, communities and support institutions.

The Plan helps to guide the region in responding and adapting to the impacts of climate change in a way that further develops community and regional resilience and furthers the broader human rights and self-determination agenda that First Nation Peoples are actively driving.





SECTION 1

THE CASE FOR ACTION - THE EXPECTED CLIMATE OUTLOOK, RISKS AND OPPORTUNITIES

Key messages


Tristan Simpson

Regardless of action to reduce emissions, the region faces ongoing climate change risks for the foreseeable future.

The areas most exposed to climate impacts include low-lying coastal settlements and coastal ecosystems, fisheries and marine species and ecosystems, and human health and wellbeing.

Globally governments still plan to produce more than double the amount of fossil fuels in 2030 that what would be consistent with limiting warming to 1.5°C.

The main direct climate impacts in the short term are extreme weather events, marine heat waves, hotter summers, and shifting seasons.

In the longer-term sea-level rise, warming average air and sea temperatures and ocean acidification pose substantive risks.

The speed at which things are changing is the main challenge. As more trapped energy is added to the atmosphere and oceans it drives greater variability and extremes in the climate system.

There is still great uncertainty on how fast and by how much the climate will change. A proactive precautionary approach is required, the focus of this Plan.

Education is important - the more people understand climate change the better able they are to respond appropriately.

Turtles and coral reefs are highly vulnerable to climate change are major declines in the health and abundance of corals and marine turtles is highly likely before 2050.

Climate change impacts from outside the region on economies, geopolitical stability and supply chains also pose a risk.

Adaptation needs to happen across all areas including infrastructure, planning, institutional arrangements, mindsets and behaviour.

Adopting climate resilient governance structures and processes will increase the capacity of the region to respond effectively.

Key climate trends for the Torres Strait

Understanding climate change risk

There are three aspects of determining climate vulnerability to climate impacts?

Hazard

what is the nature of the hazard – e.g. more intense storm systems.

Exposure

how exposed is what we are concerned about to the hazard? e.g. Homes in Alice Springs have no exposure to coastal impacts, homes on Saibai island have high exposure.

Vulnerability

How vulnerable is what we are concerned about to the impact? e.g. a house built of high quality materials has a lower vulnerability than one built of low quality materials. A wealthy family would have lower vulnerability than a poor family.

The overlap of these three determines the level of risk.

A detailed risk assessment sits behind this plan as part of the background methodology.

The global Perspective

The very real and significant impacts of human-induced climate change are already being felt across the world, and the magnitude and pace of this change is likely to increase over the coming years[3]. With current greenhouse gas emissions targets, the world is on track to experience dangerous levels of climate change over the coming decades (Figure 5).

Globally greenhouse gasses continue to accumulate well beyond historical norms. In the second half of 2023, the global average temperature exceeded 1.5˚C for 182 out of 184 days between July 1 and January 1. This warming is also influenced by factors such as El Niño. 2024 was the warmest year in global temperature records since 1850 and was the first year to have reached more then 1.5°C above pre-industrial levels (Figure 2). Each of the past 10 years (2015-2024) was one of the 10 warmest years on record[4]. Whilst the world aspires to constrain climate change within the Paris Agreement 1.5°C target, the likelihood we will overshoot this is extremely high[5] (Refer Figure 5).

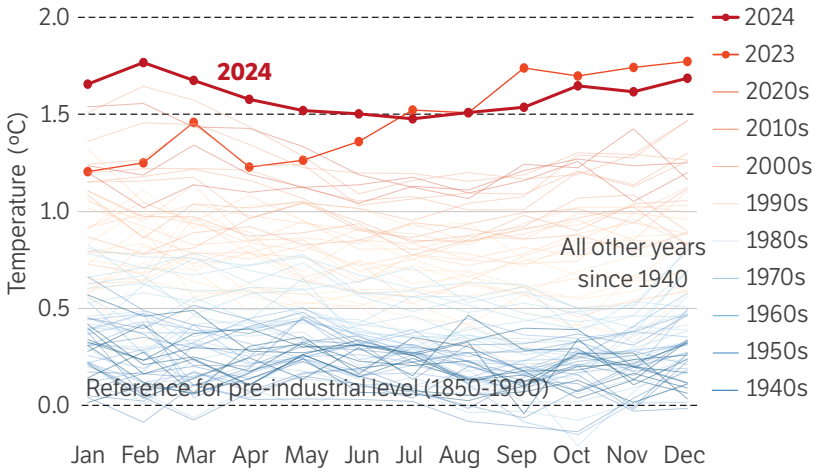


Figure 2: Global surface air temperature increase (˚C) above the average for the pre-industrial reference period (1850–1900) for each month from January 1940 to December 2024 (Source: https://climate.copernicus.eu/)

All bottom-up (driven locally and nationally) energy transition scenarios predict that average warming will reach 1.5˚C before 2035, aligning with IPCC expectations[6].

For an overview on why the climate is changing here are some useful resources:

Overview of Climate Change Science | Climate Change Science | US EPA

Overview (climatechangeinaustralia.gov.au)

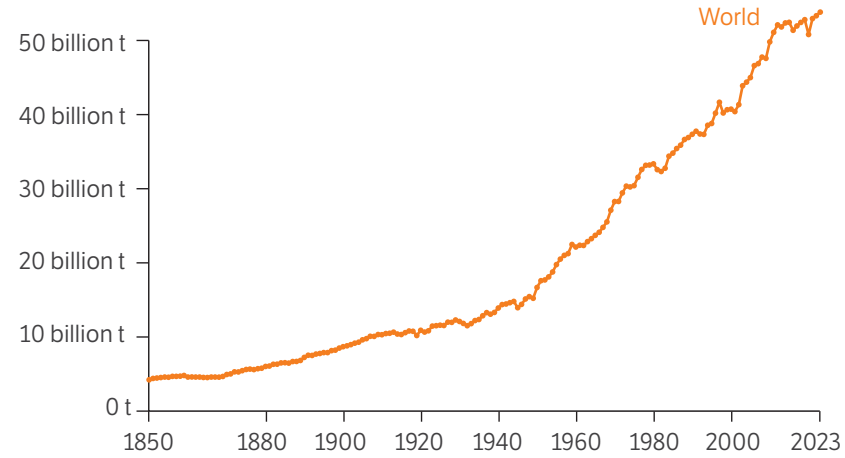
What is Climate Change? | Start Here (youtube.com)

CSIRO State of the Climate

It is important to appreciate that changes driven by the shifts in the climate are mostly not linear. Many systems, including the climate system itself, have tipping points or thresholds, and when pushed beyond these thresholds they enter a new state. Humanity is in grave danger of pushing the climate system past a point where our ability to reverse the changes now at play are lost due to the system entering a runaway phase driven by positive feedback loops. The trouble with these tipping points is we only know we have crossed them after we have done so. We may be already dangerously close to this threshold.

Greenhouse gas emissions

Greenhouse gas emissions include carbon dioxide, methane and nitrous oxide from all sources, including land-use change. They are measured in tonnes of carbon dioxide-equivalents over a 100-year timescale.



Note: Land-use change emissions can be negative.

Figure 3: Despite ongoing calls for urgent action, the world is still on a dangerous trajectory of increasing greenhouse gas emissions. The small dip at the top of the curve was due to COVID 19. Source Jones et al. 2022[7].

Global temperature trend from 12,000 years ago to present today

Temperature deviation (°C) from 19th Century average
Data: Kaufman et al., 2020

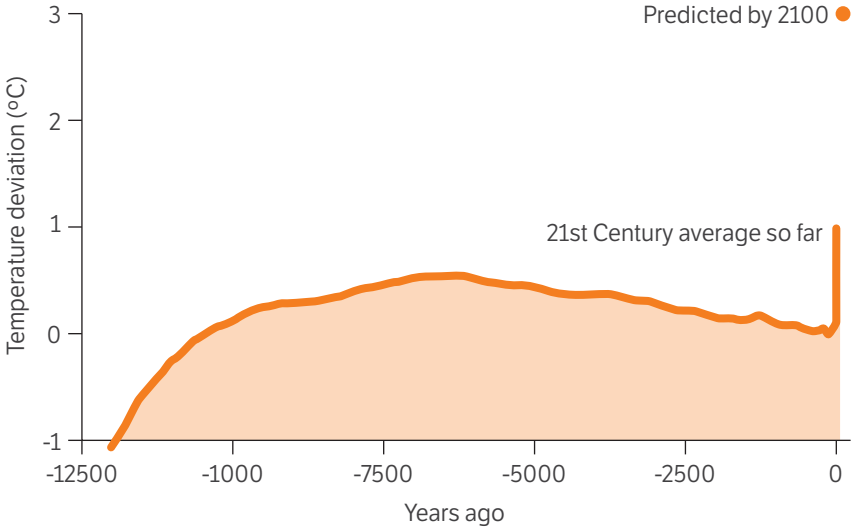


Figure 4: The recent marked increase in average temperatures over the past 12,500 years is very clear[8].

Where are we at globally in tackling the need to reduce the addition of further greenhouse gases into the atmosphere?

The United Nations Environment Program (UNEP) 2023 Production Gap Report states "Governments, in aggregate, still plan to produce more than double the amount of fossil fuels in 2030 than what would be inconsistent with limiting baseline warming to 1.5°C[9].

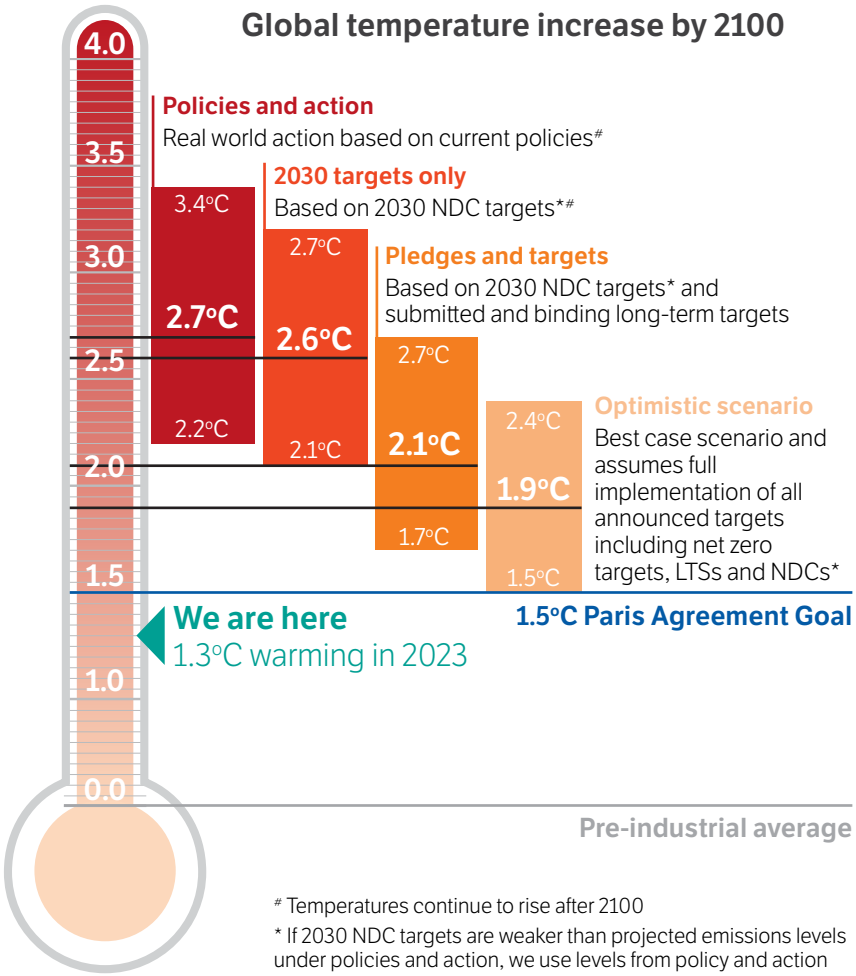


Figure 5: Under current global emissions reduction policies, we are likely to see global average temperatures increase around 2.7°C, well into the territory of dangerous climate change[10].

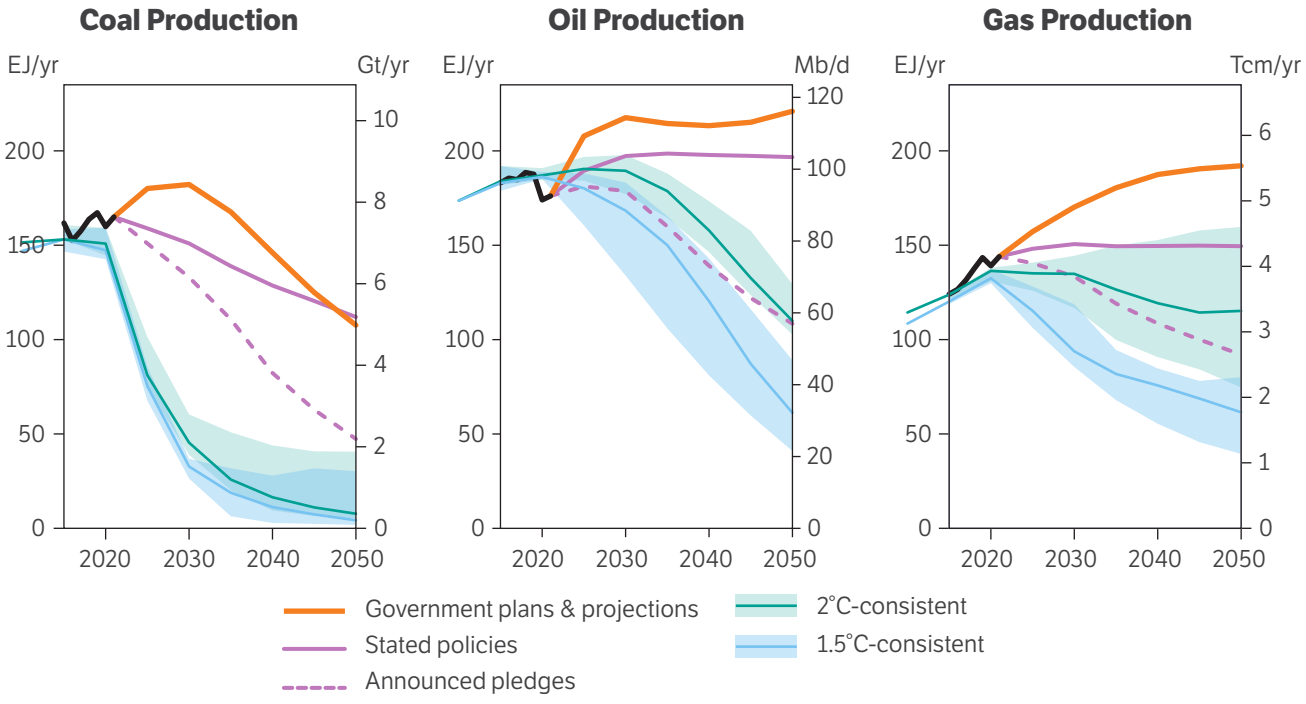


Figure 6: The gap between emissions required to achieve the Paris Agreement target of 1.5 degree compared to global plans and projections for coal, oil and gas production[11].

What are the current climate trends for Australia and the Torres Strait?

Australia's mean annual temperatures across the land have been increasing in pace with mean global temperatures. Tropical, low-lying islands like those in the Torres Strait, are particularly vulnerable to even small changes in climate.

Australia has committed to reducing it's greenhouse gas emissions by 43% below 2005 levels by 2030[12] and the Queensland Government has an emissions reduction target of 75% below 2005 levels by 2035[13].

There is a certain amount of climate change now already locked into the climate system. This means that even under the most ambitious emissions reduction actions we are still going to see some level of ongoing climate change impacts. The longer we delay reducing emissions the more severe these impacts are likely to be and the longer it will take to try bringing the climate system back to a safe equilibrium.

Observed and expected impacts for the Torres Strait

Sea level rise

The threats posed by sea level rise and extreme weather on the low-lying coastal communities weighs heavily on the minds of Torres Strait Islander people. There is concern about how this will impact homes, livelihoods, culture, and burial sites of ancestors.

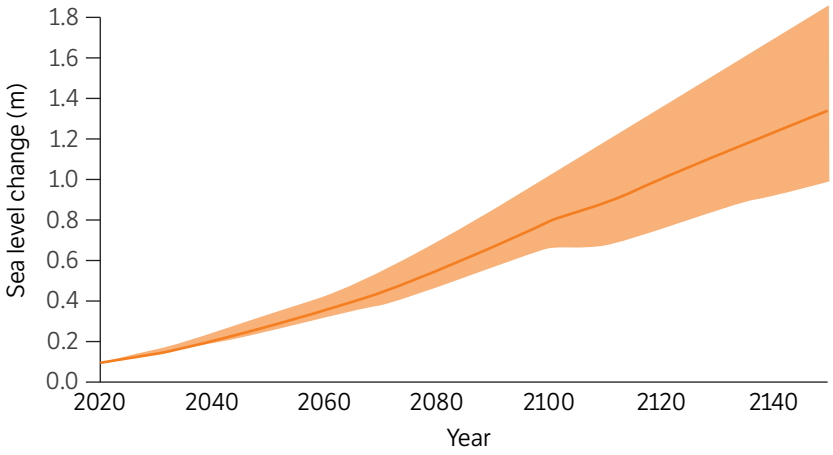


Figure 7: IPCC AR6 global average (m) sea level rise projections for high emissions scenario.

Sea levels in the region are increasing at a rate of around 6mm per year[14] and will continue to rise into the future. There is considerable uncertainty on future sea level projections (Figure 7) given the many influencing factors. Globally the rate at which sea levels are rising is currently increasing at a global average of 4.4mm per year[15], compared to a rate of 1.3 mm year between 1901 and 1971[16].

IPCC AR6 WGI report (2021) projects a likely range in global mean sea level rise by 2100 between 0.44m and 0.76m under the intermediate GHG emissions scenario (SSP2-4.5), and between 0.63m and 1.01m under the very high GHG emissions scenario (SSP5-8.5). Higher levels outside the likely range are possible and can't be ruled out e.g. approaching 2m by 2100 or 5m by 2150 under continued very high emissions[3].

The World Climate Research Programme released a report in late 2022 suggesting the high-end scenarios are more likely to be about 30cm lower than the IPCC projections, though sea levels will still continue to rise for several centuries[17], stabilising at +2 deg is expected to lead to 2 to 6m of SLR over centuries.

Queensland Future Climate SLR projections for the Torres Strait for 2100 range between 55cm-90cm for high emissions scenario compared to 1995-2014, noting higher values are possible.

Even under these lowest level sea level rise scenarios, there will be significant impacts in the Torres Strait, exacerbating coastal erosion, flooding and progressive permanent inundation of some sites. Estimates done by coastal engineer Stuart Bettington based on IPCC scenarios SSP3-7.0 indicate that mean sea levels for Boigu Island could be 1.04m above the 1900 levels by 2050 and by 1.53m above the 1900 levels by 2100. These are mean sea level rise values. Storm tide values on high tides are considerably higher but far less frequent. Long -term strategic planning and major associated investment is required to respond to these changes.

Ocean acidity

As carbon dioxide (CO_2) levels in the atmosphere increase, so too do the levels of CO_2 in the oceans, resulting in their increased acidification (drop in pH). Whilst ocean acidification is more pronounced in cooler waters, coral reefs are very sensitive to changes in pH. Limited data from the Torres Strait supports observed decline in pH in the Great Barrier Reef region[18]. Oceans around Australia are acidifying 10 times faster than at any point in the last 300 million years. When coupled with ocean warming and deoxygenation, this is putting considerable pressure on our marine environments[19]. Ocean acidification is the greatest longer-term threat to coral reefs as well as to many other marine organisms that rely on calcium carbonate to build their protective structures.

Ocean acidification is the greatest long-term threat to coral reefs

The **oceans are also becoming warmer** and there are more **marine heat waves**. Warming of ocean waters as multiple impacts on marine life including a reduced capacity of the water to hold oxygen. Many marine species are shifting their distribution to try and stay in their thermal comfort zones with significant implications for marine ecology and for fisheries. There has been a significant increase in ocean heat stress recently compared to the changes over the past 40 years[20,57].

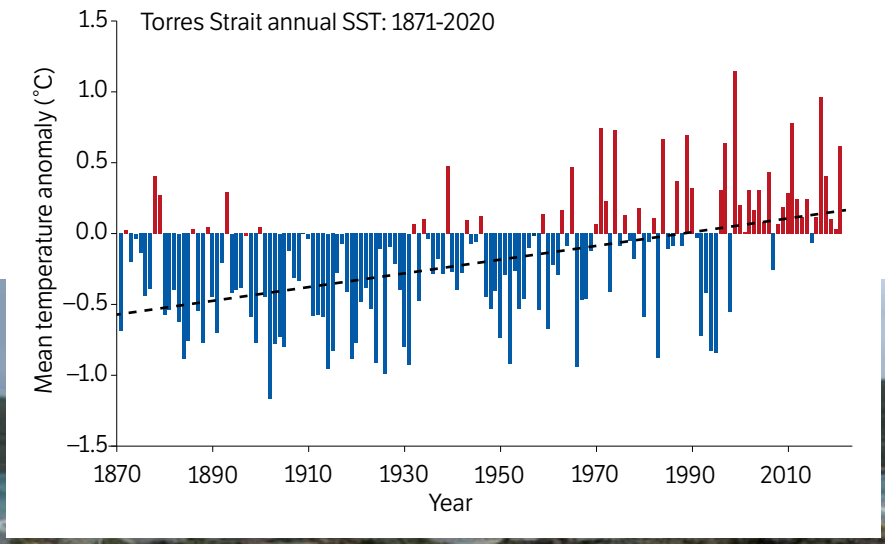
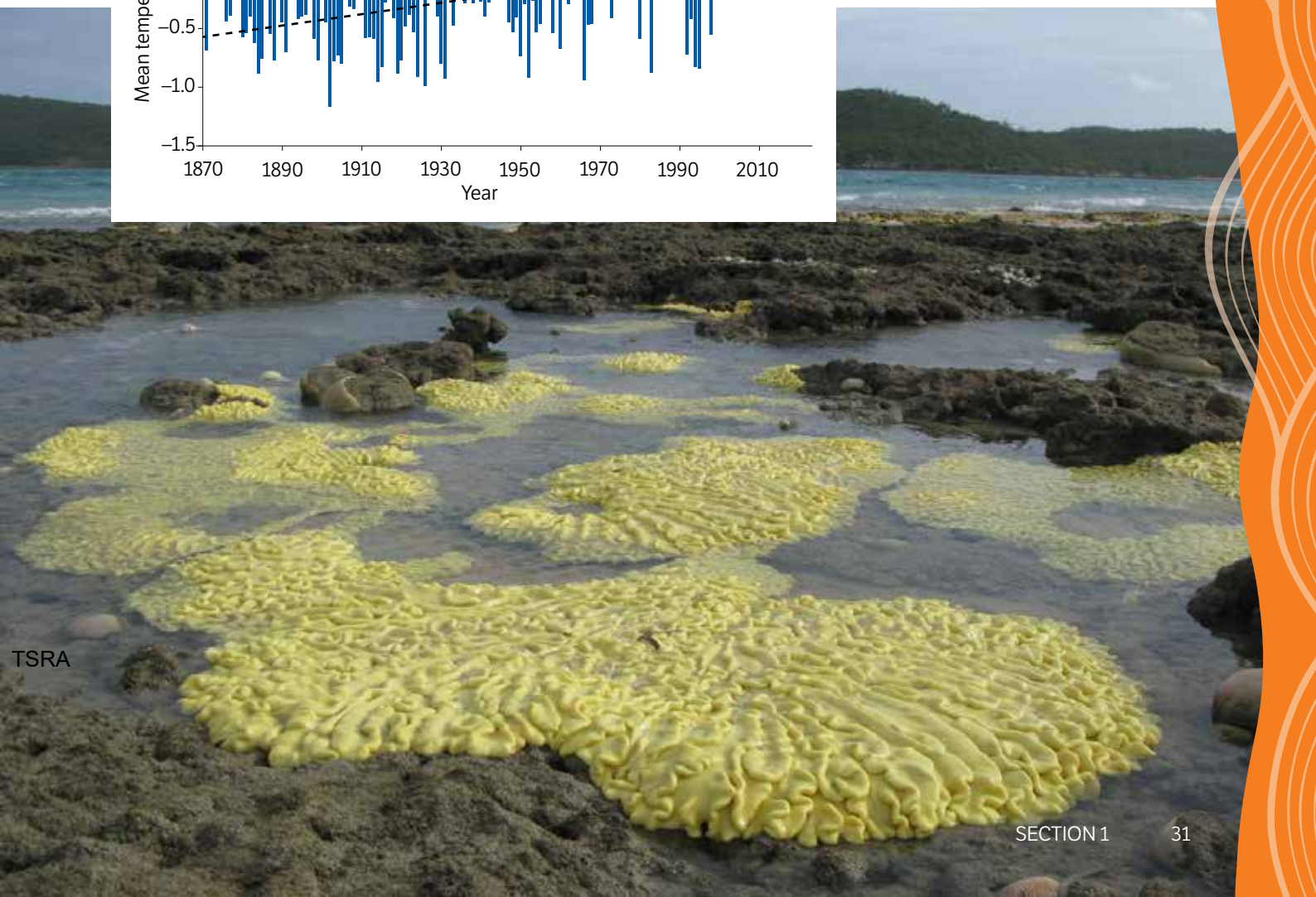


Figure 8: Changes in annual sea surface temperatures in the Torres Strait showing an increasing warming trend (Australian Institute of Marine Science).



TSRA

Increases in mean surface temperature

More hotter days, as global average temperatures increase, we will continue to see an increase in periods of hotter than normal days and more hot days per year. By 2090 under current projections, it is likely that in the Torres strait days over 35 degrees will increase by around 39 days a year by 2090.

Visit Regional Explorer | LongPaddock | Queensland Government (https://www.longpaddock.qld.gov.au/qld-future-climate/) for up-to-date climate change projections for Queensland, including the Torres Strait.

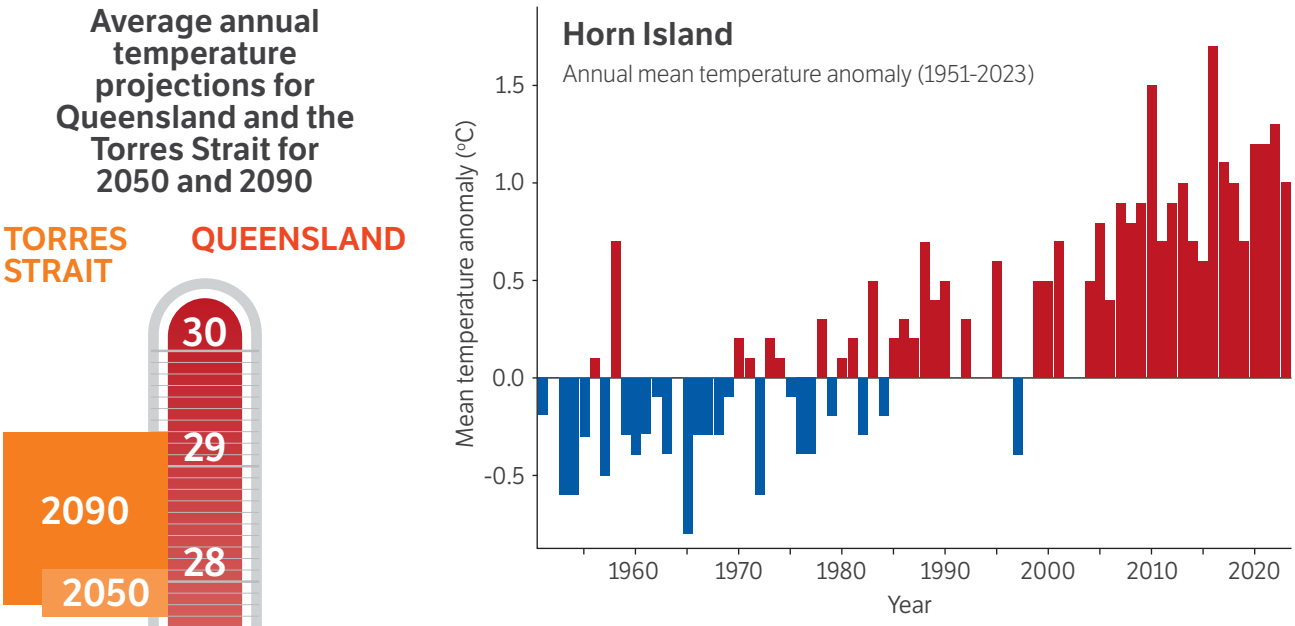


Figure 9: Data from the BoM weather station on Horn island indicates a clear trend of increasing mean annual temperature by approximate 1.5°C over this period. Source: Bureau of Meteorology

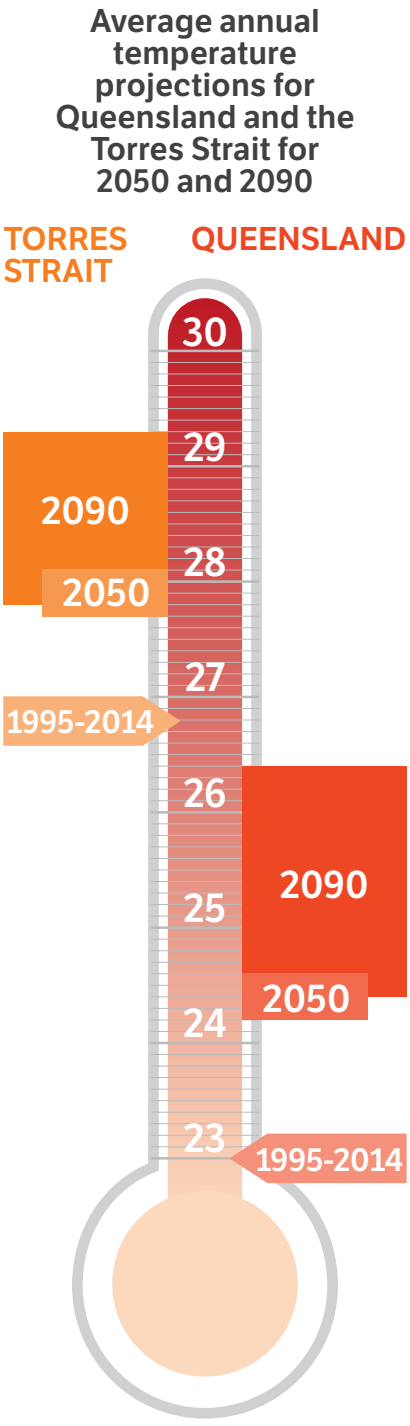


Figure 10: Projected increases in average annual temperatures for the Torres Strait compared to all of Queensland. Values show the likely changes for low (SSP1-2.6) and high (SSP3-7.0) emissions scenarios compared to the 1995-2014 baseline value. (Source: Queensland Future Climate)

Extreme heat

Heatwaves are uncommon in the region, but the high humidity levels help create high risk of heat stress conditions.

Rainfall variability

While overall annual rainfall is unlikely to change very much, when it does rain it is likely to come in more intense shorter bursts. If we are not prepared for this, it can lead to localised flooding and damage.

Hydrological drought /A longer dry season

Conversely, the period when it does rain is likely to shrink and the dry season is likely to be longer. Overall variability in the weather and seasons is likely to increase.

The region's fisheries and marine species and ecosystems are also highly vulnerable to climate change impacts as water temperatures, water chemistry and currents shift, and ocean levels rise.

There are shifts in the seasonality of weather patterns. In turn, this is impacting the fruiting and flowering of some plants and the movement of many birds and animals, causing great disruption to traditional knowledge systems (Figure 11).

Low-lying coastal settlements, community health and wellbeing, water and food security, fisheries, coastal and marine ecosystems and species are the values and systems most exposed to these risks.

Figure 11: Erub traditional seasonal calender captures traditional ecological knowledge relating to the seasonality of weather patterns and plant and animal movements and activities. Climate change is now shifting these patterns in ways that often sit outside local current and historic experiences. © Erub RNTBC and TSRA Land and Sea Management Unit, 2021. This Calendar cannot be reproduced without consent of Erub RNTBC

For tropical cyclones there is a trend towards fewer but slower and more severe storms. As the tropical zone expands due to climate change cyclones are also moving further south[20].

Many Torres Strait communities and cultural sites are at risk of inundation, threatening cultural heritage and the continued way of life. Turtle, coral reefs and fisheries like the tropical rock lobster fishery are vulnerable to warmer and more acidic ocean environments. Climate change is impacting many species that have traditionally relied on for subsistence or that have enormous cultural significance.

The third main area of risk concerns the impacts climate change will have on health and wellbeing given Torres Strait people already suffer a disproportionate burden of health impacts compared to mainland Australians.

Warmer temperatures and increases in humidity pose a significant health risk in terms of heat stress, particularly for old people and those with chronic health issues. Warmer temperatures also increase food safety risks. The risk of insect-borne diseases from neighbouring PNG also increases with warmer temperatures. Longer dry seasons are affecting the water security of communities already suffering from water shortages. Warmer temperatures and increased climate variability will also increase the spread of pests and diseases and increase fire risk to sensitive island ecosystems.

These are the main areas of direct climate vulnerability, but the region is also exposed to numerous indirect impacts that flow back into the region from mainland Australia and abroad.

Horn Island wharf submerged under king tides

Miya Isherwood

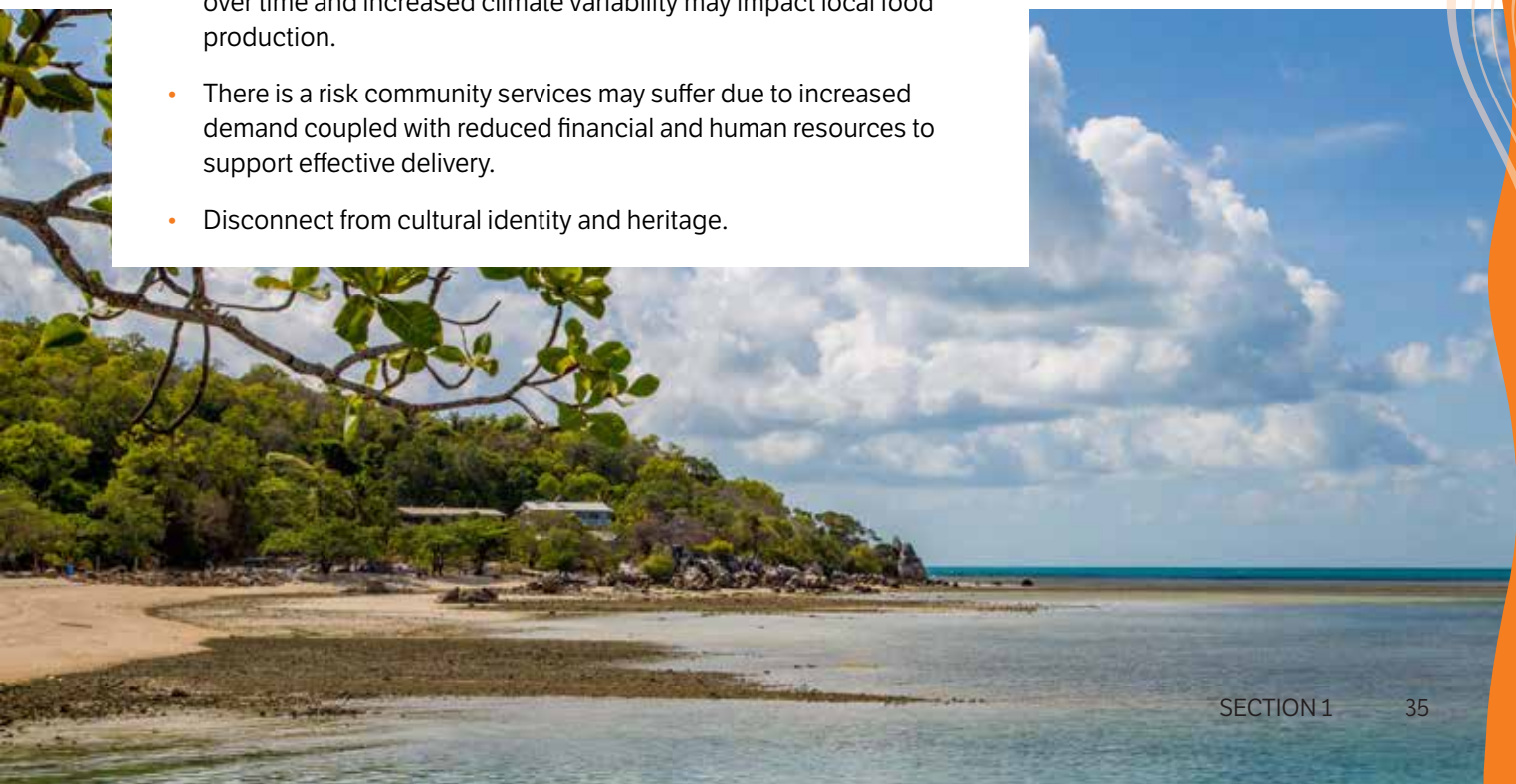
Outlook (What might the future look like?)

The outlook for health and wellbeing:

- Increased heat stress from more hotter days.
- Increased transmission of diseases, such as mosquito borne diseases, and increased reliance on better hygiene standards.
- Increased risk of food related illness due to heat impacts on spoilage and food safety.
- Mental health impacts arising from the possibility of future displacement from some islands or impacts on culture and livelihoods.
- Broader disruptions to economies and infrastructure that divert resources from the health sector and undermine health resilience.

The outlook for communities and *Ailan Kastom*:

- Outdoor activities will become increasingly restricted to cooler times or cooler locations.
- The number of people experiencing financial stress will increase without substantial efforts to reduce cost of living pressures and expand local economies.
- The demand for emergency services will continue to increase in response to direct and indirect impacts of climate change.
- Access to some key marine food resources is likely to decline over time and increased climate variability may impact local food production.
- There is a risk community services may suffer due to increased demand coupled with reduced financial and human resources to support effective delivery.
- Disconnect from cultural identity and heritage.



The outlook for enterprise and the economy:

- Declines in local availability and or productivity of key fisheries species.
- Storm and sea-level impacts on infrastructure that underpins economic activities.
- Increased cost burden for replacement, repair and maintenance of infrastructure.
- Damage to potential tourism assets (natural and built).
- Impacts on productivity from health impacts.

The outlook for land and sea:

- Changes in ocean temperature and chemistry will negatively impact many marine species and ecosystems, in particular coral reefs, seagrass meadows (and therefore dugong) and turtles.
- Increased rainfall in PNG catchments may lead to reduced water quality in the northern Torres Strait.
- Changes in rainfall frequency and intensity, seasons, increased hotter days and risk of bushfires will negatively impact terrestrial (land) plants and animals.
- Sea-level rise is a major threat to mangroves, coastal areas, coastal ecosystems and coastal amenity.

The outlook for infrastructure and services:

- Extreme weather is likely to disrupt services and damage infrastructure.
- Changing temperatures, increased variability and changes in air and ocean chemistry will decrease the lifespan of infrastructure.
- Sea-level rise and storm surge threatens some key maritime, aviation and road transport infrastructure.
- Warmer temperatures and mosquito borne disease pose a risk to water security.
- Increased fire risk is also a threat to some infrastructure.

The people of the Torres Strait appreciate that no matter how well global emissions are reduced from here onwards, the region is still going to experience a wide range of significant impacts due to the changes already locked into the climate system. Some options to maintain many key aspects of the region's ecology, cultural heritage and way of life, are no longer feasible as we move further into this new climate reality.

Some key things to understand about climate change

Understanding climate change and how it might affect us is an important part of increasing our ability to adapt to it.

Here are some important things to understand:

Climate is the longer-term trends in atmospheric conditions, weather is the day-to-day conditions we experience. Changes in the climate have a wide variety of direct and indirect consequences to people and the environment. Whilst climate is about the atmosphere, the ocean plays a major role in regulating the climate.

Climate impacts occur in two main ways:

1. Slow progressive chronic changes to average conditions such as warmer weather and warmer oceans
2. Acute/event driven impacts such as severe storms, floods and heat waves. Event driven or sudden impacts (e.g. storms) get most of the media focus, but the slow changes are also of tremendous significance in terms how they impact people and ecosystems over the longer term such as the impact on the distribution and activities of plants and animals.

Because of the amount of greenhouse gas in the atmosphere already and the time it takes for these gases to leave the atmosphere, some changes are already "locked-in" – in other words even if we stopped pollution tomorrow, we expect sea level to continue to rise for several centuries. How fast it increases and by how much can still be influenced, but a certain amount is now already locked in. Strong action to reduce emissions of GHG's can still help to avoid the worst-case scenarios of climate impacts.

Direct and indirect impacts – many of the impacts that could affect life in the Torres Strait might come from how climate change is affecting areas outside of the region, such as impacts on the national or global economy, or impacts on Western Province villages in PNG. These impacts usually then cause flow on impacts or ripple effects, called cascading consequences. See the example Figure 12.

Saibai seawall

Figure 12: Cascading consequences of climate impacts over time and across sectors as illustrated by increase in heat waves. + means and increase, - means a decrease. Text in blue are examples of adaptive actions (TSRA).

It is possible more than one climate impact might be affecting the region at any one time. From a disaster management perspective there is a risk that critical resources might not be available due to them already being deployed to nearby incidents. It is dangerous to assume only one event will occur at a time.

While there is still limited information on how to take into account such complexity, the scientific community agrees that current impact assessments are likely to be conservative due to insufficient consideration of the compounding, cascading and sometimes transboundary nature of climate risks in development of global climate models[21].

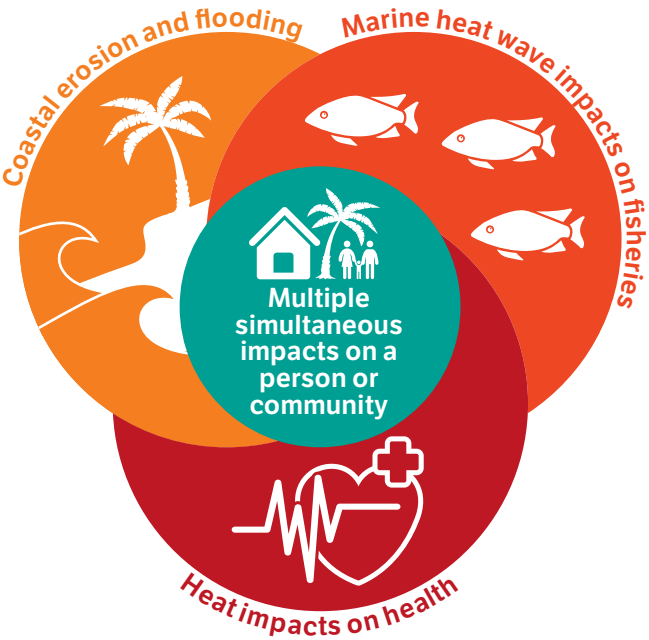
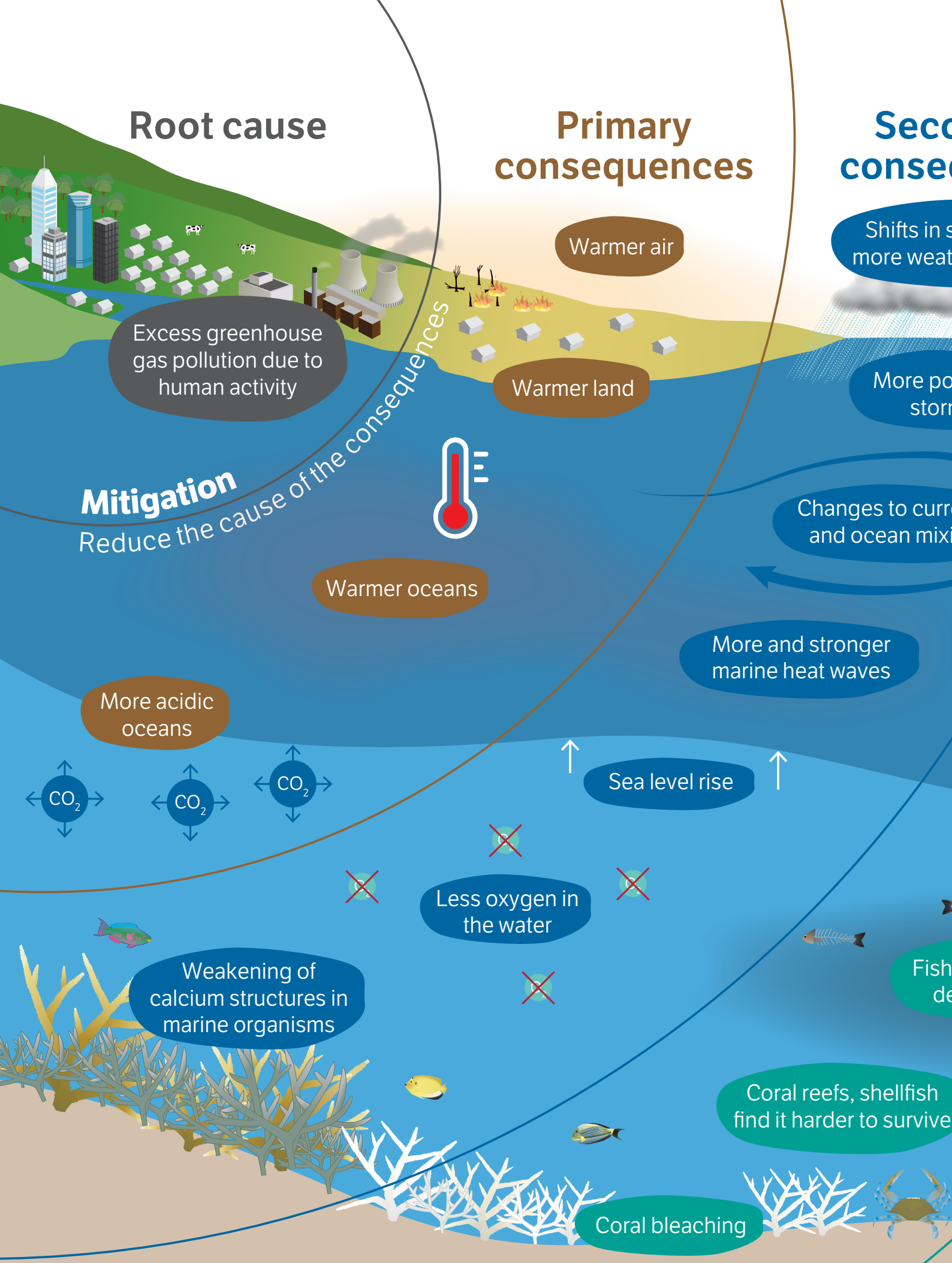


Figure 13: It is likely the region or even one site within the region might be subject to multiple climate impacts simultaneously, putting additional strain on emergency resources and capacity (TSRA).


Root cause
Primary consequences
Seco
conse
Excess greenhouse gas pollution due to human activity
Warmer air
Warmer land
Shifts in s
more weat
More po
storn
Mitigation
Reduce the cause of the consequences
Changes to curr
and ocean mixi
Warmer oceans
More and stronger marine heat waves
More acidic oceans
CO_2
CO_2
CO_2
Sea level rise
Less oxygen in the water
Weakening of calcium structures in marine organisms
Fish
de
Coral reefs, shellfish find it harder to survive
Coral bleaching

ondary
quences

seasons and
her variability

werful
ms

ents
ing

Primary impacts

Salt water contamination of ground water

Coastal erosion

Coastal inundation

Feminisation of turtle population

Loss of turtle nesting sites

Secondary impacts

Impacts on water security

Impacts on island vegetation and ecosystems

Direct impacts on communities, cultural sites and coastal infrastructure

Loss of turtles

Marine species move to cooler waters

kills, ocean
ead zones

Likely decreased fisheries certainty, quality and yield

Loss of coral reefs and certain shellfish

Adaptation
Try to reduce the impacts of consequences

Figure 14: This diagram illustrates how the root cause of climate change leads to changes in the climate itself which leads to changes in the environment leading to impacts on species and ecosystems which in turn impacts people as well (TSRA).

Table 1: Climate change affects people and the environment in many different ways. This table shows the various changes that occur due to greenhouse gas pollution and how their impacts vary for different sectors in the Torres Strait. Sea level rise impacts on the coasts tends to be the main issue that gets attention, but the impacts are far broader as highlighted here.

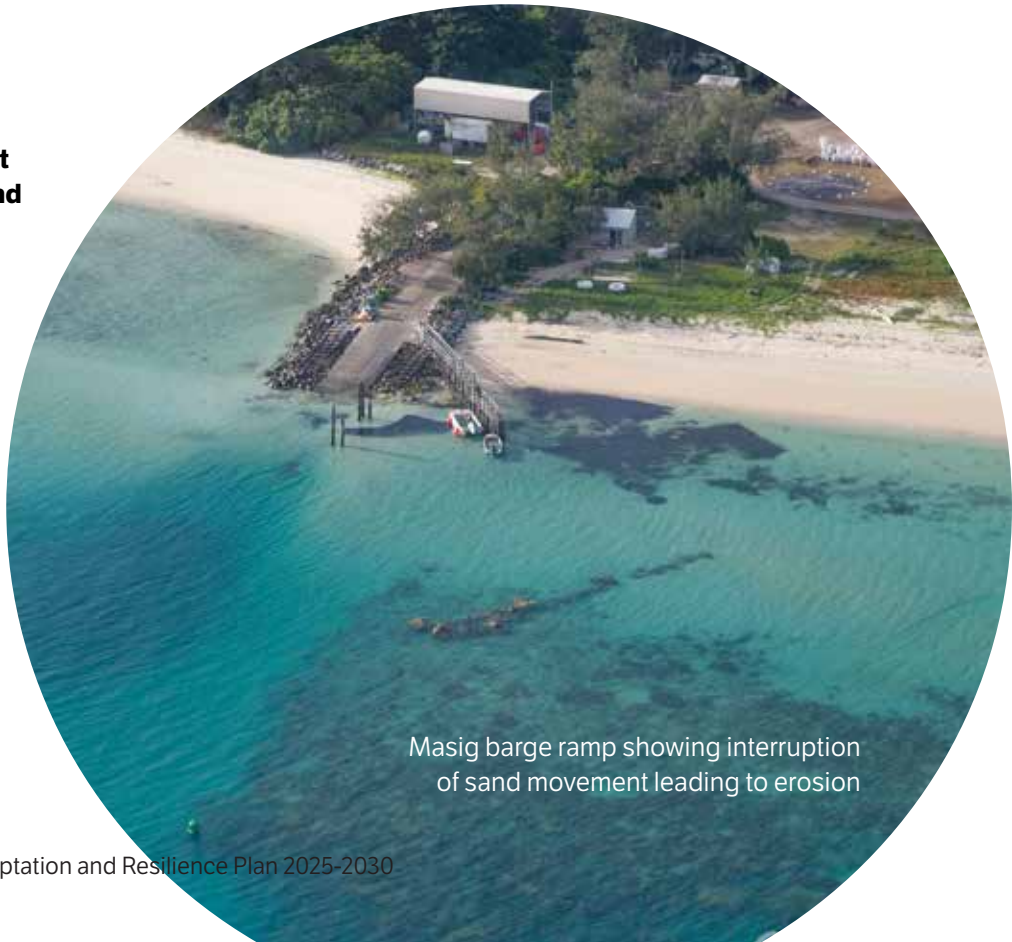
	Hotter weather	More hot days	More variable rainfall	Intense storms	Sea level rise	Shifts in seasons	Warmer oceans	Marine heat waves	Ocean acidity	Changes in ocean currents
Physical health	High	High	Medium	Medium	Medium		Medium			
Mental health	High	High	Medium	Medium	High			High		
Culture and cultural sites	Medium	Medium	Medium	Medium	High	Medium				Medium
Water security	High	High	High	Medium	Medium	Medium				
Buildings and infrastructure	Medium	Medium	Medium	High	High					
Fisheries	Medium		Medium	Medium	Medium	Medium	High	High	High	High
Corals			Medium	High	Medium		High	High	High	High
Turtles	High	High		Medium	High	Medium	Medium	Medium	Medium	
Marine ecosystems and species			Medium	High	High		High	High	High	High
Land ecosystems	Medium	High	High	Medium	Medium	Medium				
Community gardens and local food security	Medium	Medium	High	Medium	Medium	Medium				

High risk

Medium risk

Low/no risk

It is usually the extreme events that drive change, and while background trends of increasing sea level and increasing temperatures might be increasing incrementally, its possible major events will cause major disruptions to communities and ecosystem before the background values reach dangerous levels.



Masig barge ramp showing interruption of sand movement leading to erosion

Opportunities for the region

Despite the risks, vulnerabilities and challenges, communities still have the potential for a strong and vibrant future through building resilience and adaptive capacity and harnessing the strengths of culture and the region's natural values.

The Torres Strait has the potential to develop the governance, skills and products and processes related to climate adaptation and resilience that could serve as a model for other remote and Indigenous communities in Australia and abroad.

Whilst the region's prospects are relatively dependent on factors external to the region, there is enormous potential within the region to ride the wave of change to a strong future. This will require visionary leadership, collaboration, flexibility, innovation and ongoing support from all levels of government to assist us in this transition.

The region has a strong foundation to build on it in terms of its work on responding to climate change. Through the establishment of the Torres Strait and Northern Peninsula Climate Resilience Centre (TSNPACRC) this work can be expanded to further develop the thinking, tools and strategies needed to support Indigenous communities within the region and beyond to respond to climate change in ways that are supported by their culture and build their strength to thrive in a changing world. The Centre has already established a grants program to fund local resilience officers and local adaptation projects within the region and will continue to expand coordinated climate change activities.

The small size of communities in the region makes them ideal for developing sustainable resilient ways of living with lessons for others larger communities, where testing integrated whole of community change is far more difficult. If new settlements need to be created, they provide a great opportunity for new design and innovation to improve sustainability, liveability and resilience.

Tourism provides an opportunity for local employment and can help to stem the potential flow of young, educated people out of the region. It can help bring in resources to support adaptation. A lengthening of the dry season may expand the region's tourism season.

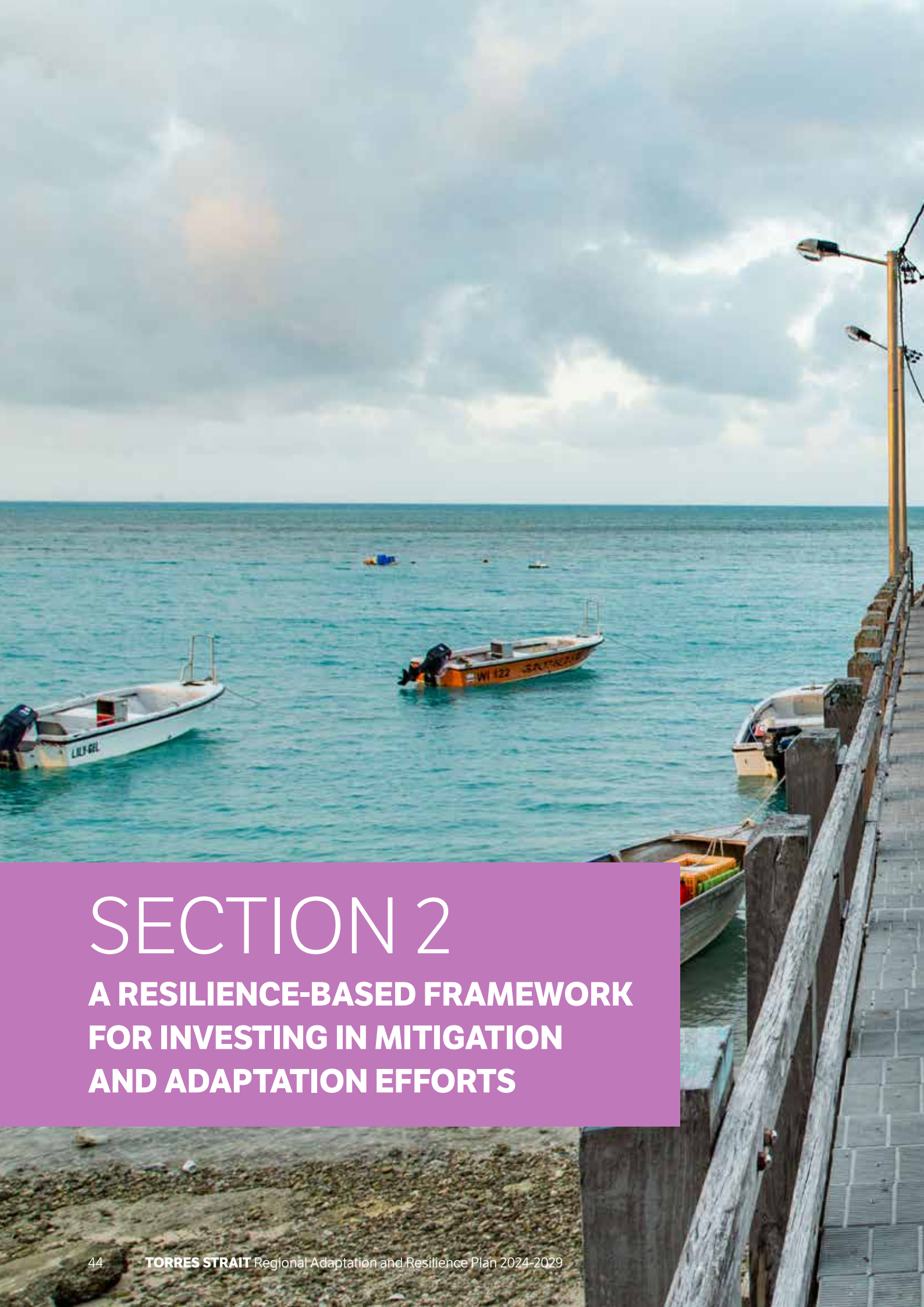
Climate change impacts are likely to see a rise in investment in infrastructure and engineering services in the region. Increased sea-levels, rising temperatures, storms and changes in rainfall will all require increased investment in infrastructure construction and repair.

There are opportunities to continue to build the capacity of local people to undertake the planning, design, construction and / or repair of infrastructure to help build the local economic base and to reduce the region's dependence on outside support. There are risks for the region associated with the high cost of infrastructure in remote areas and local capacity to meet the demand on skilled labour and professionals in this area.

A transition to reliable clean energy will open many new opportunities in the region to help keep homes cooler, create new employment opportunities and enable to transition to cleaner transport, food and water production.

Communities are still well connected to their culture and their environment, and through an integrated approach the region can demonstrate how to respond to climate change whilst making culture and communities stronger and more vibrant. A focus on resilience as outlined in the Plan provides a strategic lens through which can be developed this new approach to integrated sustainable development that brings together the best of ancient wisdom with new technologies and ideas to build strong foundations for the region's children's future.

See Appendix for more detail on climate change impact drivers and adaptive potential.



SECTION 2

A RESILIENCE-BASED FRAMEWORK FOR INVESTING IN MITIGATION AND ADAPTATION EFFORTS


DATHU-BOY

In this updated version of the Plan, the focus has shifted to respond to growing calls from Torres Strait Islander people to play a lead role in shaping future climate strategies for the region and their communities - in a way that showcases Indigenous-led adaptive approaches and pathways that revitalise and draw upon the strengths of our unique culture and traditional knowledge systems.

Climate change is not one of those problems that can be fixed. It requires ongoing attention and continuous action – all taking place in high levels of uncertainty and complexity. Responding to climate change requires more than just addressing specific climate risks. This Plan adopts a resilience approach as its conceptual foundation and has been built around the fundamental aim of building climate resilience into all facets of life and development in the region guided by a deep connection to country and based on the following 4 core aspirations:

1. Health and Wellbeing of people and country
2. Cultural identity retention and a desire to continue to occupy traditional lands
3. Sustainability
4. Empowerment

These are broad aspirations that appear frequently in official documents and are raised in community and regional workshops as ideals.

The impacts of climate change cascade across space and time, across sectors, borders and cultures. As such, the focus must be on how to continue to transform thinking and governance from business-as-usual, to the thinking and practice required to achieve these collective aspirations.

One sign of success would be the end of dedicated climate change adaptation and resilience planning due to the proper integration of the conceptual thinking into all aspects of decision making in the region. So long as responding to climate change is viewed as an add- on to business-as-usual and relegated to being an environmental issue, plans such as this will be of limited effectiveness.

This section of the Plan outlines what is meant by a resilience approach and introduces a Torres Strait Climate Resilience Framework to guide the response over the next five-year period. Interpreting the framework will require understanding some terms that might be new to stakeholders of this Plan. A brief glossary is included below.

Explanation of key concepts used in the Plan.

What is adaptation and what is climate resilience?

Adaptation is a process of changing in order to respond to changes in our circumstances and surrounding environment. Effective adaptation maintains or improves functionality and reduces vulnerability.

Vulnerability is exposure and sensitivity to harm or danger from a threat. For example, houses or other infrastructure located on the foreshore may be vulnerable to sea level rise due to where they are built (exposure to the threat by being on the coast) and how they are built (sensitivity by being built on the ground rather than being raised). Vulnerability can be reduced in two ways:

1. by reducing exposure and reducing sensitivity to the threat; and
2. by mitigating the threat.

Although the terms are not exact opposites, as a general rule, vulnerability is lower where resilience is higher.

An adaptation pathway is a proactive timeline of activity to reduce vulnerability and improve functionality much like a transition plan. However, it is designed to cater for current uncertainties that may be clearer later down the track. As such it has inbuilt trigger points at which changes of direction of key choices between strategies and or actions will need to be taken. There are a number of these pathways in the 2016 Plan and it is intended to develop them as attachments to this Plan where possible. Adaptation as it is used in this anthropocentric sense is a much more hopeful, optimistic idea than simply coping with change.

Maladapted or out of fit situations are those where resistance to change or change in the wrong direction either doesn't alter critical vulnerabilities or makes them worse and limits functionality. In these cases, communities and the ecosystems on which they depend are forced to cope as best they can.

Adaptability (sometimes known as adaptive capacity) is the capacity to respond effectively to changes in our environment and to proactively shape adaptations towards agreed aspirations. Adaptability is dependent on:

1. the quality, range and availability of resources required.
2. learning and creativity that can convert observations, accumulated knowledge and reflection into new opportunities and innovation.
3. the ability to self-organise including at times when formal leadership and structure breaks down under stress.
4. agency (conversion of will into action) to get things done when required.
5. the openness and flexibility of thinking and institutions to embrace new situations and ideas.
6. social identity which influences all of the above. Source Cinner et al, 2018[22].

Adaptation potential there is often a difference between the potential for adaptation and the amount of adaptation that can be delivered. Humans generally have very limited capacity to enhance the adaptive potential of ecosystems other than reduce stressors on them or increase connectivity of fractured parts. There is enormous adaptive potential in human systems such as responding to sea level rise through engineering, relocation, redesign of settlements and infrastructure, raising builds and ground levels and so forth – the main limitation is access to the resources to do this.

Resilience as a characteristic can be applied to many different things, from manufactured items, ecosystems, people, sporting teams, whole communities and so on. It relates to the properties of these things when they are subject to forces that change them, how easily they are disrupted and how well they recover or maintain their function.

It is a very difficult thing to measure for a region or community and depends on:

1. What internal ability there is to resist change forces (its vulnerability);
2. How much internal capacity there is to adjust and adapt;
3. The supportiveness of the systems around it.

Coconut palms are an iconic part life in the region, and provided a useful metaphor for resilience. An animation outlining the Torres Strait Resilience Initiative using the coconut palm can be viewed on the TSRA YouTube account. The metaphor is explained in more detail in the community resilience section.

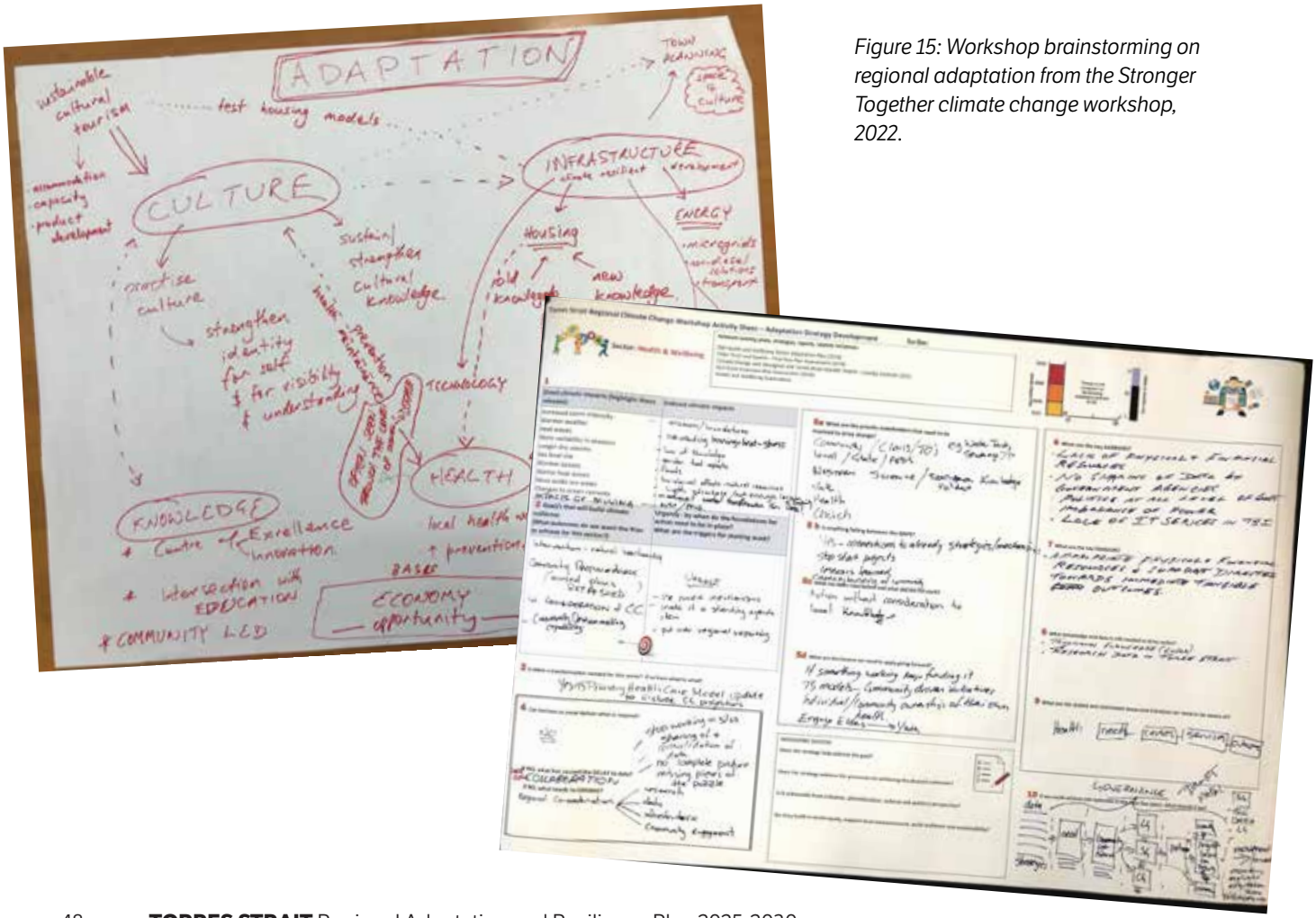


Figure 15: Workshop brainstorming on regional adaptation from the Stronger Together climate change workshop, 2022.

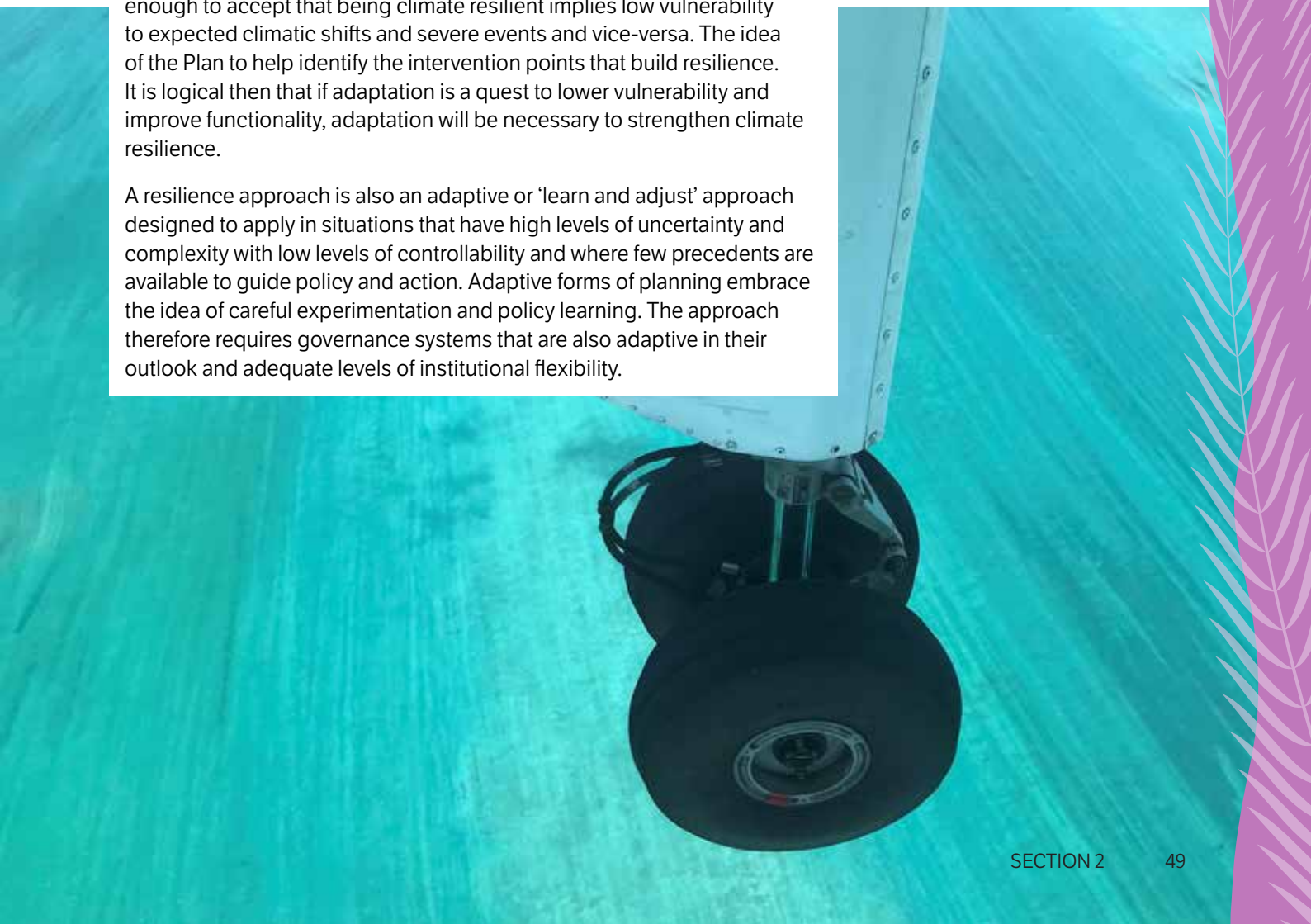
Things we need to know about using the concept of resilience

- there are many usages and interpretations of the concept of reliance e.g. its use in engineering is different from its use in ecosystem resilience and from psychology, though there are commonalities;
- resilience is not a permanent attribute and can diminish over time or be strengthened;
- tipping points or thresholds are important parts of resilience and can cause abrupt changes which are sometimes irreversible;
- resilience in principle does not always translate into resilience in practice i.e. when it is required in times of shock or stress;
- there are two types of resilience – specified resilience which is resilience of something to a specific shock and general resilience which is some resilience to all shocks, a bit like a generalised insurance policy.

A resilience approach is increasingly being used as a frame for climate change adaptation planning and disaster management in Australia. It is one in which the emphasis on risk, vulnerability and disaster management associated with climate change is shifted from post-event recovery to investing in strategic, proactive, coordinated and planned resilience to prepare for, respond to and recover from both slow climatic regime changes and severe events.

Resilience and vulnerability are not exact opposites, but they are close enough to accept that being climate resilient implies low vulnerability to expected climatic shifts and severe events and vice-versa. The idea of the Plan to help identify the intervention points that build resilience. It is logical then that if adaptation is a quest to lower vulnerability and improve functionality, adaptation will be necessary to strengthen climate resilience.

A resilience approach is also an adaptive or 'learn and adjust' approach designed to apply in situations that have high levels of uncertainty and complexity with low levels of controllability and where few precedents are available to guide policy and action. Adaptive forms of planning embrace the idea of careful experimentation and policy learning. The approach therefore requires governance systems that are also adaptive in their outlook and adequate levels of institutional flexibility.



History of Torres Strait climate change responses

The Torres Strait region was an early adopter of a resilience approach. It first started raising awareness of the importance of resilience and its partner concept adaptive capacity (adaptability) in its 2014 Climate Change Strategy and consolidated implementation of the approach in its 2016 -2021 Torres Strait Adaptation and Resilience Plan.

The 2016 plan was a pioneer in this relatively new space and received accolades for its structure and content. The history of responses to climate change in the Torres Strait region is shown in Figure 16. The 2016 plan acknowledged some potential challenges around applying resilience as a policy frame including the tendency within climate change responses to focus on the technical dimensions of vulnerability reduction (the "hardware") and to ignore the deeper systemic factors that can enable and/or inhibit successful adaptation (the "software" and the "orgware" to support it).

Communication of how resilience works and even what it is in enough detail and depth to be useful as a policy frame particularly in participatory planning, has also been a long-standing issue.

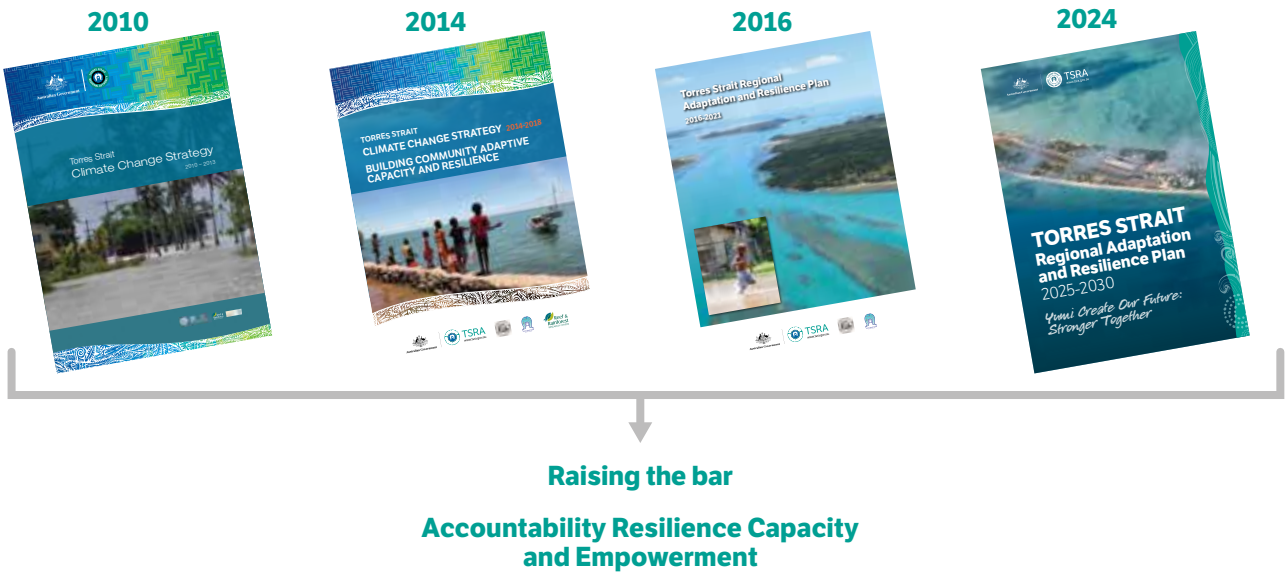


Figure 16: Shows the history of shared climate change planning in the region.

Progress since the first edition of the Plan

This Plan updates and builds upon the Torres Strait Regional Adaptation and Resilience Plan 2016-2021, which in turn was built on the earlier Torres Strait Climate Change Strategies of 2014-2018 and 2010-2014.

This Plan represents a synthesis of information collected during a series of community and regional workshops and consultation processes with Traditional Owners, elected leaders, government and sector-based partners in the course of implementing the original Regional Adaptation and Resilience Plan over the previous six years (2016 - 2022). The updated Plan draws on recent reports, local level plans, research outcomes and other expert and community input. Based on the approach, outcomes and lessons from the earlier Plan, this Plan highlights the current climate change risks, impacts and projections for the region, and identifies a series of contemporary goals and strategies to address climate risks in way that builds capacity and enhances resilience across key aspects of the Torres Strait.

The original Plan has been an important document for setting regional direction and priorities since its endorsement in 2016. Of the 122 actions, approximately a third have been completed, a third are in progress and a third have not yet been started (see Figures 17 and 18).

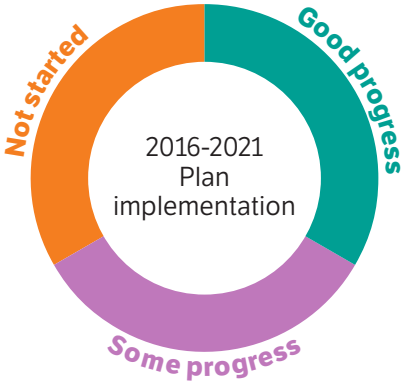


Figure 17: Overall progress in implementing actions under the Regional Adaptation and Resilience Plan 2016-2021

Significant progress has been made in relation to understanding coastal dynamics and implementing coastal defences for priority at risk communities.

Solid progress has also been made in deepening our understand of and responding to climate change in the area of land and sea management. The 2021 Torres Strait State of Environment report[23] (www.torresstraitsoe.org.au) highlighted the pervasive threat that climate change poses to the region's natural and cultural values and outlines priority areas for monitoring and action going forward.

There has also been progress in improving the regional response to disaster management, building tools to assess climate responses for fisheries stocks and deepening our understand of climate change risks to health.

Local community adaptation and resilience plans were completed for outer island communities and a Resilience Framework for the Torres Strait has also been developed (see Section 2). Despite this, there remains a great deal of work to be done to minimise the impacts of climate change and for the region to transform to greater resilience across all domains. This is the focus of the current Plan.

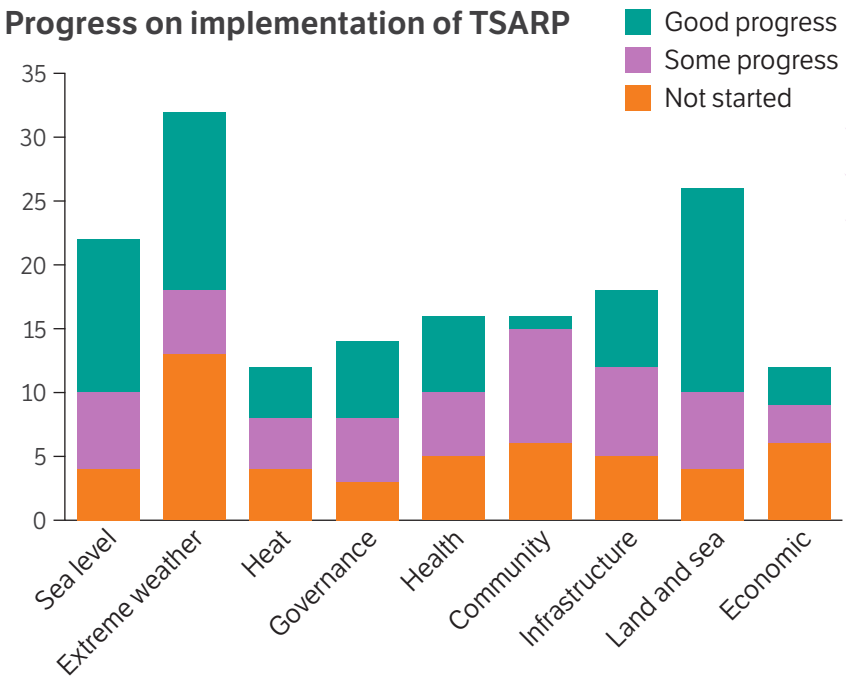


Figure 18: Progress in implementing sector-based actions under the Regional Adaptation and Resilience Plan 2016-2021

The wider adoption of resilience by governments

Since 2016, the Qld Government has also adopted resilience as a strong policy basis for disaster planning and climate responses and is developing resilience-based strategies and plans supported by new institutional arrangements. The rationale for using resilience as frame is to place emphasis on better preparation for disasters rather than focus on recovery post event. The State strategy takes advantage of existing disaster/volunteer management systems based around local governments as decentralised decision-making bodies. The Australian Government now also has a strong focus on building resilience as part of its response to climate change and disaster management (Figure 19).

Experiences so far suggests that:

1. Some conceptual translation of resilience still requires resolution if the approach is to reach its full potential;
2. Education around resilience and its benefits and limitations will be necessary for successful engagement and ownership across all scales of activity;
3. The current emphasis on engineering solutions (getting the "hardware" right) needs to be supported by improved "software" and "orgware" solutions;
4. The influence of culture on adaptation and resilience requires more attention;
5. The lack of empowerment, systemic competition and deeply entrenched path-dependencies will be problematic for successful implementation unless addressed.

In the lead up to drafting this latest version of the Plan considerable time and effort has gone into exploring and addressing these issues/assumptions.

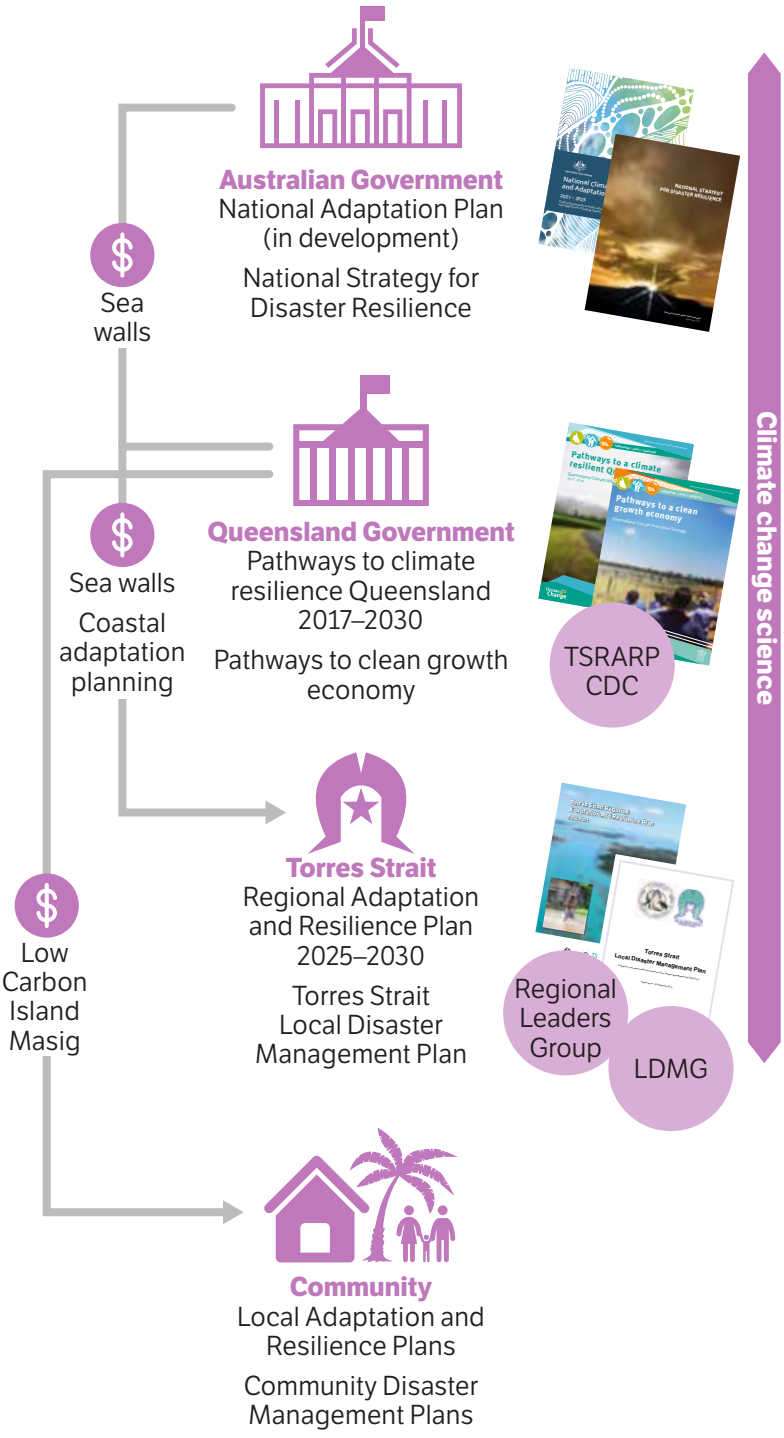


Figure 19: A nested resilience-based policy framework for climate change and disaster management spanning National, State, Regional and Local scales.

Torres Strait resilience framework

One action pathway from the 2016 plan was to deepen understanding of climate resilience and how it might be strengthened for communities and for the Torres Strait region as a whole. An outcome from that initiative is the development of a tailored Torres Strait Climate Resilience Framework which draws on both the literature on resilience and community characteristics in the Torres Strait region.

A framework is just a organising structure for the main components of something which illustrates how the components relate to each other, and provides a flow of logic to guide the reader visually. One of the challenges facing the Plan is to put in place all of the components of this framework within a timeframe consistent with the need for action.

Resilience as a concept arose in the 17th century to describe the capacity of an object to bounce back after an impact. It has since been taken on by many different disciplines - from engineering to ecology and social science - and still fundamentally refers to an ability to recover well from impacts or stress.

In its modern usage, it's more about the ability to absorb and recover from shocks - which might lead to some changes in whatever is being impacted - rather than a focus on returning to the original state after a shock.

In developing the Torres Strait Resilience Framework, we've sought to understand and identify the key attributes and considerations needed to build this ability to maintain and or recover a healthy level of functionality, from the individual scale right through to the regional scale. While we appreciate some things need to change to achieve this outcome, there is a focus on maintaining the important aspects of Torres Strait identity as expressed through culture and attachment to place.

Whilst there are some underlying principles common to all types of resilience (such as having spare capacity), the characteristics that make a person resilient are different from what makes a community, or a sector or region resilient.

Resilience is what is known as an emergent property, it's the outcome of a whole lot of factors working together. It is however also a very practical idea, and there are specific attributes and qualities that can be deliberately enhanced or built into systems that will increase their resilience to shocks and stresses. Understanding where vulnerabilities exist is a good place to start when building resilience.

Why is a resilience framework better than using just an simple adaptation framework? Resilience is a more encompassing framework that includes adaptation – the capacity to adapt to change, but also includes a focus on maintaining the systems identity and its capacity to anticipate and recover from shocks.

The framework is built by linking four key interacting dimensions:

1. **A conceptual dimension** that explains the assumptions that underpin a transition to a climate resilient Torres Strait region (sometimes known as a theory of change);
2. **An institutional (support) dimension** that enables the logic to play out effectively including effective climate governance arrangements to empower Indigenous led strengthening of climate resilience, a policy learning and reporting function and a dedicated space for bringing together Traditional and scientific knowledge about climate change;
3. **A design (foresight) dimension** that provides a participatory space for raising developing and testing potential strategies and adaptation pathways;
4. **A strategic planning dimension** that sets out agreed goals, objectives, adaptation pathways and mitigation opportunities particularly for the next five years for inclusion in the Plan.

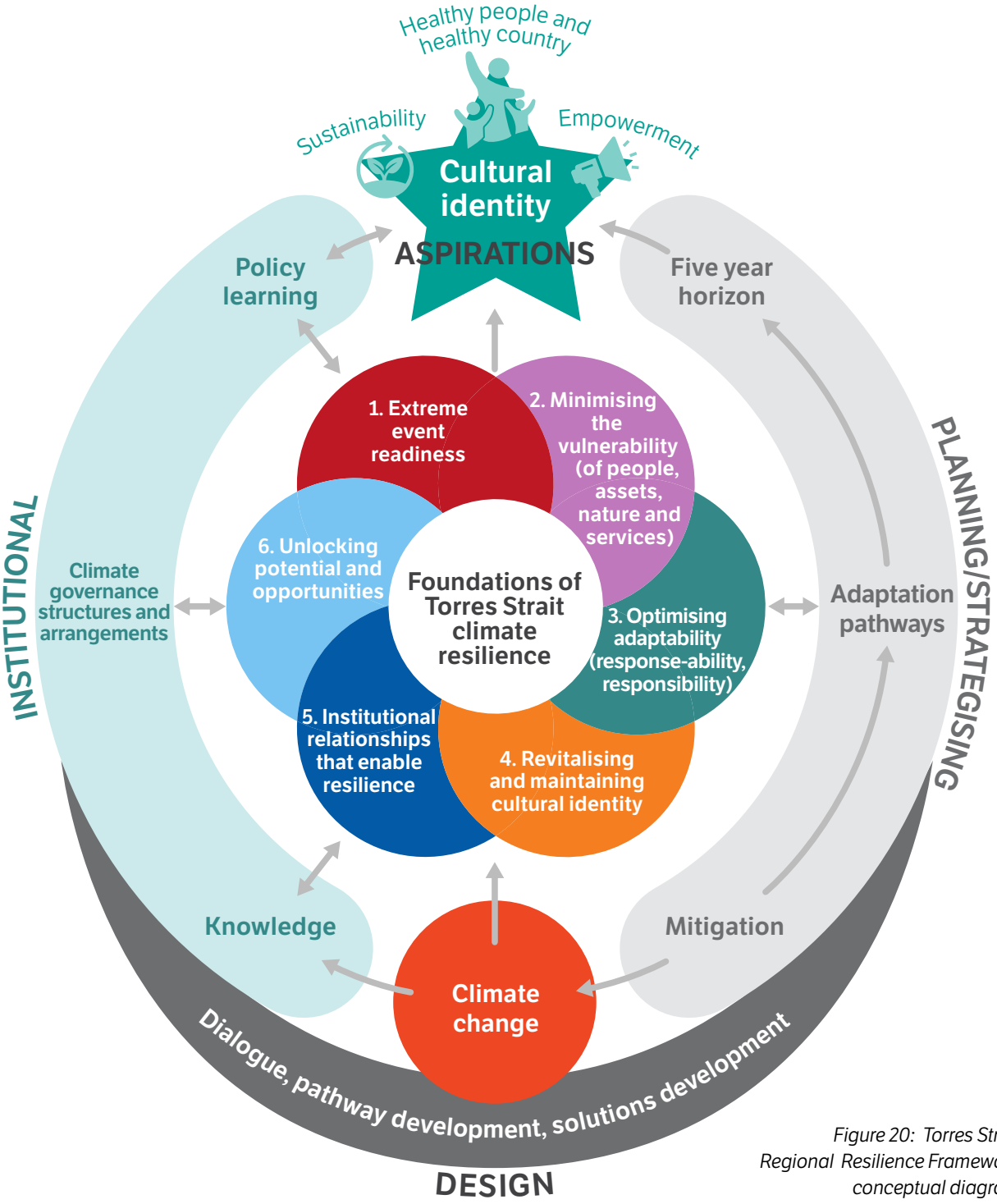


Figure 20: Torres Strait Regional Resilience Framework conceptual diagram

The underlying logic (theory of change)

The main goal of this Plan is to transition to a climate resilient Torres Strait region.

A transition is a practical step by step way of achieving the kinds of significant adaptation required for climate change

A cohesive theory of change helps to identify and understand the best possible and practical way of delivering that outcome and of the factors that need to be taken into account, including how Torres Strait people can take a leading role. The logic behind the framework was developed after reflecting on implementation issues with the 2016 plan and grounded through pilot work with Masig and Mer communities related to local scale resilience planning, as well as from regional scale workshops such as the 2019 Torres Strait Strategies Issues Interagency Forum and the 2022 Regional Adaptation and Resilience workshop.

The logic includes:

1. The logic starts by realistically framing climate change as an existential threat with huge risks but also as an opportunity given hope is a key element of driving societal change.
2. Updated understanding of risks and opportunities and the timeframes involved is critical to a response.
3. Finding ways to bringing together traditional and scientific knowledge is important.
4. Resilience is a pragmatic overarching concept because it includes adaptation as well the focus of linking efforts to the maintenance of regional identity.
5. Six influences on climate resilience of the region, if strengthened through small scale and more significant structural adaptations across and within family, sector, community and institutional scales should lead to regional climate resilience.
6. There are always trade-offs, but action should be informed by and support the aspirations of the people to achieve their desired future. This requires a full examination of the economic, social, cultural and environmental costs and opportunities of options to ensure they are equitable and support the communities vision for the region. One of the driving aspirations from the 2022 climate change workshop was the desire to lead this response from within the region.
7. Tracking progress and celebrating success is also critical to an adaptive approach so a policy learning and information sharing function will be required.
8. The remaining loop is to establish a dialogue space that brings Traditional and scientific knowledge together to innovate, co-design, and test adaptation pathways that will strengthen climate resilience at all scales of decision making: the personal and family scale, community scale, within individual service and livelihood sectors all of which contribute to

If successfully implemented, Sections 3, 4 and 5 of this Plan will establish and operationalise the Torres Strait Climate Resilience Framework.

Six key influences on climate resilience

Work carried out within the Torres Strait Resilience Initiative identified six inter-dependent influences (see right) on regional and community (place based) climate resilience. It is not uncommon in climate change plans and strategies to just focus on the first two influences, extreme event readiness and minimising vulnerability. Whilst they are important and critical considerations, they alone are not sufficient to ensure climate resilience in this region and there are other considerations that if left unattended will restrict the above efforts.

The six influences are:

1. **Extreme event readiness**

Readiness for severe climatic changes and events. Readiness reflects the extent to which families, communities, institutions and the region as a whole have proactively prepared for change and disaster situations, have clear plans and strategies for what to do during events and can coordinate post event recovery. The pathways for building readiness to severe events can be found in Section 3 of this plan along with opportunities for climate change mitigation.

2. **Minimising the vulnerability (of people, assets, nature and services)**

The level of vulnerability (or robustness as an opposite) of people, land and sea country, cultural sites service delivery systems infrastructure and livelihoods to climate change generally and to specific threats is a major determinant of climate resilience. Every possible effort will need to be made to proactively build robustness and reduce vulnerabilities to impact drivers identified in section 1 of this Plan. Hopeful, healthy and fit people will be less vulnerable to most climate impacts and more able to recover and assist with recovery if and/or when severe events occur. Healthy ecosystems will be in a better position to adapt than stressed ones. Significant redesign and potentially relocation in some situations, of existing public infrastructure community spaces and housing will be necessary to maintain community functionality. Characteristics such as diversity (lots of options), modularity (inbuilt circuit breakers), redundancies (spare and backup capacity) are design considerations.

3. **Optimising adaptability (response-ability, responsibility)**

The level of adaptability (the ability to influence and shape change/adaptation responses) from personal scale to regional will have direct and indirect effect on climate resilience. Low levels of adaptability will reinforce historical path dependencies, narrow the options available for vulnerability reduction and entrench existing cross-scale dependencies.

4. **Revitalising and maintaining cultural identity**

Social identity is a special factor in determining what adaptability levels are possible, what programs and adaptations will be acceptable and successful and ultimately what futures will eventuate.

Culture (Ailan Kastom) and religion are big parts of social identity in the region. They will inevitably play an important role in shaping adaptations and strengthening climate resilience. Readaptation is a word that emerged from the 2016 Torres Strait regional climate change workshop that describes how previous cultural knowledge and practices can be used to address current climate challenges.

5. **Institutional relationships that enable resilience**

The interactions across and within different scales of decision making determine and reinforce levels of empowerment, dependencies, supportiveness and control. Healthy cycles of development require two -way flows of information and resources, fast feedback loops, investment clarity and a functional balance between cooperation/collaboration and fragmented competition. The role of a proposed climate resilience centre as a bridging organisation between scales of decision making and other climate governance actions can be found in Section 5 of this plan.

6. **Unlocking potential and opportunities**

The embeddedness of historical **path dependencies** that limit options, opportunity and potential in the region play an invisible part in the development trajectory of a region and can significantly influence climate resilience. Path-dependencies are unchallenged modes of thinking, problem solving and habitual methodologies that become hard to change and are thus retained. Every time they are used, they further entrench the dependency. They deliver more of the same at the expense of innovation. The entrenchment of these path-dependencies can lead to stalled development in the form of traps or lock-ins which become very difficult to escape from and concern has been expressed that such traps may exist in the region.

Opening potential and opportunity to create hopeful futures under climate change will require attention to existing path-dependencies in the development model of the region and then to innovation. Timelines are useful tools to illustrate the development history and to reflect on path dependencies and past adaptations as the development history of a place is also a history of adaptation.

These influences work inter-dependently to generate resilience as an emergent attribute at any point in time.

At what level do we drive the response to climate change?

Donnella Meadows, one of the pioneers of sustainability and systems thinking, proposed a scale of 12 points that we can intervene in systems[24]. At one end are the relatively easy options like changing the price of goods or building a wall. Whilst useful and important, they have limited effectiveness in dealing with the core issues. At the other end of the spectrum are the much harder actions, like reducing global greenhouse gas emissions, the positive consequences are however enormous because it is tackling a root cause rather than a symptom. Most adaptation actions identified and actioned in adaptation plans tend to sit towards the easier action-focused end of the spectrum. **It is important that we also focus on the harder structural and system changes if we are to build deeper resilience and adaptability.**

In this Plan we are encouraging decision makers to go as deep as they can to drive change at the levels that will deliver greater resilience, including considering the development model of the region and how it can be improved. How government policies can be amended to better support local outcomes. How decisions are made and how issues are prioritised.

Any responses to a situation should consider these three domains based upon a computing metaphor to ensure they is appropriate and workable. “Hardware” – the infrastructure, Orgware – the institutional setting, data, policies, regulations, the “software” – the culture, skills, mindsets, and worldview of the people.

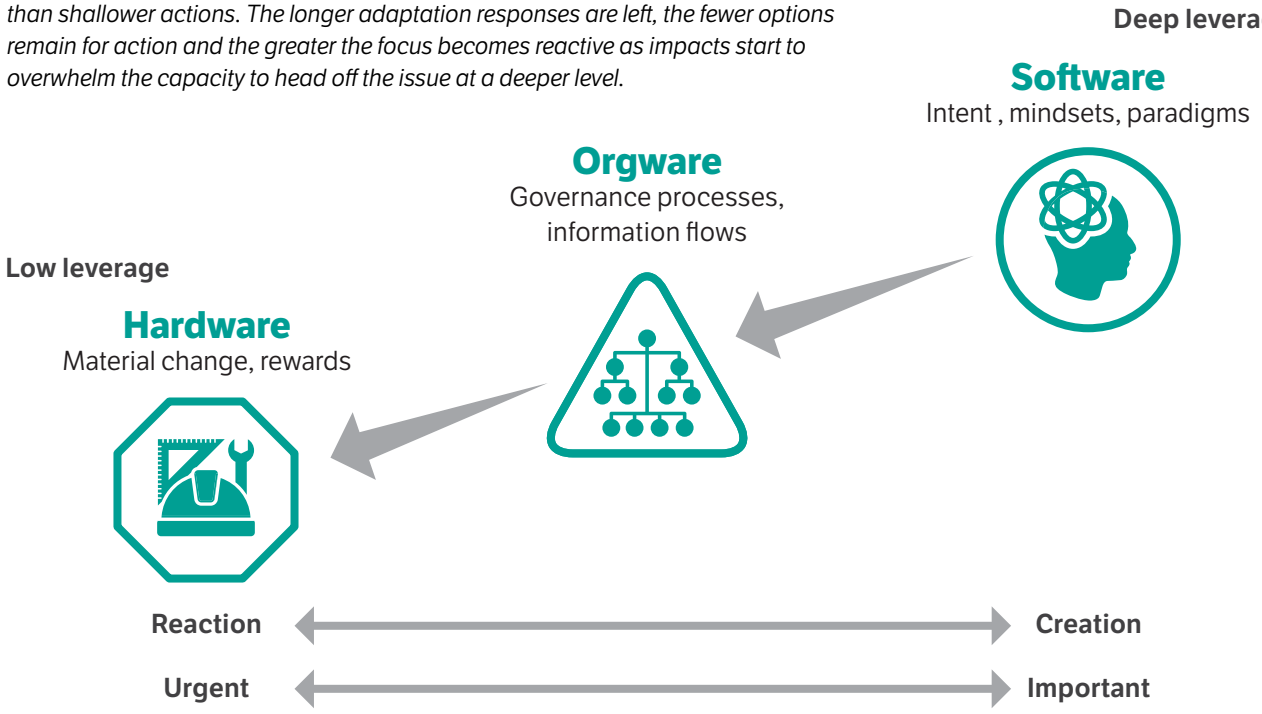
The six influences on Torres Strait climate resilience can be organized in a similar way as this metaphor. We have a new task to perform, and the old “hardware” will struggle to cope with the size and complexity of the task, so we upgrade the “hardware”. However, without new “software” (the thinking and skills to use the additional computing power in new ways to cope with the task) and without upgrading the “orgware” (the data supply, virus protection and maintenance support) the “hardware” upgrade is limited in it influence. Similarly focusing only on harm reduction (Resource vulnerabilities and Readiness) to respond to climate change is limiting if the “software” dimensions (cultural maintenance and readaptation, adaptability, and path dependencies) and the “orgware” dimension (cross-scale institutional relationships and climate governance arrangements) are not also upgraded.

At its heart it is about supporting Torres Strait people to maintain their unique culture and way of being as the Traditional Owners of the Torres Strait despite the challenges brought by climate change.

The climate most of us grew up with is now gone, we are in new unknown territory that has the potential to get increasingly hostile, so we must look to how we navigate this new reality, which will touch on every aspect of human life and every aspect of the natural world.

To ensure the Torres Strait is well positioned for this future we must look beyond seawalls and solar panels to the heart of how this region thinks, to the way it is governed, to understand the critical aspects of what makes a functioning resilient region in the face of increasing social, political, economic, and ecological change and uncertainty.

Figure 21: Options of where to act/intervene and how they impact the system. Bigger systemic charges are harder which is why they are often not attempted, but they deliver the greatest impacts when done successfully aimed at prevention rather than shallower actions. The longer adaptation responses are left, the fewer options remain for action and the greater the focus becomes reactive as impacts start to overwhelm the capacity to head off the issue at a deeper level.



Enhanced Community Resilience

The current development model in the Torres Strait is driven largely by various government services and infrastructure being delivered into communities within broader policy frameworks that are not always well aligned with the region's needs or values.

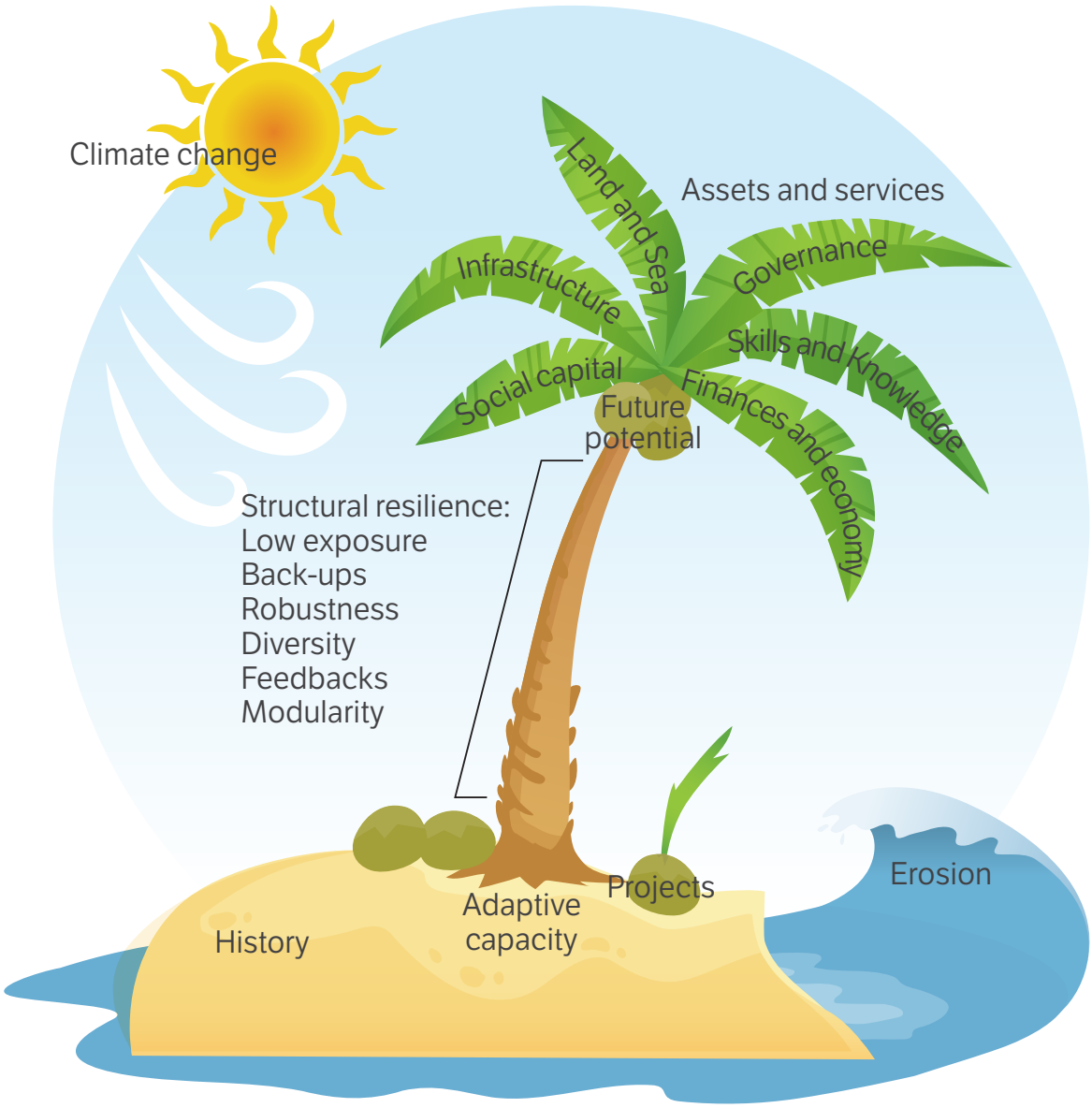
Communities have expressed they feel disempowered by having to rely on decision processes that lie in institutions sitting outside of their community. Coupled with a complex interface of local traditional governance mechanisms and western governance structures, this can make it difficult for the community to take greater ownership of their destiny.

The maintenance and practice of culture and spiritualism/faith falls for the most part entirely within community control, but most other aspects of community life rely on partnerships with government entities, with varying levels of engagement and capacity to influence outcomes. Most communities also have very little by way of social infrastructure and very little by way of recreational activities available for youth.

A core element of community resilience is community cohesion and the lack of these services and infrastructure are likely a critical missing element in facilitating better community function, resilience and wellbeing.

The community resilience framework focuses on providing a structure for communities to reflect on the status of the core aspects that provide or enable strength and resilience, clarity on what things sit within the local sphere of influence, what things they need to partner with others to achieve, and what things they can only influence as interested parties. Focus is then placed on the actions required to build those aspects of community life and function that we consider to be in need of greater focus and build our resilience to climate change.

Figure 22: The community-scale resilience framework was developed around the coconut palm as a metaphor.



The core elements of the resilience framework include (see diagram above and Figure 23):

1. Changes over time – what events and processes have shaped communities as they are today, where are communities at today in relation to our broad definition of resilience and what are the communities desired and undesirable futures?
2. What are the main external drivers, including climate change and government policies, acting on community?
3. What are the main internal drivers acting within community such as cultural values and practices, and world views/mindsets.

4. Strengthening adaptive capacity – the engine room to build resilience. Adaptive capacity can be described as the community's capacity to manage their ability to self-organise, to recover well from shocks and to adapt to change. Key components of adaptive capacity include access to assets/resources; having flexibility in adaptation options, functional organisation; agency-ability to act to drive change and learning – the ability to find and adopt new ideas and knowledge.

5. Understanding the gap between communities are and what type of change (adaptive and/or transformative) is required to move closer to their desired future. Adaptative change is improving the current structures and process to improve outcomes. Transformative change is about changing these structures and process.

6. Recognising the cultural interface through which communities and western entities interact and how this can impact understandings on either side.

7. Understanding what aspects of community need attention and/or change:

    a. Strengthening assets and services - based upon the five capitals (land and sea; economy and finances; infrastructure and services; human capital and social capital) and we have added governance as a sixth element.

    b. Reducing structural vulnerabilities – reducing exposure to risks; installing spare capacity; increasing diversity of options; ensuring their e are circuit breakers to reduce spread of impacts; have fast feedback to detect problems early; have sufficient safety margins and ensure all physical components are robust in their build.

    c. Reducing dependencies – understand and address the impacts of historical events and decisions that restrict adaptative management; identify and understand how decisions and processes and the local and regional scale constrain empowerment; appreciate how mindsets and worldviews impact decision making and capacity. These elements combined create the lock-in trap.

8. Building community clarity on what are the things within their capacity to change directly, what things they need to do in partnership with government and or others, and what things need to be done by others but which they can influence though engagement and negotiation.

9. The outcome is a list of priority actions that help target the parts of the 'system' that will drive the most positive change to achieve the four overarching goals and therefore position the community to respond effectively to climate change and other pressures.

This framework is being developed into a guide that can be used as a community planning tool an education tool, and resilience assessment tool.

Social Infrastructure and community resilience

Most of the communities in the region have very little by way of social infrastructure beyond their community hall, church and limited sporting facilities. Outside of Thursday Island and Horn Island, there are no restaurants on outer island communities, no coffee shops, no community gym facilities, cinemas, games rooms, skate or bike ramps, parks, bike or walking tracks or community BBQ facilities. There are occasional small gazabo's, and a few communities have areas to make and exhibit local art.

Social infrastructure plays an important role in keeping communities connected, which is an important element in enhancing community resilience. This position is supported by a 2023 article in the online journal, Policymaker, Building social resilience through community-oriented approaches to disaster management[25]. While the size of many of the communities prohibits the viability of some options such as restaurants, there is a very clear gap in community development in the region on the issue of social infrastructure.

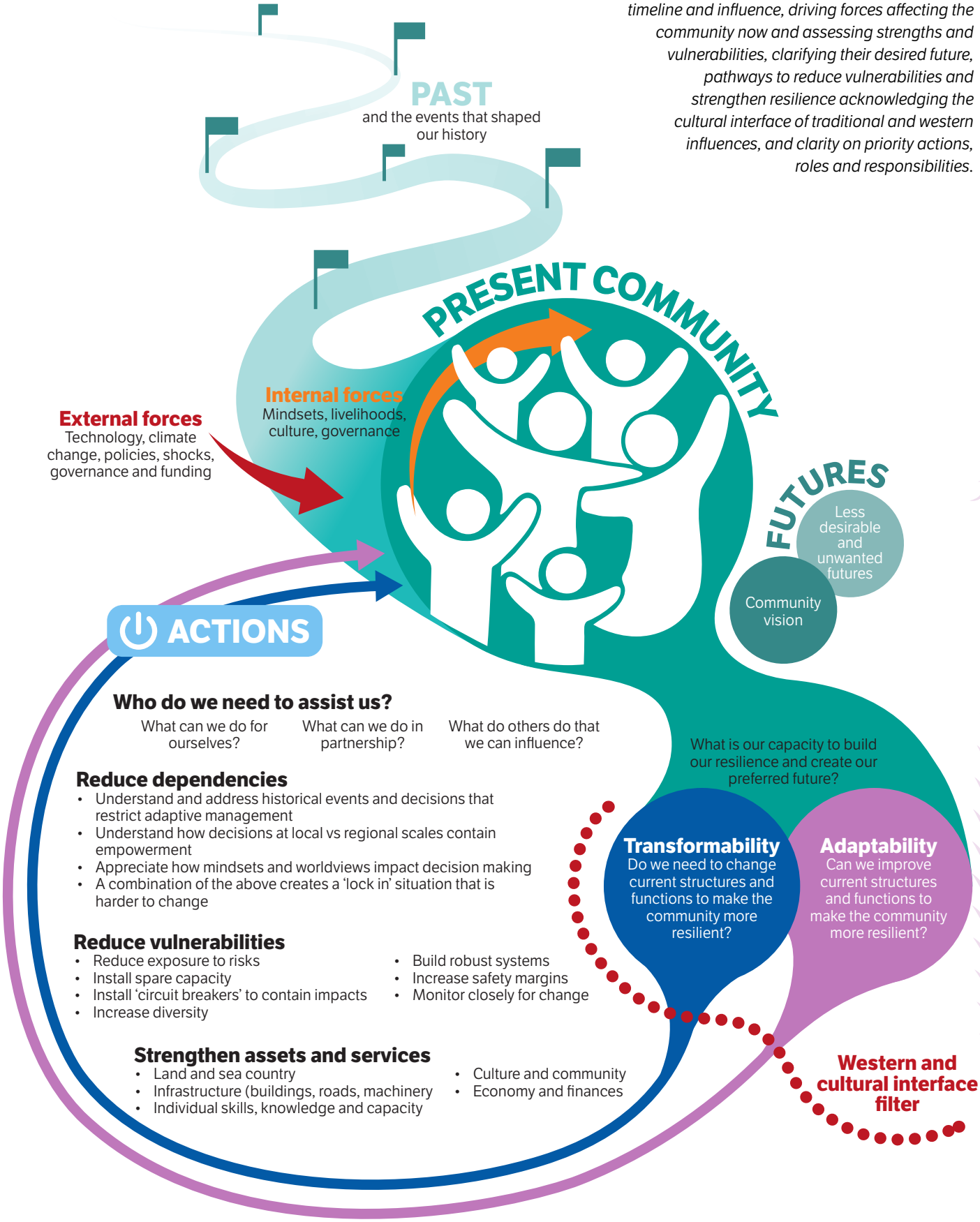
To understand community resilience, we start with the historical timeline (See Figure 23). What major events have shaped the community as it is today? Most events have had both positive and negative impacts. The introduction of supermarkets provided a wider range of products and expanded community choices and capacities. It also shifted diets towards processed foods and changed practices such as local growing of food and going out fishing.

Communities today are a product of their pasts. What lessons can we learn to help prevent/reduce negative impacts? Then we explore the community as it today, its strengths and vulnerabilities, its capacities and connectedness, its challenges and opportunities, and the external drivers (from outside community) of change and internal drivers of change (from inside community). This is done using the community resilience guide, an assessment, planning and education tool designed for this purpose. Next community articulate the vision for their desired future, what they want to see and what they don't want to see for their children.

The next step is developing an action pathway from where they are to where they want to be. What needs to change? When and at what scale is change needed? Who needs to drive it? Can it be done by the community alone or do they need to do it in partnership with others, or is it something they can only influence? What parts of the system are the actions targeting? Are they reducing dependence, reducing vulnerabilities or strengthening assets and services? This has to be done through the cultural interface that is the overlap of traditional worldviews, practices and values and western systems, practices and values. These actions should help drive the community closer to their preferred future and the process is repeated.

Erub island All Saints Anglican Church

Figure 23: Diagram representing the Torres Strait community resilience model, starting with the historical timeline and influence, driving forces affecting the community now and assessing strengths and vulnerabilities, clarifying their desired future, pathways to reduce vulnerabilities and strengthen resilience acknowledging the cultural interface of traditional and western influences, and clarity on priority actions, roles and responsibilities.

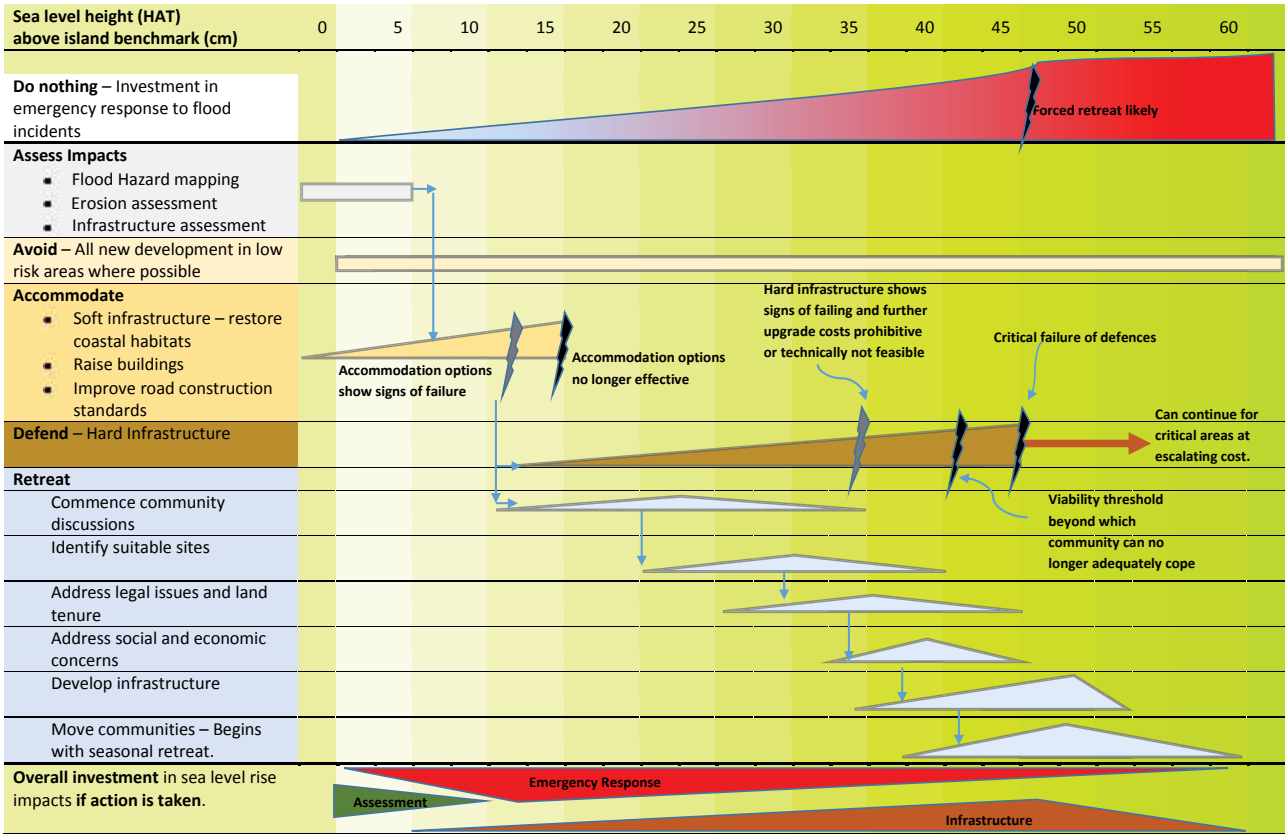


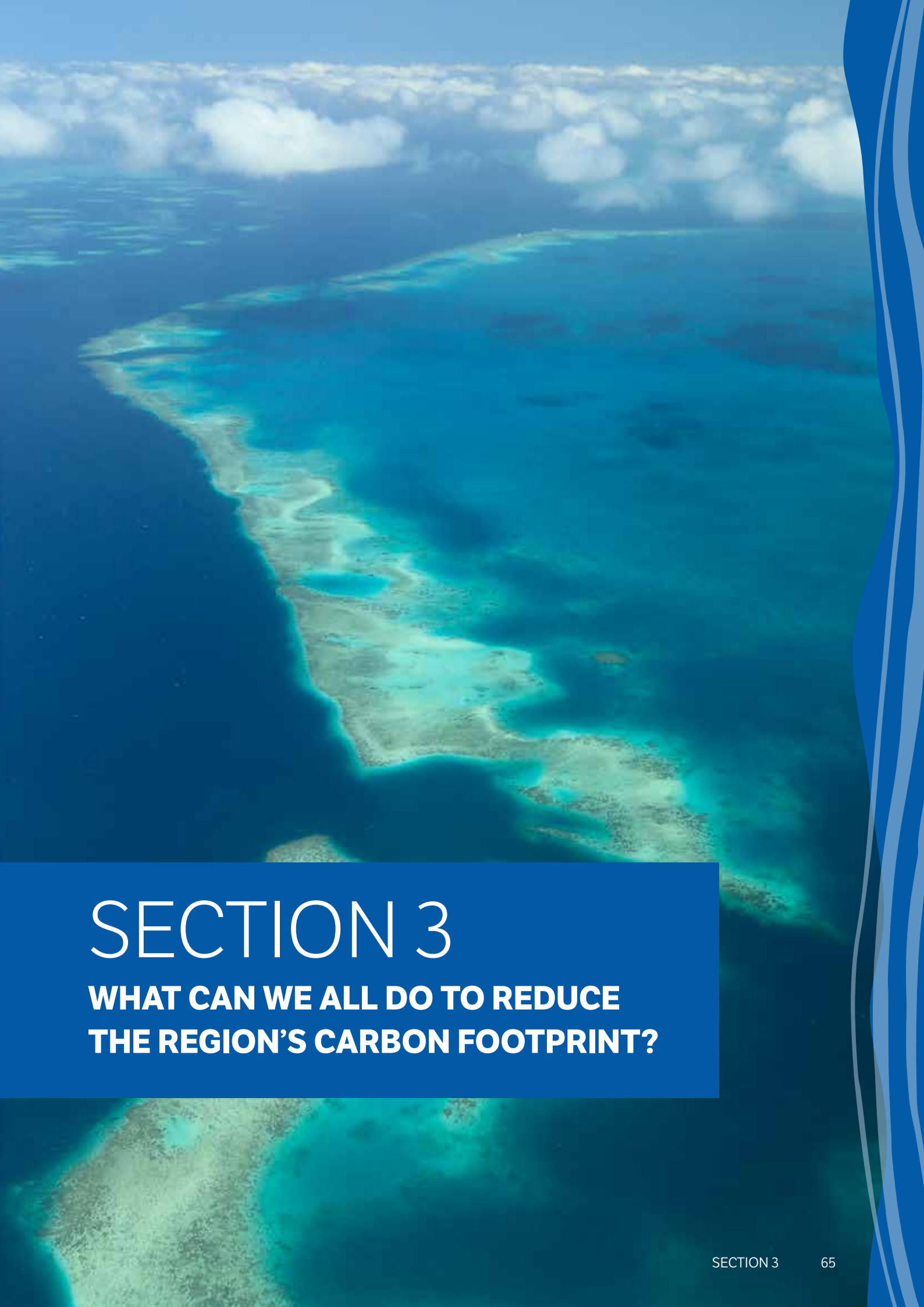
Full development of this Plan's adaptation pathways and actions

This Plan identifies a number of actions required to support climate resilience in the region. To ensure the actions in the Plan move from the Plan out to where they will have an impact, further work needs to be done to develop the detailed adaptation pathways required for their implementation. An adaptation pathway involves developing a sequence of actions that can be taken over time to achieve specific objectives under uncertain and changing conditions. They allow decision-makers to consider multiple possible futures and build in flexibility to adapt to changing circumstances.

The actions need owners to drive them, and owners need to assess how they can accommodate any actions within their current programs and priorities. It is proposed that the relevant parties associated with each set of actions meet to develop an agreed adaptation pathway/s to drive the implementation of actions relevant to their areas.

Figure 24: An example of an adaptation pathway based on responding to sea level rise from the first edition of the Plan. Changes in strategy are triggered by new circumstances. Identifying trigger points for action avoids waiting until thresholds are crossed and options to respond are reduced.





SECTION 3

WHAT CAN WE ALL DO TO REDUCE THE REGION'S CARBON FOOTPRINT?

Mitigation actions are those that reduce the cause (greenhouse gasses) and therefore the extent of climate change. With a total population of approximately 9,530 people, the region's contribution to climate change is massively dwarfed by the scale of the impacts.

In contrast to mitigation, adaptation is used in climate change to describe the personal, social, economic, infrastructure changes that are made in response to climate change and to changes in natural capital (goods and services provided by nature). These strategies and pathways are explored in sections 4 and 5.

Mitigation Strategy 1: Implementation of the Torres Strait Renewable Energy Transition Plan (RETP) 2021

Goal: Transition to 60% clean energy by 2030

Promote and enable the uptake of renewable energy, energy conservation and efficiency measures within the region through a partnership approach with all levels of government and service providers.

Background

The region's power is currently supplied predominantly by island microgrids powered by diesel generators owned and operated by Ergon/ Energy Queensland. The exception is Muralag/Prince of Wales Island where each home has its own power generation. Decentralised renewable energy is generally a very good fit for remote communities like the Torres Strait if the equipment if build to a standard to meet the harsh salty air and strong winds and well maintained. Many schools and IBIS supermarkets now have roof-top solar arrays, but most power is still generated by diesel power plants.

The region has been advocating for a transition to renewable energy for many years, but the Community Service Obligation payment and sunk costs of existing infrastructure has been a disincentive for investment in renewable energy in the region by Ergon Energy. That tide is finally starting to turn in earnest with significant RE capacity being scoped by Ergon for Thursday Island that would supply 80% of the islands power. In 2021 the TSRA developed the Torres Strait Renewable Energy Transition Plan (RETP)[26] to map out an optimal realistic 10-year pathway to shift power supply to clean energy sources.

TSRA has funded some small-scale solar array trials to reduce the cost of water production on Masig island and support the Mer Ged Kem Le PBC reduce the power bills on one of their guest houses.

A shift to renewable energy across the region would unlock massive potential for new sustainable initiatives including eMobility, sustainable intensive food production and water generation as well as the potential to install much needed climate friendly air-conditioning.

Existing mitigation initiatives

1. Ergon Energy Isolated Networks Strategy 2030 - Progressing Renewable Energy options for Thursday Island to supply 80% RE
2. Queensland Government Pathways to a Clean Growth Economy.
3. TI and NPA Power Savvy 2.0 has been launched, local providers trained in home energy assessments.
4. Queensland Climate Action Plan
5. At the time of writing, Queensland Government was set to introduce legislation to lock in a new emissions reduction target of 75% below 2005 levels by 2035.
6. The Australian Government Net Zero 2050 plan will reduce greenhouse gas emissions by 43% below 2005 levels by 2030 and achieve Net Zero by 2050.
7. First Nations Clean Energy and Emissions Reduction Advisory Committee

Wind turbines, solar PV systems and energy storage devices (e.g. Battery Energy Storage Systems) are currently the most viable options for the generation and supply of clean energy in the region.

The key elements identified in the RETP include: (H/O/S/ - Hardware/ Orgware/Software)

Mitigation Actions

Action	Lead and supporting organisations	Hardware/ Orgware/ Software
1. Establish a Torres Strait inter-agency Renewable Energy Forum and community engagement program to elevate the renewable energy focus and energy efficiency priority in the Torres Strait	Ergon, TSRA, TSIRC, TSC, NPARC	 Orgware
2. Implement large-scale centralised solutions at Thursday Island and Bamaga (80% RE) where the greatest potential Greenhouse Gas reductions can be achieved.	Ergon	 Hardware
3. Implement centralised renewable energy systems at the next largest sites including Badu Island and Horn Island, and other sites where a centralised solution is feasible	Ergon	 Hardware
4. Implement behind-the-meter solutions such as rooftop solar PV, micro wind turbines and battery storage systems utilising bulk installation arrangements to achieve economies of scale	Ergon, TSIRC, TSC, NPARC, businesses, Govt agencies	 Hardware

Mitigation Strategy 2: Energy Conservation and Efficiency initiatives

Promote opportunities for businesses and households to conserve power and use it more efficiently through an awareness and incentives campaign. Modelled on Ergon's very successful Power Savvy Program, Thursday Island and NPA Power Savvy 2.0 has been launched. Local providers have been trained in home energy assessments.

Everyone can play their part in reducing emissions through their daily choices and behaviours. These actions, whilst small in the broader scheme of mitigation, are important in giving people a greater sense of being a part of the solution and a sense of agency. They can also spur innovation and creativity, support community collaboration and cohesion and so flow into building stronger resilient communities.

Living in the Torres Strait also generally means have less access to the broad choices available to those in bigger centres. Options for white goods or food choices are far more limited, and so the role of suppliers of goods is critical in supporting local sustainability through providing more sustainable options. There is great potential for greater local sustainable food production and exploration of local waster reuse initiatives. There has been great progress in improved water management, but opportunities still exist at the household level for water efficiency and conservation.

The Queensland Government funded a sustainability assessment for Masig Island under the Low Carbon Great Barrier Reef Islands initiative[27]. The protect team engaged well with the community and developed a number of potential initiatives to dive greater local energy, water and waste sustainability.

Mitigation Strategy 3: Development of an eMobility program

The cost of fuel in the Torres Strait is far higher than most other places due the transportation cost of shipping fuel to the region. Families also often travel large distances between islands by small boat, and the cost of outboard fuel is also a limiting factor for small scale fishers. Options for vehicle and outboard motor repairs are very limited with most communities not having either the facilities or the trained mechanics to keep vehicles running. As a result, many vehicles end up having a far shorter operational life than they should and then become a big part of the regions waste management challenge.

Electric motor technologies are now well advanced across a range of transport options. They require far less maintenance and as power generation transitions to renewables they will not require imported fuel to recharge. Most of the islands have very small, limited road networks, yet as classified as any other road in Queensland, which prohibits the use of small electric buggies as a regular transport option. This is an example of how adaptation options are limited by inflexible policy and regulatory settings that are not suited to the particular circumstances of the region.

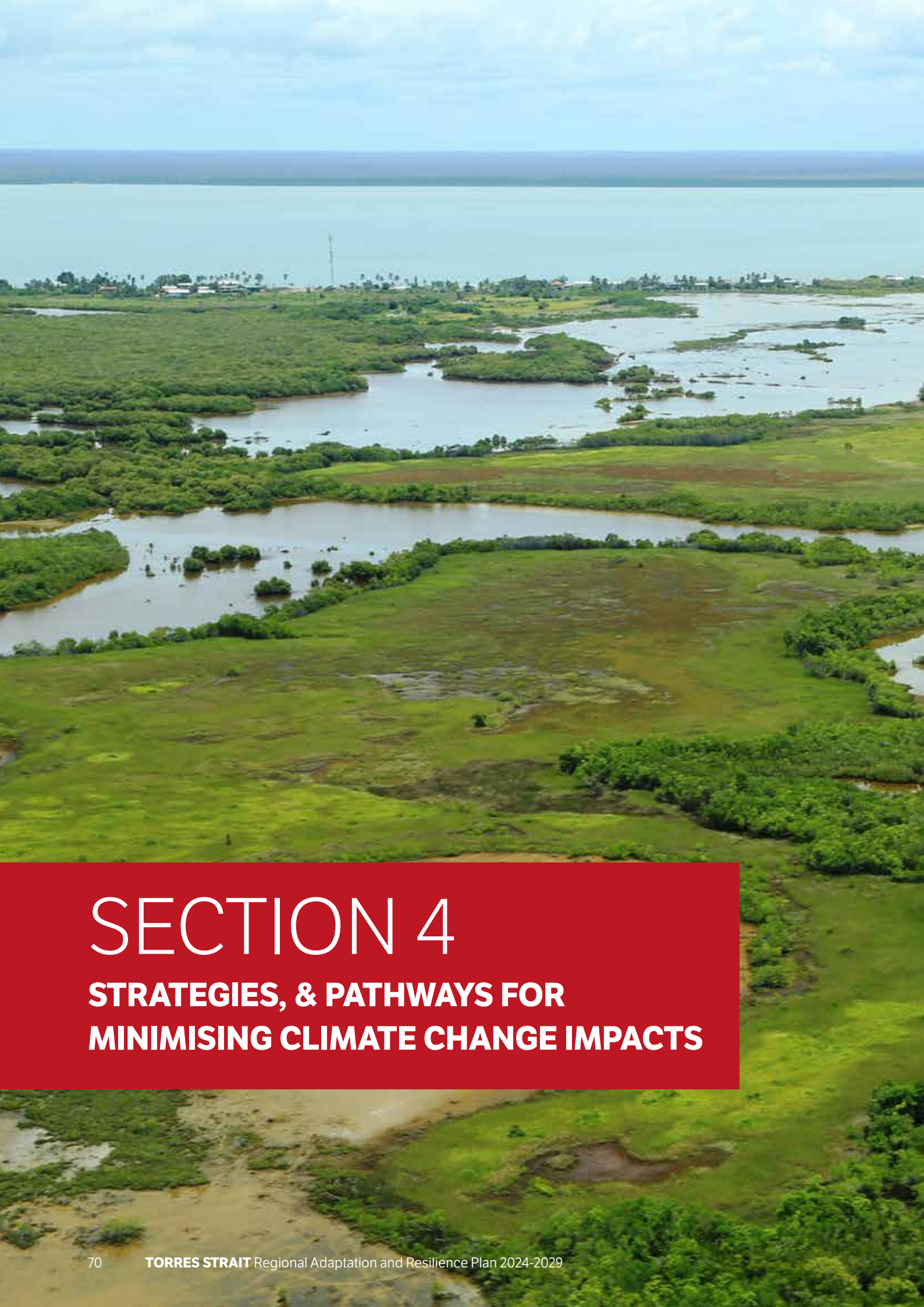
The development of an eMobility vehicle strategy for the region has great potential to reduce local emissions and provide more robust and diverse transport options for communities. It must be developed in parallel with a program to effectively manage the storage, reuse and disposal of associated battery technologies.

Mitigation Strategy 4: Ongoing representation for climate policy change

Goals: A safe climate for future generation to grow up in

The Torres Strait has a history and reputation for punching above its weight in areas of reform (Native Title law as an example). By virtue of its strategic location, its vulnerability to climate change and the strength of character of its people, it will continue to play an important role in helping the world to avoid dangerous climate change through effective use of the voices of Torres Strait islanders and their leaders in supporting the required action needed to reduce greenhouse gas emissions.

Advocacy is an important element of climate response, whether it's the Australian Government advocacy at the international climate change negotiations or the voices of local islanders calling for action to protect their islands. Torres Strait leaders have for many years been advocating strongly on behalf of the region for greater action and resourcing to address climate impacts. This has been key in bringing in significant resourcing into the region to build coastal defences. The Torres Strait 8, a group of individuals from the central low-lying cays, took their message to the United Nations and have helped to raise greater awareness internationally about the risks the region faces from climate change. Paul Kabay and Pabai Pabai, in taking their concerns to the courts, have also helped to raise awareness for the region.



SECTION 4

STRATEGIES, & PATHWAYS FOR MINIMISING CLIMATE CHANGE IMPACTS

Climate change has the potential to significantly change the human, social, economic and environmental resources available into the future either through shifts in climatic patterns over time or via severe weather events.

This section of the Plan outlines the first two of six climate resilience strategies designed to put in place the corresponding climate resilience foundations. The first one is directly concerned with public safety and readiness for severe events. The second is about putting appropriate settings and "hardware"/infrastructure in place to adapt to climate change and strengthen climate resilience in a way that minimises structural resource base vulnerabilities in timeframes consistent with scientific predictions.

The assumption here for both strategies is that there will be more options available and less disruption if proactive action is taken rather than waiting until after the impact occurs.

Resilience Strategy 1: Maximising readiness for extreme events

Goals

1. Communities are well informed about impending extreme events.
2. Communities have the support, resources and skills to prepare for and where possible reduce the impacts of climate related emergencies and to recover well from such events.
3. Readiness is maintained through up-to-date plans incorporating new knowledge reinforced by regular drills and simulations.

Transformations required

Background

A primary concern in responding to climate change is public safety and limiting damage. Climate change is and will continue to generate more severe weather events with potentially higher intensities which brings preparation for, and safety from, these events into the forefront of consideration when planning to strengthen climate resilience. Severe events include cyclones, storms, prolonged heat waves, drought, major fires, intense rainfall and flooding.

All communities have their own local disaster management plan, with varying knowledge and capacity to implement them across the region. Whilst the region is fortunate not to experience many direct impacts from cyclones, severe weather can and does cause damage to community infrastructure and associated services and amenities.

The region is an international shipping lane so the risk of a major shipping incident remains possible despite significant risk reduction strategies being in place. Local capacity to respond to oil spills has been improved through education and training whilst simulations and workshops with lead agencies have helped to refine how a major shipping incident might be dealt with given the particular challenges of the region's location, geography and oceanography.

COVID 19 posed a new challenge, but the region's Local Disaster Management Group responded well and communities avoided significant impacts from the disease. The region's proximity to Papua New Guinea increases the risk of human, plant and animal disease outbreaks. The region is highly dependent on air and sea transport and digital communications technology and impacts to any of this infrastructure can have major consequences.

There are an increasing number of severe events around the Australia and elsewhere in the world. New terms like 'atmospheric rivers' and 'bomb cyclones' have been coined to events that are occurring at new levels of intensity. While the Torres Strait region has so far been spared these new intensity events pattern changes are being observed and some severe events will be inevitable.

Australia has a long history of severe events which has necessitated the development of a well-established disaster management framework based on event severity and a network of well-trained volunteers. There are agreed roles and protocols. This Plan does not seek to and has no mandate to change those arrangements which have stood the test of time and are constantly under review and adjustment at all levels. However, no system is perfect, particularly a one size fits all system, so some important issues and some targeted finetuning opportunities are highlighted and addressed.

Current status and initiatives:

All communities have their own local disaster management plan, with varying knowledge and capacity to implement them across the region. Whilst the region is fortunate not to experience many direct impacts from cyclones, severe weather can and does cause damage to community infrastructure, coastal zones and local services and amenities. The region is an international shipping lane so the risk of a major shipping incident remains possible despite significant risk reduction strategies being in place. Local capacity to respond to oil spills has been improved through education and training whilst simulations and workshops with lead agencies have helped to refine how a major shipping incident might be dealt with given the particular challenges of the region's location, geography and oceanography.

TSRA initiated the installation of additional weather stations and tide gauges in the region to expand the quality and quantity of local data. The meteorological information available in the region is still below mainland standards however and this information is important leading up and during extreme events. TSRA also established a regional disaster dashboard, Yumi Safe, as a "one-stop-shop" for weather, tide and disaster information (TSRA Dashboard (torresstraityumisafe.com.au), and the installation of digital noticeboard in most communities to improve access to emergency information.

COVID 19 posed a new challenge, but the region's Local Disaster Management Group responded well, and communities avoided significant impacts from the disease. The region's proximity to Papua New Guinea increases the risk of human, plant and animal disease outbreaks. The region is highly dependent on air and sea transport and digital communications technology and impacts to any of this infrastructure can have major consequences.

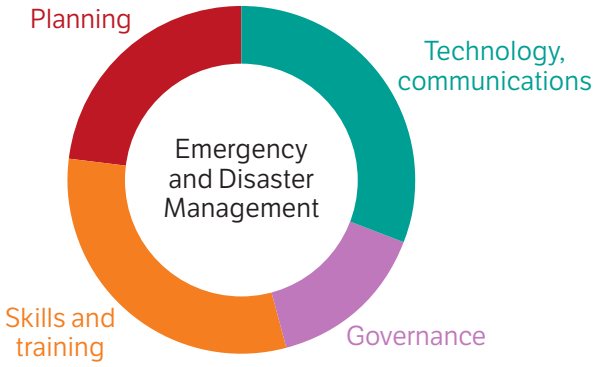
The Local Disaster Management Group has strong membership and works collaboratively across the region. Increased investment into SES and disaster response capability by State Government.

- SES Uplift –SES has commenced on onboarding of additional full-time staff to increase their capability to visit the SES Groups that will ensure more training to build local volunteers' capability. A new position, Engagement/ Recruitment officer, that will help to grow the volunteer members for each unit including undertaking engagement with community, government and other stakeholders.
- Realignment and strengthening of agency responsibility within disaster management in Queensland:
  - Dedicated budgets will boost resourcing across Queensland with the reform bringing an uplift of almost 500 full-time emergency services personnel.
  - establish a new entity, Marine Rescue Queensland, which will bring together coast guard and marine rescue activities
  - expand the Queensland Police Service to incorporate additional disaster management functions, including the State Emergency Service and the soon-to-be-established Marine Rescue Queensland. These organisations will continue to maintain their respected identities, procedures and uniforms.
  - boost capability and capacity for the Queensland Reconstruction Authority to improve resilience.

Adaptation Actions

Action	Lead entities	Hardware/ Orgware/Software
1. Assess community awareness of local Disaster Management Plans	Councils, QFES	Orgware
2. Run drills on communities to test capabilities and ensure equipment, processes and LDMP's are kept current and operational.	Councils	Hardware Orgware Software
3. Review quality and accessibility of current weather information across the region to bring it up to standard with mainland meteorological data and forecasting.	TSRA	Hardware Orgware
4. Increase engagement with community on preparedness.	QFES, Councils	Software
5. Continue to improve communications capabilities– what other redundancy systems might be required when comms fail (e.g. newer technology such as StarLink)	Councils, TSRA, SES	Hardware

Improving disaster management and response will require actions across as range of areas as illustrated right. Note these values are only rough approximations to illustrate a point.



Resilience Strategy 2: Minimising vulnerabilities in the five Capitals

As per the 2016 Torres Strait Adaptation and Resilience Plan, this plan frames vulnerabilities around the 5 Capitals Framework. In this framework, capital is the resources on hand for communities to work with. Capital also generates services for the community.

There are five types of Capital:

1. Built Capital – (infrastructure)
2. Human Capital – (people and their knowledge and skills)
3. Natural Capital – (land and sea)
4. Social Capital – (culture and community cohesion)
5. Financial Capital – (investment, livelihoods)

Sustainability is where the underlying capital (e.g. fish, drinkable water) is not depleted and the communities live off the services and spare capacity. Climate change will impact resources so maintaining resource condition will require extra focus. Communities in the region will need these resources to remain healthy for future renewal and functionality. It is critical that preparations are made both for severe events and slow onset changes to minimise vulnerabilities in the resources base to the slower onset of climatic pattern changes.

Health and wellbeing - Healthy bodies, healthy minds, resilient families

Goals

By 2026 The region understands the likely impacts of climate change on health and wellbeing and is implementing proactive measures to address these risks, with an emphasis on empowering communities and individuals and preventative healthcare.

Transition needed

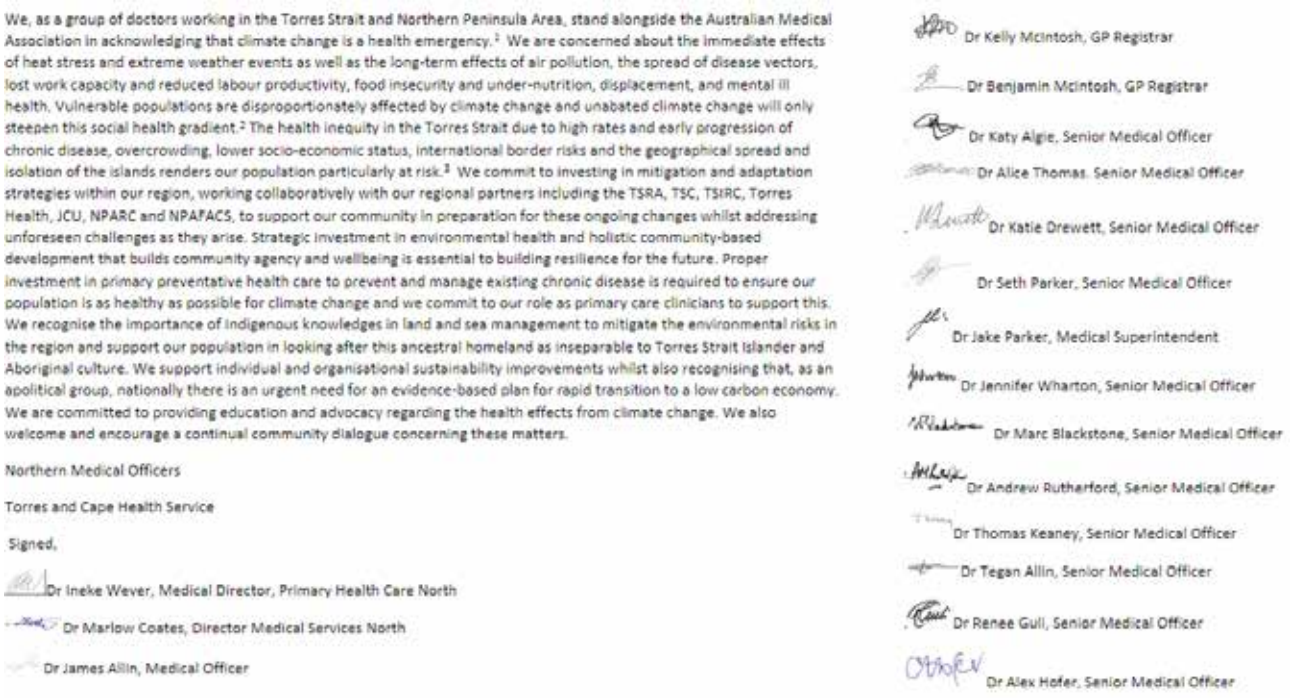
Keeping people healthy through proactive preventative community-driven measures and reducing the number of people entering the critical care system.

Background

Torres Strait communities still experience a high burden of chronic health conditions compared to mainland communities[28]. For Australia's Aboriginal and Torres Strait Islander peoples, life expectancy is still 8 years less than that of non-Indigenous Australians, with little improvement over the past 25 years[29]. Non-communicable diseases (NCDs) are responsible for 75% of this gap, with poor diet among the leading modifiable risk factors[30,31]. Proximity to the improvised villages of neighbouring PNG where malaria, TB and other communicable diseases are still common is a further risk factor.

Existing health disparities and people's close connection to country exacerbates the impacts of climate change on health and wellbeing. Climate change will add additional pressure to the health system and increase health risk and impacts on individuals. Physical health effects from climate change include increase in heat-related disorders, vector-

borne diseases (primarily mosquitos), food and waterborne diseases, respiratory disorders and exacerbation of chronic diseases including heart and kidney disease[32].



We, as a group of doctors working in the Torres Strait and Northern Peninsula Area, stand alongside the Australian Medical Association in acknowledging that climate change is a health emergency.[1] We are concerned about the immediate effects of heat stress and extreme weather events as well as the long-term effects of air pollution, the spread of disease vectors, lost work capacity and reduced labour productivity, food insecurity and under-nutrition, displacement, and mental ill health. Vulnerable populations are disproportionately affected by climate change and unabated climate change will only steepen this social health gradient.[2] The health inequity in the Torres Strait due to high rates and early progression of chronic disease, overcrowding, lower socio-economic status, international border risks and the geographical spread and isolation of the islands renders our population particularly at risk.[3] We commit to investing in mitigation and adaptation strategies within our region, working collaboratively with our regional partners including the TSRA, TSC, TSIRC, Torres Health, JCU, NPARC and NPAFACS, to support our community in preparation for these ongoing changes whilst addressing unforeseen challenges as they arise. Strategic investment in environmental health and holistic community-based development that builds community agency and wellbeing is essential to building resilience for the future. Proper investment in primary preventative health care to prevent and manage existing chronic disease is required to ensure our population is as healthy as possible for climate change and we commit to our role as primary care clinicians to support this. We recognise the importance of indigenous knowledges in land and sea management to mitigate the environmental risks in the region and support our population in looking after this ancestral homeland as inseparable to Torres Strait Islander and Aboriginal culture. We support individual and organisational sustainability improvements whilst also recognising that, as an apolitical group, nationally there is an urgent need for an evidence-based plan for rapid transition to a low carbon economy. We are committed to providing education and advocacy regarding the health effects from climate change. We also welcome and encourage a continual community dialogue concerning these matters.

Northern Medical Officers

Torres and Cape Health Service

Signed,

Dr Ineke Wever, Medical Director, Primary Health Care North

Dr Marlow Coates, Director Medical Services North

Dr James Allin, Medical Officer

Dr Kelly McIntosh, GP Registrar

Dr Benjamin McIntosh, GP Registrar

Dr Katy Algie, Senior Medical Officer

Dr Alice Thomas, Senior Medical Officer

Dr Katie Drewett, Senior Medical Officer

Dr Seth Parker, Senior Medical Officer

Dr Jake Parker, Medical Superintendent

Dr Jennifer Wharton, Senior Medical Officer

Dr Marc Blackstone, Senior Medical Officer

Dr Andrew Rutherford, Senior Medical Officer

Dr Thomas Keaney, Senior Medical Officer

Dr Tegan Allin, Senior Medical Officer

Dr Renee Gull, Senior Medical Officer

Dr Alex Hofer, Senior Medical Officer

Figure 25: A statement published by doctors working in the Torres Strait on recognising climate change as a health emergency.

Torres Strait Islanders are deeply connected to their land and sea country and there are strong correlations between the health of country and the health of its people

Climate change also has significant consequences for mental health as communities worry about the future of their islands and impacts on their land and sea country and livelihoods. Heat also exacerbates intolerance and feeling aggravated and has capacity to increase conflict and domestic violence. Most homes are without the capacity to reduce heat stress through air-conditioning.

There are also multiple indirect 'cascading consequences' resulting from altered natural systems, challenges to water and food quality and security and from altered social systems (employment and workforce productivity, housing comfort, and health service delivery)[33,34].

Climate-sensitive infections pose a disproportionate burden and ongoing risk to Torres Strait Islander peoples. Hall et al. 2021[33] identified five infectious diseases of tuberculosis, dengue, Ross River virus, melioidosis and nontuberculous mycobacterial infection were identified as diseases of concern under a changing climate in the Torres Strait.

The socio-economic factors in the region are an important element in both the vulnerability and resilience of the people to climate-driven health impacts.

> "Aboriginal and Torres Strait Islander communities are likely to suffer increased disadvantage especially in relation to health."
>
> Australian Academy of Science - The risks to Australia of a 3 Deg C warmer world

"A forward agenda for climate action and Aboriginal and Torres Strait Islander health needs to initially lay the groundwork within communities to build adaptive capacity. An agenda should focus on ways to strengthen Aboriginal and Torres Strait Islander knowledges and their inter-generational transmission and promote the value and legitimacy of biocultural knowledges within climate adaptation and mitigation planning. Strong partnerships across environmental science and health sectors are required to bring together and build on existing scholarship in Aboriginal and Torres Strait Islander land and sea management and health and wellbeing co-benefits."

Climate Change and Aboriginal and Torres Strait Islander Health Discussion Paper. Prepared for the Lowitja Institute and the National Health Leadership Forum.

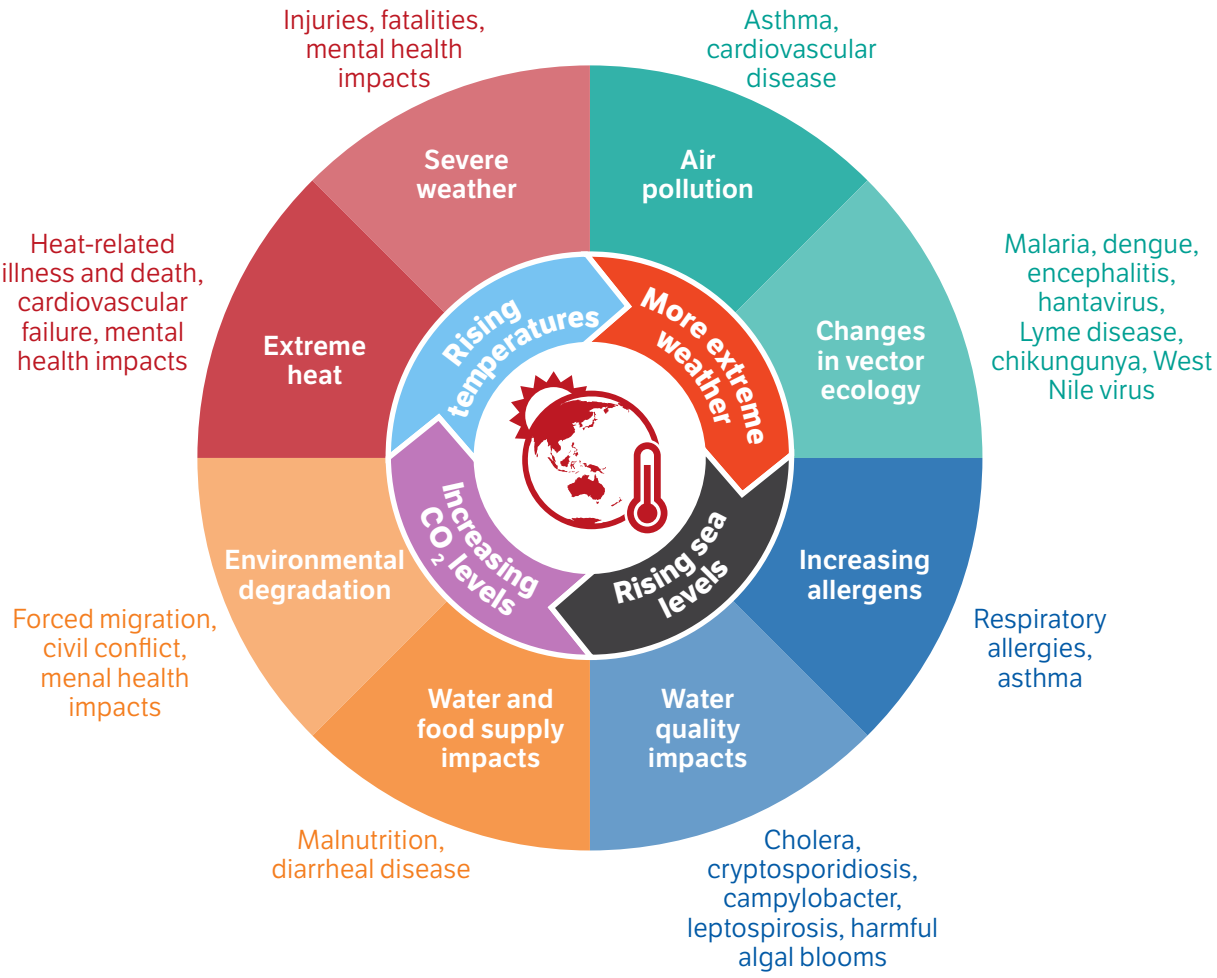


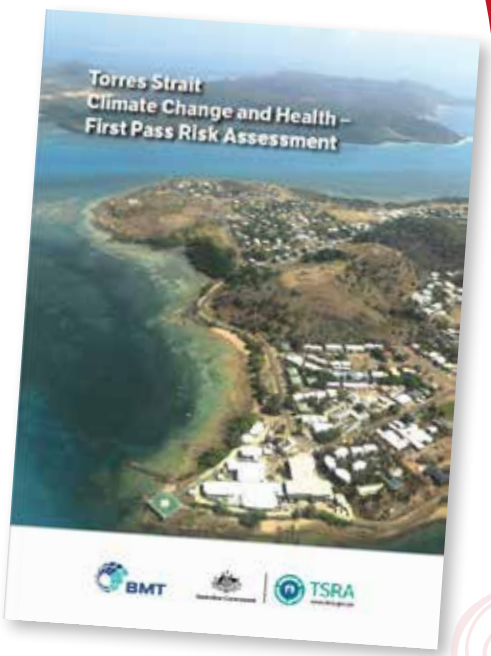
Figure 26: Climate change has multiple consequences for human health and wellbeing and novel impacts are continuing to be seen as more evidence accumulates. The list above is by no means comprehensive..

Table 2: Climate impact drivers and their associated impacts on health and wellbeing.

Climate Impact Driver	Health risk
Rising sea level	• Flooding of sewerage intakes requires reboot of waste treatment plants which then discharge raw sewerage into coastal areas adjacent to communities. • Impacts on mental health due to concerns of long-term risks • Washing of pollutants into community and ecosystems • Impacts on critical infrastructure that supports access, wellbeing and health care
Increase in mean surface temperature	• Reduced capacity for people to shed heat in summer • Impacts on subsistence food resources
Extreme heat	• Heat stress and heat stroke • Impacts on food and water quality and quantity, important natural resources and ecosystem services • Increased risk of respiratory illness • Increased risk of antisocial behaviours
Heavy precipitation	• Increased risk of vector born diseases
Extended dry season	• Impacts on food crops • Increased risk of respiratory illness
Increased fire weather	• Increased risk of respiratory illness
Extreme storms	• Increased risk of physical injury • Damage to critical infrastructure • Impacts of capacity of health services to reach clients
Coastal erosion	• Damage to critical infrastructure impacting services and security
Marine heatwaves	• Impacts on food resources and livelihoods
Increase in mean water temperatures	• Impacts on food resources and livelihoods
Decreased ocean oxygen	• Impacts on food resources and livelihoods
Ocean acidification	• Impacts on food resources and livelihoods

Progress to date

- The Torres and Cape Health and Hospital Service noted in the 2022 regional climate workshop important gains in the Improvements in chronic disease management, a steady decline in the number of presentations at the emergency department, improved management of diabetes and a trend towards healthier body-mass indexes.
- The Lowitja Institute discussion paper Climate Change and Aboriginal and Torres Strait Islander Health (2021).
- First Pass Risk Assessment for the Health System of the Torres Strait (TSRA/BMI 2021)
- Health system resilience assessment tool – codeveloped by TSRA and ARUP
- Health and Wellbeing Queensland have been promoting a greater focus on preventative approaches to health through programs such as Deadly Choices and Gather and Grow
- Masig Heat Stress Assessment Report (TSRA 2021)
- National Health and Leadership Forum – Position Paper on Climate Emergency and Health
- Surveillance and control of Aedes albopictus in the Torres Strait - Federally funded program 2021-2024
- Queensland Government Sector Adaptation Plan for Health and Wellbeing
- Queensland Health Equity Strategy



Whilst there are specific actions that can be implemented to reduce climate impacts on health, reform of the broader Torres Strait health system to increase the focus and investment into community-based preventative health care is the most powerful way to reduce the health impacts of climate change.

This has to be managed both through adaptation/transition in the health system to adjust to the new challenges demands of climate change but also by focussing on the family scale implementation where women play a major role. Four pathways that support a transition and contribute to healthy people, healthy mins and resilient families are set out below.

A codesigned and culturally appropriate health system transition plan

Adapting to climate impacts on health requires we identify and respond to the vulnerabilities right across all the areas of the health system:

- Health Infrastructure (buildings, transport, communications, equipment)
- Medical staff skills, capacity and resources
- Communities and individuals
- Policy and institutional settings and funding
- Socio-cultural-environmental -determinants of health

The Torres and Cape Hospital and Health Service provides health services across the region and Cape York. A number of local NGO's, State and Commonwealth agencies operate in the region.

Health-protective climate change response initiatives should be co-designed and prioritised by local organisations and evaluated using culturally-appropriate health and wellbeing indicators.

A proactive focus on preventative health

Getting the balance right between effective and often urgent clinical care of existing illnesses and preventative measures that reduce the need and demand for that care is a constant dilemma for health care systems. Policy positions do fluctuate to shift the balance however, for the most part the emphasis is placed on clinical care as the more visible political issue and the direct responsibility of health care professionals.

Climate change will expose increasingly more people to health risks but will probably not reduce any existing risks placing increased pressure on the health system and in particular on the clinical care. Healthy fit people will be better able to cope with the risks posed and would hopefully reduce or at least stabilise the demand on chronic clinical care. Being physically fit and healthy plays a large role in reducing susceptibility to the impacts of heat stress[35].

Leaders in thew Torres Strait region are acutely aware of this relationship and the need for education around processed food availability and behaviours such as drug and alcohol abuse which can lead to wider impacts including domestic violence. The 2010 Torres Strait and Northern Peninsula Area Regional Plan highlighted the need for preventative health investment. However, by 2019 when a review of the plan was undertaken the investment balance by the QLD Government had actually shifted in the opposite direction. There is evidence that some more recent gains have been made at the regional scale. This climate change plan seeks to build on these initiatives and momentum and at the same time highlight the changing risk outlook.

> [In the Torres Strait,] climate change is a health emergency. We [medical officers] are concerned about the immediate effects of heat stress and extreme weather events as well as the long-term effects ... Vulnerable populations are disproportionately affected by climate change and unabated climate change will only steepen this social health gradient ... Proper investment ... is required to ensure our population is as healthy as possible for climate change ...10 (Wever I, Coates M, Allin J, Brown M. Northern Medical Officers Opportunities. Cairns (AUST): State Government of Queensland. The Torres and Cape Hospital and Health Service; 2019.)

> The impacts [of climate change] are here and now, are a clear and present danger, and must be regarded as a global health emergency. Health in the climate emergency: a global perspective IAP

Adaptation Actions

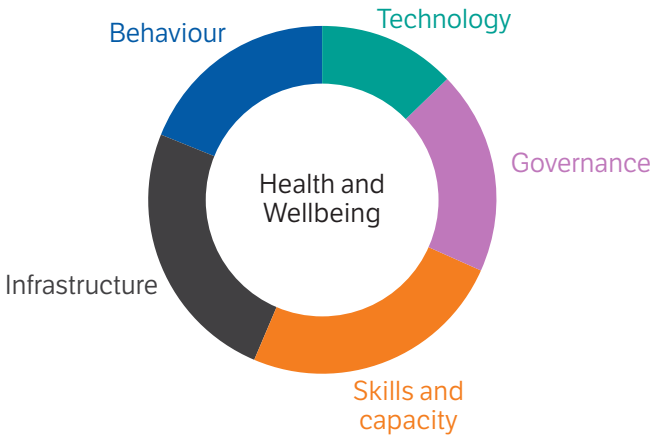
Action	Lead entities	Hardware/Orgware/ Software
Undertake a detailed assessment of how climate change will impact regional health and wellbeing and develop suitable actions and strategies to mitigate these risks	Qld Health	Orgware
Undertake an assessment of the resilience of the Torre Strait health "system" to climate change impacts.	TCHHS	Hardware Orgware
Collect appropriate data to evaluate linkages between weather and climate and community health and wellbeing. Robust data frameworks need to be developed to document evidence that is meaningful for Aboriginal and Torres Strait Islander communities and can guide policy and practice.	TCHHS	Orgware
Host a Torres Strait health forum to develop practical strategies to address critical health issues that actually close the gap.	TSRA	Orgware
Continue and expand monitoring of diseases vectors.	Qld Health, JCU, Councils	Hardware
Improve collaboration and coordination amongst existing health service providers.	All	Orgware
Progress a codesigned and culturally appropriate health system transition plan.	TCHHS	Orgware Software
Develop a regional heat response plan which factors in preventative education and awareness strategies, targets vulnerable subpopulations, expands shaded and cooled areas, policies for heat stress risks and processes for field staff and heat stress risks for sporting activities, and recommendations for the improvement of building design and construction.	Qld Health, Councils, TSRA	Hardware Orgware Software
Expand personal empowerment and mental wellbeing programs.	Qld Health, TSRA	Software
Continue to expand preventative health programs.	Qld Health	Orgware Software
Build community understanding and awareness on the links between climate change and health and measures that can take to reduce these risks	Qld Health	Software

Sport and climate change

Sport is an important part of life in the Torres Strait, especially for the youth who have far fewer opportunities for recreational activities compared to most mainland communities. The predominant sports are basketball and Australian League Football. There is growing awareness of the heat stress impacts of climate change on sport and other physical activities. Major national sporting events are increasingly being impacted by extreme weather[36] but the intersection of sport and climate change is still not being properly factored into sports planning and associated infrastructure needs. Beyond the health risks for participants and spectators, there is also a question of liability. A recent report[37] found that most sporting organisations are not taking adequate steps to factor in climate change risks, exposing them to possible legal liability through a failure of duty of care.

In the Torres Strait it is not just heat, but the extreme humidity levels that increase health risks of physical exertion on hot days. It will be important councils and others who fund and install sporting facilities to factor in the need to keep participants safe from heat stress, and for event organisers to consider safe time for these activities to occur. This may require changes in when and how sports are conducted in the region. It may are require considering other forms of sport new to the region that can occur indoors where possible.

Adapting to health and wellbeing impacts will require actions across a range of areas as indicated here. Note these values are only rough approximations to illustrate a point.



Heat risk in homes on Masig Island

Whilst tropical regions tend not to be subject to heat waves and extreme variations in temperature, they experience prolonged seasons of high temperatures accompanied by significantly high humidity levels. The high humidity reduces the body's capacity to shed heat through sweating. Acclimatisation plays some role in reducing risk, but human thermoregulatory capacity has upper physiological limits regardless.

People living in hot regions of the world are already at or close to the upper limit of their potential to acclimatise to any further increases in temperature[38,39]. It is possible that despite being acclimatised to warm weather, that many Torres Strait Islanders are already close to the limits of their capacity to cope with heat stress, a situation that will be exacerbated due to increasing temperatures due to climate change.

Periods of very hot weather can also exacerbate other issues as people's social tolerance levels decrease from heat irritation. A study reviewing heat impacts on human conflict found a very strong relationship between increase in warmer temperatures and increased rates of interpersonal violence[40]. Heat is not just a daytime issue. Cool night-time temperatures are essential for good health and to allow people to recover from hot days. 25 degrees is considered a threshold for hot nights. The number of nights over 25 degrees in parts of Queensland have increased significantly and could increase further[41].

To better appreciate the risks in the region 8 Testo temperature and humidity loggers TSRA placed in homes on Masig Island after discussion with the Masig Community Health Committee. The loggers have been collecting valuable data on actually living conditions in several types of houses on the communities (Figure 27).Safe' heat stress conditions were achieved less than 25% of the time in homes where data was collected over a period of 17 months, with 'Extreme caution' and more dangerous conditions being reached at most sites for more than half the recorded period[58].

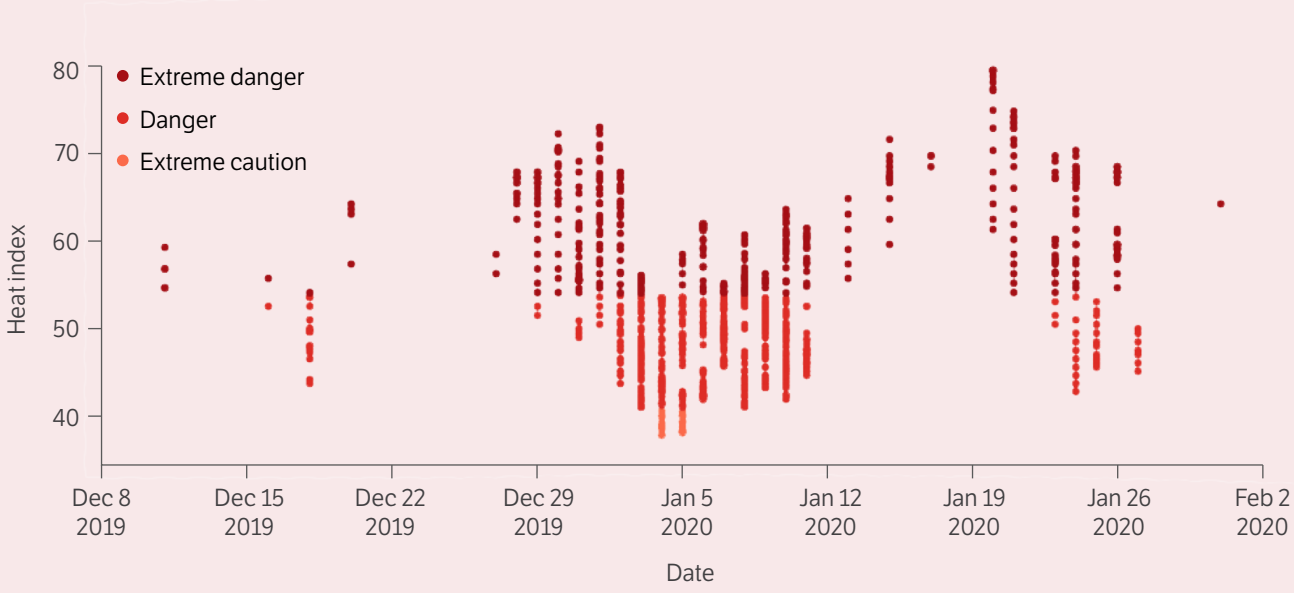
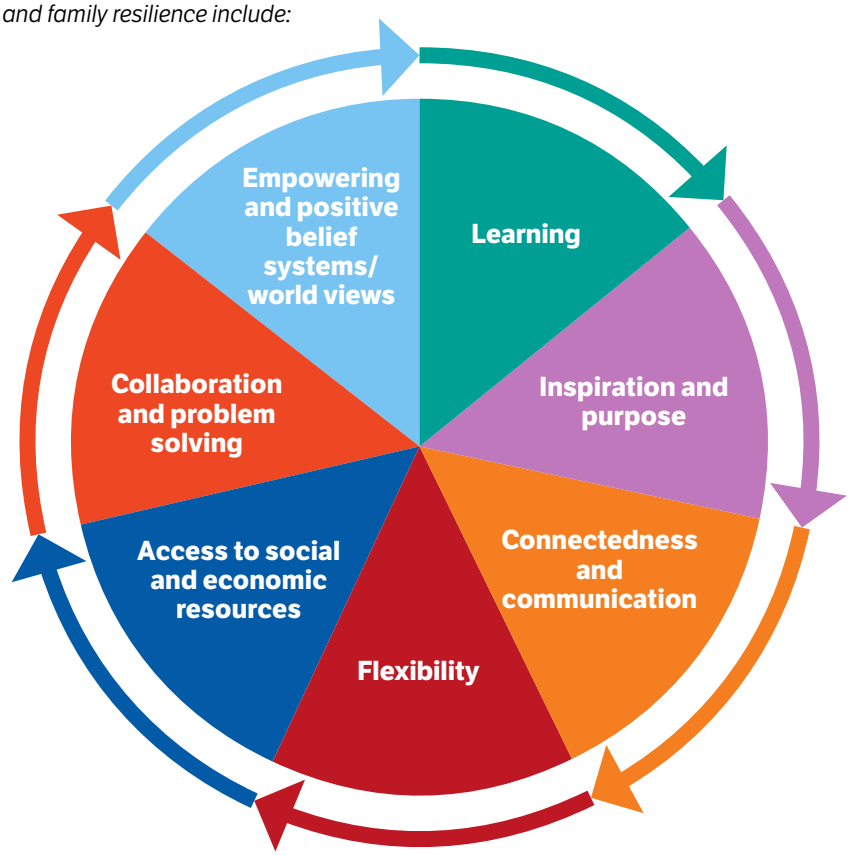


Figure 27: Scatterplot showing the heat index staying mostly within at least the caution zone even at the coolest times of the sample period.

Strong Individual and Family Resilience

Individual and family resilience is the bedrock of resilience in the region. Without good levels of health and wellbeing and the capacity of individuals to function well as members of their family and community, the capacity of the region to thrive in the face of climate change will be limited. All four levels of resilience need to be enhanced as they are interconnected and interdependent. A great deal of work has been done internationally on identifying the elements of individual and family resilience. To a large degree the core processes and attributes align with the broader resilience frameworks represented here already.

Figure 28: Key elements of individual and family resilience include:



Empowered Women and Youth

"Acknowledging that climate change is a common concern of humankind, Parties should, when taking action to address climate change, respect, promote and consider their respective obligations on human rights, the right to health, the rights of indigenous peoples, local communities, migrants, children, persons with disabilities and people in vulnerable situations and the right to development, as well as gender equality, empowerment of women and intergenerational equity," Paris Agreement, UNFCCC 2015

2022 Torres Strait Regional Climate Change Workshop - Stronger Together women participants

The regional climate workshop in 2022 included a dedicated session on Torres Strait woman and climate change. Key points raised included a need for greater focus and involvement of women and youth in climate change planning and action. Climate change is likely to impact woman in multiple ways, including some gender specific health and safety risks. The session highlighted that business as usual was not going to deliver the changes needed for women to play a greater role in decision making or in reducing climate change impacts. Better social indicators, a dedicated Women and Climate Change forum, and establishing a dedicated focus on Torres Strait Women within the regional governance portfolios were also highlighted as enabling mechanisms to move this issue forward.

Women speak on the processes and patterns of the culture taught within the affiliation of women's business and looking at the impact of climate change in the Torres Strait Islanders' culture through the lens of a woman gives one the strength that no one can take away.

Reflecting on stories shared within the family kinship, both oral and written, painted pictures of men and women who were agriculturists, healers, and teachers in their cultural rights.

Our mothers were traditional hunters and gathers of the coastal shores and reefs, they were women who practised traditional medicine, and weavers who taught cultural ceremonies through dancing, singing, and storytelling while maintaining language and cultural law.

Women did not require a university degree to grow and harvest crops. They provided the food and resources required to maintain sustainable community life. They knew the season. They knew when to collect from the reef and physically cultivate the soil in their traditional gardens. They knew by the season when and what food was in abundance. They knew the coastal and inland layout of the land. The seasons in the stars, the moon, the sea, the clouds, and the winds, navigated island life.

As colonization dominated our lives and the world changed, traditional agriculture disappeared and with that our culture and traditions maintained our connection to land and sea. Gathering from the supermarket became a social normality. The weaving of baskets and mats was no longer required, and plastic was introduced. The seasons now come in a 12-month calendar posted on the fridge. Employment opportunities did not recognize women as cultural agriculturists, traditional healers, weavers, or keepers of cultural knowledge. Non-Torres Strait Islanders came into the regions based on qualifications to teach the fundamentals of Torres Strait life. Sharing cultural knowledge of toiling the soil and reading the season is now family gathering stories and it is left to the child's imagination to practice.

As the world continued to change, a new challenge emerges. It threatens the pure existence of our land and sea and poses a big threat to maintaining our culture.

Climate change is serious business. Its primary cause is human activity. These human activities release greenhouse gases into the atmosphere and warm the planet creating climate change.

Climate change has a big impact on Women's Health. Researchers note a sharp surge in domestic violence affected by scorching weather. Research indicates that extreme heat also increases the incidence of stillbirth and is linked to maternal and neonatal outcomes. Through colonization, we witnessed high rates of chronic diseases and the continuum impact it has on Torres Strait Islanders.

The world continues to change, and things beyond our control impact our cultural values. The younger generation accepts these changes because it is an easy life. The older generation looks back with regrets and tries to take responsibility and wants to see the alignment of cultural values. If our values are not culturally interwoven and our spiritual and cultural practices are not aligned and reconnected with the land, sea, stars, and winds.

Ella Kris


Ella Kris

Healthy Country – Land and Sea


TSRA

Importance and urgency

The Torres Strait contains some of the world's more pristine and important marine ecosystems. The islands also play an important role in supporting local terrestrial ecology and as resting and foraging sites for migratory species that move through the region. Communities have a deep connection with the plants and animals that share their land and sea country.

Climate change is by far the greatest risk to the health of the region's environment. Sea surface temperatures have been on a steady increase over the past five decades (Figure 7). The region suffered its first regional mass bleaching event in 2016-2017 with further bleaching occurring in 2019-2020. As a shallow tropical marine environment, the Torres Strait is sensitive to the multiple ways in which climate change is altering both the oceanography and biology of the region (Figure 14) various ways climate change impacts the marine environment). Long-term monitoring is essential for detecting and describing change and informing appropriate management responses.

The Land and Sea Management Strategy for Torres Strait 2016-2036 sets the strategic direction for management priorities in the region and is the main document covering management directives for marine and terrestrial ecosystems. Most of the actions taken in the region support climate adaptation through reducing threatening processes and building greater understand of trends and ecological and threatening processes.

	2030	2050	2070	Adaptive Potential
Impacts on Coral reefs				Low
Impacts on Dugong				Low
Impacts on Turtles				Low-Medium
Impacts on Invasive pests				Medium
Impacts on Mangroves				Medium
Impacts on coastal erosion and inundation				Medium

Approximate timing of severity of impacts and indication of adaptive potential

Goals

Empowering Torres strait Islander and Aboriginal peoples to sustainably manage and benefit from their land, sea and cultural resources into the future. The region's ecosystems remain healthy and able to respond optimally to climate impacts.

Marine species and ecosystems

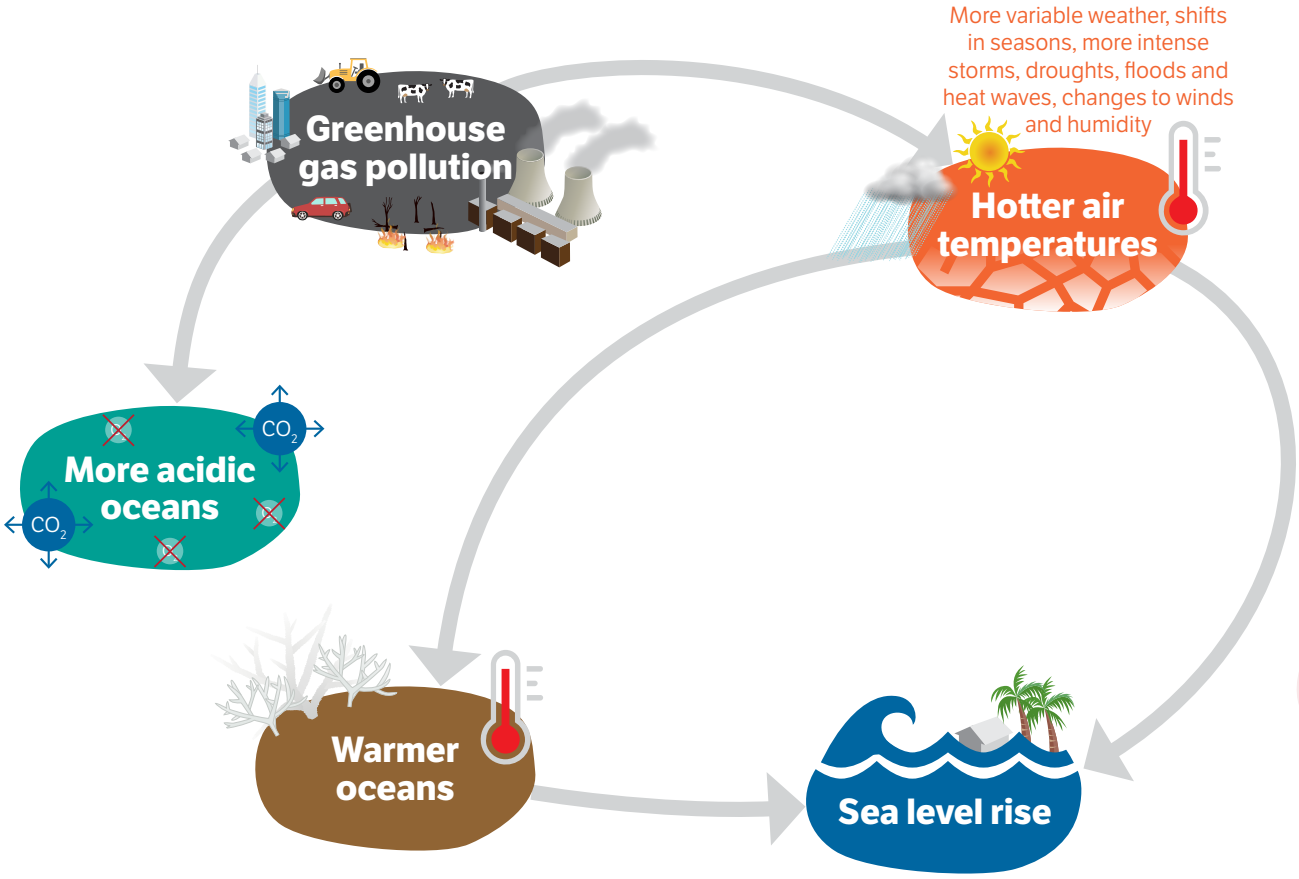


Figure 29: Climate change impacts marine environments both through changes in temperature and changes in ocean chemistry (TSRA).

Coral Reefs

The eastern Torres Strait is the northern extent of the Great Barrier Reef and links to the global coral biodiversity hotspot Coral Triangle to the north. There are over 1200 reefs across the region, the eastern reefs are particularly diverse, and being in deeper waters adjacent to cool upwelling from deep waters off the continental shelf, these reefs are especially important nationally and globally as refugia from marine heat waves[42]. Despite this it is likely that climate change is already changing the composition of the Torres Strait reefs, in particular the central and western reefs, and indication are that recruitment has also declined in recent years[43]. Marine heat waves/warmer ocean temperatures and decreasing pH (ocean acidification) are the two key threats to coral reefs, both have critical thresholds beyond which reefs would struggle to survive as we know them[44]. The broader consequences of the impacts on coral reefs for other marine species and ecosystems is not yet well understood.

Current initiatives

- Monitoring coral reef health in the eastern Torres Strait – AIMS and TSRA.
- Aerial assessment during mass bleaching events.
- Development of semi-autonomous reef monitoring capabilities - AIMS
- Crown of Thorns (COTS) control program
- Sea Surface Temperature monitoring

Figure 30: Bleached corals in the Torres Strait Photo: TSRA


TropWater

Seagrass meadows

Seagrass is a critical habitat in Torres Strait, supporting populations of dugong, green turtle and important fishery species. Torres Strait Island communities have strong cultural and spiritual links to these species and environments.

The Torres Strait has some of the world's most extensive seagrass meadows (over 13,000km^2) They act as a massive store of carbon. Seagrasses can store huge amounts of carbon per square kilometre[45] and its estimated around 80 million tons of carbon are stored in the Torres Strait, with about 1.7 million tonnes sequestered each year[46]. which means they potentially store over a billion tons of carbon in the Torres Strait. They also underpin much of the marine ecosystem productivity and are critical in supporting the health and diversity of the broader marine environment. It's because of its seagrass meadows that the region is home to the world's largest population of dugong and is a key foraging site for marine turtles.

The sensitivity of seagrasses to climate change is likely to vary from species to species. It's possible some species may thrive under warmer water temperatures and higher levels of dissolved carbon dioxide, but only up to a certain point. Overall, there is likely to be shifts in the distribution and species composition of seagrasses of meadows. The key species that support dugong (*Halodule univeris* and *Halophila ovalis*) fortunately have high levels of resilience[47]. The 2023 Torres Strait Seagrass Report Card indicated that overall seagrass condition is good in the Central and Inner Clusters, satisfactory condition in the Western Cluster, and poor condition in the Eastern Cluster. Some subtidal sites in the western cluster in the area of the dugong sanctuary have very low seagrass biomass.

Current initiatives

JCU/TropWater and TSRA Rangers undertake subtidal and intertidal seagrass monitoring at 28 sites across the region to produce the annual Torres Strait Seagrass Report Cards (www.tropwater.com/project/torres-strait-seagrass-report-cards).

Marine Turtles

Six of the 7 species of marine turtle use the Torres Strait for feeding, nesting or a migration route. Turtles carry enormous cultural value and are also an important part of the traditional subsistence diet of many Torres strait and Papua New Guinea communities. The region has one of the largest nesting populations of Hawkesbill turtles and is an important feeding, mating and nesting area for the northern population of Green turtles.

Turtles are particularly vulnerable to climate change impacts on several fronts. Sea level rise threatens their nesting beaches with erosion and coastal flooding can drown their eggs. The sex of the hatchlings is also temperature dependant, with warmer sand temperatures leading to nearly all female hatchings.

The waters and therefore the beaches of the eastern Torres Strait are cooler than surrounding areas due an upwelling offshore current. Monitoring of these sites is looking at their possible role as a key area for the production of males into the population.

Current Initiatives

- Baseline nesting turtle and hatchling monitoring programs.
- Sand temperature monitoring at turtle nest sites ion Mer Island
- Monitoring turtle nesting success sand movements of Bramble Cay/ Mauzab Kaur
- Review of Community -based Turtle and Dugong Management Plans

Tristan Simpson

Dugong or Dhangal / Deger

The Torres Strait is known as the dugong capital of the world. The species has enormous cultural, spiritual and practical significance to Torres Strait Islander and Aboriginal communities. Dugong are highly dependent on the health of the seagrass meadows on which they feed, which in turn makes them very vulnerable to climate impacts. Updated aerial monitoring of the region's dugong population is long overdue, but by all accounts, the population is still healthy.

Current Initiatives

- Review of Community -based Turtle and Dugong Management Plans (TSRA with communities)
- Dugong Protection Zone (PZJA)
- Subtidal seagrass monitoring (JCU/TSRA)

V Kilikov/Shutterstock.com

Table 3: Exposure, sensitivity and adaptive potential of green turtles, dugong and seagrass.

Species	Climate change pressure	Exposure	Sensitivity	Adaptive potential	V
Green Turtles	Increased air and sea temps SLR Extreme weather events	Habitual nesters	Temp on sex, inundation and erosion on nesting, broader oceanographic change	Limited (intensive rearing, nesting beach protection)	H
Dugong	Extreme weather events Warmer SST	Dependence of seagrass feeding grounds	Storm and temperature impacts on seagrass	Very limited	H
Seagrass	Extreme weather events Warmer SST	Limited capacity to migrate or tolerate substantive changes in conditions	Storm and temperature impacts on productivity	Medium	M

Terrestrial Ecosystems

The flora and fauna of the Torres Strait terrestrial island ecosystems are part of the Australo-Papuan assemblage, having links to both Australia and Papua New Guinea[48]. Historically the region was part of the Sahul land bridge linking these islands. The diversity of island geomorphology enhances species diversity, but the region is not especially diverse with respect to its faua, which is to be expected of small islands. The region does however have high level of mangrove diversity and is important at national and international scales for mangroves and migratory birds. Terrestrial ecosystems of the Torres Strait have been assigned a health status of 'good', although the direction of health status change under prevailing threats is uncertain and requires additional monitoring[23].

Islands tend to be resilient to natural disturbance regimes but are particularly vulnerable to threats such as invasive species and anthropogenic development, including increased rate of climate change. The vulnerability of terrestrial island ecosystems can generally be attributed to their isolation, limited extent of habitat availability, low faunal species diversity and small population sizes, high endemism, and low capability for species to adapt to introduced predators.

Climate driven shifts in maximum temperatures, dry season duration and soil moisture are likely to increase fire risk which could have significant consequences for island species and their habitats.

Increased fire risk, increased extreme weather and seasonal variability, shifts in the abundance and distribution of pests and diseases, as well as shifts in the abundance and distribution of pollinators and dispersal agents all have the potential to impact the health and composition of the region's terrestrial ecosystems.

Of all the island groups, the health status of coral cay island ecosystems is most precarious due to increased levels of anthropogenic pressure (land clearing for development, firewood, etc.) and their extreme vulnerability to sea level rise, subsequent erosion as well as the impacts of ocean acidification on the generation and durability of coraline sands from which cays are formed and replenished. Coral cays, freshwater ecosystems and coastal ecosystems and coastal birds are considered to be most at risk from climate change.

Eastern Curlew

The eastern curlew is listed as critically endangered. It is the largest migratory shorebird in the world, with a long neck and a very long downcurved bill. They migrate from eastern Russia after they have bred down into the southern Australia, often resting and feeding in the Torres Strait on their way through between July and February (Conservation Advice Numenius madagascariensis eastern curlew (https://www.dcceew.gov.au)). Species that rely on coastal environments will have an elevated vulnerability to climate impacts.

JJ Harrison

Mapping of climate sensitive vegetation

Vegetation communities (regional ecosystem classifications) on inhabited islands have been mapped for their sensitivity to sea level rise, saline incursion into ground water and broader climatic shifts (Figures 31 and 32). Coastal areas are as expected highly vulnerable. The mud island of Saibai and Boigu are the most exposed to sea level rise impacts.

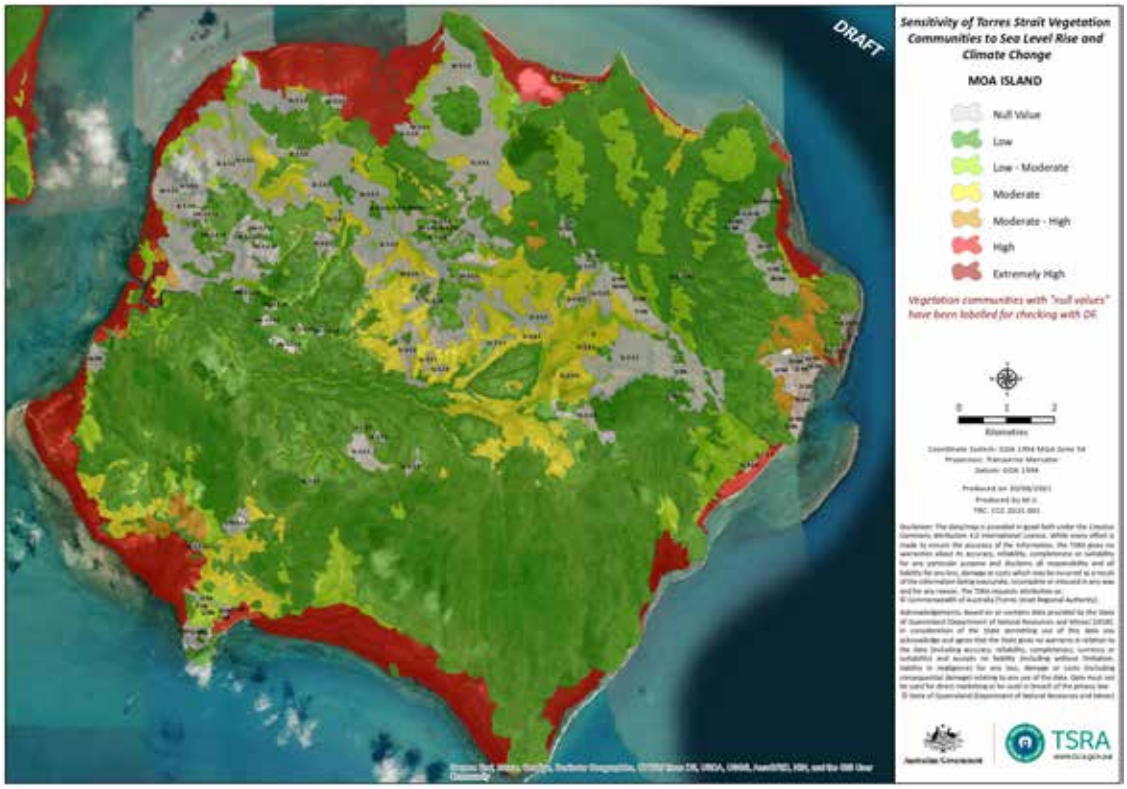


Figure 31: Moa island regional ecosystem sensitivities to climate change.

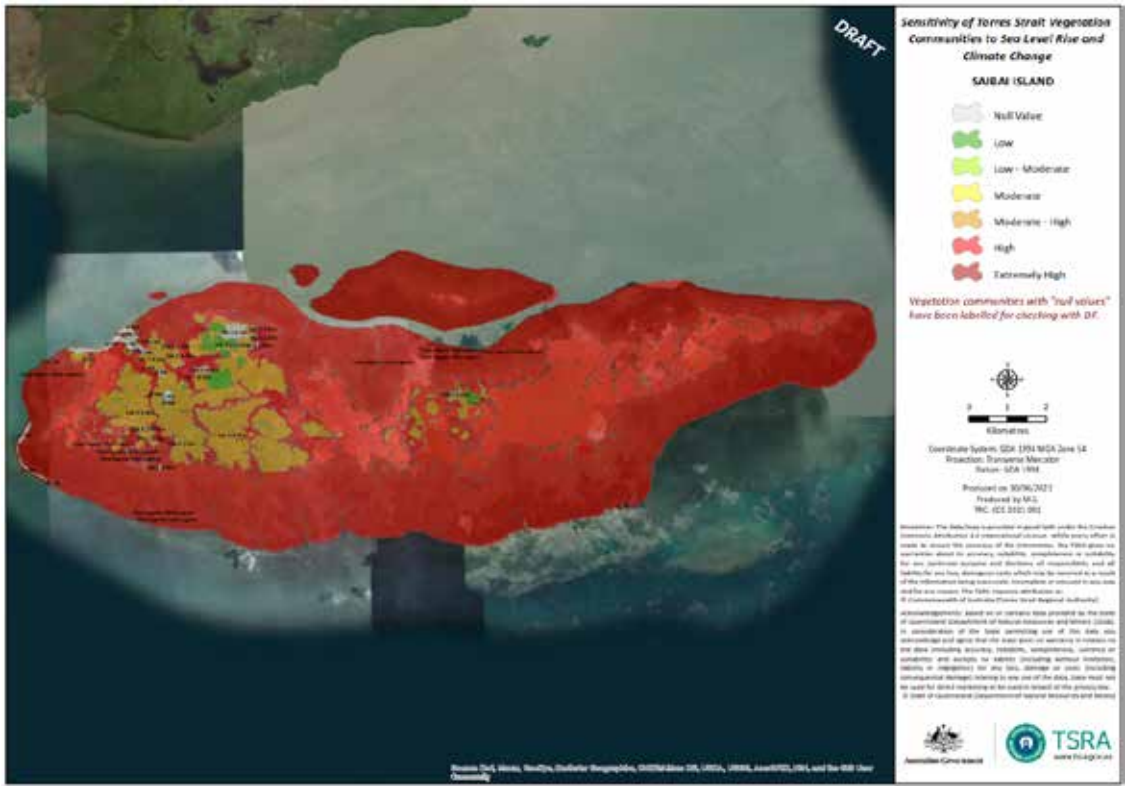


Figure 32: Saibai island climate sensitive vegetation communities.

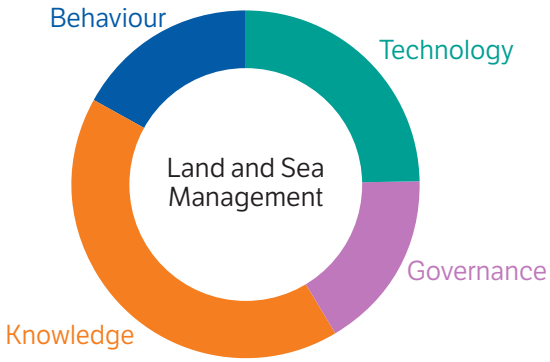
Land and Sea Adaptation Actions

High-level strategies relevant to this Plan. For more detailed information refer to the Torres Strait State of Environment Report Card (http://www.torresstraitsoe.org.au) and Land and Sea Management Strategy for Torres Strait 2016-2036.

Actions	Lead entity	Hardware/Orgware/ Software
Identification of climate refugia and climate sensitive non-coastal terrestrial species.		
Minimising stressors and threatening processes. 1. Weed and feral pest eradication programs 2. Sustainable take of resources 3. Protection of nesting turtles from feral dogs 4. Removing plastic pollution 5. Reduced vehicle use on beaches	TSRA, Councils, PBC's, Biosecurity	Hardware Orgware Software
Enabling landward expansion of coastal systems.	Councils, PBC's	Orgware
Adapting traditional burning practices to align with the new climate conditions and protection of important refugia and habitats. Currently no formal processes around management of traditional burning.	TSRA, PBC's, Councils	Orgware
Develop coastal management plans for vulnerable coastal species including mangroves and freshwater ecosystems, and species that use the coast for nesting or foraging.	TSRA, Councils, PBC's	Orgware
Building in climate change shifts into traditional seasonal calendars.	TSRA, PBC's	Software
Expand investment into oceanographic monitoring to build a deeper appreciation of the region's thermal dynamics and of reef connectivity.	AIMS, CSIRO, TSRA, DCCEEW	Orgware
Assess impacts of reef stressor on coral recruitment	AIMS	Orgware
Build greater community awareness of the impacts of climate change on land and sea country.	TSRA	Orgware Software

Actions	Lead entity	Hardware/Orgware/ Software
Review and update environmental monitoring activities across the region to ensure improved ability to identify and track climate driven changes and impacts.	TSRA	Orgware
Build capacity of communities to address local marine threats such as COTs and undertake coral recovery projects.	TSRA	Orgware, Software
Work with communities to optimise the effectiveness of local Turtle and Dugong Management Plans	TSRA, TO's	Orgware, Software

Supporting species and ecosystems to adapt to climate impacts key adaptation domains. Note these values are only rough approximations to illustrate a point.



Resilience Strategy 3: Minimising vulnerabilities of public infrastructure, housing, cultural sites and coastlines to predicted threats.


Josephine David

Planned and resourced coastal adaptation

Goal

Coastal risks are being well managed to ensure communities and vital assets are protected. Transition required is the development of adaptive land-use planning and infrastructure investment to ensure capacity of impacted and receiving community settlements to respond proactively to coastal impacts.

Background

Of the 17 inhabited islands in the region, seven are considered to have high vulnerability to climate driven coastal impacts, and 3 have medium vulnerability. The low elevation and small size of some of these islands means that they potentially risk being rendered uninhabitable if sea level rise exceeds certain thresholds. The social, cultural as well as the ecological implications of this are of great to concern to Torres Strait people. Island culture is strongly tied to the islands themselves, where people's ancestors are buried, and where stories originated. If under the worst-case scenario some people must relocate, there are also implications that need to be considered and planned for in the receiving communities. The focus is to keep communities on their islands, but it is prudent to consider the risks and prepare for various possible futures as best we can. This is a process that must happen with thorough consultation with communities.

The coastal hazard risks faced by islands in the Torres Strait come in two main forms.

Coastal erosion – as sea levels rise and storms increase intensity, so we are witnessing increasing erosion of beaches in the region. Erosion on coral cays is also exacerbated by the impacts of ocean acidification. Impacts include damage to roads and infrastructure, loss of cultural sites, loss of community amenity, impacts on coastal habitat for coastal species, notably waders and coastal nesting birds. Traditionally, communities were able to relocate their dwellings to accommodate changing coastlines, but infrastructure is now more permanent. Erosion is a high priority issue for coral cay communities and communities located immediately adjacent to eroding beaches[49]. Maritime infrastructure such as barge ramps and access channels has in many cases exacerbated local erosion.

Coastal flooding/inundation - as sea levels rise the frequency and scale of coastal flooding increases. Over time this can lead to a permanent loss of low-lying areas. Impacts include inundation of sewerage systems with salt water, salinisation of soils impacting food security, saltwater contamination of ground water, damage to infrastructure and cultural sites. Sea-levels are now expected to continue to rise for at least several centuries[16] and will cause gradual permanent loss of low-lying coastal areas to inundation and will also compound erosion problems. A well-considered, community led strategy to assess risks is being developed that will identify thresholds, options and priorities. This will enable the development of a clear pathway for communities and governments to respond to risks from sea-level rise as they unfold.

This requires significant discussion and planning to ensure community aspirations and priorities are adequately considered. All options need to be assessed.

Impacts of storms – climate change essentially energises the oceans and atmosphere driving more intense storms. Large storms can lead to the impacts noted above as well as direct physical impacts of waves and intense rain leading to loss of important coastal vegetation, damage to infrastructure and property and putting people's safety at risk.

Current initiatives

This is a very high priority area of focus for the Torres Strait given the expected increase in sea level rise and extreme weather expected over the coming decades. A significant body of work has already been done to build a solid understand of regional sea level rise coastal hazards. TSIRC and TSC are currently developing Coastal Hazard Adaptation Strategies (CHAS) for their local government areas funded by the QCoast2100 program. Coastal protection works have been or are being installed at Saibai, Boigu, Poruma, Masig, Iama and Warraber.

Advances in image processing have allowed the development of public access tools to monitor changes in coastal areas around Australia based on satellite imagery. Changes in sites around the Torres Strait can be viewed at https://maps.dea.ga.gov.au/story/DEACoastlines

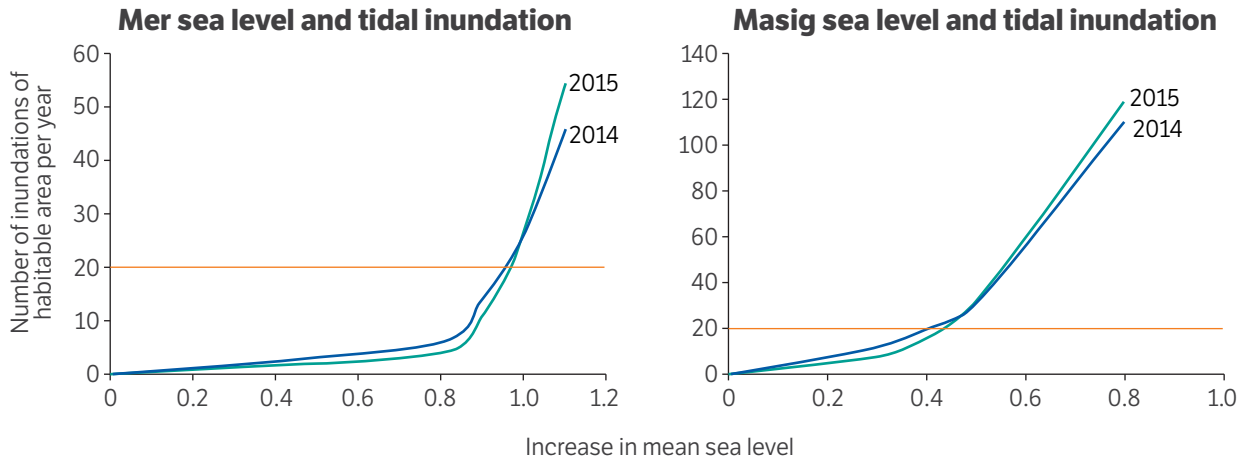


Figure 33: Assessment of sea level rise that would result in annual inundation of around 20 times per year based on astronomical tides (no storm surge) as a possible threshold

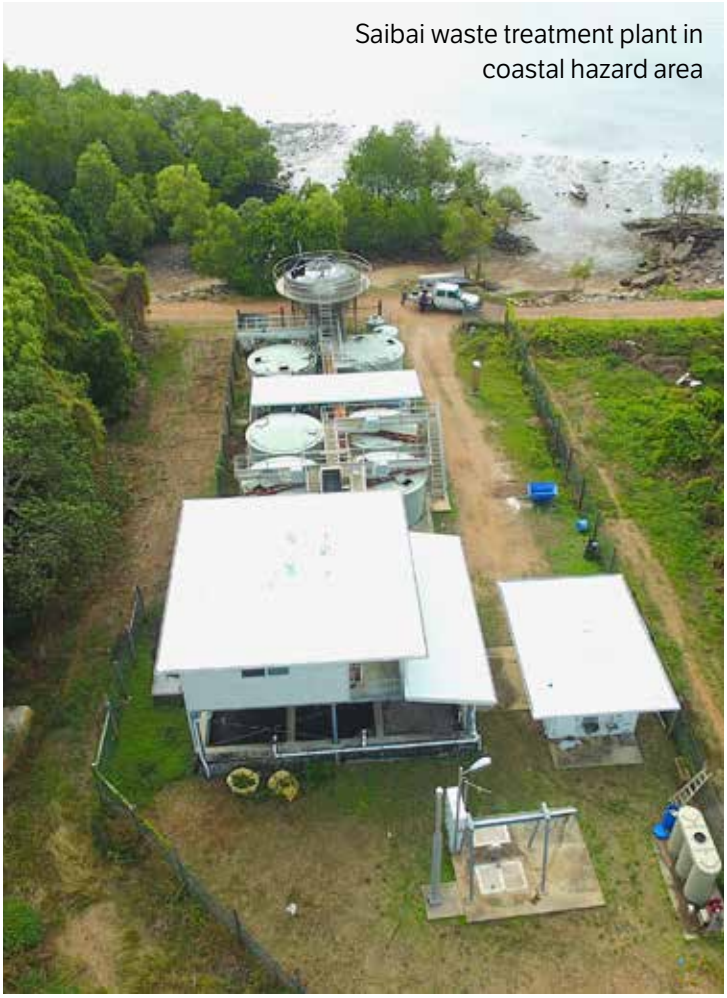
QCoast 2100 is a Queensland Government initiative designed to assist coastal councils in addressing climate change-related coastal hazards. The program provides funding, tools, and technical support to enable local governments to develop long-term plans and strategies for managing these risks. Its goal is to enhance coastal resilience and protect communities from the impacts of rising sea levels and extreme weather events. Councils in the region have all participated in the program and developed local coastal hazard adaptation strategies. At the time of writing these plans were in the final stages of consultation, completion and endorsement. The plans contain a number of more detailed actions for respective communities. The actions identified here are aimed at supporting these initiatives.

Table 4: Vulnerability to sea level rise and indicative adaptive capacity for each of the TSIRC island communities. Source: TSIRC CHAS[50]

Island community	Island type	Vulnerability to sea level rise	Adaptive capacity
Arkai	Continental	Medium	High
Badu	Continental	Very low	Very high
Boigu	Mud flat	Very high	Very low
Dauan	Continental	Very low	Very high
Erub	Volcanic	Low	High
Iama	Continental	High	Medium
Kiriri	Continental	Very low	Very high
Mabuiag	Continental	Medium	High
Masig	Coral cay	High	Low
Mer	Volcanic	High	High
Poruma	Coral cay	High	Medium
Saibai	Mud flat	Very high	Very low
Ugar	Volcanic	Low	Very high
Warraber	Coral cay	High	Low
Wug	Continental	Medium	High

Future Outlook

Globally, sea level rise is one of the most significant impacts of climate change given how much of the world's population live in coastal areas. Due to the complexity of factors that drive sea level rise and the lag time between cause and effect, the rate and extent of sea level rise is still very much uncertain. The science suggests that due to the amount of climate change that is already locked into the system, sea levels are going to continue to rise for several centuries. The high end projections for global sea level rise by 2100 if we continue on the high emission pathway is likely to be around 1.3-1.6m[17]. If the full Paris Agreement were to be implemented it would help constrain sea level rise by 2300 to around 2.2-2.5 meters, still a very significant level for island communities around the world. It is likely therefore that at some point some Torres Strait communities may have to consider relocation, but this may be many decades away. It is very likely that sea level will rise by more than 0.5 m from current levels by 2100, even following low-emissions scenarios, and may rise by more than 2 m under very high emissions scenarios.

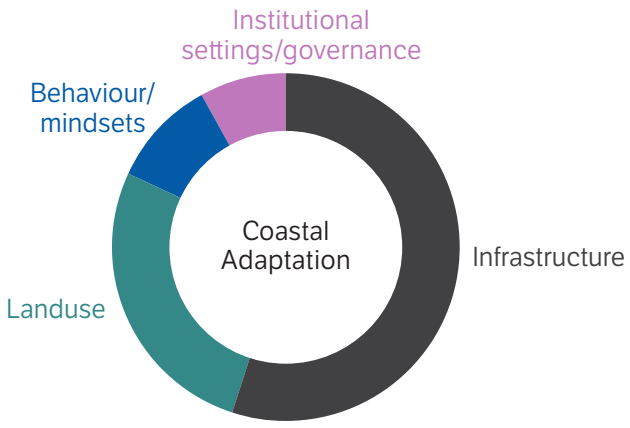


Saibai waste treatment plant in coastal hazard area

Adaptation Actions

Action	Lead Agency	Hardware/Orgware/ Software
Increase capacity in local governments to assess and respond to climate driven coastal risks	Qld Govt, Councils	Hardware, Orgware, Software
Refine methodology to determine coping and impact thresholds of coastal inundation	Councils	Orgware
Develop appropriate communications products for communities	Councils, TSRA	Orgware
Hold community consultation on options and thresholds for response implementation	Councils	Orgware
Assess fit-for-purpose innovative solutions for coastal protection and management.	Councils,Qld Govt.	Hardware, Orgware, Software
Expand community driven photo monitoring program to all priority eroding sites.	Councils, TSRA	Hardware, Software

Adapting to coastal impacts will require actions across a range of areas, but is dominated by infrastructure as indicated here. Note these values are only rough approximations to illustrate a point.



How does climate change affect coral cay islands?

How are coral cays formed?

Coral cays form where waves and currents move loose coral sediments across the reef platform to what's called a focal point or depositional node, and deposit them forming an island. Masig, Poruma and Warraber are three inhabited cays in the Torres Strait. They are different to other types of islands which are formed by continental land masses surrounded by water like Mabuiag or Dauan, or from volcanic activity them rock out from the seafloor to form an island, like Mer and Erub, or mud from rivers that deposit on old reefs like Saibai. They are dynamic – they move and change shape with seasonal shifts in currents and winds. Cays grow larger when storms dump coral sand onto the existing island, so big storm events are actually important for the health of the cay and their ability to grow. The size and location of the cay on the reef platform is due to a balance of movement of sediment between the wet season (north westerlies) and the dry season (south easterlies).

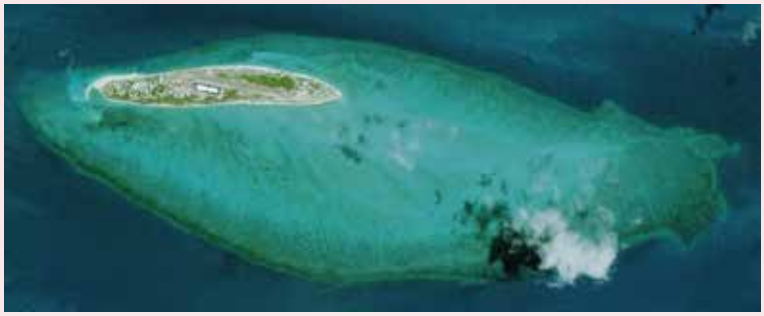


Figure 34: Shifts in the end point of Poruma island due to changes in prevailing seasonal wind and current conditions illustrate the dynamic nature of coral cays

What is the sand made up of?

Coral sand is a mixture of carbonate materials made by marine organisms including corals, molluscs, and foraminifera (microscopic marine organisms what produce a shell). A characteristic of coral sand is steep beaches compared to rock derived sands. It is also vulnerable to ocean acidification which can weaken and dissolve carbonate materials.

What is the rock found under parts of coral beaches and is it important?

Coral beach rock is coral sand that has been highly consolidated over time due to carbonate chemical processes. Beach rock plays an important role in anchoring cays, which are generally quite mobile over time due to shifting current and wave energy.

So how will climate change affect coral cays?

Sea level rise (SLR) is the main, but not the only, climate change pressure that affects cays. SLR impacts cays in five ways:

1. If SLR happens fast enough it can outpace the ability of the cay to grow in response.
2. Higher water levels also change the nature and energy of waves hitting the island leading to increased erosion.
3. This can disrupt the balance of movement of sediment leading to the cay being slowly pushed off the reef platform if it is not anchored by beach rock or seawalls.
4. Higher sea levels also increased the frequency and severity of flooding events.
5. SLR also increases the risk of the freshwater lens under the cay being contaminate with salt water, which would kill of the cays vegetation and make it uninhabitable.

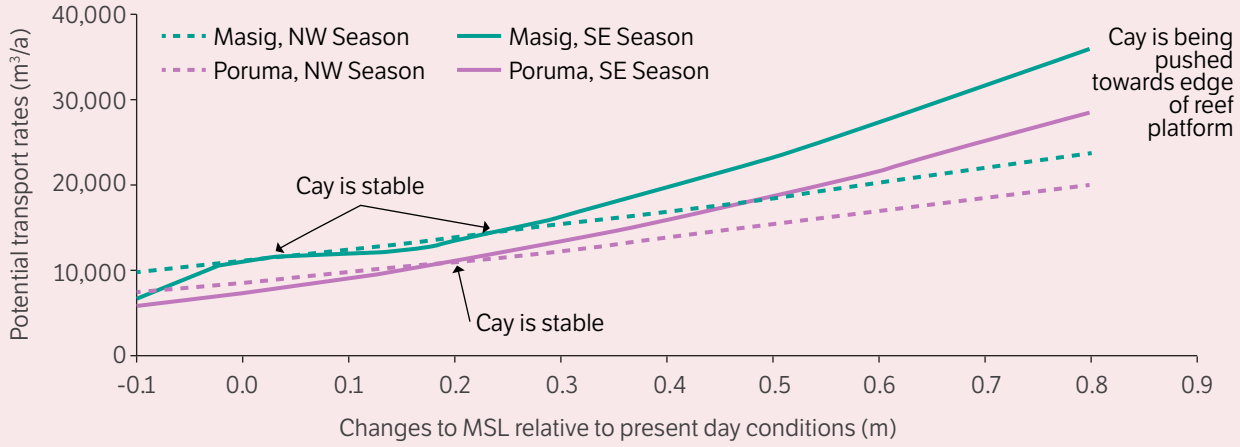


Figure 35: Models changes in the transportation rates of coral cay sands under increasing sea levels for Masig and Poruma islands indicate that beyond 0.2-0.3 m SLR the cays become increasingly unstable as sediments gets increasingly lost off the reef paltform.

Key messages

- Healthy coral reefs are critical for the health and growth of coral cays.
- Where possible avoid extracting ground water, but if it necessary ensure it is monitored closely for signs of saltwater intrusion.
- Do everything you can to protect cay beaches to ensure sediments/ sands can move freely and are not lost from the island.
- Coastal protection using suitable geobags can help to anchor the cay and reduce erosion but do come with impacts such as loss of amenity and associated beach areas.
- Avoid building any new infrastructure near to beach and relocate structures to higher areas as they need to be replaced.
- The big long term risks are submersion, loss of the cay off the reef platform, and loss of the freshwater lens.

Acknowledgments: Thanks to coastal engineer Stuart Bettington who has been assisting the Torres Strait understand and respond to coastal impacts for over a decade and has helped to build this deeper understanding of cay dynamics.

Climate Resilient Infrastructure

Goal

Infrastructure is designed, built, and operated to be resilient to projected climate conditions and impacts

Communities can prosper only if they have operational and hazard-resilient buildings and infrastructure systems.

Background

Supporting communities with infrastructure is a major challenge in the Torres Strait for many reasons. The remoteness of communities adds a significant additional cost to the transport, installation, running cost and general servicing and maintenance. The harsh environment and salt air reduce the lifespan of many materials and technologies. The distribution of typically small communities over geographically isolated locations requires multiple sets of infrastructure across the region. Historically the types of infrastructure deployed in the region have not always been optimal for the circumstances or developed with the impacts of climate change in mind.

Early construction of barge access ramps in some areas has had significant and ongoing impacts on the coastal dynamics. Inundation by saltwater flooding requires impacted waste treatment facilities to reboot and pump raw sewerage out into the water right next to communities and reducing the lifespan of the plants. Desalination plants require a large amount of energy and frequent changing of expensive filters. Houses are usually not designed or orientated for optimal passive cooling or designed and constructed to be climate resilient and culturally considerate.

Advances in material sciences and technologies offer an exciting opportunity for the region to build greater sustainability and resilience. Renewable energy is capable of powering equipment, buildings and vehicles and vessels. Plastics can be replaced by bioplastics or potentially recycled on communities with small scale plastic recycling technology. eMobility technologies require less maintenance and avoid the need to import hazardous and expensive fuels. Digital technology enables greater connectivity and reduced travel through teleservices. These measures do also need to be able to adequately deal with the expired batteries as part of local waste management.

Climate risks to Infrastructure extend beyond direct impacts on assets to risks supply-chains, labour force, reputational risks, financial risks, regulatory risks and legal risks. The costs of deploying and maintain infrastructure as climate impacts grow are also likely to increase, especially if they are not designed for the expected conditions.

Waste management is a very significant challenge for the region. High freight cost, complex biosecurity arrangements and limits to local capacity for managing and processing waste make waste management in the region challenging and expensive. A Regional Torres Strait NPA Waste Management Strategy has been developed to help address some of these issues.

Many buildings in the region suffer from the use of sub-standard materials that do not last in the harsh environment of the region. This increases the risk of damage from extreme weather and increases operation and maintenance costs over the life of the infrastructure.

Building hazard areas into local planning schemes and planning for future development to occur in safer areas through a staged relocation process will help to significantly reduce many risks to infrastructure and services. There is adequate time to undertake this process to ensure all options are considered and that future plans are well considered, appropriate, and have the required support and investment, although it would be prudent to commence this planning and analysis process soon.

Operation and maintenance costs of critical infrastructure

Increased temperatures will increase demand for air conditioners, putting stress on the power networks. Lengthening of the dry season will put stress on water supplies dependent on rainfall. Increased sea-level will potentially lead to salinisation of groundwater supplies and increased flooding of sewerage systems. Extreme weather events are likely to inflict damage on infrastructure. Changes in background environmental conditions will tend to decrease the lifespan of many materials. There will also be increasing maintenance requirements for sea walls and other coastal and maritime infrastructure as sea-levels and storm surges increase.

In most areas, there is limited backup for current utilities, particularly power supply and sewerage. The remoteness of communities can also mean delays occur in getting parts, materials and expertise out to site to repair services.

There are opportunities to increase local power generation through solar, wind and tidal technologies to increase resilience of power supplies and reduce ongoing power costs. Tidal energy produces base-load power and can also be used to produce desalinated water, for example.

The current operation and maintenance costs of environmental health infrastructure are beyond the capacity of councils to cover and are economically unsustainable in the longer term. Current technologies, whilst of a high standard, may expose communities to service failures due to their centralised and complex nature. There are opportunities related to developing infrastructure that is better suited to remote island locations that have lower economic and environmental costs and build greater resilience into communities.

Construction of energy efficient housing for example, while having a higher upfront cost, will have significant benefits in the long term by reducing demand for power. Where possible, decentralised low technology wastewater management options may be a better option on suitable islands compared with the current high technology energy intensive systems which are expensive to build and operate and are highly exposed to saltwater intrusion.

Current initiatives

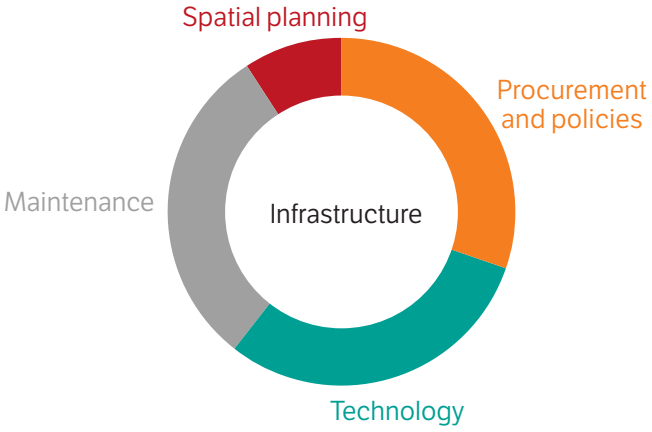
Regional Infrastructure Advisory Committee

Straits and Northern Peninsular Regional Waste Management Plan

Actions

Action	Lead Agency	Hardware/Orgware/ Software
Review regional infrastructure needs considering projected climate change conditions over the next thirty years.	TSRA, Qld Govt	Orgware
Establish a clear understanding of climate risks to existing infrastructure (nature, timing, extend and consequence).	Qld Govt, Councils	Orgware
Identify critical vulnerabilities and cross dependencies in current critical infrastructure.	Councils	Orgware
Review the decision and procurement processes underpinning infrastructure investment to ensure the delivery of fit for purpose infrastructure that is climate resilient.	Councils, TSRA, Qld Govt	Orgware
Develop a regional eMobility strategy (including end of lifecycle management).	Councils, TSRA	Orgware
Transition to renewable energy supply systems.	Ergon, Councils	Hardware, Orgware, Software
Housing - assess scope to retrofit existing homes to increase their climate resilience.	Councils, Qld Housing	Hardware, Orgware
Housing – ensure all future houses are designed, located and built for climate resilience. Identify where the existing blockages to this outcome are in the process from funding through to construction and work with key stakeholders to remove these impediments.	Councils, Qld Housing	Hardware, Orgware
Co-designing a resilient water and energy toolbox for Aboriginal and Torres Strait Islander communities.	TSIRC	Orgware, Software

Building climate resilience into regional infrastructure will require actions across a range of areas as indicated here. Note these values are only rough approximations to illustrate a point.



High levels of water security

Goal

Most islands in the region are small and have limited available freshwater. Most communities rely on desalination plants and artificial catchment dams in combination with rainwater tanks and imported bottled water for water security. Water restrictions are common during the dry season. Significant improvements have been made in water management over the past few years by the introduction of smart meters coupled with improved leak detection and the use of Scada technology for remote monitoring and management of water treatment and supply facilities. More needs to be done to improve water security in the face of expected climate impacts.

Transformation required

Generation of water from clean energy and improved demand management

Existing measures and initiatives

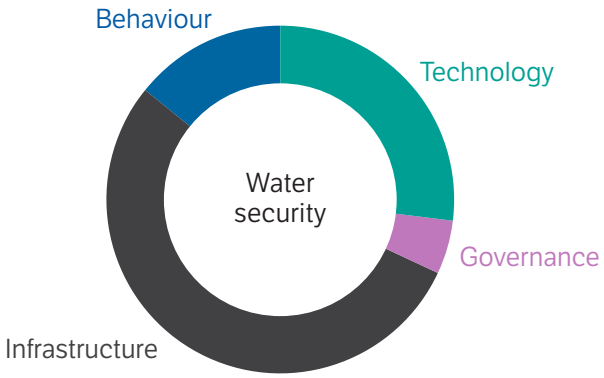
- Ranger Groundwater Monitoring Project
- SOURCE Hydropanel trial
- Installation of smart water meters
- TSIRC Sustainable Water & Wastewater Management Plan
- I know-we know - Co-designing a resilient water and energy toolbox for Aboriginal and Torres Strait Islander communities.

Water security	Climate change pressure	Impact	Adaptative capacity	Vulnerability	Response Options
Catchment supplies (tanks and dams)	Longer dry seasons and greater pressure on supplies	Decreased rainfall into catchments over dry season	Moderate	Moderate	Increase storage capacity Increase production capacity Improved demand management
Desalinated supplies	Longer dry seasons	Greater pressure on desal plants, higher maintenance costs	Moderate	Low	Improved demand management Increase storage capacity Introduce other sources of supply Explore improved desal tech
Groundwater supplies	Saltwater intrusion due to sea level rise	Contamination of well supplies	Low	Moderate (ground water provides only a small proportion of needs for most communities)	Monitor to ensure supplies are not overdrawn and to detect possible saline intrusion (critical for coral cays) Assess capacity of ground water to sustainably meet more of community demand

Actions

Action	Lead Agency	Hardware/Orgware/ Software
Promote community water conservation and efficiency practices and technologies for home and garden	Councils, TSRA	Hardware, Software
Support deployment of water efficient appliances and technologies	Councils, Qld Govt, TSRA	Hardware, Orgware
Expand the use of rainwater tanks for non-potable water supplies (ensure tank maintenance program in place)	Councils	Hardware, Orgware
Trial innovative technologies to help increase the sustainability and reliability of water supply	Councils, TSRA	Hardware, Orgware
Closely monitor ground water levels to ensure sustainable extraction and signs of saltwater intrusion	Councils, TSRA	Orgware
Ensure adequate back up supply of drinking water for emergency situations	Councils	Hardware
Explore the use of tertiary treated wastewater for tree crops	TSRA	Orgware
Explore the use of solar distillation for wastewater recycling and general water production	Councils	Hardware

Improving water security will require actions across a range of areas as indicated here. Note these values are only rough approximations to illustrate a point.



Resilience Strategy 4: Proactive livelihood diversification and food security

The region's economy is dominated by government and private sector services and commercial fisheries. This limited diversity, coupled with a range of barriers that undermine the development of a more diversified and resilient appropriate local economy, places the region at heightened risk to the impacts of climate change.

The urgent economic considerations are in natural resource dependent livelihoods such as tourism and fisheries where changes to marine ecosystems are predicted. Of particular concern is the linkages between fish/seafood and food security.

Tourism is currently a relatively minor component of the regional economy, but there is some potential for this sector to expand in niche markets associated with eco- and cultural tourism and recreational fishing tourism in particular.

Given the geography of the region, air and sea transport and freight are another significant component of the regional economy. The high cost of living pressures (driven mostly by freight costs) for food, retail goods and transport create additional economic challenges. Micro economies for individual islands have yet to be properly explored, but face challenges associated with local capacity and issues related to welfare dependence.

Climate change is likely to affect the regional economy on a number of fronts, including impacts on natural resources, labour productivity (from health impacts and shifts in working patterns related to hot weather), impacts on community, personal infrastructure and assets and increasing competition for government support from affected mainland communities.

This Plan does not develop strategies for economic management of the region under climate change though that is something that should be considered now and research commenced prior to the next generation of this plan in five years' time.

In summary, the key climate impacts identified from a financial capital perspective were:

- Declines in local availability and or productivity of key fisheries species
- Storm and sea-level impacts on infrastructure that underpins economic activities
- Increased cost burden for replacement, repair and maintenance of infrastructure
- Damage to potential tourism assets (natural and built)
- Impacts on productivity from health impacts

"The economic impacts are likely to be severe, but could bring opportunities."[51]

	2030	2050	2070	Adaptive Capacity
Impacts on fisheries				Low
Impacts on tourism				Medium
Impacts on infrastructure				Medium
Impacts on productivity				Medium
Approximate timing of severity of impacts and indication of adaptive capacity				

Developing a Climate Resilient Fisheries sector

Goal

By 2030 the impacts of climate change on fisheries and fishing are well understood and proactive measures are in place to manage impacts and build greater resilience and diversity into the fisheries sector.

Background

Climate change is likely to result in significant impacts of climate sensitive fisheries species, including shifts in their distribution and increased variability in abundance[52,53]. This will have associated impacts on the culture, livelihood, and lifeways of Torres Strait Islanders, who are deeply connected to their marine estates and heavily dependent on marine resources for their survival and spiritual well-being.

Fisheries are a critical part of the economic, cultural, and social life of Torres Strait Islanders. Key commercial fisheries in the region include the Tropical Rock Lobster (TRL), Finfish, Beche de mer/sea cucumber, trochus, prawns and pearl oysters and mud crabs. There is currently focused effort on expanding local Indigenous participation in commercial fisheries. Dugong and turtle are considered traditional fisheries. The Torres Strait Protected Zone Joint Authority (PZJA) is responsible for the management of all fisheries in the Torres Strait Protected Zone (TSPZ).

The TSPZ is defined in the Torres Strait Treaty between Australia and Papua New Guinea. The Treaty sets out a framework to guide both countries in providing for the management, conservation and sharing of fisheries resources in and around the TSPZ. It also sets out guidelines for the enforcement of fisheries legislation.

The principal purpose of the TSPZ is to acknowledge and protect the traditional way of life and livelihood of the indigenous inhabitants of the area including their traditional (subsistence) fishing and their traditional right of free movement. The Australian Fisheries Management Authority (AFMA) is the lead government agency responsible for management of Australia's fisheries interests in the region. Malu Lamar is the RNTBC representing the native title rights of Torres Strait Islanders in relation to the Regional Sea Claim Determination Part A.

Goals and transition required (What do we want and what needs to change?)

A climate aware collaborative fishery sector with suitable capacity and flexibility in management arrangements to accommodate variability and exploration and expansion of alternative protein and economic resources.

To ensure the continued viability of Torres Strait fisheries in the face of growing impacts from climate change, it is vital that there is increased flexibility in management arrangements to accommodate variability and exploration and expansion of alternative protein and economic resources. This requires:

Government, industry, research partners and Traditional Owners working collaboratively to optimise the sustainable management of Torres Strait fisheries and reduce pressures on stocks where possible.

Exploration of adaptation options and opportunities, including but not limited to, fisheries management responses, to enhance local food and economic security.

Current Situation (What is happening now?)

- Oceans are changing in ways that will impact many fisheries spatially (where fish are), temporally (when fishing can occur) and phenologically (life-cycles)[52,54].
- The waters in the Torres Strait are already on a clear warming trend (see Figure 8).
- The rate and scale of change is unclear, but are likely to be acute by 2050.
- Flexible adaptive management is going to be essential, as will be development of alternative sources of livelihoods, protein and income[55].
- There are limits to adaptation and we need to recognise potential losses.
- There is a need to future-proof fisheries management to allow adaptation and transformational changes[56].
- Secondary impacts are likely to also be important for livelihoods, markets and supply chains.
- Beyond economic impacts, there are likely to be significant social and cultural impacts, including impacts on peoples' spiritual and mental health and wellbeing[57].
- Vulnerability assessments need to look beyond the impacts on the species in situ and include risks during the catch phase. Sea surface temperatures have been on a steady increase over the past five decades (Figure 8). The 2016-17 marine heat wave impacted the TRL where crayfish died whilst being held in capture cages due to high water temperatures. Boat engines also struggled to keep cool due to the high-water temperatures.

Status of efforts to understand and respond to impacts:

- Assessing the vulnerability of Torres Strait fisheries and supporting habitats to climate change[58]
- TSRA/CSIRO Workshop and Report: Climate Change in the Torres Strait - Implications for fisheries and marine ecosystems (2018)
- Fisheries Climate Adaptation handbook – AFMA/CSIRO 2021[55]
- Guidance on Adaptation of Commonwealth Fisheries management to climate change and Appendix Summary of Commonwealth Fishery Climate Sensitivity
- Understanding climate variability and change relevant to key fisheries resources in the Torres Strait and adaptation and mitigation strategies (Ecosystem model) – A joint TSRA/CSIRO/AFMA three year project to develop a climate driven ecosystem model to inform fisheries management.
- TSRA/AIMS monitoring of sea-surface temperatures.
- Mapping of traditional sea country boundaries
- Establishment of Zenadeth Kez Fisheries
- FRDC/AFMA Project to improve assessment and reporting of non-commericial catch

Future Outlook (What could happen?)

Climate risks	Impacts on sector
Rising sea surface temperature, rising sea-level and ocean acidification Increased wet season rainfall Shifting seasons and weather patterns Inundation and storm surge as a result of more frequent and severe weather events Complex interactions between rainfall, seasonality, water quality and other variables Changing ocean currents Marine heatwaves	Primary impacts: Changes in growth, distribution, reproduction, recruitment and phenology of key marine species at various stages in their life cycles and catch phases. Impacts on marine water quality (especially when coupled with more intense land clearing and development pressures in PNG). Reduction in the time available for fishers to operate, increased safety risks at sea and possible impacts on the timing and location of reproduction for certain marine species Risks to infrastructure that supports fishing (such as jetties and wharves) Impacts on the lifecycle and productivity of systems important to fisheries in the region Coral bleaching, movement of certain species to cooler deeper waters. Secondary impacts: Potential for increased operating costs and safety risks for fishers. Variability in the quality and availability of commercial fisheries species. Impacts on livelihoods, market security and supply chains.

Climate change is likely to result in greater environmental variability leading to greater variability in the distribution and abundance of climate sensitive fisheries species. Over time highly climate sensitive species are likely to move to new areas and possibly disappear from the region. As impacts on fisheries grow, the opportunities for effective adaptation will eventually decline.

Fishers report they have already seen shifts in winds, tides, the distribution and behaviours of target species.

An assessment of the relative vulnerability of Torres Strait fisheries to climate change found that when comparing fisheries' importance and vulnerability to climate change, the TRL, pearl oyster and trochus fisheries are priority fisheries in relation to climate impacts[58]. Whilst some target species like mackerel might be less vulnerable, their adaptive response could be to move to cooler environments, which could impact their availability in the Torres Strait region. It is also important to understand the socio-economic risks from changes in fisheries/catches due to climate change in the long-term.

Rising sea surface temperature, rising sea-level and ocean acidification are likely to have significant impacts on fisheries in the medium to long term, via direct and indirect effects, such as changes currents, in growth, distribution, reproduction, recruitment and phenology[53], with a number of climate related changes in marine systems already documented around Australia and internationally[55]. A risk for tropical fisheries is that there is nothing to replace species that shift into cooler subtropical and temperate regions. There is nowhere warmer that species are moving away from that might bring new species to the region.

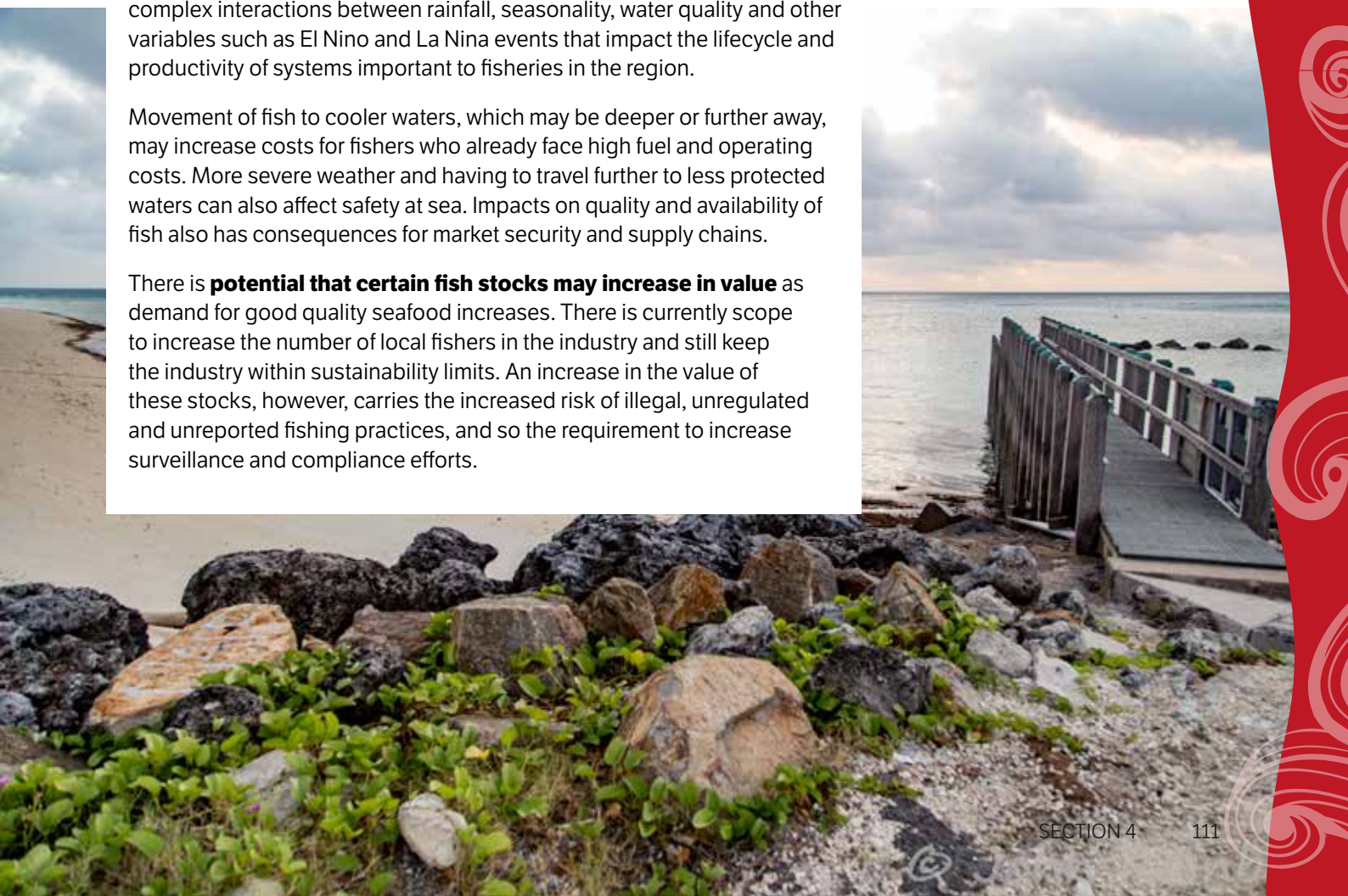
Key vulnerabilities include the sensitivity of **coral reef systems** to temperature and acidification, vulnerability of key **fish breeding and feeding habitats** such as mangrove and seagrass systems to sea-level rise, and a shift in distribution and abundance of target species to cooler waters. The large die off of mangroves in the Gulf of Carpentaria in 2018 was driven by climate change and highlights the exposure of these ecosystems to the confluence of unfavourable conditions that can lead to widespread and long- lasting impacts. Increased wet season rainfall coupled with ongoing land clearing in PNG might also **increase runoff** into the region, further affecting some aspects of fisheries, such as breeding and recruitment. **Shifts in ocean currents** could have major implication for recruitment of larvae into the region[59,60].

Weather patterns are also likely to change. Some local fishers have already reported a **shift in the monsoon** by up to two months and changes in wind patterns that are making them less predictable. Such changes may impact the amount of time available to fishers to operate, safety at sea and may also affect the timing and location of reproduction.

Infrastructure that supports fishing, such as jetties and wharves, is at risk from sea-level rise inundation and storm surge. There are also complex interactions between rainfall, seasonality, water quality and other variables such as El Nino and La Nina events that impact the lifecycle and productivity of systems important to fisheries in the region.

Movement of fish to cooler waters, which may be deeper or further away, may increase costs for fishers who already face high fuel and operating costs. More severe weather and having to travel further to less protected waters can also affect safety at sea. Impacts on quality and availability of fish also has consequences for market security and supply chains.

There is **potential that certain fish stocks may increase in value** as demand for good quality seafood increases. There is currently scope to increase the number of local fishers in the industry and still keep the industry within sustainability limits. An increase in the value of these stocks, however, carries the increased risk of illegal, unregulated and unreported fishing practices, and so the requirement to increase surveillance and compliance efforts.



Adaptation Actions

Action	Lead Agency	Hardware/Orgware/ Software
Develop tools to address uncertainty and build transformative capacity to enable autonomous adaptation in response to longer-term climate impacts. The Torres Strait marine ecosystem model (in development) to assess sensitivity of key species to climate impacts will be a key resource.	CSIRO, TSRA, AIMS	Orgware
Undertake risk assessment of key target species (as per the Adaptation of Fisheries Management to Climate Change Handbook).	AFMA, CSIRO	Orgware
Scope opportunities and alternative livelihoods protein/income options based on both local aspirations and future changes via an iterative process of science-planning-management (i.e. adaptive management).	TSRA	Orgware
Identify where reform of management instruments is required to better enable adaptive responses.	AFMA	Orgware
Build resilience into fishers' capacity (e.g. trial the use of electric boat motors to reduce operational costs, reduce environmental impacts of fuels and help move the fisheries to carbon neutrality; improved weather conditions forecasting).	TSRA, Zenadeth Kez Fisheries	Hardware Orgware Software
Improve assessment of non-commercial catch.	AFMA, TSRA	Orgware
Engagement with sector on climate change to develop culturally appropriate options to reduce pressure on marine environment and identify and opportunities.	TSRA, Zenadeth Kez Fisheries	Software
Strategic data collection and monitoring to better understand changes and impacts on fisheries and socio-economics.	AFMA, TSRA	Orgware
Protect key refugia, spawning grounds and near-shore environments which are critical to fisheries productivity.	Zenadeth Kez Fisheries, AFMA	Orgware

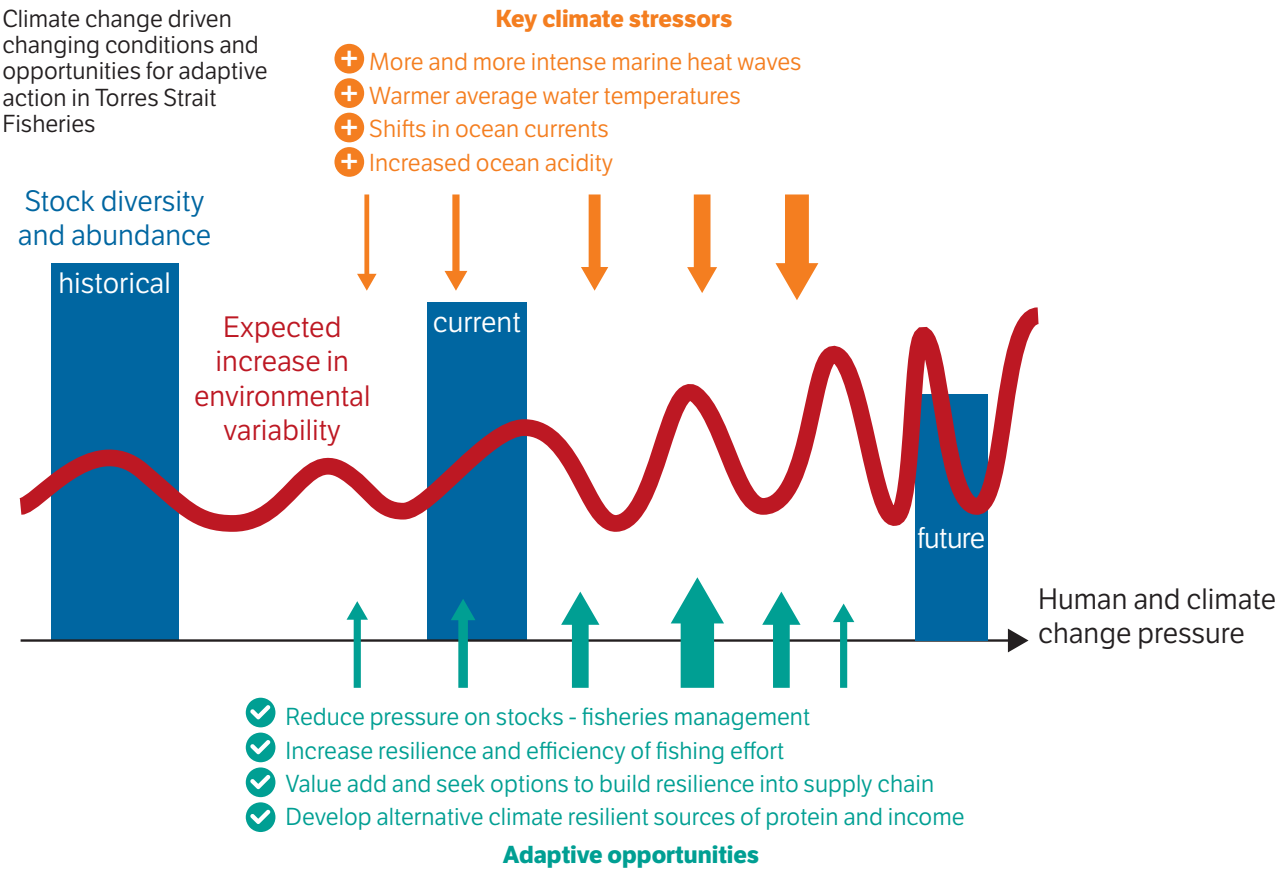
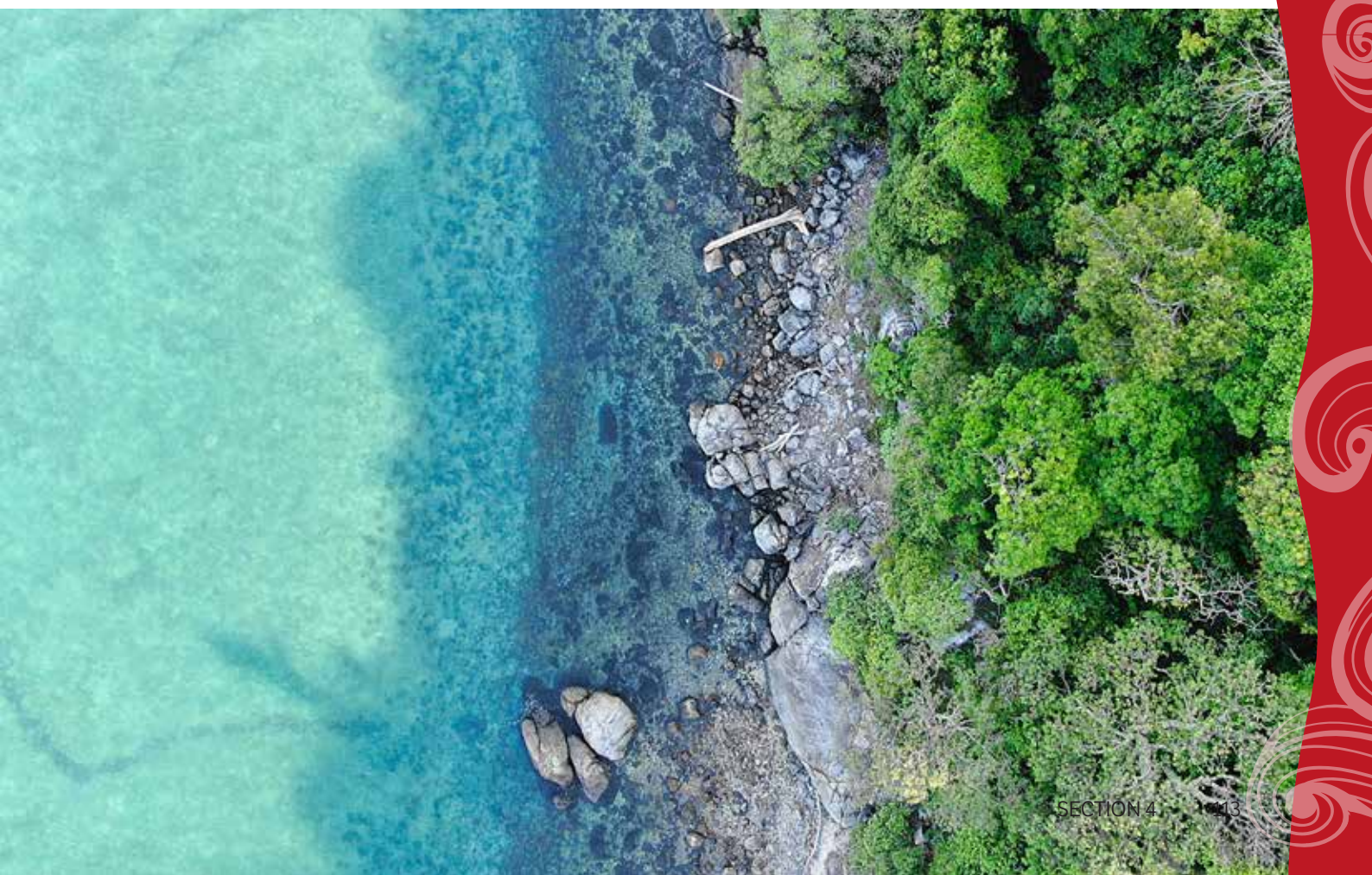


Figure 36: Schematic representation of how climate change impacts fisheries variability and response opportunities over time. Climate change is likely to result in greater environmental variability leading to greater variability in the distribution and abundance of climate sensitive fisheries species. Over time highly climate sensitive species are likely to move to new areas and possibly disappear from the region. As impacts on fisheries grow, the opportunities for effective adaptation will eventually decline. Image: TSRA



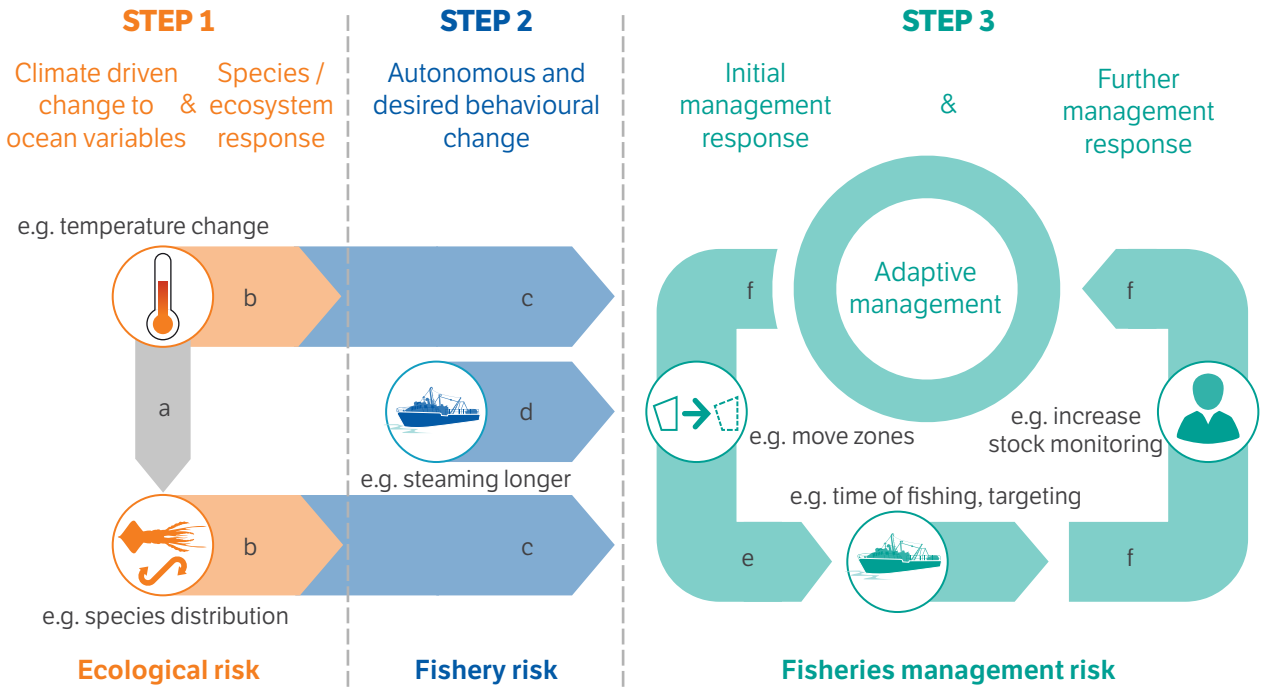
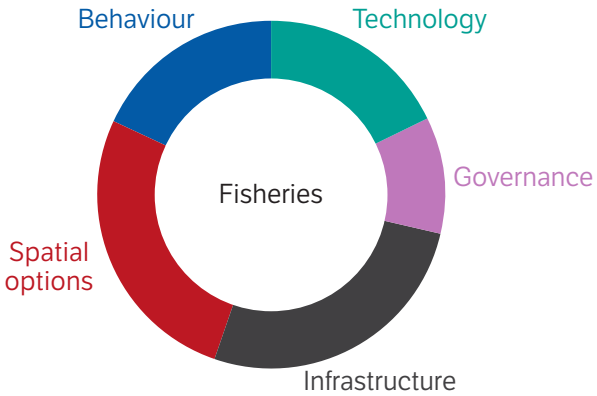


Figure 37: Schematic representation of why a risk assessment needs to be undertaken – showing the relationship between climate change, autonomous fleet adaptation and response and any management responses. (Source: AFMA/CSIRO Adaptation of fisheries management to climate change Handbook)

Fishers will shift practices automatically for some changes which will help them cope with increased variability. Fisheries management responses may also be needed such as changes to temporal or spatial closures. Flexibility will be important to accommodate changes in the distribution, availability and abundance of stock. Also important is what fishers are and could be doing better to adapt (i.e. autonomous adaptation)[56]. Flexibility will be important in spatial planning, and work on mapping traditional fishing country boundaries will need to consider how marine resources might shift spatially over time.

Adapting to impacts on fisheries will require actions across a mix of areas as indicated here. Note these values are only rough approximations to illustrate a point.



Building greater food security

There are 18 communities on 17 islands in the Torres Strait. Food, water and energy security are vital to the future viability of communities across the region. Increasingly, communities are looking for ways to revitalize their traditional subsistence practices, or to seek innovative new ways to become more self-sufficient and resilient in terms of their water resources, food supplies and energy systems.

A recent study into the cost and availability of healthy foods in the Torres Strait concluded that: While less expensive than the current diet, recommended diets are unaffordable for most households. Consequently, many Torres Strait Islander families are at high risk of food insecurity and diet-related disease.

Communities are already noting shifting in seasons and greatly difficulty of growing crops due to water access and the shift in timing of growing seasons. Saltwater inundation and intrusion in ground water is an additional risk exacerbated by climate change.

Many families grow supplementary crops, notably coconuts, bananas, papaya and yams. Subsistence fishing is also an important part of most people's diets.

Challenges to building food security include land ownership issues, unreliable rainfall and water supply, biosecurity restrictions, the lack of a resourced regional food security action plan that is driven from both community level and top down.

Current initiatives

Mekem Garden (Sustainable Horticulture) Project

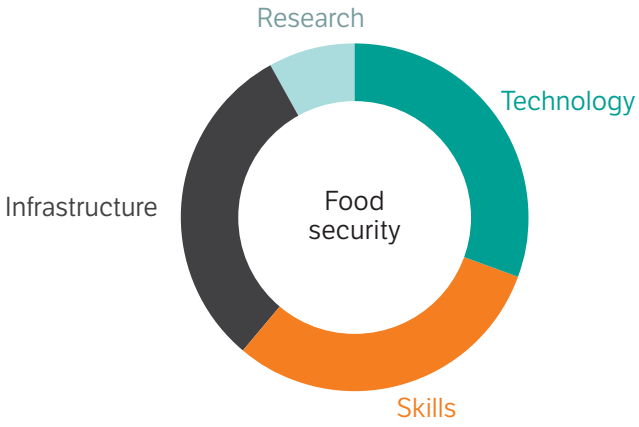
Qld Health and Wellbeing Gather + Grow Remote Food Security Action Plan

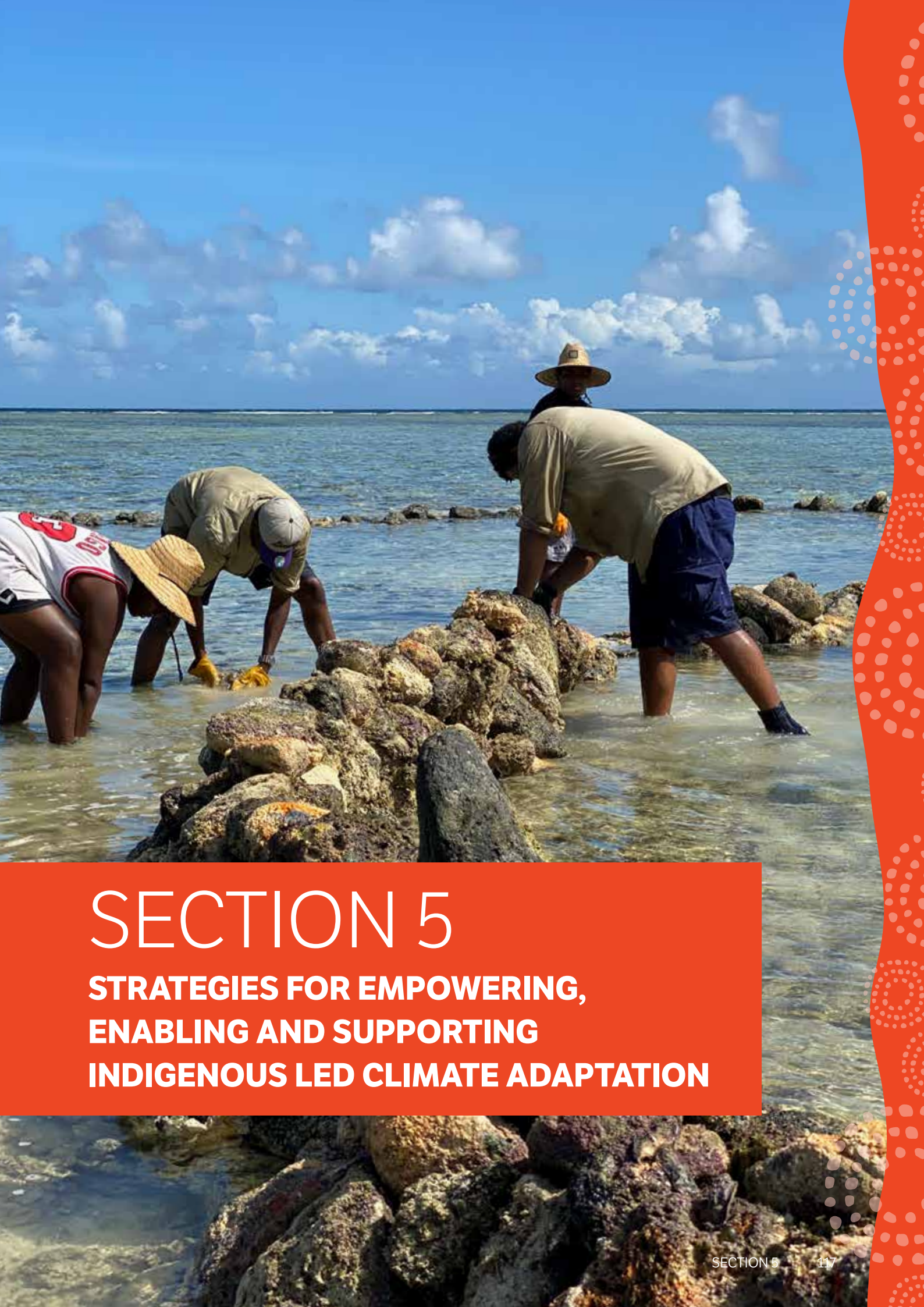
Food security	Climate Change Pressure	Impact	Adaptative capacity	Vulnerability
Marine food resources	Marine heatwaves Changes to currents	Changes in where food is found, changes in availability	Low	Medium
Locally grown produce	Longer dry seasons, more intense rain and shifts in timing of seasons	Plants under greater stress, less suitable growing conditions, more susceptible to diseases and pests, water scarcity	Moderate to high	Medium
Availability of commercial food	Extreme weather	Disruption to southern supply lines Increase in the cost of food due to impacts of climate change on imported foods	Medium	Medium to high

Adaptation Actions

Action: Development of a Torres Strait Food Security Action Plan that includes:	Lead Agency	Hardware/Orgware/ Software
Assess climate sensitivity of important local crop resources and identify climate resilient varieties.	CSIRO, Dept Ag	Orgware
Scope and establish climate resilient local fresh food production businesses to reduce reliance on imported food .	TSRA	Hardware Orgware Software
Continue to support the expansion of island-scale domestic food production .	TSRA	Software
Assess options for improved irrigation including use of tertiary treated wastewater for tree crops and domestic subsurface irrigation for home gardens.	TSRA	Hardware Orgware
Incorporation of traditional and western knowledge into optimizing local food production and security.	Communities, TSRA	Software
Reinforce links between community food production and cultural maintenance.	Communities	Software

Building greater food security will require actions across a range of areas as indicated here. Note these values are only rough approximations to illustrate a point.





SECTION 5

STRATEGIES FOR EMPOWERING, ENABLING AND SUPPORTING INDIGENOUS LED CLIMATE ADAPTATION

The safety measures and new "hardware" (climate resilient infrastructure, baseline health, food security and so on) are only part of strengthening climate resilience and will be limited if 'business as usual' thinking and processes are used to inform and drive decisions. The world is on the cusp of a 4th industrial revolution with new sources of energy production and distribution, information distribution, processing and management, and transportation, and its important the region is accessing these new opportunities. It is essential for plan success and for longer term adaptation that the conversations around the underlying enablers and inhibitors of adaptation in the region are identified, understood, and addressed.

This section of the plan seeks to

1. Construct practical and culturally acceptable adaptation pathways for the three '"software"' influences on regional climate resilience (adaptability, social identity and systemic path dependencies or lock-ins – *see below for more information*) and their potential to adapt to climate change by:

    a. Optimising adaptability;

    b. Supporting cultural integration so that futures are shaped as much as possible in the direction of cultural aspirations;

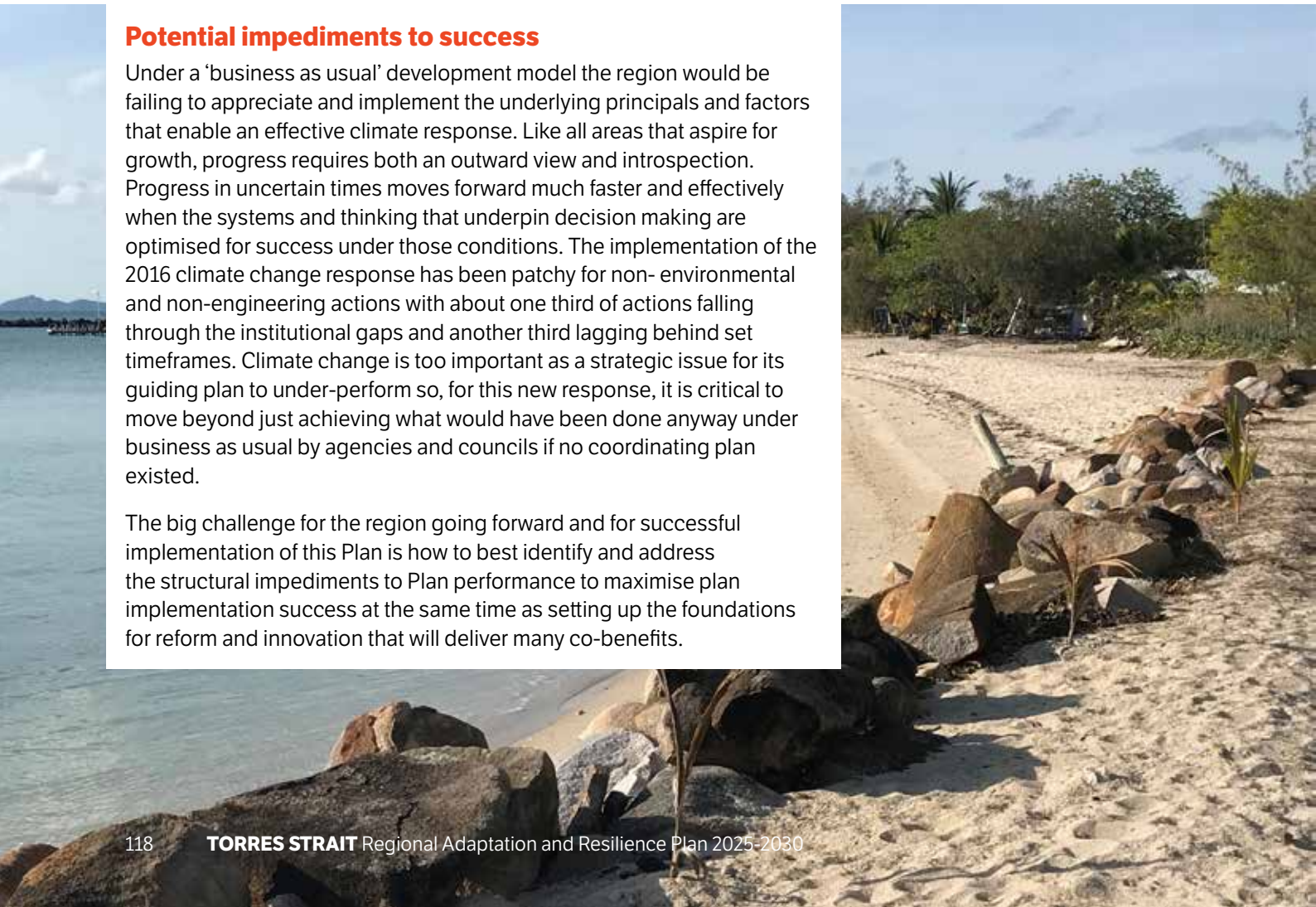
    c. Unlocking potential and opportunity.

2. Highlight opportunities to deliver effective climate governance that will effectively empower, enable and support the strengthening of climate resilience in general, and the implementation of this Plan in particular.

Potential impediments to success

Under a 'business as usual' development model the region would be failing to appreciate and implement the underlying principals and factors that enable an effective climate response. Like all areas that aspire for growth, progress requires both an outward view and introspection. Progress in uncertain times moves forward much faster and effectively when the systems and thinking that underpin decision making are optimised for success under those conditions. The implementation of the 2016 climate change response has been patchy for non- environmental and non-engineering actions with about one third of actions falling through the institutional gaps and another third lagging behind set timeframes. Climate change is too important as a strategic issue for its guiding plan to under-perform so, for this new response, it is critical to move beyond just achieving what would have been done anyway under business as usual by agencies and councils if no coordinating plan existed.

The big challenge for the region going forward and for successful implementation of this Plan is how to best identify and address the structural impediments to Plan performance to maximise plan implementation success at the same time as setting up the foundations for reform and innovation that will deliver many co-benefits.



The importance of social capital

The social capital aspect of the five capitals framework and its role in resilience was given only minor attention in Section 4.

Social capital is the glue that holds societies, regions and communities together. It most often described in terms of:

1. bonding capital – which supports within group networking and support
2. bridging capital – which supports wider networking between groups; and
3. linking capital – which covers the relationships and networking between formalised bodies such as councils, agencies, PBCs and so on.

For this plan social capital is widened to include institutions and culture. The attribute at the centre of all of these forms of social capital is trust. Low trust leads to social organisation vulnerabilities, cultural erosion and institutional isolation and undermines both resilience and functionality. From engagement with pilot communities and observations at workshops bonding capital is strong at the family and group level, while bridging capital is patchy and linking capital even lower. Building appropriate '"software"' and '"orgware"' foundations of climate resilience that re-establish trust at all levels is fundamental to an effective climate change response and particularly so if that response is to be driven by the people and value systems of the Torres Strait and if the generally agreed aspirations are to be become reality.

Empowerment

it is important to highlight that empowerment to act, and also disempowerment, comes from two directions – either from within or from some external more powerful source or a combination of both. In this section changing the three types of "software" (see below) is a form of self-empowerment. Changing the institutional relationships and structures is a way of reversing disempowerment and with good collaboration to provide an empowering environment.

Resilience Strategy 5: Optimising adaptability (response-ability and responsibility)

Goals

1. Effective climate leadership that can mobilize resources, bring different perspectives to bear and get key innovators and investors to work together to proactively shape futures that deliver on agreed aspirations
2. Within five years to build sufficient capacity of the region to be recognised as a national leader in the development and implementation of effective Indigenous led adaptive responses to climate change
3. In the longer term all communities have developed community-led local scale climate adaptation plans or strategies. By 2026 at least three high risk communities have a trained resilience Officer and have developed their specific response to climate change and by 2027 have embedded their aspirations into programs, masterplans or funding streams

Transformations required to achieve this outcome

1. From reactive adaptation to resilience literacy including the skills of proactively managing adaptation in the unbounded present
2. Shifts in responsibility to support Indigenous-led aspirations and a proactive approach
3. Emergence of coordinated climate leadership
4. Development and implementation of an adaptability assessment framework

Background

Adaptability (sometimes known as adaptive capacity) is fundamental to resilience and to adaptation. In the context of climate change in the Torres Strait region it is essentially the capacity/abilities of individuals, institutions and organisations to influence the pace, scale and direction of adaptation at one or more scales and by doing so to shape climate resilience and futures.

In many plans adaptability is just ”response-ability”, the ability or capacity to respond. In this plan it has an added dimension of responsibility which is necessary for a shift from reactive to proactive adaptation and even more relevant to the aspiration of an Indigenous-led response in which cultural erosion is one of the key drivers.

Optimum adaptability involves

1. Access to and mobilisation of available of resources (the five capitals) that are sources of community wellbeing, recovery and renewal – which from a human perspective is a rights, leadership and negotiation skill issue – some of the resources will be owned and under direct control but others permissions in advance will be required;
2. The necessary openness and flexibility to consider and adopt new options (too little leads to maladapted (out of fit) situations while too much can lead to chaos) – which is essentially about personal, cultural and institutional rigidity and mindsets;
3. Awareness of the world around us and recognition of its changing patterns – essentially the basis of generating and updating Traditional Ecological Knowledge;
4. The ability to convert this knowledge into practical lessons and innovation – essentially to learn and make adjustments to reduce vulnerabilities and improve functionality – so TEK is not an end in itself but an input to readaptation, infrastructure design, resilience management and so on;
5. The ability to convert will/aspiration into action (agency) – which requires skills to actually make things happen when required and some acceptance of responsibility to drive your own aspirations – so it is not just using rhetoric but applying implementation skills
6. The ability and necessary leadership to socially self-organise/re-organise when required – which applies to formal leadership but also often emerges under stress when ordinary people become leaders when it matters most.

It was mentioned earlier in the Plan that adaptation can take either shallow or transformative pathways depending on the nature of the threat. It makes sense that if adaptability is the capacity to adapt that there will also be different skills and capacities required to drive transformative action than would be required to drive shallow change to business as usual. Optimising both forms of adaptability will be a critical contribution to the aspiration of Torres Strait people becoming a shining example of Indigenous-led climate change adaptation.

From discussions with communities' people and even leaders feel disempowered to act due a mix of challenges relating to complex institutional arrangements as well as elements of local cultural complexities. When people's culture and way of life is under threat it is natural to look to the past for certainty, but its equally important to look forwards with a mindset focused on actively creating a preferred future rather than simply adjusting to changes as they arrive.

Table 6: The core components of adaptability, characteristics that can be impediments, areas for reform and and transformation

Components of adaptability (capacities)	Restrictive adaptability characteristics	For adjustment	For deeper change and transformation
Resources	Limited access to resources	Leadership ability to access resources	Leadership ability to mobilise resources in new ways
Openness and flexibility	Closed mindsets, rigid rules and institutions Innovative ideas are shut down	Incremental change	Openness to innovation
Climate awareness	TEK is from the past	Informed climate awareness	Climate awareness linked to alive TEK and science
Learning and innovation	Reinforcement of entrenched mindsets and methods	Single loop learning that accepts improvements to existing systems	Deep (triple loop) reflection and learning Readaptation
Agency	It is someone else's responsibility	Willingness and skill to negotiate	High level of skill
Self- organisation	Try to manage with business as usual	Minor changes to institutions and behaviours tolerated	Climate leadership and willingness to reorganise if required

What progress has been made so far?

The importance of adaptability and community capacity to the climate change response was raised in the 2016 Plan and establishment of a community-based resilience champions program. Funding has been made available by the Commonwealth Department of Climate Change Energy, the Environment and Water to progress this important itinitiative. The TSNPACRC has provided a platform to have a regional dialogue on climate change, shown through the steering committee meetings whereby regional leaders across the TSI and NPA come together to discuss climate adaptation matters. The grant program will fund climate resilience officers and climate adaptation works that align with regional priorities.

A community resilience framework has also been developed through conversations with Mer and Masig communities which focused on building an understanding of barriers and enables to adaptation and resilience at the community level. The coconut tree was agreed on as a good metaphor for climate resilience that communities could relate to.

There is an obvious and clear benefit in existing Torres Strait institutions and their leaders reflecting on the current levels of adaptability, and in acquiring and applying those skills and insights to support the strengthening of climate resilience. A similar benefit applies to the current service delivery systems that operate more or less on their own set of governance arrangements, funding streams, and habitual ways of doing business. However, most of the implementation happens at community and family scales and it is here that impacts of shifts in climatic patterns and of severe events will be felt most and in different ways for each community. There is a strong case for more attention than has been given in the past to adaptability as a factor in climate resilience at these finer scales and for exploring ways to legitimise and empower community and family scale decision making and adaptation planning.

Social change and skill development takes time. Nor is it easy to achieve so expectations need to be realistic. By implementing strategies to establish new institutional structures for policy learning, empowering communities, individuals and groups, bringing together traditional and scientific knowledges and creating space for innovation, as well as drawing attention to some of the systemic blockages to adaptation the region will fast track its progress to building a climate resilient future.

The pathways developed for this plan seeks to strengthen adaptability at family, livelihood, sector, community and regional scales.

Adaptation Actions

- Development and delivery of an Indigenous Climate Resilience Program. In late 2024, DCCEEW released the Torres Strait and Northern Peninsula Area Climate Resilience Grant Program (3 years funding).

This is an enabling action that will fast track the local skills and knowledge required to move climate change response to the next level that this Plan aspires to achieve. Establishment of a bespoke Indigenous adaptation and resilience training package to provide the skills and context for community resilience champions to be able to driver local adaptation and resilience planning. Training should include building understanding of the fundamentals of climate change science and impacts, understanding resilience at different scales, what is adaptation and how to plan for it, communication, negotiation and facilitation skills, driving culturally appropriate social change and project management.

- Local Climate Resilience Officers engaged.

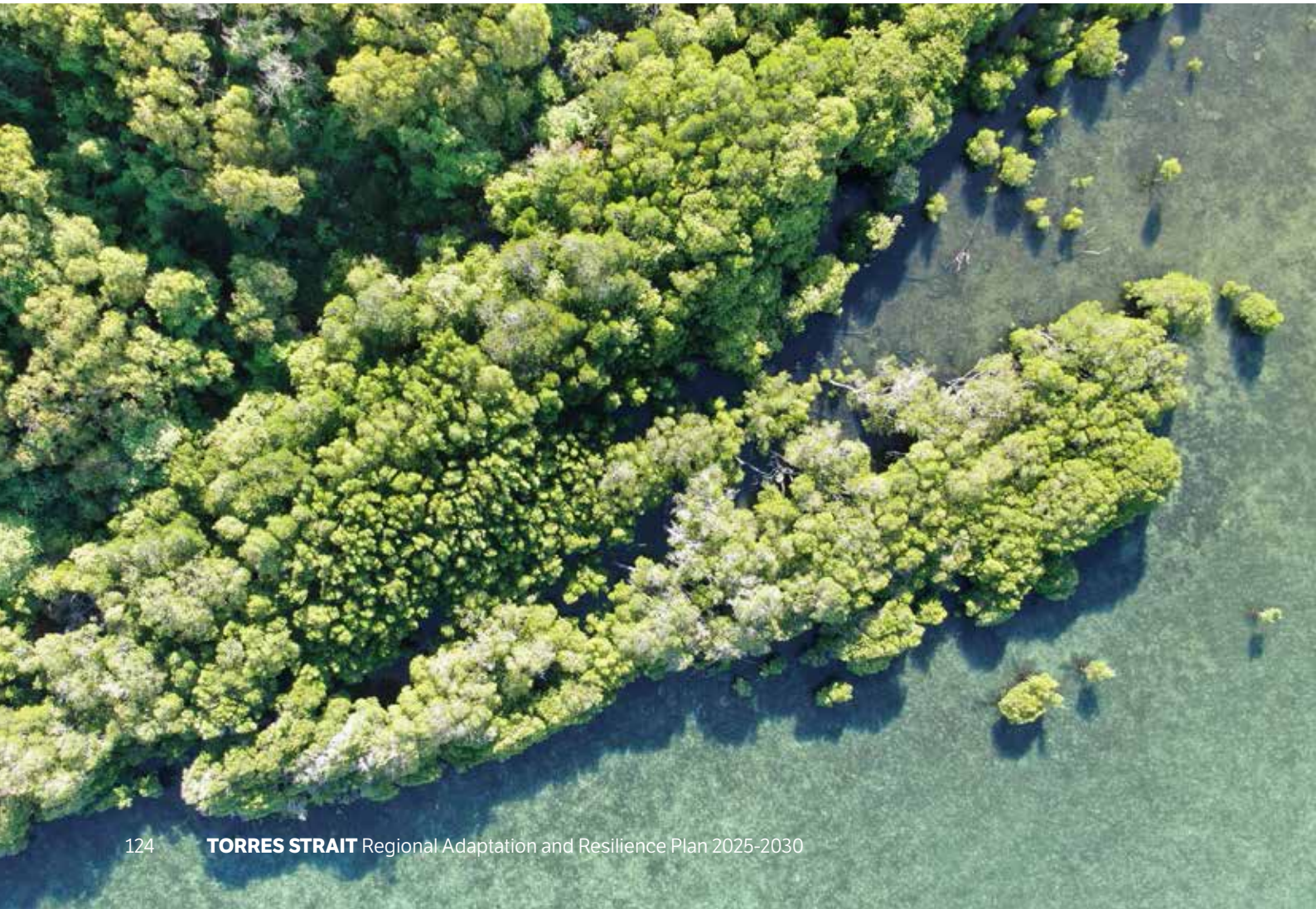
A fully paid position focused on planning, coordinating and implementing community level adaptation and resilience actions. This is a high priority action.

- deliver on-ground adaptation solutions
- perform community outreach
- provide community education on climate matters

One way of self-assessing the need for attention to adaptability is to contrast the idealised components of optimum adaptability with what low levels of adaptability might look like – then asking both generally and for each component 'are we more like this or more like that'?

Access to adaptability capacities	Low adaptability characteristics	Optimal characteristics
Resources	Very limited or no access to critical resources (funds/food/water/transport/communications)	High levels of access to resources
Openness and flexibility	Closed perspectives to ways of being grounded in fear of change and loss	Openness to new ideas and ways of being grounded in knowledge and creativity finding culturally appropriate pathways forwards
Climate awareness	Limited appreciation of climate change and therefore of how it will impact the region	High appreciation of climate change and how it may impact multiple aspects of life in the region
Learning and innovation	Limited interest or access to new ideas and information	Desire for knowledge and creative thinking driven by curiosity
Agency	A mix or internal and external forces inhibit the ability to drive change	Internal and external forces are aligned to support action
Self- organisation	Internal capacity for response is low and feedback loops are limited.	Internal capacity to respond is high supported by fast appropriate feedback

Table 7: Assessing adaptive capabilities through contrasting where communities sit on the spectrum of low to optimal adaptive characteristics for each of the 6 capacities.



Resilience Strategy 6: Cultural integration into climate response

Goals

The culture of the region remains strong and vibrant and informs the climate response.

Culture is itself adaptable and dynamic. Responses to climate change in the region needs to both be informed by the values and aspirations of the people as well strengthen their culture and identity.

Transformations required

The Torres Strait climate response reflects and reinforces the values and culture of the region.

Background

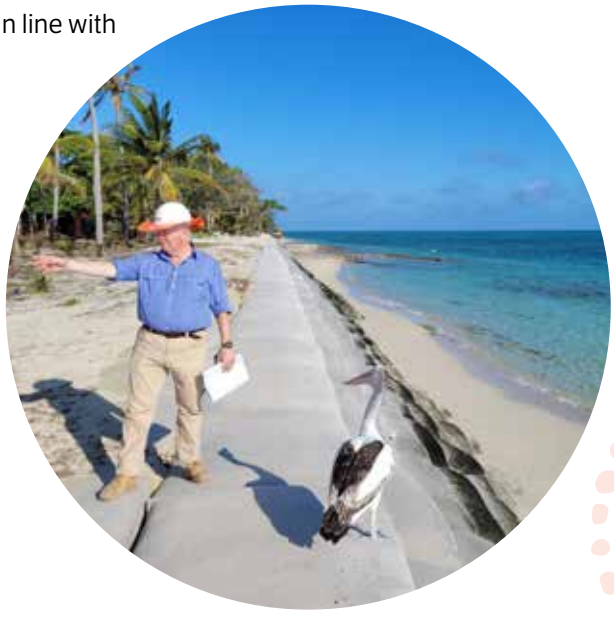
The Torres Strait region is culturally and bio-geographically unique in Australia. The people of the Torres Strait have a strong desire to drive climate change adaptation in a direction that retains that unique identity and to give themselves every opportunity to continue to occupy their traditional land and sea country into the future.

The people of Torres Strait are acutely aware of climate change as a threat to their lifestyles, livelihoods, their traditional land and sea country, culturally significant sites and as a consequence to their identity.

The impacts of climate change are already experiencing on culture. As the seasons shift, there are changes in the movement of birds and animals, in the times that that breed, changes in the flowering and fruiting of plants in ways that are outside of traditional knowledge of land and sea country. These changes are starting to undermine the ability to rely on traditional knowledge and are of great concern. Coasts and beaches being eroded away by the sea, in some cases washing away the graves of ancestors. Identity and culture are inextricably linked to land and sea country. If land is lost to sea level rise, it leads to a loss of parts of cultural identity. However, Torres Strait people have adapted to many changes in the past, and there are many facets of the culture that can support them in adapting to this new reality.

How the region responds to climate change is going to be a blend of drawing on old ways and capitalising on new ways that are in line with their values.

The Torres Strait climate Resilience framework recognizes social identity as a such a significant influence on adaptability and adaptive potential that it is given its own status as a core foundation of climate resilience. Of most concern is the potential of social groups to resist change and severely limit adaptability and the options available for adaptation. Culture is a strong driver of social identity so how culture is reproduced and practiced is a major influence on resilience, though elders are concerned that it is being eroded as young people are increasingly influenced by western understandings and technologies. As with cultures everywhere staying relevant to all ages and groups is critical to cultural revitalization and survival.



Climate change and its pressure to adapt, often through new and unfamiliar ways, adds another change driver to these existing western/traditional interface pressures. However, it also provides an opportunity to revitalize cultural interest and give it renewed relevance. The big challenge for cultural sustainability under these new climate realities has two aspects:

- **Managing the risk** - How can we manage the risks to cultural integrity and cultural sites from a changing climate, the severe events that it will generate, consistent with our need to adapt our infrastructure, our institutions, our behaviours, and our mindsets if we are to have a hopeful future?
- **Managing and leading adaptation -** How can the response draw on stories, values, lores and TEK developed over a long period of time under a relatively stable climate, develop new knowledge to help adapt to the changing climate and the uncertainty that accompanies it, at the same time as reversing cultural erosion?

It is not the role of this plan to set cultural directions to respond to these challenges – that must come from within the cultural leadership. Rather in the shorter term, it seeks to educate about climate change, address timely cultural site protection wherever possible (see section 4), give voice and opportunity to aspirations, and in this section to establish dialogue space and appropriate structures for cultural input, and highlight opportunities for cultural maintenance using climate change as a window of opportunity for readaptation.

Progress so far

Conversation around cultural erosion and what role culture could play in adapting to climate change was started as far back as 2015 and raised again in pilots with Masig and Mer communities and in the 2022 Regional Stronger Together workshop had a dedicated session on climate change and culture, but the real work has yet to begin.

Adaptation Actions

- Establish a process for community scale dialogues to examine how climate change is impacting and might impact culture, how cultural values and practices and support and inform adaptative responses, what aspects of culture might be a barrier to effective adaptation, and how youth can be more fully engaged in the process to ensure cultural continuity.
- All actions progressed from this plan are assessed by appropriate people or entities to ensure alignment with the cultural aspirations outlined.

Resilience Strategy 7: Unlocking potential and opportunity

Goals

The imperative to adapt and build resilience is used as a catalyst for wider system reform that breaks disabling systems and processes takes the region closer to greater self-reliance and sustainability. This includes opening up as many options for adaption as possible.

Transformations required

- The aspiration of a hopeful future under climate change rather than just coping with the impacts after the event, is tied up with the recognition of climate change as 'a window of opportunity' in addition to the urgent imperative of engaging with it as a significant strategic threat.

Background

The existing governance systems reflect the historical development trajectory of the region. These structures are however not always the best fit for current and expected conditions. When western governance values and structures extend into areas holding a differing set of values and systems, a length period of renegotiation is required to find a solution that works for both sides of this dynamic, and great clarity is required as to the questions these systems are aiming to ultimately address. Often the conflict is related to the fact that each side is trying to answer different questions with the existing governance structures and processes.

The complex of competing values and priorities at this interface of western and traditional governance can lead to ongoing frustrations unless these "knots" are unteased and there is clarity about what and how these structures and relationships need to be organised to better achieve the respective aspiration of each side of the dynamic. Whilst this might sound somewhat abstract, their impacts are very real of often very disabling to meaningful progress. Untangling these knots requires shifts in mindsets on both sides as both have their own locked-in thinking, both sides need to be accountable, and both need to be prepared to find a path forward, but the onus is on the western systems to be respectful and accommodating of local values and cultural norms. Building climate resilience effectively requires this consideration be given equal weight to other options such as coastal defences – they are all important part of the response to build a more self-reliant and resilient region.

Both State and Commonwealth Governments have recognised the need for reform in the area of Indigenous relations and hopefully this will lead to improvements that support better on ground outcomes for communities. Climate change is also now a key consideration of local governments and is becoming more institutionalised.

Adaptation Actions

- Regional leadership convene a workshop to explore where the key blockages to optimising the ability to capitalise on opportunities and unlock regional potential through examination of historical path dependencies.

Resilience Strategy 8: Transitioning to climate resilient governance.

Goals

By 2029 the core structures and functions of a trusted multi-scalar system of climate governance are in place that strengthens climate resilience in ways that empower the people of Torres Strait Region to shape their own futures, supports in times of need and opens opportunities for adaptation.

Transformations required

1. Indigenous led climate change planning and response.
2. The regional development model is characterised as being strategic, proactive, innovative, inclusive and collaborative.
3. A shift in perspective from focusing on trying to solve problems to a focus on creating better alternatives.

Background

Resilience theory reinforces that effective climate change responses cannot be managed at one scale of decision making or by individual agencies, governments or organisations operating alone.

Governance in the region is dominated largely by a western framework characterised by competition, silos, project driven, largely reactive and in many instances suffers from a lack of quality local data to inform decisions.

The times we find ourselves in require an examination of the governance systems to ensure they can effectively respond to a rapidly changing socio-political-technical and ecological environment that has increasing challenges and disruptions due to climate change. Effective governance also needs to better meet the demands of addressing the urgent short-term priorities whilst also prioritising the important long-term priorities.

It is a recommendation of the Plan that agencies and entities operating in the region collaborate to develop a regional development pathway that is built upon the principles of climate resilient governance. Implementing such a transition would deliver additional benefits to the region beyond climate change responses such as support aspirations associated with greater regional empowerment and self-reliance.

The IPCC recognised the need for effective governance to drive urgent climate change action as highlighted in the AR6 Summary for Policymaker (2023) Effective climate action is enabled by political commitment, well-aligned multilevel governance, institutional frameworks, laws, policies and strategies and enhanced access to finance and technology. Clear goals, coordination across multiple policy domains, and inclusive governance processes facilitate effective climate action.

"The uncertainty of future climate change impacts, the multi-sectoral and multi-jurisdictional nature of the issues, and the need for inclusive and equitable responses, require that proposed solutions stress the need for the participation of diverse stakeholders. This involves learning and innovation, self-regulation, accountability and shared knowledge and decision-making by all parties. This has been embodied in practical recommendations for decentralisation by national governments, greater power sharing across local, national and regional levels of government, multi-stakeholder initiatives incorporating the private sector and civil society and greater citizen participation and community-driven processes. However, such recommendations for governance systems are rarely reflected in reality" (*Supporting governance for climate resilience, 2017*) "

How do we create governance that can better support human and environmental resilience to multiple shocks and stresses in uncertain times? This is an ongoing process of engaging both with politics and with complexity: finding 'best fit' for context as well as taking advantage of a plurality of solutions, operating flexibly and working at multiple levels simultaneously. Trade-offs are inherent and need to be acknowledged. The involvement of too many actors can decrease workability. Flexible organisations can respond and scale up quickly, but often at the expense of accountability. All these actors need to be recognised and considered.

Table 8: Characteristics of governance for improving resilience to climate risks. Source: Supporting governance for climate resilience, 2017[61].

	Diversity and participation	Flexibility, experimentation, innovation and learning	Automoy and self-regulation	Accountability	Communication and knowledge sharing	Collaboration, integration and shared deciion-making
Decentralised governance			✓	✓		
Multi-stakeholder governance	✓	✓			✓	✓
Multi-level governance	✓	✓	✓		✓	✓
Polycentric governance	✓	✓	✓		✓	✓
Participatory governance	✓			✓	✓	✓
Community-based governance	✓		✓		✓	✓
Adaptvie governance	✓	✓			✓	

Table 9: Characterisation of the current Torres Strait regional development model

Current predominating characteristics	Desired state
Fragmentation and silos	Coordinated and integrated
Competitive	Collaborative
Project driven	Initiative driven
Reactive	Proactive
External western governance model	Better balance of western and traditional governance
Limited quality local and regional data	Good quality local and regional data
Top-down	Top-down and bottom -up

Progress so far

The governance arrangements around climate change within the region have not changed substantively since the first climate response plan was produced in 2010.

Both the Commonwealth and QLD Governments have introduced new resilience-based institutional arrangements, investment pathways and structures related to climate and disaster preparation and recovery since 2016. These pathways link state institutions primarily to local governments consistent with existing disaster management arrangements covered in section 4. Under these arrangements a resilience plan has been prepared by the Cape and Torres Indigenous Council Alliance though it is mostly an infrastructure resilience plan.

Adaptation Actions

- Establish a strategic leadership group for the region to drive accountability in delivery of this Plan and oversee development of mechanisms to drive greater collaboration and integration.
- Strengthen institutional policy learning capabilities (hindsight). Any effective learning process requires the ability to reflect on past efforts, failures and successes to ensure the lessons are recognised and built into new thinking, planning and delivery. To do this requires a deliberate process of policy learning lest we fail to learn from the past to the detriment of efforts to build a better future.
- Work through the Torres Strait and Northern Peninsula Area Climate Resilience Centre as the coordiation and accountability mechanism for Plan delivery. The aspiration from the workshop was to have an entity that would position the Torres Strait as a national and international leader in climate change adaptation for remote Indigenous communities and provide a structure that would support and enable a locally led coordinated adaptation response from the community scale cross up to the regional scale.

The Department of Climate Change Energy Water and Environment committed $16 million dollars to the establishment and running of this initiative over 4 years.

A planning and investment framework for supporting community scale adaptation planning. Building the capacity of local communities to develop their own adaptation and resilience plans and to implement actions within their sphere of responsibility is a high- level priority. To achieve this outcome two key ingredients are required:

Each community needs a local skilled champion to facilitate the local plan development who has a paid position dedicated to this task.

A planning framework that enables communities to clarify their vision for the community, assesses their baseline resilience, clarifies priority actions and strategies that sit withing their sphere of control that results in an achievable local implementation Plan owned by the community.

It also reinforces that the power relationships and day-to-day information/ resource flows (feedback) between scales of decision making can either support or inhibit climate resilience and are critical successful adaptation whether that is building readiness and reducing asset vulnerabilities, staying safe during severe events or during post event recovery phases.

Not even the best plans implement themselves. Signing off on a plan is just the start, not the end of the planning process. It is important for success of this plan, that the institutional arrangements, roles responsibilities, accountabilities and decision making for the ongoing management of the climate change response (the "orgware" and cross-scale support systems) are clear and effective and have the support and approval of key stakeholders.

This plan cannot and does not have the legitimacy to specify climate governance arrangements. That needs to negotiated be leaders, key institutions and governments and will take time and a sound information basis. What it can do and has done throughout is articulate some of the pitfalls of the 'do nothing different' option, put forward some critical functions and potential intervention points, articulate some ideals of climate governance for consideration in negotiations and set up the first few steps in a pathway towards effective climate governance for the region consistent with the context and aspirations of Torres Strait people.

The second part is to look at what reforms to the underlying institutional structures and functions might be necessary and practical to enable effective cross-scale working relationships and the aspiration of the people of the Torres Strait to lead this response to climate change and shape their own futures.

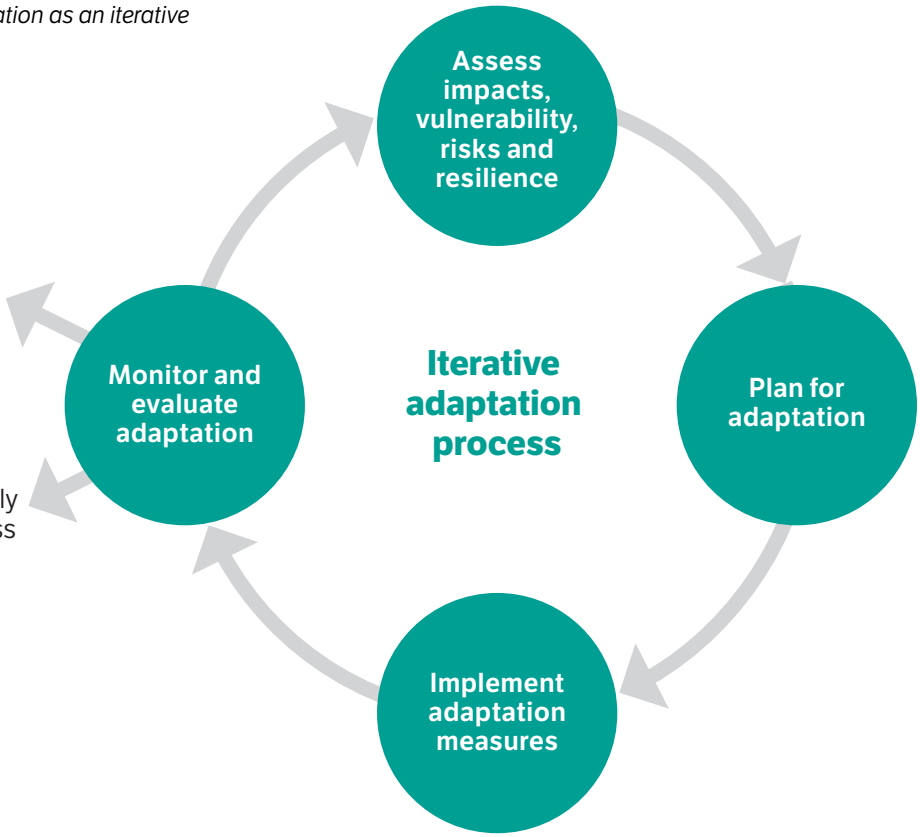
The response to climate change so far has been driven primarily from within the environment and engineering/infrastructure focused program areas of government agencies in the region. Climate change is far more than an environmental and infrastructure issue and if we are to drive effective responses across the region more integrated decision making is required. A reflection on the success of implementation of the previous version of this Plan supports this point where most of the focus and progress related to environmental and coastal engineering activities. Moving forward putting in place more effective coordination, collaboration and enabling structures will enhance the potential for great implementation of this Plan.

Healthy cross-scale relationships are ones that have strong multi-directional interactions that enable flows of information from one scale to scales above and below.

MONITORING AND EVALUATION

Monitoring and evaluation is critical for ongoing learning and course correction. It is often not well execute as a process, largely because the process is often unrealistically complex requiring more resources than are generally available.

Figure 38: Monitoring and Evaluation as an iterative adaptive process Source: IPCC



Monitoring entails tracking progress made in implementing a specific adaptation action in relation to its objectives and inputs

Evaluation entails systematically and objectively determining the effectiveness of an adaptation action

Monitoring and evaluation can be a challenging thing to do well given the effort to collect data against nominated indicators. In this Plan we are suggesting a more pragmatic approach that is likely to be easier and more useful that a traditional approach as used in the first edition of the Plan. Using specific indicators also often has the disadvantage of focusing in only on a poor and often narrow surrogates of the issue being considered, so even when data is available, it doesn't always actually tell us anything particularly meaningful.

In evaluating progress, the underlying question being asked is where are we situated on a spectrum from no or poor outcome to a Goal? "Is it more like this or is it more like that compared to when this Plan was released?" If it's very easy to determine where we sit on that spectrum it's a sign that it there is broad agreement. Evaluation should be based on discussions with a selection of key stakeholders across the spectrum from planning the actions to experiencing the outcomes and include reasons/evidence as to why they selected a particular score. It should also focus on both process (what steps have been undertaken to make this happen?) and outcomes given some outcomes are often long term. Assessment is based where things were at the start of this version of the Plan compared to the time of the evaluation.

As an example

Adaptative Fisheries

Goal: A climate aware collaborative fishery sector with suitable capacity and flexibility in management arrangements to accommodate variability and exploration and expansion of alternative protein and economic resources.

Is it more like this...

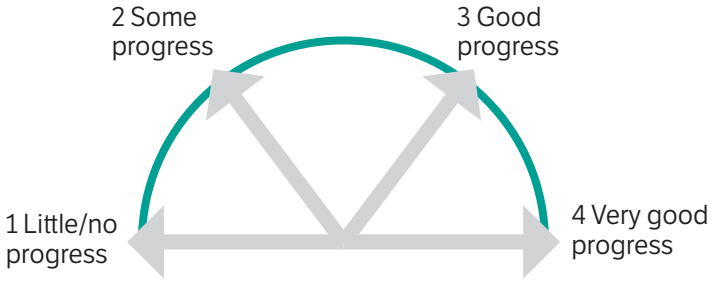
Fisheries management has only a superficial appreciation of climate risks and management arrangements remain unchanged, and fishers have a poor appreciation of how climate change will impact them and how they might respond. The relationship between fishers and fisheries management is combative. Strategies listed in the Plan have not been actioned. Score of 1

Or this....

Fisheries management has a deep understand of how climate change is likely to affect fisheries, is highly adaptive in its management and fishers have a good appreciation of the risks and capacity to response. The relationship between fishers and fisheries management is collaborative. Strategies listed in the Plan are being actions as per the identified action tables. Score of 4

What evidence is your assessment based on? What has occurred in terms of any processes? Have any outcomes been realised?

A clear governance and accountability mechanism needs to be established to support the implementation of this Plan.



Accountability: This Plan exists to serve the people of the Tores Strait. The region's leadership hold the responsibility to represent and advocate for their interests. The reestablishment of a regional climate leadership group representing the key regional leadership would act as an ideal accountability mechanism. Those tasked to deliver this Plan should report to this leadership group on progress 6 monthly or on an annual basis.

Tracking progress: There is a range of excellent web-based reporting platforms that would enable the easy collation of progress, compiling it into report cards, allowing real time assessment of progress against Goals. It is recommended such a platform be implemented to help coordinate progress and the report cards fed up to the regional climate leadership group as required.

It is recommended that an appropriated evaluation proves be established in line with this process to ensure a pragmatic and meaningful evaluation process is implemented.

ACRONYMS

ABS	Australian Bureau of Statistics
AIMS	Australian Institute of Marine Science
AMSA	Australian Maritime Safety Authority
BOM	Bureau of Meteorology
DSDSATSIP	Department of Aboriginal and Torres Strait Islander Partnerships [Queensland]
LDMP	Local Disaster Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water [Commonwealth]
EM	Emergency Management
FRDC	Fisheries Research & Development Corporation
GBK	Gur A Baradharaw Kod Torres Strait Land and Sea Council
HAT	Highest astronomical tide
IBIS	Islanders Board of Industry and Service
IVA	Integrated climate change and vulnerability assessment
JCU	James Cook University
LSMU	Land and Sea Management Unit
MSQ	Maritime Safety Queensland
NGO	Non-Government Organisation
NPA	Northern Peninsular Area (tip of Cape York)
NPARC	Northern Peninsular Area Regional Council
PNG	Papua New Guinea
RNTBC	Registered Native Title Bodies Corporate
SES	State Emergency Service
TEK	Traditional Ecological Knowledge
TCHHS	Torres and Cape Health and Hospital Service
TSC	Torres Strait Council
TSIRC	Torres Strait Island Regional Council
TSRA	Torres Strait Regional Authority

APPENDIX

Table 10: Summary table of slow and fast impacts, timing, most at risk sectors and adaptive capacity

	Primary impacts in the Torres Strait	**Possible timing until consistent significant impacts**	**Sector most at risk**	**Capacity to adapt** Low/Medium/ High
Slow onset change				
Increased sea level rise	Coastal flooding and erosion, inundation of water tables	2050	Coastal communities and low-lying islands, maritime infrastructure	High
Increase in ocean acidity	Decline in calcium-based marine life like corals and molluscs	2050	Marine ecosystems and fisheries	Low
Warmer average sea temperatures	Decline in ocean oxygen levels, changes in ocean currents, changes in the distribution and abundance of marine organisms	2030	Marine ecosystems and fisheries, traditional knowledge	Low
Warmer average air temperatures	Greater capacity of the atmosphere to hold moisture, changes in winds, shifts in the timing of seasons, decline in soil moisture, stronger storms, changes in the distribution and abundance of marine organisms	2030	Human health, island ecology, traditional knowledge, food and water security	Medium
Fast change/extreme events				
Increased frequency and severity of droughts and fires	Changes to island vegetation and ecosystems	2030	Water and food security, infrastructure	Low
Increased frequency and severity of storms and floods	Damage to infrastructure, impacts on ecosystems, risks to human health and wellbeing, impacts on livelihoods	2030	Human health, coastal infrastructure, coral reefs, transport and communications services	Medium
Increased frequency and severity of heat waves	Increased risk of heat stress, impacts on infrastructure	2030	Human health, infrastructure, heat sensitive plants and animals	Medium
Increased frequency and severity of and marine heat waves	Increased risk of coral bleaching, fish kills and impacts on tropical rock lobster fisheries	2030	Marine ecosystems, (coral reefs), food security, fisheries	Low

Table 11: Climate change impacts on health and wellbeing considering exposure, sensitivity and adaptive potential.

Issue	Climate pressure	Exposure	Sensitivity	Current adaptive capacity	Adaptive potential	Adaptive response
Heat Stress	More hot days, hotter days, Warmer nights	Lack of capacity to keep dwellings and community areas cool, outdoor activities	A large number of people over 65 years of age and people with existing health challenges	Medium Behavioural and planning solutions exist to reduce heat stress risk	High – behavioural, planning and technical solutions exist to significantly reduce heat stress risk.	Investment – sustainable cooling technologies Behaviour Institutional settings – heat risk WH&S policy
Chronic diseases	More hot days, hotter days Increased extreme weather events	Extended periods of high apparent temp over summer Impacts on health delivery system- transportation, power supply, capacity	Elderly and people with chronic illnesses have less capacity to cope with heat stress	Low	High – access to air con, maintaining hydration	Monitoring for increased incidence of climate related illness; implement hazard reduction measures for heat stress
Mental health	Impacts of SLR Heat stress Broader climate change driven uncertainty	Concern for loss of country, identity	People with existing stresses	Low	Medium	Investment in mental health /personal empowerment
Vector borne diseases	Warmer temps	Proximity to PNG (and Limited surveillance?)	Existing high health burdens, overcrowding	Medium	Medium	Improved monitoring and response capabilities
Health system function and delivery	Extreme weather events Increased stress on services due to more people with health issues	Disruption of transport, communications and supplies Secondary impacts on economy/ capacity	Regional highly reliant on air travel Remoteness of clinics	Low-Medium	Medium to High	Undertake systems resilience assessment and invest in building resilience as required

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