



Wet Tropics Regional Resilience Strategy



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The Wet Tropics Regional Resilience Strategy is a partnership between the Queensland Government and the following Far North Queensland Regional Organisation of Councils (FNQROC) member councils.

Council/website	Disaster Dashboard
Far North Queensland Regional Organisation of Councils (FNQROC) fnqroc.qld.gov.au	
Cairns Regional Council cairns.qld.gov.au	disaster.cairns.qld.gov.au
Cassowary Coast Regional Council cassowarycoast.qld.gov.au	disaster.cassowarycoast.qld.gov.au
Douglas Shire Council douglas.qld.gov.au	disaster.douglas.qld.gov.au
Hinchinbrook Shire Council hinchinbrook.qld.gov.au	disaster.hinchinbrook.qld.gov.au
Tablelands Regional Council trc.qld.gov.au	dashboard.trc.qld.gov.au
Yarrabah Aboriginal Shire Council yarrabah.qld.gov.au	

Cover image: Mossman Gorge, Daintree National Park. Credit: Shutterstock.
Below: Henry Ross lookout, Cairns. Courtesy QRA.



Foreword

The Wet Tropics region is on a world stage. The people of this region share the benefits and responsibilities of vast areas of World Heritage listed rainforest and one of the earth's greatest natural wonders – the Great Barrier Reef. When we consider natural hazards and impacts of disasters, we instinctively consider the effects on our landscape and our seascape simultaneously.

The people of the Wet Tropics live here because they love it. However, the landscape we value brings with it challenges in maintaining our settlements and services with many isolated townships, steep and inaccessible places, deep valleys, cascading streams and rivers and physical connections vulnerable to interruptions.

Our economy stems from the landscape with strong tourism links, a vibrant arts and culture sector, a robust baseline in agricultural and emerging marine and education sectors strongly linked to traditional economies. As we move towards more discerning visitors and consumers our economy is adapting to concentrate on environmentally-focussed tourism, best practice in agriculture and minimising our footprint on this valuable landscape. Our urban areas too, are strongly oriented to creating a sustainable future through purposeful climate conscious actions and strategies.

Located at the very top of Queensland we face additional challenges in distance and supply chains. We rely upon open connections nationally and internationally for labour force, visitors and supply chains. Our enviable scenic landscapes are vulnerable to volatile weather and coastal hazards. In the future we can expect the changing weather patterns to have greater impacts on our traditional economic base.

Our opportunities are considerable, but we must harness these with an eye to the future and build on these strengths while remaining cognisant of our challenges and inevitable change. Identifying opportunities to bolster future resilience can help our region to collectively shift our thinking and actions to a more resilient future.

The Wet Tropics Regional Resilience Strategy is our plan to enhance resilience for our six partner Councils. The Strategy helps us protect our common values, acknowledges that working together across government, communities, organisations and as individuals, to collaborate and share our knowledge and efforts is our pathway towards a more resilient future.

The strategy identifies opportunities to strengthen disaster resilience and draw upon the skills, knowledge and experiences of our community, to contribute to a resilient future together.



Councillor Michael Kerr
Mayor Douglas Shire
Chair, FNQROC

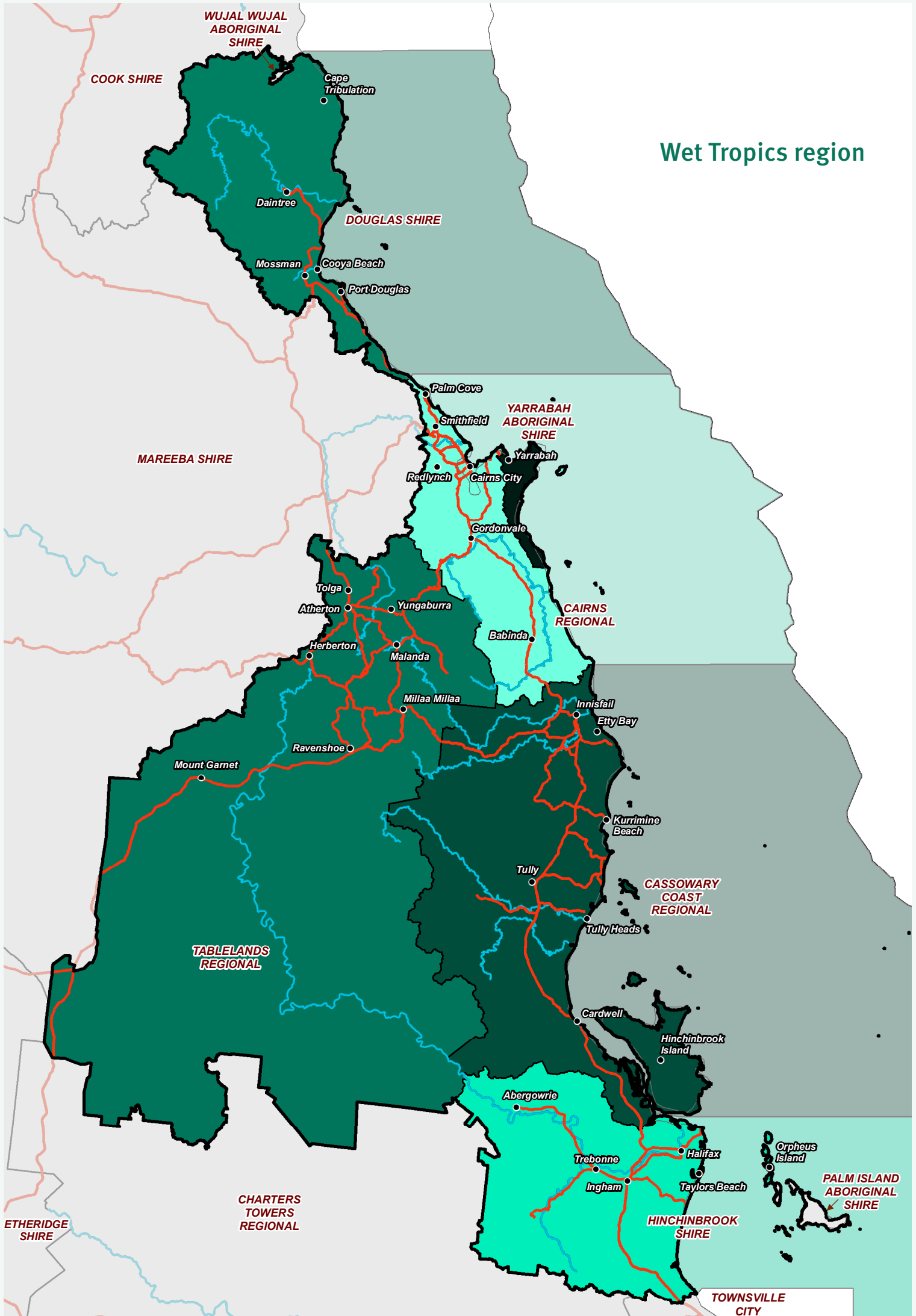


Acknowledgement of Country

We acknowledge the Aboriginal peoples and Torres Strait Islander peoples as the Traditional Owners and Custodians of this Country. We recognise and honour their ancient cultures, and their connection to land, sea and community.

We pay our respect to them, their cultures, and to their Elders, past, present and emerging.

Wet Tropics region





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Our vision

Our region is on a world stage from the Daintree to Hinchinbrook, and we value the seclusion of the rainforest retreats and seaside hamlets from Cow Bay to Lucinda.

Our culturally diverse history continues as we welcome new residents and visitors to live and experience our special part of Australia with World Heritage values and support the largest Indigenous community in Queensland at Yarrabah.

We speak of the landscape and the seascape as one: the waters fresh or salt, the Ranges, and the Reef are intrinsic to how we live.

We responsibly steward our landscape to continue to support our lifestyle through the fertile coastal flood plains, the high-quality and diverse production of the Atherton Tablelands and the tourism experiences of the reef to rainforest.

We understand and share environmental changes and natural hazard risks, and the impact this will have on our and our visitors' wellbeing.

We communicate how our unique geography and topography defines our ability to respond to natural hazards, and harness support to improve infrastructure and service provision to overcome these limitations.

Our settlement legacy is a unique string of dispersed coastal and tablelands townships, each with clear identity, contributing to current opportunities and challenges.

About the strategy

Resilience is everyone's business. Resilience in the Wet Tropics region is dependent on a shared but also collective responsibility model.

This Strategy encourages a role for everyone in the Wet Tropics region to rally around and deliver upon a common description of regional resilience, reflecting the voice of our locals. It highlights key opportunities to build disaster resilience that are unique to our region.

The end goal for resilience in the Wet Tropics region is to shorten and minimise recovery to future disaster events, and to enable transformation and adaptation to the range of stresses and shocks we experience in the Wet Tropics region.

Aims

- tell the unique story of resilience in the Wet Tropics
- bolster on what needs to be done to improve disaster resilience in the Wet Tropics
- deliver a clear Regional Resilience Strategy and Local Action Plans to further strengthen disaster resilience for our region.

Objectives

- identify the region's disaster resilience priorities
- identify actions and initiatives to address resilience needs
- prioritise the identified actions and initiatives
- connect priorities to future funding and resourcing opportunities
- articulate how risk-informed disaster resilience actions and projects meet local needs and align to state and national disaster risk reduction and resilience policy objectives.

Council partners

This Wet Tropics Regional Resilience Strategy (the Strategy) is a partnership between the Queensland Government and the Far North Queensland Regional Organisation of Councils (FNQROC) member councils.

- Cairns Regional Council
- Cassowary Coast Regional Council
- Douglas Shire Council
- Hinchinbrook Shire Council
- Tablelands Regional Council
- Yarrabah Aboriginal Shire Council.



Values guiding our resilience pathway

The Strategy reflects our values in the Wet Tropics, which are unique and make us who we are. There are four underpinning values that guide our resilience pathway.

Tailored identity

The people of the Wet Tropics share a global stage. We are surrounded by landscape and seascape of international importance. We welcome this challenge and the prosperity it brings. We are equally at home away from the limelight in our rainforest retreats, coastal hamlets, and history rich townships.

Strength in diversity

We are proud of our identities which bring global and local cultures together. We celebrate diversity in residents and in visitors. Many are strongly connected to and influenced by place.

Duty of care

We have a duty of care to the land and sea, flora and fauna, that provides us with our economic base and place connections. We understand its behaviours and our vulnerability. We value our coastal and rainforest lifestyle and the views of our mountains and valleys.

Recognition of vulnerabilities

Our region is vulnerable due to our settlement pattern and topography. We seek to ensure this is recognised in services, infrastructure, and assistance, so we can properly manage our unique region.

Image: Walsh's Pyramid, Cairns. Credit: Shutterstock.



Strategic alignment

The Queensland Government is committed to strengthening disaster resilience, so our communities are better equipped to deal with the increasing prevalence of natural disasters.

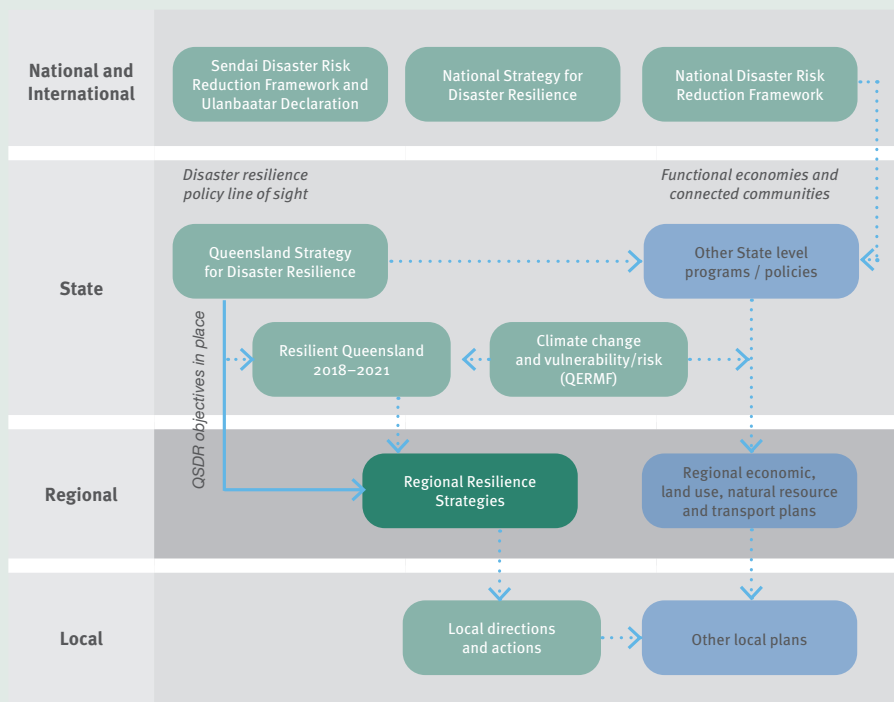
By 2022, every region across Queensland will be part of a locally-led and regionally-coordinated blueprint to strengthen disaster resilience.

The Strategy is a deliverable under the Queensland Strategy for Disaster Resilience and Resilient Queensland - the statewide long-term blueprint to support Queensland’s vision of becoming the most disaster resilient state in Australia.

The Wet Tropics Regional Resilience Strategy aligns the Queensland Strategy for Disaster Resilience and its implementation plan: Resilient Queensland, and with national and international disaster risk reduction and sustainable development agendas articulated by the Sendai Disaster Risk Reduction Framework and the National Disaster Risk Reduction Framework.

This Strategy supports and aligns to the Queensland Disaster Management Arrangements (QDMA) and builds upon the Queensland Emergency Risk Management Framework (QERMF) and the Queensland Climate Adaptation Strategy (QCAS).

Figure 1. The Wet Tropics Regional Resilience Strategy disaster resilience policy line of sight to local, regional, state, national and international levels.





Our locally-led approach

This Strategy has been developed using a community-led approach with the voice of the locals. To build resilience means to think and deliver systematically – to deliver what is needed in the places it is needed.

We have applied CSIRO’s Resilience Adaptation Pathways Transformation Approach (Q-RAPTA) process is a resilience building approach tailor-made for the Queensland context.

An approach that is locally-led, regionally coordinated and state facilitated has allowed us to draw on local leadership and direction for this Strategy to ensure local needs and priorities of the Wet Tropics are reflected.

This approach means identifying and prioritising regional resilience needs that we can strengthen over time by matching these needs with real funding and resourcing opportunities.

This approach allows for greater collaboration and coordination of resilience efforts across our region, guided by the principles of:

- local leadership
- flexibility and adaptation
- shared responsibility and collaboration
- prioritisation
- resilience becoming business as usual.

Figure 2. The Resilient Queensland implementation delivery approach (adapted from CSIRO).

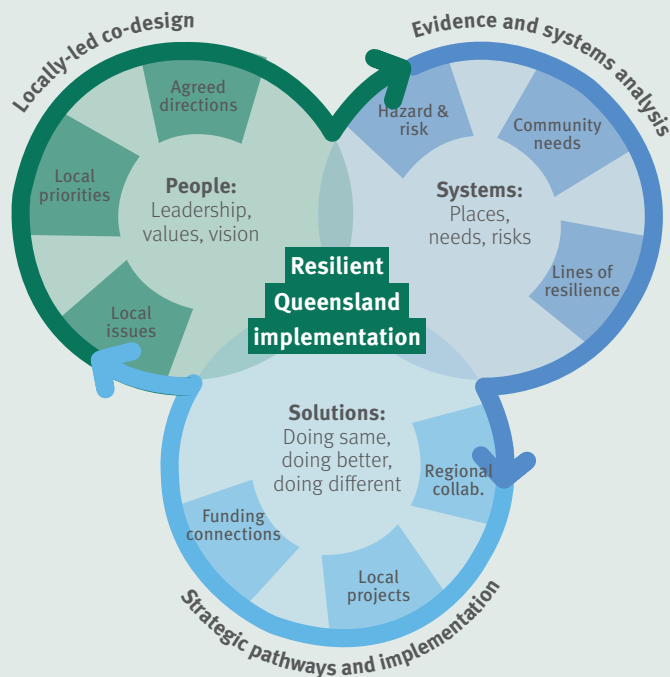


Image: LDMG workshop Cairns Regional Council. Courtesy QRA.



How the strategy has been developed

This Strategy has been co-designed with local representatives, through multiple engagement opportunities using regional “Big Map” workshops and active listening. The Strategy is developed with the input of elected officials, disaster management group members, council officers, local landowners and community groups.

The process has applied the latest in resilience thinking :

- relationship and trust-building engagement
- co-design with locals
- risk-informed
- place-based strategies
- locally-led and regionally coordinated solutions
- integrated multi-objective responses.

The Strategy has a multi-dimensional and cross-disciplinary approach and considers the five elements that contribute to systems-based resilience.

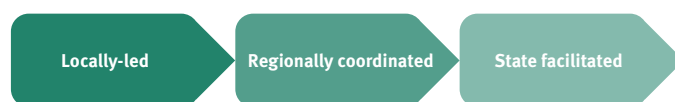
The Strategy was developed taking a disaster resilience lens to our economic, social, and environmental systems to ensure the best of disaster management and risk reduction practices can brought into effect in the Wet Tropics region over time.

Our engagement with local representatives reflected a deep understanding of local and regional issues and a desire to find collective responses to these needs. It identified challenges and discussed resilience in place using Big Map workshops.

This context is then matched to an understanding of the exposure and vulnerability of each council area within the region to a range of hazards informed by the Queensland Emergency Risk Management Framework (QERMF), including cyclone and severe wind, flooding, bushfire, heatwave and earthquake .

Drought and other natural hazards (such as storm tide inundation) are also considered by the Strategy where they have been raised as an issue at the local level.

The impacts of climate change are a key component to long-term resilience and are incorporated, both in terms of relationships with hazards but also by alignment of the Strategy to the Sector Adaptation Plans developed for the Queensland Climate Adaptation Strategy (QCAS) and the QCoast 2100 Coastal Hazard Adaptation Program.



Elements of resilience

The multi-dimensional and cross-disciplinary approach of this strategy contemplates five elements that contribute to systems-based resilience. These are:



Integration and alignment

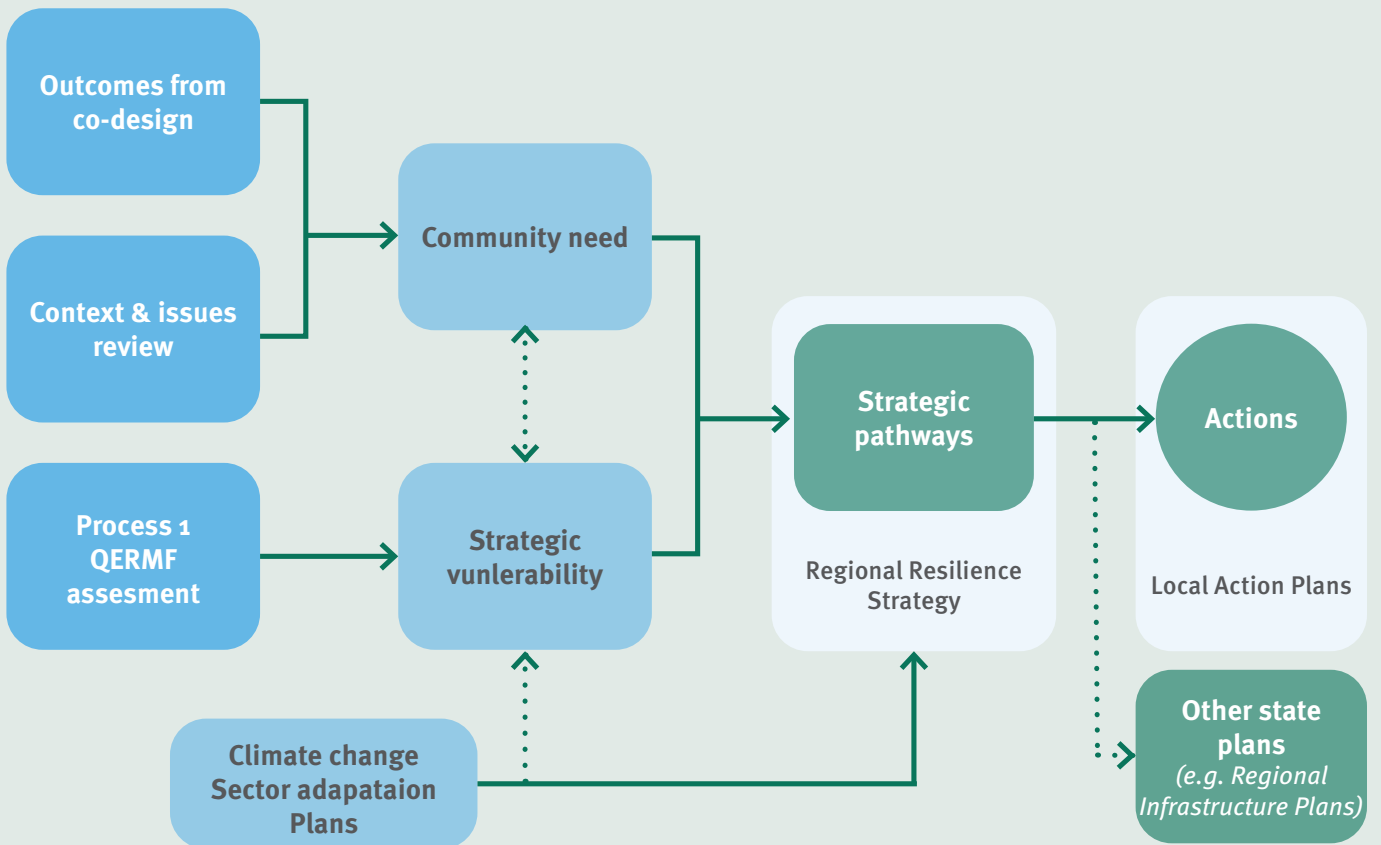
This Strategy reflects previous and existing work at the state, regional and local levels to ensure this work is taken forward, and not ‘reinvented’, and provides a further mechanism to connect local needs to further funding opportunities at the state and federal levels. This Strategy culminates in resilience pathways that provide a linkage between locally identified actions or projects, and the state, federal and international policy environment. That way, the need for a particular project or action can be justified by it meeting a regional pathway to resilience that meets one or more objectives of the Queensland Strategy for Disaster Resilience.

This Strategy is supported by Local Action Plans setting out the specific projects and initiatives that are needed to deliver on the aspirations set out by the Strategy. These Local Action Plans are provided to partner councils to implement.

The Strategy aligns with the following risk management, recovery resilience and adaptation planning initiatives, strategies and plans.

- [Queensland Resilience, Adaptation Pathways and Transformation Approach project \(QRAPTA\)](#)
- [Queensland Emergency Risk Management Framework \(QERMF\)](#)
- [Queensland State Natural Hazard Risk Assessment and hazard-specific risk assessments prepared by Queensland Fire and Emergency Services](#)
- [Climate Change Sector Adaptation Plans](#)
- [Queensland Climate Resilient Councils Climate Risk Management Framework and Guideline](#)
- [QCoast2100 Coastal Hazards Adaptation Program](#)
- Various FNQROC programs www.fnqroc.qld.gov.au/regional-programs/climate_resilient_alliance
- [FNQ Regional Plan 2009-31 \(DSDILGP\)](#)
- [Yarrabah Masterplan \(DSDATSIP\)](#)
- [Local Government Corporate Plans, Economic Development, Biosecurity, and other plans](#)
- [Cairns and FNQ: Becoming the capital of the Smart Green Economy in Australia](#)

Figure 3. Strategy development process reflects the CSIRO Q-RAPTA resilience building approach tailor-made for the Queensland context.





Resilience in the Wet Tropics

Resilience is a term that means different things to different people. The QSDR defines resilience as:

A system or community's ability to rapidly accommodate and recover from the impacts of hazards, restore essential structures and desired functionality, and adapt to new circumstances.

In the Wet Tropics, we have learned a lot about what resilience really means to our people and places, how stresses and shocks can affect existing levels of resilience, and how future events and trends will impact the ability to remain resilient.

Our vision for resilience is to see the Wet Tropics and its people continue to live in harmony with a landscape and seascape they love.

We understand our exposure which stems from the uniqueness of our region. We must be vigilant in ensuring our visitors and new residents share an understanding of the risks we face.

Image: Machans Beach. Courtesy QRA.

We endure cyclones, storms and fire regularly. Our coastline is vulnerable to sea level rise, erosion and storm surge hazards. High rainfall and the topography exacerbates landslide risk across the region. We are prepared. We understand the additional complexities our remote and isolated communities, proximity to the coast, inaccessible mountainous topography and linear settlement pattern bring to disaster management and community resilience.

The spirit and character of the people of the Wet Tropics is our greatest asset. This sense of ownership and responsibility extends from the Traditional Owners of this Country to future generations who will steward this land long after us. It extends from the generations of farmers of the fertile plains to tourism operators on land and sea; and from isolated hamlets to our urbanised centres.



Our resilience needs

There are many geographic, demographic and climatic events that can have major impacts on the Wet Tropics.

Trends

Transformative forces that could change a region:

- changing tourism markets, product demand and travel trends
- climate change
- increased digital delivery of services and reliance on telecommunications
- demographic shift in population growth and decline, increasing multiculturalism in visitors, new residents and workforce
- growth of health and social services sector and geographic responsibility
- increasing opportunities for remote learning and working
- heightened awareness and concern about natural systems of the Wet Tropics.

Stresses

Long term situations or circumstances, weakening the potential of a given system and deepening vulnerability – they may be periodic or chronic:

- reliance on only one large urban centre (Cairns) for essential and critical services
- tailoring needs to our linear and dispersed settlement pattern
- loss of and ageing volunteers
- regional reliance on limited and vulnerable supply routes
- high population transience and diversity
- responsibility for island communities and visitors
- intrinsic value of surrounding landscape
- reliance on a narrow economic base like tourism
- socio-economic inequality leading to increased vulnerability such as access to insurance.

Shocks

Sudden events with an important and often negative impact on the vulnerability of a system and its parts (such as a flood or bushfire):

- cyclones and storms (severe wind and storm tide inundation)
- flooding
- bushfire and grassfire
- heatwave
- earthquake
- landslides
- short sharp and sudden rainfall events.

Core resilience needs

- strategic prioritisation of and continual improvements to supply chain routes
- continual improvement to physical and telecommunications connectivity during events
- improved facilitating infrastructure or innovation in digital connectivity, water and energy
- approaches to decrease reliance on centralised services which are inherently vulnerable
- recognition of regional role in service provision and resources
- support for disaster management resources, capability and capacity and response in smaller events
- recognition and support to amplify the role everyone must play in resilience from business owners to traditional owners and all points in between.
- collaboration and resources in natural resource management and landscape and agricultural sustainability
- improved regional collaboration of governance bodies, agencies and service provider
- strengthening social capital and community cohesion and community voice

Image: Tablelands. Courtesy QRA.



How resilience is affected by stresses and shocks

Our disaster management system has traditionally dealt very well with the event-based episodic or acute shocks like floods, cyclones or bushfire. But we need to continue dealing with more of the systemic issues that worsen disaster events when they occur, and place increased burden on our disaster management system.

Investment and effort in building social, economic, infrastructure and environmental resilience helps to reduce the periodic stresses and means that communities are better able to cope with episodic events when they happen.

Figure 4. How resilience is affected by stresses and shocks.





Rethinking resilience in the Wet Tropics

To date our focus has been on post-disaster recovery processes, and building resilience through programs like infrastructure improvements that can limit the impacts of recurrent events.

However, with our lived experience of recovery, we now acknowledge the need to proactively identify and deliver over time on initiatives that help avoid the stresses and shocks in the first place – ultimately putting us on a more sustainable track for growth and prosperity.

How we make real and lasting change

To meet our collective challenges we need to actively take steps to reduce disaster risk and equip our Wet Tropics communities to thrive in spite of the stresses and shocks they face. We need to match community need with funding and support to deliver – by refocusing over time from recovery to prevention and preparedness.

Limiting impact or shortening recovery from stresses or shocks

This Strategy focuses on identifying actions that limit impact or shorten recovery from stresses or shocks. These will help communities in the immediate aftermath of an event.

It provides pathways for actions to adapt or transform socio-economic settlements or systems to avoid or resist the impact in the first place. This will help our communities in the Wet Tropics to grapple with stresses like climate change, and the lineal settlement pattern.

This way, we can provide a long-term blueprint for how our region can continue to improve its disaster resilience for years to come.

Figure 5. Improving our prosperity through resilience (adapted from Joseph Fiksel).

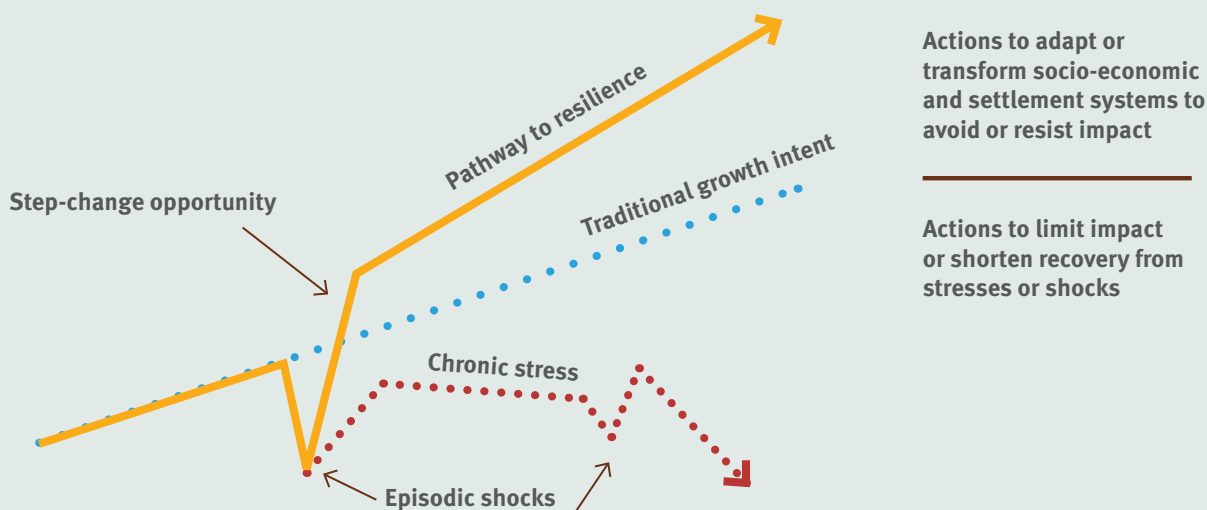


Image: Meandering rivers and mangroves in front of Hinchinbrook Island. Credit: Shutterstock.



The changing funding landscape

Under the joint Australian Government-State Disaster Recovery Funding Arrangements 2018 (DRFA), assistance is provided to alleviate the financial burden on states and territories. It also supports the provision of urgent financial assistance to disaster affected communities.

The DRFA replaced the previous Natural Disaster Relief and Recovery Arrangements (NDRRA) on 1 November 2018.

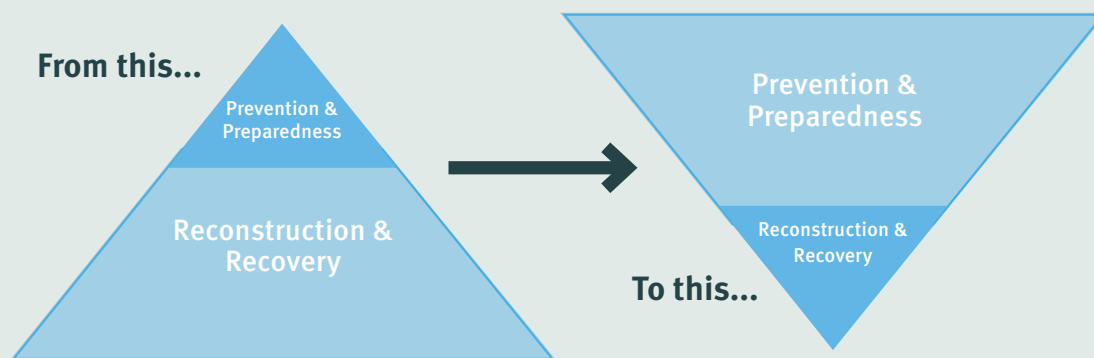
The reforms to the DRFA included, for the first time, a framework to incentivise reconstruction efficiencies to create more funds for resilience and mitigation purposes.

Efforts to realise efficiencies under DRFA are critical to fund resilience and mitigation efforts in the future, and will help change the funding landscape from a focus on reconstruction and recovery to a focus on prevention and preparedness.

We now have a clear forward plan for how we can make lasting change into the future through sustained investment in resilience and mitigation activities. Recent changes in funding arrangements will enable the creation of funds for mitigation and resilience, along with a range of other funding programs (e.g. the Local Government Grants and Subsidies Program, Get Ready Queensland) that support resilience building.

Regional Resilience Strategies will provide the ‘long list’ of locally-identified actions that can be prioritised against a wide range of possible funding opportunities (including DRFA efficiencies) to build resilience in Queensland communities over time.

Figure 6. Changing the focus from reconstruction to prevention and preparedness.





Our region

Flanked by the World Heritage-listed Wet Tropics Rainforest in the west, and the Great Barrier Reef in the east, the Wet Tropics Region is an internationally renowned tourism destination.

Encompassing 1.3 per cent of the state, the Wet Tropics region roughly follows the boundary of the Wet Tropics Natural Resource Management area and includes the six local government members of the Far North Queensland Regional Organisation of Councils. The region stretches between Douglas Shire in the north, Hinchinbrook Shire in the south, and the Tablelands in the west connected by vibrant towns and communities.

The region is rich with biodiversity and internationally significant environmental assets, like the Daintree and Great Barrier Reef. This places the Wet Tropics region on the world stage, with a reputation to uphold – the only location where two World Heritage sites meet.

Cairns is the economic powerhouse and central service centre of the region, experiencing international visitation and trade connections overseas. Many smaller townships located across the region, like Daintree Village, Atherton, Innisfail, and Ingham offer more boutique and local experiences. Yarrabah is the largest Aboriginal Shire and community (by population) in the State.

For many years agriculture was the dominant industry across the Wet Tropics, but this has shifted in recent times. Health care, tourism and hospitality industries are now the largest employers across the region. Agriculture continues to be a large industry for many coastal and hinterland townships, supported by strong primary production in dairy, horticulture, cropping, sugar and grazing. The region is the northern food bowl.

In contrast to the region's international identity, the settlement pattern and landscape of the region enables a distinctly unique and isolated living experience for residents who choose it. These two experiences – an international spotlight and intensely isolated living – can sometimes come into conflict.

A number of strategic highways and roads keep the Wet Tropics connected. The Bruce Highway runs north south, connecting Cairns south though to Townsville and onto Brisbane. Those travelling further north use the Cook Highway to Daintree River or travelling west will include one of the range crossings, which can often be impacted by severe weather. Yarrabah to the east is accessed via the Pine Creek-Yarrabah Road.

The North Coast railway line terminates in Cairns. The line is predominantly used for freight, sugar, grain and livestock, with occasional long-distance passenger services operating on the line.

Image: Cape Tribulation. Credit: Shutterstock.

Hinchinbrook Shire

In the south of the region is Hinchinbrook, a Shire crisscrossed with narrow-gauged tramways and the sugar fields they service.

Located near the banks of the Herbert River is Ingham, the administrative centre of Hinchinbrook Shire. Much like many of the townships along the southern coastal fringe of the Wet Tropics, Ingham is surrounded by a patchwork of agricultural production. The Herbert River flows out to the Hinchinbrook Channel. Where the channel meets the Coral Sea is the small coastal settlement of Lucinda. This township is an important fixture to the region's sugar industry. The Lucinda Terminal and its six kilometre jetty is the world's largest bulk sugar loading facility.

Across the Shire, many families have called this region their home for several generations; however, an ageing population and the effects of out-migration is contributing to population decline in the Shire.

Cassowary Coast

Immediately north of Hinchinbrook is Cassowary Coast, situated on fertile plains interspersed with forests and national parks. Well-known as the banana capital of Australia, with Innisfail and Tully producing more than 90% of Australia's bananas.

The colourful town of Innisfail is at the confluence of the North and South Johnstone Rivers. Surrounded by green sugar plains and fruit fields, Innisfail is the administrative centre of Cassowary Coast. The town is also the art deco capital of Australia, with over 20 of these decorative buildings in the central business district and free walking tours offered weekly.

Tully is one of the wettest towns in Australia, showcased by The Golden Gumboot – a relatively recent edition to Australia's many 'big things'. Further south Mission Beach is North East of Tully, nestled between rugged rainforest and the coastline. Tucked away on the coastline, this quiet and quaint tourist destination provides one of the closest access points to the Great Barrier Reef anywhere along the Wet Tropics coastline.

In the south of Cassowary Coast is Hinchinbrook Island, one of the many islands in the Wet Tropics region. Hinchinbrook Island is an explorer's paradise with cloud-covered mountain ranges, rainforests, bays, beaches and rocky headlands, well known for its houseboat holidays.

Cassowary Coast featured on the world stage for all the wrong reasons in 2011, after Severe Tropical Cyclone Yasi made landfall at Mission Beach, leaving a path of destruction across the region. This was preceded by a devastating Cyclone Larry in 2006 which together tested the fortitude of residents in Cassowary Coast.

Tablelands Regional Council

Those seeking a change of scenery and climate can visit the Tablelands, located 500 to 1,000 metres above sea-level inland from Cairns and Cassowary Coast. In the north is the principal centre of Atherton. The region is a patchwork of small, unique townships. This unique settlement pattern is a byproduct of the region's agricultural history; with each town having emerged to service surrounding farms and producers. Don't be surprised if you pass a road sign for the same town more than once.

This lush and fertile region is a foodie's paradise, with an abundance of farms producing locally grown produce including tropical fruits and a thriving dairy industry.

The region is host to Australia's largest wind energy resources and with construction of a new hospital underway is emerging as much-needed medical and health care service centre through purposeful local planning.

Residents across these highlands have strong community and cultural connections, having lived here for many years. These strong cultural ties are often showcased, with each town hosting community events most weekends.

Cairns Regional Council

Cairns is a globally renowned destination and is the gateway to an array of iconic tourism locations across the Wet Tropics region, including the World Heritage-listed Wet Tropics Rainforest and Great Barrier Reef.

With a population just under 167,000, Cairns has the greatest number of residents in the region. Featuring international air and sea ports, Cairns City is the economic heart of Far North Queensland, including international trade connections to South-East and Eastern Asia. The city is a service centre for much of far north Queensland. Not only does Cairns support its immediate neighbours in the Wet Tropics, but also Cape York and Torres Strait, the Far North Hinterland, North-West Queensland and Papua New Guinea.

The council area is hemmed in by the Bellenden Kerr Range to the south and the Main Range to the west forming a linear settlement pattern from the Russell River and Mirriwinni in the south to Buchans beach in the north.

Yarrabah Aboriginal Shire

Located across Trinity Bay from Cairns is Yarrabah Aboriginal Shire. It is approximately 60 kilometres by road from Cairns on a scenic route hugging the coast at Bessie and Lyons Points before climbing over the Murray Prior Range to the Yarrabah Peninsula. The township of Yarrabah has a northern aspect over picturesque Mission Bay, while a number of small, discrete communities are located along Back Beach Road to Oombunghi Beach in the south. The Shire boundary stretches much further south hemmed in by the Malbon Thompson range to Palmer Point some 30 kilometres south of Yarrabah town.

The township has a complex history, stemming from its missionary roots in the late 1800s and the forced relocation of Aboriginal and South Sea islander groups to Yarrabah. Today, many community members claim historical or traditional ownership to the area. The township has an arts centre and a museum showcasing the history of the settlement.

With only one road in or out of the peninsula, residents can become isolated during periods of severe weather. The census population is considered locally to underplay the population who call Yarrabah home with estimates closer to 4,000 permanent residents.

Douglas Shire

The Douglas Shire is a tale of two contrasts. A little over an hour drive north of Cairns along the Captain Cook Highway are the towns of Mossman, the Douglas Shire's administrative centre, and Port Douglas, an international tourist destination. Mossman and Port Douglas are the last large townships on the route to the Daintree River and rainforest. Port Douglas features world class accommodation golf, marina and Four Mile Beach. Visitors will find an array of boutique shops and restaurants along the main street of town, all with a colonial and relaxed tropical vibe.

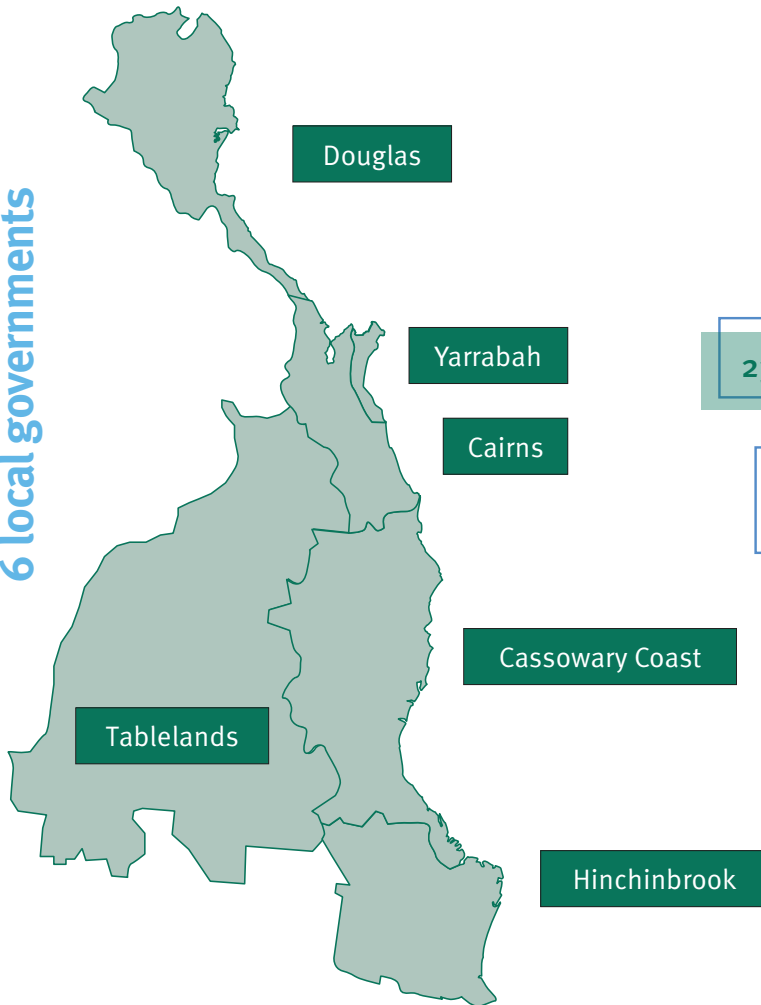
Travelling north, the Daintree River provides a symbolic division between the Daintree Rainforest and the rest of the world. Passing over the river, only by ferry, travellers enter a unique and ancient place. The pristine, unique beauty of the Daintree River and dense rainforest evokes isolation and ruggedness. Visitors can choose a travel itinerary to suit their level of adventure. Experienced and well-equipped four-wheel drivers can travel along the rough CREB track from Daintree village through the World Heritage-listed rainforest to Wujal Wujal. While others might choose the vehicle ferry crossing and taking the Bloomfield Track to Cape Tribulation.

Amongst this dense jungle north of the Daintree are a number of small settlements, including Cape Tribulation, Cow Bay and China Camp. Residents here are caretakers of this pristine region but they can face extended periods of isolation during the wet season.

A snapshot of community characteristics



6 local governments



Population: 248,186
(4.9% of Queensland population)

23,052km² 1.3% of Queensland's land mass

Over the next 25 years the average annual growth rate is expected to increase by 1.2%

Over the next 25 years the average annual growth rate is expected to increase by 1.2%

40.9% migration rate

31.2% in the most disadvantaged SEIFA quintile

9.7% Aboriginal and/or Torres Strait Islander Peoples

19.5% under 14 years old

16.4% over 65 years old

Median age 39.8 years

Top five employing industries:



Health care and social assistance (13.2%)



Retail trade (10.3%)



Accommodation and food services (9.8%)



Education and training (8.8%)



Construction (7.7%)

Our landscape

The Wet Tropics region has a diversity of landscapes not found anywhere else. We are blessed with landscape extremes from the highest peak in the state at Mt Bartle Frere, to low lying floodplains of the Herbert River valley, picturesque coastlines and islands like Ella and Etty bays and Dunk Island and thick Daintree rainforest to the open expanses of the Great Barrier Reef.

Our region is rich with biodiversity – with the oldest rainforest and the largest reef system in the world – and is interwoven with fertile plains and tablelands. Our landscape is a haven for tourists and a food bowl for communities domestically and internationally.

A dominating feature of the landscape is the Great Dividing Range, and subordinate ranges. There are several roads crossing the range. The mountainous region is home to Queensland tallest mountain, Mount Bartle Frere, with an elevation of 1622 metres, just south of Cairns.

Our diversity of landscapes lends itself to a diversity in wildlife. Tree-kangaroos inhabit the high-altitude forests along these ranges, as well as the rainforests in the upper Daintree River. Cassowaries inhabit much of the Wet Tropics, found along the mountainous rangelands and the coastal stretch.

The region is the gateway to the Great Barrier Reef, the largest coral reef in the world and a World Heritage-listed site. The significance of the reef comes with responsibility. There is international interest in the reef's beauty, but also, its health and longevity. We are custodians of many islands scattered along the coast in the Coral Sea. Some of these are popular tourist destinations, others are untouched.

An important element to ensuring the health of the reef is to ensure the health of our waterways, which flow out into the reef. Our water catchments are characterised by their short-and often fast flows into the Coral Sea.

The Daintree River is one such example, rising high on the range and swiftly loses height as it flows over waterfalls forming rapids. The river eventually emerges into the lowland Daintree valley which is used predominantly for cattle grazing. Just upstream of the Daintree Mouth is a network of tidal creeks and mangrove communities where you might spot a saltwater crocodile in these wetlands.

The Barron River rises in the west, with runoff from the Mount Hypipamee National Park – the crater remnants of a volcanic gas explosion – flowing north into Lake Tinaroo. It is one of the larger catchments in the Wet Tropics region. The Barron flows from the lake towards Mareeba, where it is joined by Tinaroo Creek. It continues north, before flowing east towards Kuranda, then over the spectacular Barron Falls through the Barron Gorge. It continues towards Cairns and flows into the ocean north of the Cairns Airport.

Neighbouring Yarrabah is rough and rugged terrain, with high ranges and creeks and wetlands. The creeks are mostly first order waterways, short and direct into the ocean. These do not present a flooding issue. Much of the local government area of Yarrabah is uninhabited.

The topography of the coastal plains between Cairns and Ingham lends itself to agricultural practices. These plains are crisscrossed with rivers and creeks. This, however, also makes these plains flood prone.

The Mulgrave and Russell rivers are characteristic short flow rivers – flowing from the range down to the plains between Cairns and Innisfail, before converging into a single river mouth a few hundred metres before the Coral Sea.

The Johnstone River and catchment is made of several catchment areas and rivers, not just the Johnstone. The Johnstone rises in the Atherton Tablelands, passes over the range through the Wooroonooran National Park. Before reaching the Coral Sea, it is joined by the South Johnstone in Innisfail. The South Johnstone rises in the middle of the catchment, with headwaters on the range in high rainfall areas capable of producing severe flooding, especially in the Innisfail area.

Other waterways in the southern part of the catchment are the Moresby River, Liverpool Creek and Maria Creek. Each of these are unique catchments which flow into the Coral Sea and are not hydrologically connected. Each of these waterways in the Johnstone catchment have substantial coastal wetland systems.

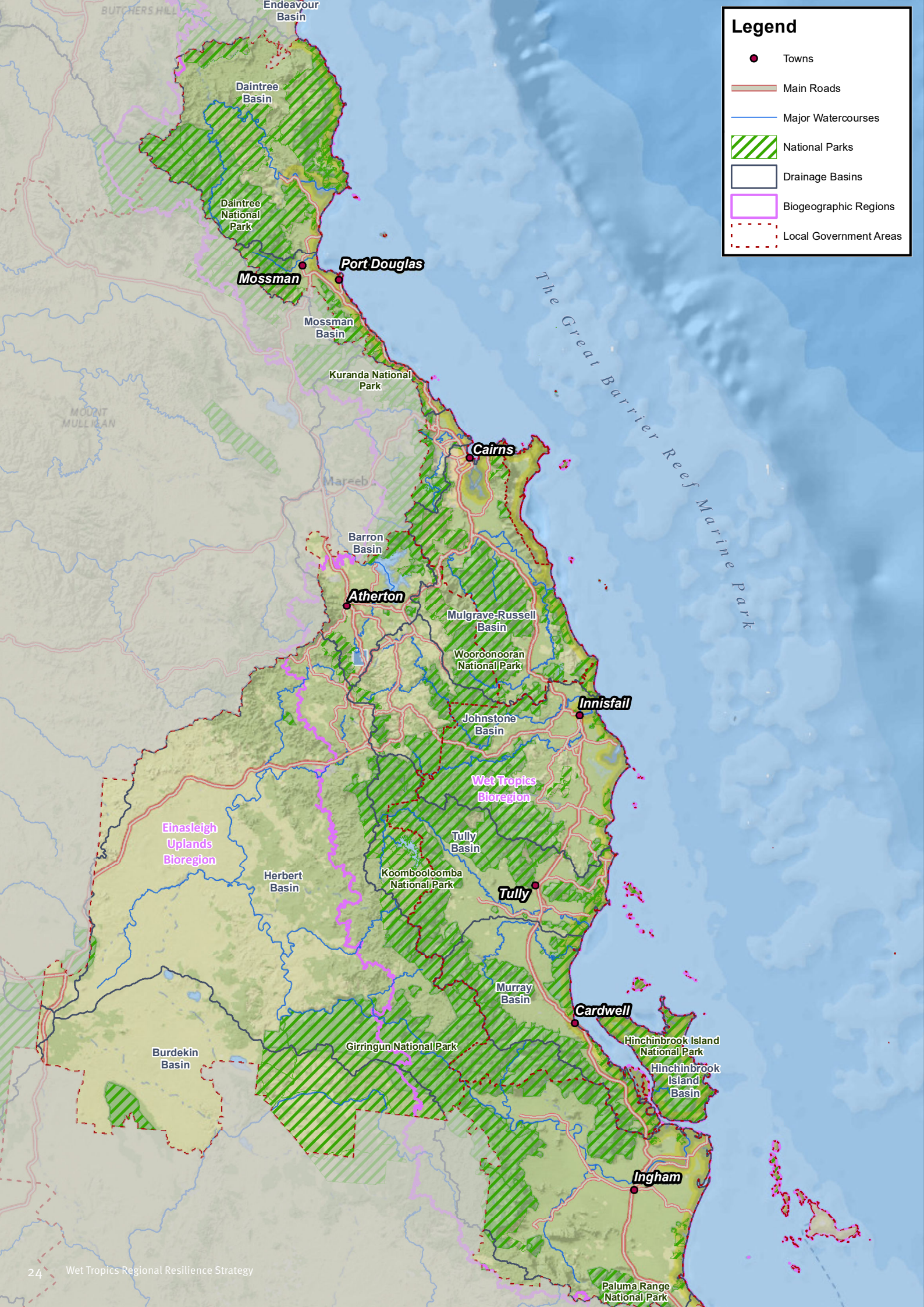
Immediately south is the catchment of the Tully River, which begins upstream of the Koombooloomba Dam on the Great Dividing Range. It rises in high rainfall area and flows downstream through the dam and into Tully Gorge. It flows across the coastal plain towards Tully – joined by several streams and creeks along the way before discharging into the Coral Sea. Floods in the Tully and the adjacent Murray River inundate cane lands and larger floods isolate farmhouses. A common impact of Tully River floods is the Bruce Highway becoming cut at Euramo and Murray Flats.

The Herbert River is the largest catchment and longest river in the region. It begins immediately south of Herberton in the Tablelands Region, and flows southward through the Tablelands, past numerous townships like the Innot Hot Springs, Mt Garnet and Gleneagle. After passing Gleneagle, the river begins an eastward course towards Ingham and Halifax before flowing into the Hinchinbrook Channel. The Herbert River responds quickly to heavy rainfall and river rises can be rapid.

The area around Ingham is very flat and the town itself is located on the floodplain of the river. Several natural watercourses distribute floodwaters through the town during major flooding and most areas of the town are subject to inundation.

Aside from these catchments the region is characterised by high peaks and heavily vegetated slopes of thick tropical rainforest vegetation, transitional rainforest and surrounded by Sclerophyll forest and woodlands including Eucalypt and Melaleuca stands. These provide extensive wildfire fuel in dry conditions. The slopes also increase the risk of landslide, especially in periods of very high rainfall or disturbed areas, and adjacent to transport routes.

There are numerous locations identifying wetlands of high ecological significance, including much of the Cassowary Coast coastline, the Yarrabah Peninsula and of course the Daintree River.



Legend

- Towns
- Main Roads
- Major Watercourses
- National Parks
- Drainage Basins
- Biogeographic Regions
- Local Government Areas



Our climate

Our livelihoods and lifestyle are closely linked to the climate. The Wet Tropics can range from oppressive heat and humidity in the build-up to summer storms, to calm and balmy evenings of the winter months. On shore breezes cool the summer heat which can escalate to severe winds as the tropical lows roll in off the ocean.

If it is going to rain in the Wet Tropics, it will be during the tropical monsoon period in the summer months. These downpours can make getting around our region difficult, particularly for those not familiar with our roads and landscape. Some isolated pockets of the Wet Tropics, like communities north of the Daintree River or cattle stations in southern Tablelands, can be cut off for several weeks or months.

Winters in the Wet Tropics are mild and dry. It is during these winter months, when the temperature is pleasant, that tourists tend to explore our region.



Rainfall systems

Our region operates in dry and wet seasons. Heavy rainfall in the Wet Tropics region is most often caused by monsoonal systems or tropical lows which can form into cyclones. Both of these can lead to widespread flooding, landslides, coastal hazards and wind damage.

A monsoon usually develops over northern Australia during the summer season when the land warms at a faster rate than the ocean, resulting in a considerable sea breeze circulation that draws in moisture from the ocean over the lower pressure of the land. A monsoon trough becomes established as humidity rises. True monsoonal flow, with deep low-level westerly winds, exists north of the trough, so when the trough moves south over a location, this area becomes affected by monsoonal conditions.

Temperature

Our summers are hot, with maximum temperatures ranging from 28-32° Celsius, but it is not uncommon for temperatures to exceed 40°. On average, our humidity sits between 62 to 72 per cent, however, it can approach 80 per cent during our summer months. A combination of high temperatures and high humidity can be very uncomfortable for individuals not acclimatised. If you are unprepared, these extreme temperatures can be deadly for residents and visitors alike.

The interior of our region experiences up to 150 days above 30°C each year. But increasing intensity and frequency of heatwaves means we will experience longer periods of increased temperatures.

Fire weather

Bush and grass fire is endemic to the landscapes of the region, often ignited by lightning strike. Good fire also supports a healthy landscape, with many of the region's ecosystems dependent on a level of fire frequency.

Aside from fuel loads, our weather and climate play a significant role in the intensity to which fire may occur, and how easily fuels may burn.

Fire weather is determined by aspects of temperature, low relative humidity, high wind and drought factor. These aspects are considered as part of a framework known as the Forest Fire Danger Index (FFDI) as well as the Grass Fire Danger Index (GFDI). Based on data analysis performed by the BoM, from 1950 to 2018, annual accumulated FFDI has increased in the Wet Tropics by 11 per cent.

Changes to fire frequency are uncertain, as this is dependent on the spatial variability of future rainfall. However, when fires do occur, its behaviour is likely to be more extreme. Fire weather conditions will both intensify and become more frequent, heightening the risk of bushfire and grassfire across the region.

Future climate trends

Generally, in the years to come our climate will change with extreme conditions becoming more frequent, more intense, and longer lasting.

The Queensland Regional Climate Change Impact Summaries provide climate change projections for the years 2030 and 2070. In the future, the Wet Tropics can expect to experience:

- higher temperatures
- hotter and more frequent hot days
- more intense downpours
- less frequent but more intense tropical cyclones
- rising sea level
- more frequent sea-level extremes
- warmer and more acidic seas.

These changes will impact our lifestyle and landscape.

Our challenges and opportunities

Our unique region brings with it challenges to resilience but also opportunities. The landscape dominates our lifestyle, economy and societal function.

This means that our communities are constrained by how our landscape lets us move around, how others access us and how our infrastructure services our settlement pattern.

Our resilience challenges and opportunities are found in devising ways to live with this unique set of parameters.



Environment

With our responsibility for world heritage listed environmental assets comes challenges with protection and education for some segments of the environment such as water quality and endangered species like the Southern Cassowary.

On a larger scale the region is proactively taking on a carbon neutral strategy. More innovative responses are needed to protect the Great Barrier reef from warming, and the region is prepared to play a key role in protecting the environment they value.

The nature of our catchments makes weed control, waterway blockage and sedimentation problems arise. Balance between clearing for fire and protection of vegetation is tested and sometimes tensions between goals arise.

Biosecurity threats, like pest fauna (including feral pigs and wild dogs) and pest flora (including Miconia and Hiptage) each have the potential to impact the biodiversity and livelihoods, if not properly managed.

Our biosecurity responsibilities are undertaken with the highest duty of care, but we need more help in our terrain to really make a difference with species like Hiptage aquatic weeds and feral pigs.

The high value placed on our coasts, beaches and waterways means it will be hard for our community to undertake the transformational changes that adapting to coastal hazards requires.

Waste management is an emerging challenge across the region from landfill to green waste, cost and recycling opportunities. During summer events waste poses particular health issues for the region.

Towns and infrastructure

Our network of towns and built environment stems principally from our small-scale agricultural heritage, and the traditional beach house culture which still thrives in our coastal villages. Much of our housing stock predates modern building codes and while the classic 'Queenslander' has experienced many weather events, education, and opportunity for upgrading structures and eliminating asbestos is welcomed.

The planning and design of our towns can have a large influence on how we experience heatwaves. A commonly used solution to cool towns is street trees. However, in our region, street trees can create other risks during tropical cyclones and severe storms. In the Wet Tropics, alternative solutions could include passive design strategies such as solid shading elements, orientation according to breeze and wind directions and 'cool' walls, floors and roofs.

Image: Cairns. Credit: Shutterstock.

The region is proactively greening our built environment through regional strategies and alliances. In addition, continued work in asset management systems means we can make truly informed decisions. We are challenged by the location of critical infrastructure in vulnerable places.

Our flood warning infrastructure continues to improve. This is essential for the sheer number of waterways in the region and the future outlook for more intense and shorter rainfall events or 'microbursts'.

During disasters, redundancy and back up is especially important for energy and telecommunication networks. With a dispersed population, staying connected is paramount. Support from infrastructure providers in recognising challenges in locations where redundancy is limited, and alternatives even less, means we can work together to do better for infrastructure that is fit-for purpose and enduring.

Roads and transport

Our road network is characterised by local roads which are frequently cut by small rainfall events filling our numerous water ways. Usually, local interruptions in small catchments are brief.

The Bruce Highway is the primary supply chain route that also experiences interruptions from flooding events. The region is dependent upon this highway remaining open further south too. Where closures occur and traffic can be re directed via an inland route, the range crossings become our lifeline. The Kuranda Range Road and the Gillies Highway are themselves vulnerable to closures through landslides and debris, as is the Captain Cook Highway further north. There are opportunities to examine how to improve the resilience of the range crossings and broader road network, and better inform local suppliers and retailers on the benefits of enhanced stock levels during the summer to account for supply disruption.

With both state and local roads vulnerable and services dispersed, the region is presented with a very challenging picture of fragmentation during disaster events. Knowing which routes will be cut and how to direct our people is a challenge. Support for greater modelling on evacuation routes and strategic road improvement plans is a key opportunity.

If the highway is closed, then usually the rail line is too. This makes connection via airstrips important. Local councils are challenged with affording required upkeep to airstrips where no passenger services exist. There could be opportunity to better connect the region via sea barge or similar, using existing ports and jetties with some investigation



People and communities

Our people and communities are defined by our settlement pattern borne out of legacy and topography. The isolated villages, network of small towns, coastal hamlets and urban centres are what shapes and strengthens our identity. However, this settlement pattern is also a vulnerability. It means we are separated, and decentralised and even small events disconnect us from jobs, schools and services.

Reliance upon only one large urban centre, Cairns, which is vulnerable to the same disconnection means that centralization of services applies more stress to our region in two directions: stress on service providers who are unable to connect to the people who need them and stress on our people who are unable to reach the services they need, or when they do, this often results in being stranded or incurring significant expense. This is particularly the case for our vulnerable community members: those needing health care or wishing to age in place. It must be remembered that this region is also a service centre for the broader Cape York and Torres Strait and the Hinterland to Gulf regions.

The challenges of topography and settlement pattern are amplified as coastal communities evacuate uphill to towns without significant resources. Our disaster management efforts are duplicated and regularly pre deployed to maintain assistance levels required by our people and communities. We rely upon our people being prepared and staying in place.

Finding ways for residents to access essential services in more of the Wet Tropics' townships will enhance residents' quality of life and confidence, reducing travel times, expense and the burden on existing providers.

Our people in isolated communities understand their risks. Locals anchor memories to Larry and Yasi, however the number and multicultural nature of our visitors means that continued vigilance in education and messaging is essential.

Despite these ongoing challenges, we are well practiced at supporting vulnerable members of our community. Our people live here because they love it. Our unique environment and biodiversity and culture and sense of community is what makes people stay.

We celebrate our community and diversity through our strong and active networks of community groups and events.

Economy

Our economy is deeply linked to tourism markets and the value of the natural environment. The land supports both sightseeing and experiences, and extensive agriculture in bananas, cane sugar, cattle and dairy, avocados, mangoes and horticulture.

Challenges in both industries include labour access, and supply chains. Both our key industries rely upon working travelers and visa holders as a labour force. Adequate manpower is a challenge for business owners, housing and product delivery.

The road network is key to ensuring our produce gets to market so any cut in the network has flow on impacts to the agricultural industry and the extensive drive tourism market. As a service centre, the region plays host to many travelers enroute to tourist drives across Queensland and further north to the Cape.

Visitors are sensitive to any notion that the weather may not be perfect. Reports of weather interruptions far afield or with no impact on services in our region can result in unnecessary reduction in visitation.

We are striving to add the educational and eco-tourism aspect to our product offerings which a mature market is demanding. Our visitors are also actively looking for evidence of our caring for the Wet Tropics and the Great Barrier Reef.

Our business owners are becoming more aware of the regular shocks and stresses place on operations through weather, disconnection, labour and sensitive clientele. Sustained effort in education and awareness must continue to maintain a strong economic sector. Diversification and flexibility will also enhance economic resilience



Climate influences

Our climatic challenges include projections of higher temperatures, hotter and more frequent hot days and nights, harsher fire weather, more intense downpours, less frequent but more intense tropical cyclones, rising sea level, more frequent sea-level extremes and warmer and more acidic seas. Changes to drought are less clear, but reduced rainfall in the region may give rise to more instances of drought than currently occur.

Tropical cyclones are expected to track further south across Queensland than has previously been the case. The quantity of cyclones each year is projected to decrease, but their general intensity is forecast to increase, which presents potential changes to the cyclone risk exposure of the region.

Rainfall is projected to become concentrated, with a smaller number of high volume, intense events. More intense rainfall episodes could increase agricultural vulnerability and potential erosion. More intense downpour events could increase flash flooding risks without increasing infrastructure resilience to cope.

A rise in mean temperatures brings with it an increase in the number of hot days experienced, giving the effect of an extended summer. The number of hot days (over 35°C) and very hot days (over 40°C) are both projected to increase, bringing with them hot nights.

Temperature rises will have impacts on our people. The elderly, children and the ability to work and enjoy our unique natural lifestyle. The need to cope and adapt to the heat will bring with it increased use of refrigerated cooling. This places increased demands on our energy networks, from both residential and commercial uses. Despite our best efforts, some people will experience heat stress or heat stroke, placing increased demands on our region's hospital and health service.

In our landscapes, heatwaves will also impact our flora and fauna, placing a particular strain on our native animals and world-class environmental areas. In our seascape, marine heatwaves may result in mass bleaching of the Great Barrier Reef. Significantly impacting the ecology and biodiversity of the reef itself, and surrounding ecosystems.

Economic costs of heat may see a reduction in the tourism season rather than the desired lengthening. Risk to tourists' health and well-being will emerge where low risk awareness can potentially be a burden on emergency services resources. Reductions in the health of the reef from marine heatwaves will impact tourism-dependent businesses. Heat also increases the risk of mechanical failure for business, especially in energy overloads, road surfaces, rubber and plastic components failure of plant and equipment.

The behaviour of our environment and ecosystem functions may change. Shifting climatic patterns may promote the spread of invasive flora further afield. Irrigation will need to increase for our crops or alternative varieties developed requiring less water for growth.

Fire hazard will grow as fire weather conditions become more frequent and intense, making bushfires and grassfires in the region more difficult to contain and suppress. Fire presents human, economic and environmental risks.

Natural hazards may threaten tourism infrastructure and damage or interrupt visitation to popular environmental sites. Changes in natural systems may have implications for the health of Country and wildlife, including their intrinsic and Indigenous cultural values. Our changing climate compounds existing difficulties and inequalities isolated communities face. The emotional and psychological toll of disasters can linger for months and years, affecting whole families and the wellbeing of communities. In some circumstances, some people may never truly recover.

Cumulatively, these changes challenge the baseline of resilience. To avoid unwarranted stresses, maintaining and maximizing collaborative, grassroots approaches will be paramount. The opportunities for resilience stem from technology, innovation, commitment and collaboration in a way that harnesses local knowledge and expertise.



Our exposure and risks

A critical element in understanding risk are the elements of exposure and vulnerability which exist at both a micro and macro scale. For example, specific bridge or culvert assets may be exposed or vulnerable to natural hazards however, the resupply network these bridges and culverts support may then also be vulnerable. From a resilience perspective, it is necessary to consider risk consequences across a broad spectrum from asset-based analysis through to strategic and systems-based analysis.

The following section provides a high-level overview of the nature of hazard exposure across the Wet Tropics region. The following observations are drawn in large part from the 'process one' analysis of each hazard using the QERMF approach across each local government area.

Cyclone, severe storm and coastal hazards

Tropical cyclones are caused by low pressure systems which form over warm seas. With the right environmental conditions, a tropical cyclone can exist for many days at a time, producing heavy rainfall, large storm tides and sustained gale force winds.

In February 2011 Severe Tropical Cyclone Yasi crossed the Queensland coast at Mission Beach. Crossing as a category 5 system, it weakened as it tracked in a south-west direction inland. Wind gusts in Mission Beach as Yasi made landfall were estimated to have reached 290km/h.

Residents across the region were evacuated, including all patients from the Cairns Base Hospital. Those individuals had to be flown by the Royal Australian Air Force and Royal Flying Doctors Service to hospitals in Brisbane.

Climate projections show that tropical cyclones are projected to decrease in frequency but increase in intensity. The Queensland State Natural Hazard Risk Assessment identifies tropical cyclones as the highest natural hazard risk priority for Queensland, followed by severe weather as the second highest. Cyclone activity relevant to the Wet Tropics region can include systems from the Pacific Ocean east or from the Gulf in the north-west.

Across the Wet Tropics, each LGA has historically experienced a one per cent annual-exceedance probability of gust wind speeds which equate to category three tropical cyclones. Under projected future scenarios, these gust wind speeds are expected to increase slightly, while remaining category three strength.

Image: Palm Cove. Courtesy QRA.

Major cyclones can also be a primary source contributing to the development of heatwaves. Emerging evidence suggests a link between major cyclones in Queensland and subsequent significant heatwave events, resulting in further impacts upon already vulnerable communities. Understanding this link is important, as cyclone-impacted areas may have suffered extensive infrastructure damage and loss of power; therefore, eliminating the ability to use 'cool places' which are mechanically ventilated, like shopping centres, to seek respite from the heat.

Severe storms are associated with gale force winds, heavy rainfall and lightning strikes. Infrastructure is exposed across the region to high winds for isolated assets such as mobile phone towers, power lines, and communications and airport towers or transmitters.

Severe storms are associated with low-pressure systems. These intense systems and their associated cold fronts can generate strong winds and heavy rain over large areas, causing local flash flooding and riverine flooding. These events can also produce damaging hail. Severe thunderstorms generate damaging wind gusts of 90 kilometres per hour or more, with peak wind gusts exceeding 160 kilometres per hour in the most damaging storms.

The 2019 monsoon trough rainfall and flood event impacted many of the local government areas in the region, each experiencing extreme rainfall. Associated flooding occurred in the Daintree catchment. This resulted in powerlines becoming inundated and telecommunications at Daintree Village failed for an extended period. Several days later, the monsoon trough shifted south. Townsville experienced its greatest riverine flood in 120 years and up to 500,000 cattle perished in flood waters across north-western Queensland. High rainfall totals can result in landslides, slumps and slips or rockfalls, many of which impact our roads and physical connectivity across the region. This also occurs through wind damaged, broken and fallen trees.

Coastal erosion results in the loss of land or removal of beach and dunes due to waves, water flows or permanent inundation. Caused by cyclones and severe storms, the temporary inundation of land by sea water due to abnormally high sea levels is storm-tide inundation. The region is particularly vulnerable to storm tide inundation as are many critical infrastructure assets including the Cairns Hospital. On a longer-scale, sea level rise will result in the permanent loss of land. Each of these coastal hazards pose significant risks to coastal communities, infrastructure and environmental areas in our region. To support this increased awareness of coastal risk and to set adaptation pathways, Councils in the region are developing coastal hazard adaptation strategies under the QCoast 2100 program administered by the Local Government Association of Queensland.



Flood hazard

Across the region, exposure to flood is expected by locals. Catchment behaviours and characteristics dictate various vulnerabilities depending on warning times, extents, time isolated due to heights, channel widths and receding speed.

Many rivers are short run catchments, meaning rains in the west at the top of the catchment only take several hours to flow down the river. An exception to this is the Herbert River, which is the longest in the region, beginning in the north of the Tablelands, travelling south before swinging towards the coastline and entering the Hinchinbrook Channel.

Floods across the coastal plains often cut the Bruce Highway in Hinchinbrook and Cassowary Coast. Coastal communities like Tully Heads can quickly become isolated during a significant event.

Across the region, air, road and rail transport infrastructure are all exposed at high degrees.

Airports, airstrips and helipads are enormously vital during these situations for medical care, re-supply and in some case, evacuation – particularly for our isolated communities. However, many of these assets are flood exposed. Other assets such as hospitals, healthcare and emergency services and SES facilities are also exposed. This combination of hazard exposure to hospital and health care services and facilities which undertake or support aeromedical evacuations places not only hospital patients, but the entire community at risk.

Across the region, many waste treatment and landfill facilities are exposed to flood. Temporary solutions are often required during events.

Heat and heatwave hazard

Most people have an adequate capacity to cope with many of the heatwaves experienced in Queensland, as they are low intensity heatwaves. However, less frequent, higher intensity severe heatwaves can be challenging and an additional stress for the most vulnerable in the communities: the very young, the senior citizens, pregnant individuals, those with pre-existing health conditions and the inability to run cooling systems in their homes. Even more rare are extreme heatwaves, but these can have significant multi-sector impacts, impacting power and transport infrastructure, as well as any individuals who do not take precautions to keep cool.

Heatwaves are also Australia's most costly natural disaster in terms of human impact, with severe and extreme heatwaves being attributed to more than half of all natural disaster related deaths.

During late-November and December 2018, our region experienced a period of persistently hot weather, combined with severe and extreme heatwaves. For four days, urban areas of Cairns experienced temperatures above 42°C. This was a first for the city. Cairns Regional Council received calls for assistance with failed air conditioners and thousands of spectacled flying foxes perished, unable to cope with the harsh conditions. During this prolonged period of high temperatures, the Cairns and Hinterland Hospital and Health Service also treated dozens of patients with heat-related symptoms, many more than they would at that time of year.

The region currently sees an average of around 21 heatwave days per year, higher for Cairns and Cassowary Coast. Under future climate conditions, the number of heatwave days per year in 2090 fluctuates across local government areas but is projected to increase across all. This increase is sharper in Cairns and Cassowary Coast, the former of which is projected to rise between 59 and 109 heatwave days per year, depending on the climate model scenario.



Bushfire and grassfire hazard

The primary drivers of bushfire behaviour are fuel, topography and weather. The topography of the landscape significantly influences bushfire behaviour, particularly where the landscape includes a slope greater than ten per cent.

This means that Bushfire risk is common across the region with variations in characteristics depending on the fuel load, remoteness and access, source and property risk. Large areas of the region are state parks and forests, and resources do not stretch to combating remote fires which are often inaccessible and ignited by lightning strikes.

Heat and dryness are two of the biggest drivers of the weather-related components of bushfire risk. The drier and hotter the weather, the less bushfires require, from a thermodynamic perspective, to spread faster and become increasingly dangerous.

Higher temperatures and longer dry seasons will increase bushfire risk in some regions, particularly for communities where houses and businesses neighbour natural ecosystems as they do in the Wet Tropics.

Property owners mitigate bushfire risk through good management practices and mechanised firefighting. Properties which are not well maintained or allowed to become overgrown pose an additional risk. This is highlighted by the changing nature of rainfall where drier periods are expected resulting in high fuel loads and higher bushfire risk.

Annual fire seasons are now arriving almost a month earlier than was the case 70 years ago and extending around a month longer.

Across the region, identified flora and fauna are highly exposed to bushfire. Smoke inhalation in hot weather can impact vulnerable persons and any fire scarring will have a long lasting effect on visual amenity.

Earthquake hazard

The Wet Tropics region is located within four Seismic Hazard Source Zones. The majority of the region sits within Source Zone 1, the northern extent of the Douglas Shire is within Source Zone 28, the south-western extent of Tablelands is within Source Zone 34 and the southern extent of Hinchinbrook Shire is with Source Zone 29.

The Queensland State Earthquake Risk Assessment identifies Source Zone 1 as being exposed to a 12.15 per cent probability of 5.35 magnitude earthquake occurring over the next 100 years.

The risk assessment identifies key aspects of exposure for earthquake in Queensland include water supply and sewerage systems, which is both a function of their underground connectivity, construction and in some cases, the age of the assets. Damage to this infrastructure can yield significant cascading effects in terms of availability of water, sanitation and public health and disease.

Coastal areas may also be exposed to more risk, as they are located on softer soils.

Fuel and gas storages are at risk from earthquake, both those located underground as well as those above ground but without shock baffling.

Energy, telecommunications and information technology disruption and damage may also occur and service restoration may be a function of several things including the level of damage, availability of response personnel and equipment and broader priorities depending upon the scale of impact. Impact to building stock and housing is also possible.

Hinchinbrook Shire

Principal exposure in Hinchinbrook relates to flood. Critical infrastructure, like distribution and power transmission stations and access and resupply assets, including the local roads, the highway and railway stations have high exposures to flood.

In addition, all age care and health services, emergency services facilities and schools have high exposure to flood and vulnerability to tropical cyclones.

Agricultural activities are highly exposed across all hazard types.

Considering severe wind, Hinchinbrook Shire is currently exposed to 47.6 gust wind speed (metres per second), which equates to a category three tropical cyclone. Under the projected future scenario, this is expected to remain consistent. Across Hinchinbrook Shire, 80 per cent of dwellings were constructed prior to the 1980s, therefore, having a greater level of vulnerability to severe wind. The Shire is exposed to sea level rise and coastal hazards with impacts expected to require adaptation pathways such as future transformation.

Hinchinbrook Shire is currently exposed to 18 heatwave days per year. Under the future scenario, the LGA is potentially exposed to between 13 to 49 additional heatwave days per year. With a high median age and large population of residents aged over 65, increasing heatwave conditions will create heat-health risks for this cohort.

Cassowary Coast Regional Council

Considering severe wind, Cassowary Coast is currently exposed to 50.8 gust wind speed (metres per second), which equates to a category three tropical cyclone. Under the projected future scenario, this is expected to remain consistent. Principal vulnerabilities are powerlines and communication towers, as well as accommodation and hospitality activities. Across Cassowary Coast Shire, 50 per cent of dwellings were constructed prior to the 1980s, therefore, having a greater level of vulnerability to severe wind.

Cassowary Coast can face flood risks from several of the rivers within its boundary. Flood exposed infrastructure include railway tracks, schools and SES facilities. Flood exposure is high for all land-use across the LGA, including the significant agricultural industry.

A high proportion of critical power infrastructure and road infrastructure is bushfire exposed.

Cassowary Coast is currently exposed to 25 heatwave days per year. Under the future scenario, the LGA is potentially exposed to between 43 to 79 additional heatwave days per year. The LGA's high rate of residents in lower socioeconomic groups (44 per cent in SEIFA Quintile 1, which is the category of most disadvantage) is a vulnerability during extreme heat events.

Tablelands Regional Council

Considering severe wind, Tablelands is currently exposed to 48.5 gust wind speed (metres per second), which equates to a category three tropical cyclone. Under the projected future scenario, this is expected to remain consistent. Much of the LGA's primary industries – agricultural activities – are highly vulnerable to severe wind.

Across the Tablelands, 45 per cent of dwellings were constructed prior to 1980s, therefore, having a greater level of vulnerability to severe wind.

Both state and local road bridge infrastructure across the LGA is extremely exposed to flood.

Tablelands is currently exposed to 19 heatwave days per year. Under the future scenario, the LGA is potentially exposed to between 13 to 43 additional heatwave days per year.

Cairns Regional Council

Across Cairns, flood exposure poses the greatest risk compared to bushfire. Critical assets like power infrastructure and air, rail and road transportation assets are all exposed to flood.

Coastal hazards also pose a significant risk to the Cairns coast which is highly urbanised, with many residents and critical infrastructure situated along the coastline, including the Cairns Hospital.

Considering severe wind, Cairns is currently exposed to 50.1 gust wind speed (metres per second), which equates to a category three tropical cyclone. Under the projected future scenario, this is expected to remain consistent. Many of the LGA's health and aged care facilities are vulnerable to tropical cyclones.

Cairns is currently exposed to 26 heatwave days per year. Under the future scenario, the LGA is potentially exposed to between 33 to 83 additional heatwave days per year.

Yarrabah Aboriginal Shire

The single access road into Yarrabah is extremely exposed to bushfire and flood hazards. Residential dwellings are highly exposed to bushfire and much of the LGA's critical community infrastructure, like police and ambulance stations, SES and schools, are exposed to flood hazard. The wastewater treatment facility is exposed to both flood and bushfire.

Considering severe wind, Yarrabah Aboriginal Shire is currently exposed to 47.4 gust wind speed (metres per second), which equates to a category three tropical cyclone. Under the projected future scenario, this is expected to remain consistent.

Yarrabah Aboriginal Shire is currently exposed to 21 heatwave days per year. Under the future scenario, the LGA is potentially exposed to between 17 to 46 additional heatwave days per year. The LGA's high rate of residents in lower socioeconomic groups – 100% in SEIFA Quintile 1 – is a vulnerability during extreme heat events.

Douglas Shire

The Shire features the major catchments of the Daintree and Mossman Rivers, exposing the Shire to isolation when flood waters rise. In 2019 the Daintree River reached 12.6m – the highest level in 118 years. This impacted the ferry and cut the north-south connection in the Shire. The Shire's assets are not significantly exposed, but principal vulnerability remains connectivity.

Much of the transport network is exposed to bushfire, this includes airstrips, local and state roads and the Daintree ferry.

Considering severe wind, Douglas Shire is currently exposed to 50.5 gust wind speed (metres per second), which equates to a category three tropical cyclone. Under the projected future scenario, this is expected to remain consistent.

Douglas Shire has over 100 kilometres of coastline and is exposed to coastal hazards. In 2019 the 'Resilient Coast' strategy was completed which summarised exposure as 50% of beach and foreshore assets at risk from coastal hazards, increasing to 85% by 2100. Critical infrastructure such as sewerage, drainage and water reticulation assets have a relatively low risk.

Douglas Shire is currently exposed to 21 heatwave days per year. Under the future scenario, the LGA is potentially exposed to between 8 to 33 additional heatwave days per year.

DESIGNING FOR DENSITY IN THE TROPICS

DESIGN GUIDE



Case Study: Understanding and designing for extreme heat in Cairns

Urban environments are generally hotter than their non-urbanised surroundings. This is due to urban heat island effect, a phenomenon where heat generated from human activities builds up and becomes trapped in materials like concrete, which have high thermal mass. While urban heat islands are an issue in and of themselves, they also amplify the intensity of heatwaves when they occur in our cities and towns.

To better understand urban heat island in Cairns and the impacts it has on people living and working in the central business district (CBD), 75 real-time temperature and humidity sensors were installed across the CBD. This collaborative project between James Cook University and Cairns Regional Council is set to inform how Council communicates heatwave risk to the public and assist in guiding the development of new planning and urban design initiatives to mitigate urban heat.

Another important consideration to mitigate and manage extreme heat is to understand and design for the climate we are in, a process called climate-responsive design. This design method responds to local weather and climatic conditions to create comfortable building and spaces. Doing this and capitalising on natural processes like air flow, vegetation and optimising access to sunlight are some of the most effective methods we can use to manage heat in our buildings and urban environments.

The latest tropical building design guidance in Cairns, *Design for Density in the Tropics Design Guide*, provides the community, developers, builders and built environment practitioners practical advice on how to design and construct well-designed housing which suits Cairns. One aspect of this is responding to the tropical climate of the region. In practice, this means orienting a building to capture prevailing breezes and shading eastern and western-facing walls, for example.

Image: “Designing for Density in the Tropics” cover.

Case Study: A resilient energy grid in Yarrabah

Microgrids are local energy grids which can operate autonomously from the traditional energy grid. They can vary in scale, but share the same characteristics, in that they are a grouping of electricity sources and users in a localised area. Community microgrids commonly include renewable energy sources (both household and plant), complimented by battery storage. Battery storage enables dispatchable power when renewable energy sources like solar are not active to energy users, households and businesses.

The Yarrabah Microgrid is a federally funded feasibility study, due for completion early 2022. A focus of the feasibility study is scoping and analysis to ensure the microgrid will efficiently operate in the region’s tropical, marine and cyclonic context. Once constructed, the microgrid will provide Yarrabah with greater resilience during severe storms and tropical cyclones. Previously during such events, the township has lost power for several days at a time. In March 2021, Cyclone Niran resulted in 4-day power outage in Yarrabah. Over 150 Ergon Energy workers were deployed to the region to restore critical power infrastructure and reconnect homes and businesses.

The Yarrabah Microgrid project is intended to become a showcase example of a self-reliant, sustainable microgrid which can be rolled out to other communities.

Image: Yarrabah.



Our pathways to resilience

This Strategy has been formulated through regional engagement and collaboration with the local governments and stakeholders within the region, and calibrated by drawing upon a spectrum of existing resilience efforts across the region, including a wealth of existing studies, reports, plans and strategies. It also draws upon the strategic observations drawn from the initial assessment of exposure and vulnerability undertaken across the region.

This enables the consideration of both locally identified community needs and strategic vulnerabilities derived through risk informed information, which when considered together, can be used to bolster resilience initiatives across the region.

The concept of resilience action can be considered in the context of three options or opportunities:

‘Doing same’ – some parts of the system may be able to continue successful functioning even with disruption. However, other parts of the system will not endure major disruptions and to ‘go back to normal’ after disasters is reinforcing existing vulnerabilities.

‘Doing better’ – some parts of the system may be amenable to incremental changes and adjustments, allowing for improved decisions and actions based on updating knowledge.

‘Doing differently’ – large parts of the system will not be able to withstand increasing frequency or magnitude of disruption and will require a step change to deliver on goals and things that are valued. System structural changes can be achieved by addressing root causes and re-prioritising.

For the Wet Tropics, the doing same, doing different and doing better model encompasses the following examples:

- continuing existing work, collaboration and partnerships across the region, on regional biosecurity issues
- improving road and other networks funding and decision making through enhanced asset management systems; and
- focusing on skills and education development in the region to support economic diversification.

Regional strategic pathways

The strategic pathways identified below form a blueprint for coordinated resilience action for the Wet Tropics region. Efforts at the local level are calibrated to work toward the achievement of regional goals. Each strategic pathway is mapped to its corresponding QSDR objective, referenced by the coloured number reference.

	Resilient society	Resilient towns and infrastructure	Resilient transport	Resilient economy	Resilient environment
Doing same	Celebrate community and cultural connections 2	Explore ways to cool our towns with solutions fit for our tropical climate and hazard profile 3	Identify and deliver local solutions to local interruption issues 1	Support local business through consistent, positive messaging to external markets 1	Our landscape is our heartbeat. Continue to collaborate with all on environment management 2
Doing better	Create fit-for-purpose disaster preparedness messaging 4	Understand how our settlements create disaster management issues 1	Understand strategic links during floods and storms for improvement 4	Support tourism in finding new educational and eco-tourism products 3	Enhance waste management solutions 4
	Support the unique disaster management approach required in the Wet Tropics 4	Improve the reliability and resilience of our telecommunications infrastructure 2	Identify strategic whole of network solutions across transport modes 4	Support our businesses in planning for stress and shocks 4	Contribute to regional desire for carbon neutrality 2
Doing different	Foster collaborative partnerships in the community services sector 2	Explore new ways to service our unique settlement patterns for the following critical services: <ul style="list-style-type: none"> • Health • Education • Government services 4	Advance regional transport priorities that build disaster resilience and strengthen supply chains, such as the range crossings	Diversify our economy for greater flexibility 3	Foster new collaborative partnerships in the environmental management sector 2

- 1** we understand the potential disaster risks we face
- 2** we work together to better manage disaster risk
- 3** we seek new opportunities to reduce disaster risk
- 4** we continually improve how we prepare for, respond to and recover from disasters

Delivering over time

The strategic pathways above provide the broad themes that address the region’s identified resilience needs. Focusing the right effort at the right time is also critical to advancing resilience in a sustainable way.

Being able to describe what is needed and when is a key aspect of coordinating whole of government and collective responses to locally identified needs.

The diagram below provides a conceptual roadmap to understand key actions and investment priorities for the region, and when they might be applied, having regard to funding mechanisms and broader delivery programs of investment. It anticipates that stresses and shocks will continue to happen into the future – but it provides the trigger points for key interventions at the relevant points over time (before and event, during, and after) that are needed to help sustain socio-economic growth into the future.

This can be used as a mechanism to understand key recovery and resilience priorities ahead of time, so that when an event occurs, all stakeholders are already aware of the key needs of the region through the action plan which enables post disaster efforts to be better coordinated and streamlined.

The phased approach, demonstrated by the figure below, acknowledges that resilience is a journey and is punctuated by events that change our circumstances. Sometimes, it is easier to achieve changes to the status quo after an event, when the consequences are in clear memory. As challenging as events are, they also present opportunities for change so that today’s lessons can be retained and put to work for future benefit. In other periods, under blue sky conditions, other opportunities also exist to build hazard and risk information datasets, undertake monitoring and plan for uncertain times.

Importantly, this approach means that efforts, projects and activities need not be all done at once. Individual local government circumstances will dictate what is needed and when certain actions are best carried out depending on local priorities and needs at any given time.

Future action and investment priorities and phasing

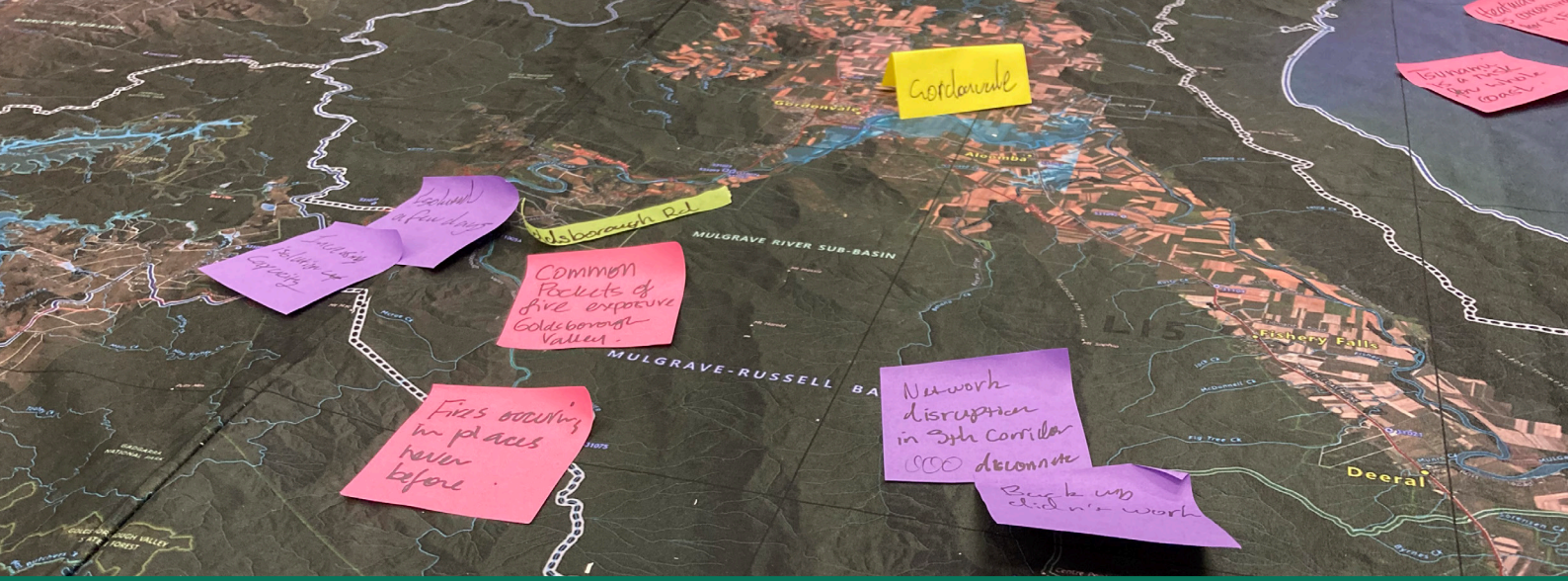
Figure 7. Improving our prosperity through resilience (adapted from Joseph Fiksel).



Action planning

A local action plan relative to each local government in the region supports the implementation of this Strategy. The action plan identifies a suite of potential projects, that if implemented, would contribute to improving resilience to natural hazards at both the local and regional level. It is calibrated to provide direction on how to pivot actions as events occur and circumstances change.

Each local government will be a primary driver for implementing the local action plan, however it is acknowledged that not every action identified is the responsibility of the local government, with some actions requiring involvement by state agencies, local stakeholder groups, charities, NRM bodies and community groups. Where this is the case, Council can work with stakeholders to share these actions and projects.



Implementation

Working together to implement the strategy

This Strategy will be implemented as a partnership across the six local governments of the Wet Tropics region. The Strategy actions will be driven through local leadership and regional resourcing under the direction of the Far North Queensland Regional Organisation of Councils (FNQROC), with appropriate support from other coordinating bodies and entities including District Disaster Management Groups (DDMGs), local disaster management committees, recovery and resilience officers, state government agencies, and not-for-profits.

This approach recognises that while actions are best delivered locally, multi-disciplinary regional level support is also required to encourage cross jurisdictional collaboration, provide technical assistance and proactively assist project implementation.

Enduring governance and funding arrangements

This Strategy provides an opportunity and supports how local governments, and stakeholders work together to achieve common resilience outcomes for the Wet Tropics region.

Under this model, the Strategy acts as the regional blueprint for coordinated and sustained action. An agreed governance arrangement will support the implementation of the Strategy and an enduring commitment to championing resilience into the future. Stakeholder-identified key requirements for the successful implementation of this Strategy are:

- a broad, multidisciplinary approach to resilience building
- sustaining governance arrangements, funding, and resource capability for implementation of resilience actions over time
- a clear understanding of how resilience arrangements interplay with Queensland Disaster Management Arrangements

- greater collaboration between government and nongovernment organisations to optimise resilience service delivery and efficiency
- clarification of the proposed resilience implementation arrangements at state, regional and local levels so that local actions can be programmed and delivered accordingly.

This model is underpinned by a role for everyone in delivery including:

Local leadership

Local governments are encouraged to establish their own multi-disciplinary resilience working groups to transition community and climate-related disaster resilience to front-of-mind in all local government functions. This could be achieved by combining existing recovery group arrangements with an ongoing resilience focus over the calendar year.

Regional coordination

Regional coordination is encouraged through the FNQROC with a strong link to other existing related governance arrangements such as the relevant DDMGs.

State support

As a locally-led and regionally coordinated strategy, the role of the State is intended to be one of provision of enabling measures such as administration of grant funding programs, delivery of core governmental functions that interface with resilience building, and facilitation or coordination of support that can assist implementation.



www.qra.qld.gov.au/regional-resilience-strategies/wet-tropics