



North West Regional Resilience Strategy

March 2022



Document details

Security classification	Public
Date of review of security classification	March 2022
Authority	QRA
Document status	Final
Version	1.0
QRA Reference	QRATF/20/4149 GD:0642

Copyright



This publication is protected by the *Copyright Act 1968*. © The State of Queensland (Queensland Reconstruction Authority), March 2022.

Licence

This work is licensed by State of Queensland (Queensland Reconstruction Authority) under a Creative Commons Attribution (CC BY) 4.0 International licence. To view a copy of this licence, visit www.creativecommons.org/licenses/by/4.0/

In essence, you are free to copy, communicate and adapt this publication, as long as you attribute the work to the State of Queensland (Queensland Reconstruction Authority).

Interpreter



The Queensland Government is committed to providing accessible services to Queenslanders from all culturally and linguistically diverse backgrounds. If you have difficulty in understanding this report, you can access the Translating and Interpreting Services via www.qld.gov.au/languages or by phoning 13 14 50.

Disclaimer

While every care has been taken in preparing this publication, the State of Queensland accepts no responsibility for decisions or actions taken as a result of any data, information, statement or advice, expressed or implied, contained within. To the best of our knowledge, the content was correct at the time of publishing.

Copies

Copies of this publication are available on our website at: www.qra.qld.gov.au/regional-resilience-strategies/north-west
Further copies are available upon request to:

Queensland Reconstruction Authority
PO Box 15428
City East QLD 4002
Phone (07) 3740 1700
info@qra.qld.gov.au
www.qra.qld.gov.au

The North West Regional Resilience Strategy is a partnership between the Queensland Government and the following North West Queensland Regional Organisation of Councils (NWQROC) member councils.

Council/website	Disaster Dashboard
North West Queensland Regional Organisation of Councils (NWQROC)	www.nwqroc.com.au
Burke Shire Council www.burke.qld.gov.au	www.burke.qld.gov.au/our-community/emergency-information
Carpentaria Shire Council www.carpentaria.qld.gov.au	disaster.carpentaria.qld.gov.au
Cloncurry Shire Council www.cloncurry.qld.gov.au	www.cloncurry.qld.gov.au/council/stay-connected/disaster-recovery-information
Doomadgee Aboriginal Shire Council www.doomadgee.qld.gov.au	
Flinders Shire Council www.flinders.qld.gov.au	flindersdashboard.qitplus.com
McKinlay Shire Council www.mckinlay.qld.gov.au	www.mckinlay.qld.gov.au/council-services/disaster-management
Mount Isa City Council www.mountisa.qld.gov.au	www.mountisa.qld.gov.au/disaster-management/disaster-management-1
Richmond Shire Council www.richmond.qld.gov.au	www.richmond.qld.gov.au/community/disaster-management

Images in this document courtesy of NWQROC.

Cover image: Herding cattle on the flood plains near the Gulf of Carpentaria.
Image below: Stockyards, Karumba, Carpentaria Shire.

Foreword

From rugged ochre landscapes to the sparkling waters of the Gulf of Carpentaria, North West Queensland is place of natural beauty. It is also the home of bustling townships and strong hardy communities, businesses and industries.

We are all used to the boom and bust cycles of flood and drought in the North West, but as our landscape, weather and climate continue to change, our drive towards continuous improvement and sustainability for our communities is being challenged.

We are no strangers to disasters in the North West – an extraordinary heavy rainfall event in January and February 2019 saw major flooding across 39 local government areas, including six in our North West region – Burke, Carpentaria, Cloncurry, Flinders, McKinlay and Richmond. In economic terms, the total estimated impact of this disaster was in the vicinity of \$5.68 billion. The communities of Mount Isa and Doomadgee were completely isolated. The impact on people, families and communities was beyond measure.

In response to the 2019 Monsoon Trough event, both the state and federal governments released recovery plans which have been integrated as part of this Strategy to provide a consistent and complementary approach from recovery through to future improvements.

The North West Queensland Regional Resilience Strategy has been developed as a partnership between the Queensland Government, the North West Region of Councils (NWQROC) and its following member councils:

- Burke Shire Council
- Carpentaria Shire Council
- Cloncurry Shire Council
- Doomadgee Aboriginal Shire Council
- Flinders Shire Council
- McKinlay Shire Council
- Mount Isa City Council
- Richmond Shire Council

The NWQROC is a collaboration of councils with a key focus on delivering shared solutions to common challenges across the North West. We're working together to make North West Queensland a region attractive for people to live, work and invest.

The purpose of this Strategy is to guide how we work together to proactively support resilience actions and planning across the North both now and into the future.

Cr Jack Bawden

Chair, NWQROC

Mayor, Carpentaria Shire Council

Image: Mt Walker, Flinders Shire.



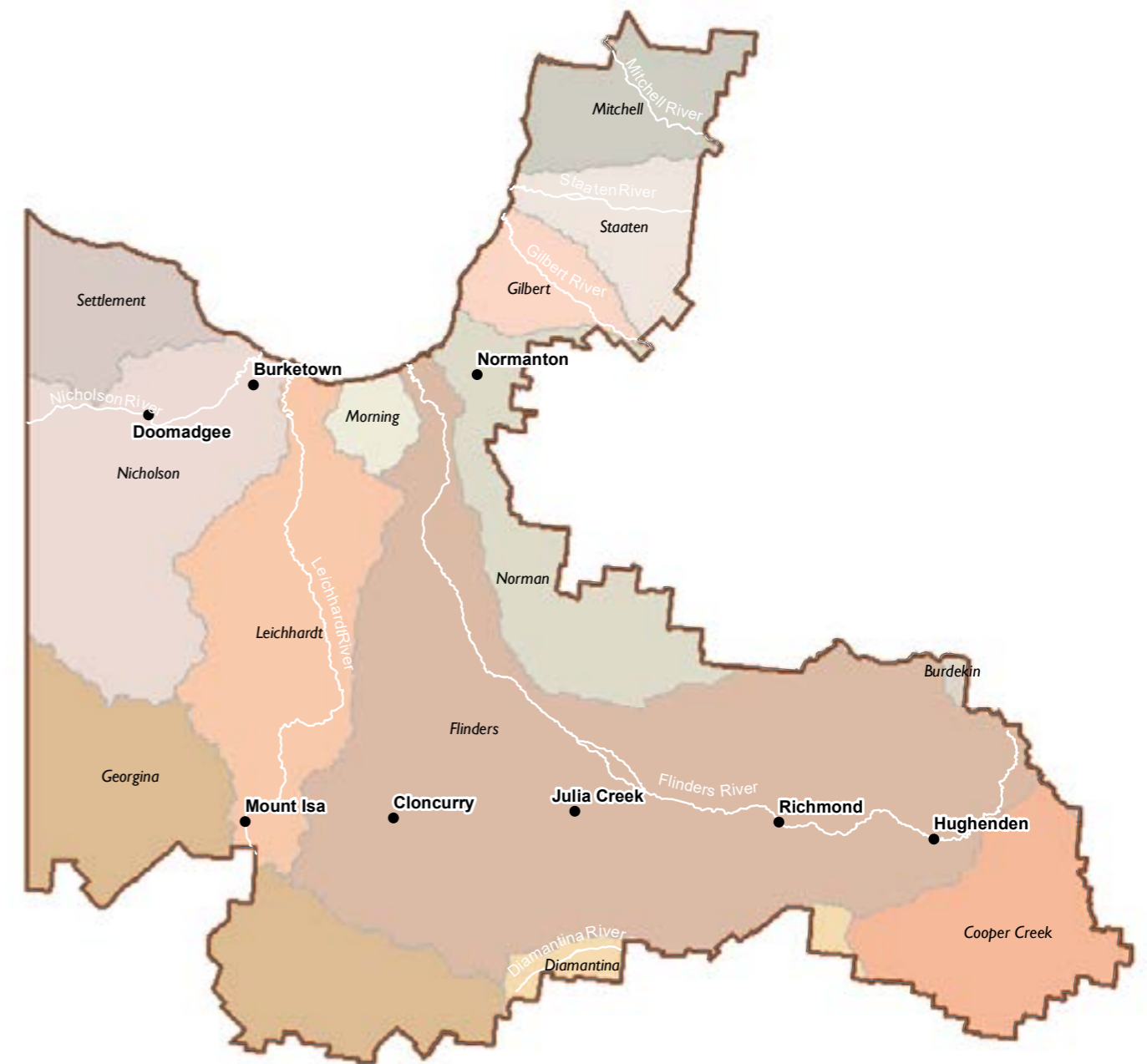
Acknowledgement of Country

We acknowledge 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.

North West region



Contents

Foreword	3	Our landscape	26
North West region	5	North West Queensland Region	27
Our vision	9	Our climate	28
About the strategy	10	Rainfall systems	28
This Strategy aims to:	10	Temperature	29
The objectives are to:	10	Fire weather	29
Strategic alignment	11	Future climate trends	29
Our locally-led approach	12	Our challenges and opportunities	30
Elements of resilience	12	Environment	30
Co-design process	13	Towns and infrastructure	31
Resilience in the North West	16	Roads and transport	31
Our resilience needs	17	People and communities	32
Trends	17	Economy	32
Stresses	17	Climate influences	33
Shocks	17	Our exposure and risks	34
Core resilience needs	17	Cyclone, severe storm and coastal hazards	34
How resilience is affected by stresses and shocks	18	Flood hazard	35
Values guiding our resilient pathway	19	Heat and heatwave hazard	36
Identity	19	Bushfire and grassfire hazard	36
Inter-generational legacy	19	Earthquake hazard	37
Comradery and teamwork	19	Case study: Glenmoan Station erosion management	38
Innovation and ingenuity	19	Case study: North West Queensland Flood Warning Infrastructure Project	38
Staying power	19	Our pathways to resilience	39
Rethinking resilience in the North West	20	Regional Strategic Pathways	40
Limiting impact or shortening recovery from stresses or shocks	20	Delivering over time	41
How we make real and lasting change	20	Action planning	41
Reconstruction & Recovery	21	Implementation	42
Prevention & Preparedness	21	Working together to implement the Strategy	42
Reconstruction & Recovery	21	Enduring governance and funding arrangements	42
Our region	22	Local leadership	42
Burke Shire	23	Regional coordination	42
Carpentaria Shire	23	State support	42
Cloncurry Shire	23		
Doomadgee Aboriginal Shire	23		
Flinders Shire	23		
McKinlay Shire	23		
A snapshot of community characteristics	24		
Case study: Wernadinga Wetlands	25		
Case study: Gulf Savannah Fire Management Guidelines	25		



Image: Anode wheel, Mount Isa. Courtesy of Glencore.



Our vision

In the North West, we pride ourselves on our strengths of self-sufficiency and ingenuity.

We thrive on our own brand of innovation. We bring this innovation to all aspects of our lives, to help us develop unique ways to prepare and endure the serious weather we know will come each year. Some years are harsher than others.

We live in a land of flood, wind, heat, storms and fire. As tough as these conditions can be at times, we rely on these natural processes to sustain our communities, livelihoods and landscapes.

From Camooweal to Karumba, Kynuna to Cloncurry, we know our land and its systems like the back of our hand.

We work together in the face of adversity.

We share our skills, knowledge and time for the benefit of others and our communities.

We know how to live with isolation, but relish connection and the connectivity networks that conquer our distance.

We work hard to enhance our economic base as one of Queensland's richest minerals, primary production, fishing and tourism regions.

We value our wealth of First Nations knowledge and culture, and work to sustain these vital connections.

We work together towards healthy Country and the prosperity it brings.

Image: Hughenden, Flinders Shire.

About the strategy

Resilience is everyone's business. Resilience in the North West is dependent on a shared but also collective responsibility model.

This Strategy encourages a role for everyone in the North West 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 is for resilience in the North West 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 North West.

This Strategy aims to:

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

The objectives are to:

- 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.



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 (QSDR) and Resilient Queensland - the statewide long-term blueprint to support Queensland's vision of becoming the most disaster resilient state in Australia.

The North West Regional Resilience Strategy aligns with the QSDR and 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 North West Regional Resilience Strategy disaster resilience policy line of sight to local, regional, state, national and international levels.

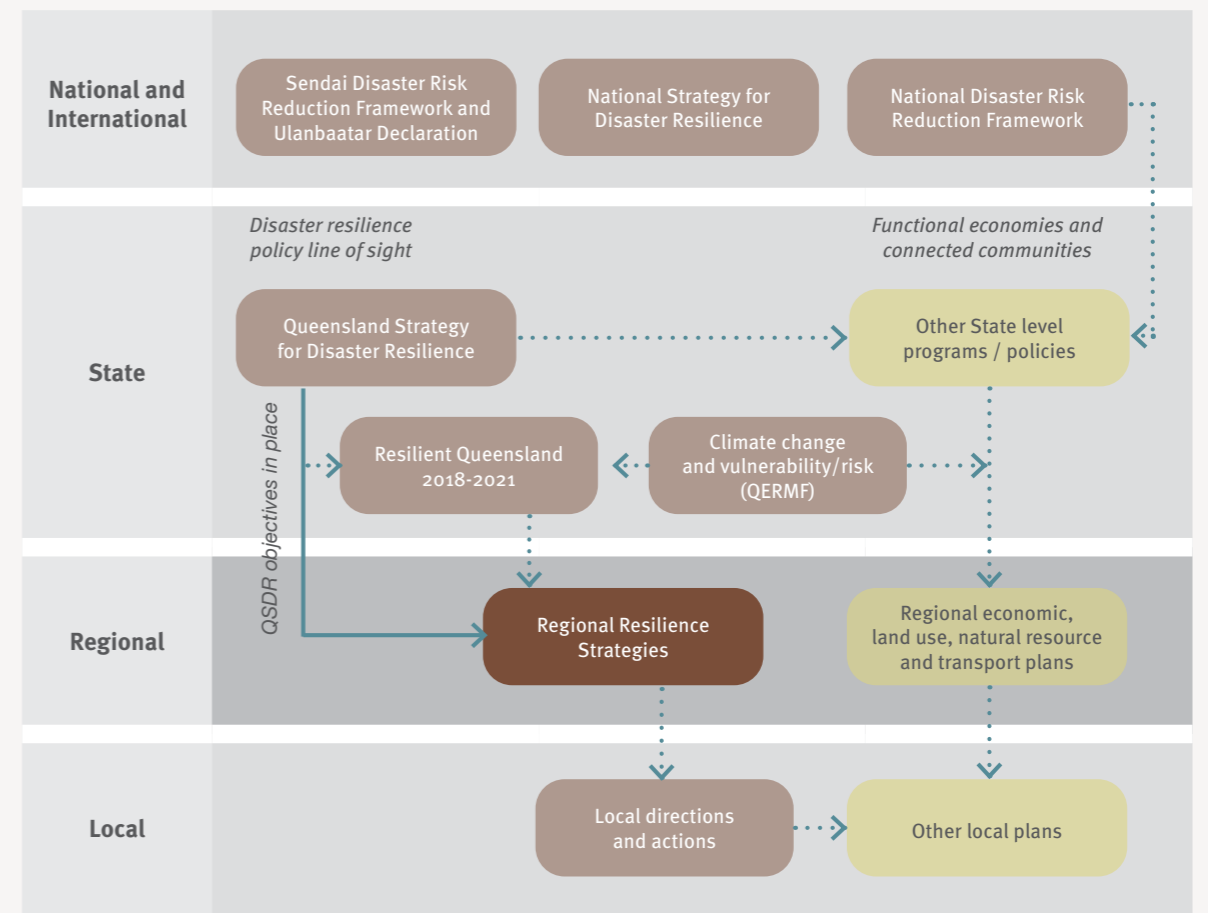


Image: Rigby Falls.

Image: Lawn Hill, Burke Shire.



Our locally-led approach

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 North West are reflected.

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

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

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 five elements of resilience that contribute to systems-based resilience.

Elements of resilience

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



Image: Sunset billabong, Doomadgee.

Co-design process

This Strategy has been co-designed with local representatives and 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.

This risk-informed approach takes a disaster resilience lens to our economic, social and environmental systems to ensure the best of disaster management and risk reduction practices can be brought into effect in the North West over time.

Engagement with local representatives reflected a desire to 'get on with it' to advance meaningful outcomes for communities in the North West.

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 QERMF, including cyclone and severe storm, flooding, bushfire, heatwave and severe wind.

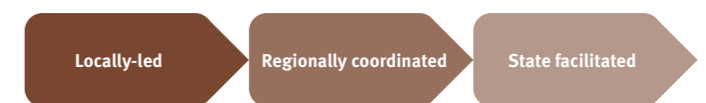
Drought and other natural hazards (such as storm tide inundation) are also considered by the Strategy where they have been raised as an issue at the local level.

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 QClimate Action Plan.

Figure 3. The Resilient Queensland implementation delivery approach (adapted from CSIRO[1]).



Image: Solar farm, Hughenden, Flinders Shire. Courtesy of Lighthouse.





This Strategy reflects previous and existing work at the state, regional and local levels to ensure this work is taken forward, not 'reinvented', and provides a further mechanism to connect local needs to further funding opportunities at the state and federal levels.

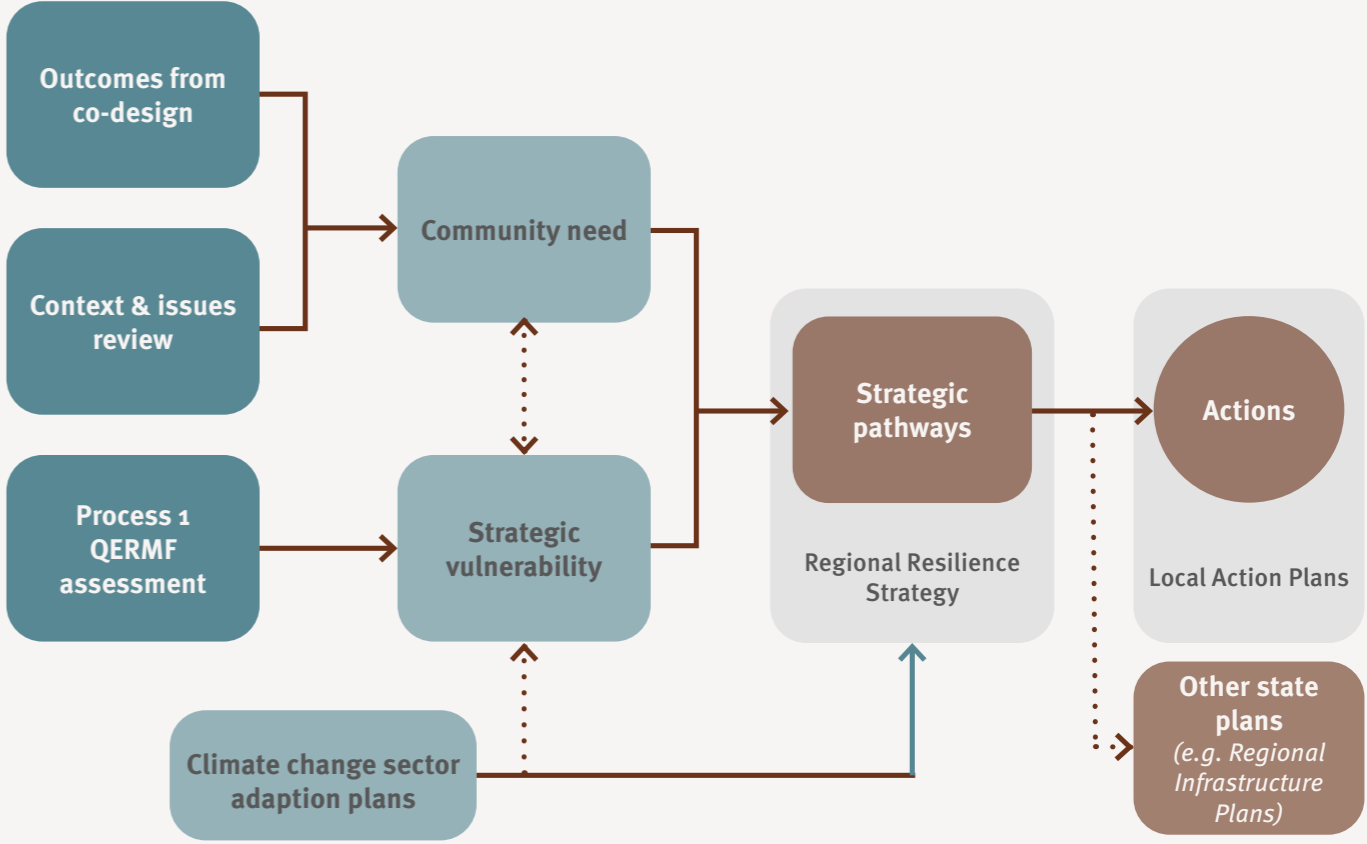
This Strategy culminates in resilience pathways that provide a linkage between locally-identified actions or projects, and the state, federal and international policy environment. That way, the need for a particular project or action can be justified by it meeting a regional pathway to resilience that 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](#)
- www.qld.gov.au/environment/climate/climate-change/adapting/sectors-systems
- [Queensland Climate Resilient Councils Climate Risk Management Framework and Guideline](#)
- [QCoast2100 Coastal Hazards Adaptation Program](#)
- [North and Far North Queensland Monsoon Trough – State Recovery Plan 2019–2021](#)
- [2019 Queensland Monsoon Trough – After the Flood: A strategy for long-term recovery](#)

Figure 4. Strategy development process reflects the CSIRO Q-RAPTA resilience building approach tailor-made for the Queensland context.





Resilience in the North West

Being resilient is part of life in the North West and it is the cornerstone of pretty much everything we do. It is not new to us, and it certainly isn't special. It is simply part of who we are. Our community prides itself on self-sufficiency. Every season presents a new challenge and so we've gained a lot of experience in strengthening our resilience over the years.

Our vision for resilience is to see the North West and its people continue from strength to strength into the future. From the Traditional Custodians of this Country who came before us, to future generations who will steward this land long after us, the spirit and character of the people of the North West is our greatest asset.

We endure floods, cyclones, storms, fire, heat and flies. Our connection with the landscape we live in and how it works primes us to prepare each year and we know what to expect. Each time Mother Nature comes knocking, we stand together as a community to press forward, onward and upwards.

Image: Flinders Highway, McKinlay Shire.

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

People have told us the health of the underlying social, economic and environmental systems in an area affect its disaster resilience. Our communities that are under sustained pressure from chronic and periodic stresses will be less likely to cope in the long term. Without change, something will make these systems break – whether it is the chronic or periodic stress, or episodic shocks like floods.



Our resilience needs

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

Trends

Transformative forces that could change a region including:

- population decline
- changing market forces
- ageing population
- loss of youth from the region
- limited food security
- increased digital enterprise
- climate change.

Stresses

Long term situations or circumstances (which may be periodic or chronic) that weaken the potential of a given system and deepen vulnerability including:

- periodic and long-term drought
- water resource availability (surface and ground water)
- rising sea levels
- weed and pest outbreak
- access to infrastructure and services
- housing availability, diversity, quality and affordability
- availability of in-region aged care
- cost of construction
- skilled workforce availability
- above-average homelessness in parts of the region
- pandemic.

Shocks

Sudden events with an important and often negative impact on the vulnerability of a system and its parts including:

- flooding
- bushfire and grassfire
- cyclones and storms (severe wind and storm tide)
- heatwave
- earthquake
- biosecurity outbreak
- industrial incidents.

Core resilience needs

- improved physical and digital connectivity
- infrastructure resilience
- reliable and cost-effective energy
- long-term economic resilience through catalyst projects and 'adapting to the new normal'
- social wellbeing and population retention and expansion
- support for disaster management resources, capability and capacity
- coordinated disability, physical and mental health services
- essential service delivery
- natural resource management and landscape sustainability
- enduring weed management approaches
- changing land uses and condition

Image: Fire and Rescue, Cloncurry Shire.



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 stresses caused by periodic stresses like drought and means communities are better able to cope with episodic events like floods, bushfires or cyclones when they happen.

Figure 5. How resilience is affected by stresses and shocks.



Image: Lilies, Doomadgee Aboriginal Shire.



Values guiding our resilient pathway

The Strategy reflects our values in the North West which are unique and make us who we are. There are five underpinning values that guide our resilience pathway.

Identity

We draw from a long pioneering history and much longer Indigenous history which characterises our culture and the way we do things.

Inter-generational legacy

Our knowledge and love of the land will be passed on to future generations. Our skills and capacity have and will continue to build an independent region and a bright future for emerging generations. We value the health of our natural assets, soils and river systems.

Comradery and teamwork

Our sense of community and mateship are amongst our greatest assets. We will not hesitate to pitch in and help each other when the need arises.

Innovation and ingenuity

Finding pragmatic solutions to complex challenges is a hallmark of our high level of leadership, self-capability and efficiency as a community.

Staying power

We go the distance. Times may not always be easy, but commitment to seeing things through and deriving positive outcomes provides us with great pride. A focus on our physical and mental wellbeing is a key factor.

Image: Clean-up day, 2019, Doomadgee Aboriginal Shire.



Rethinking resilience in the North West

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.

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 North West to grapple with long term trends and stresses like climate change, drought and economic downturn.

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

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 North West 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.



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.

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

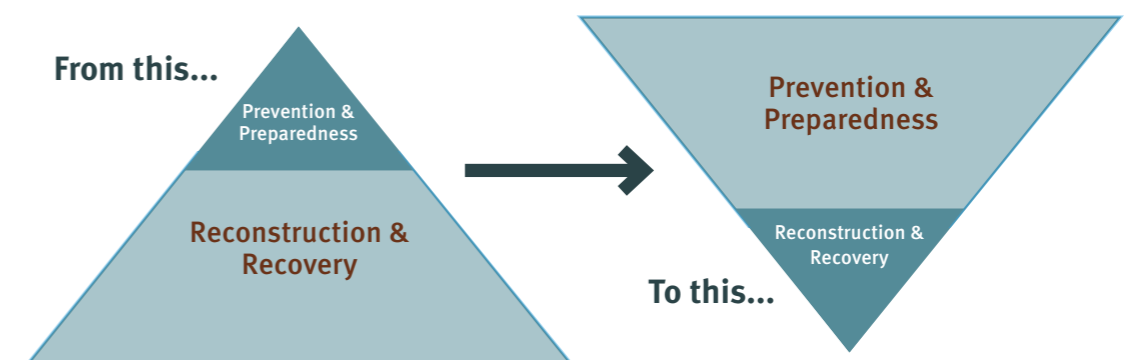
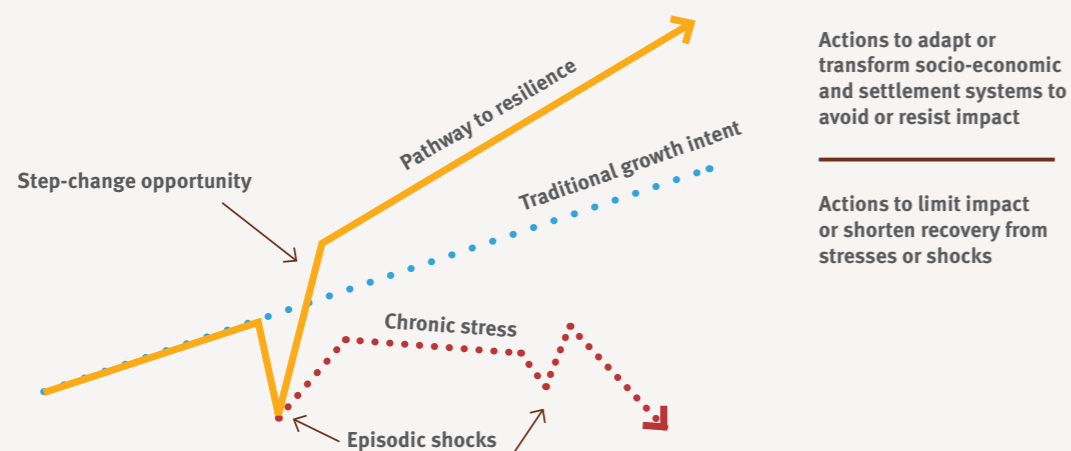
The reforms to DRFA included, for the first time, a framework to incentivise reconstruction efficiencies to create more funds for resilience and mitigation purposes.

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



Our region

Stretching from the Northern Territory border in the west, taking in the southern coastline of the Gulf of Carpentaria and east to Torrens Creek in the Flinders Shire, the North West region of Queensland accounts for approximately one fifth of area of the State.

The North West is a region enriched with natural beauty from spectacular gorge country to sandstone cliffs, hidden lakes to freshwater springs as well as an abundance of famous fishing spots. The local population swells in size during the cooler months as grey nomads and visitors come in droves. Part of the attraction is the region's rich history, containing world heritage fossils and rare

mineral deposits, as well as being the birthplace of the Royal Flying Doctor Service and first Qantas flight in Cloncurry. It is home to valued areas of cultural heritage and World War II history.

With a relatively small population to land area ratio, the majority of the region's population resides in Mount Isa, which maintains a strong economic focus on mining. The remainder of the population is dispersed across a network of townships and small communities, large cattle stations and remote Indigenous communities.

Burke Shire

In the far north west corner of Queensland, Burke Shire shares a border with the Northern Territory, around 250 kilometres of Gulf coastline and is home to the famous Boodjamulla National Park (formerly named Lawn Hill National Park) and Riversleigh Fossil Fields. Burketown is the major township, situated on the Albert River, and is renowned as a destination for recreational fishing, hosting the World Barramundi Fishing Championships in autumn each year. With a population just over 350 residents, Burke Shire is often isolated for extended periods of time in the wet season. The Gregory Downs Camooweal Road dissects the Shire from south to north and joins the Wills Development Road at Gregory. From Burketown, the road continues east to Normanton in Carpentaria Shire.

Carpentaria Shire

The fourth largest local government area in Queensland, Carpentaria Shire shares a border to the west with Burke Shire, stretching across the southern coastline of the Gulf of Carpentaria for around 350 kilometres where it meets the boundary of Kowanyama Aboriginal Shire. Five other local government areas share a border with Carpentaria. The two main population centers, Normanton and Karumba, are both located on the Norman River. Karumba is the only town in the region that is located on the southern Gulf coastline. Normanton provides an administrative hub for the Shire, with Karumba being both a tourist hotspot and commercial activity generator through an active port based on mining and live cattle export as well as a substantial fishing industry. With a population of almost 2000 residents, Carpentaria Shire has a diverse landscape ranging from vast inland plains to mangrove forests, deltas and salt pans along its coast. The Shire is the outlet of the Leichhardt, Flinders, Gilbert, Norman and Staaten Rivers, and partly also the Mitchell River.

Cloncurry Shire

To the west of Julia Creek is Cloncurry Shire. This area is generally sparsely vegetated, with undulating rugged country to the south and west and generally flat and undulating country to the north and east. With a population just over 3000 residents, the township of Cloncurry is located on the Flinders Highway, on the banks of the Cloncurry River. Other key centres in the area include Dajarra and Duchess both located south of Cloncurry township, as well as Kajabie to the north west. Grazing, transport service and mining industries are the core industries in the Shire. Cloncurry Shire can experience intense weather, from extreme temperatures to strong isolated winds without warning, severe electrical storms and flooding.

Doomadgee Aboriginal Shire

Doomadgee Aboriginal Shire is surrounded by the wider Burke Shire, with the original Mission located on the Gulf and known as 'Old Doomadgee'. The southern boundary of the shire is formed by the Nicholson River. The community of Doomadgee is formed by the Gangalidda and Waanyi people (the Traditional Owners of the land) as well as the tribal groups of Gadawa, Lardil, Mingginda and Garawa. The only access route into the township crosses the Nicholson River via a low level causeway on Wollongorang Road which is often closed for an average of three to four months each year, sometimes up to half a year. The population of Doomadgee is around 1500 residents, decreasing in the wet season with many people leaving town for drier areas.

Flinders Shire

Named after the Flinders River, Flinders Shire shares its boundaries with Richmond to the west, Etheridge to the north, Charters Towers to the east and Barcaldine to the south. The Shire covers a variety of diverse landscapes with basalt caps and gorges to the north, desert country to the south east and open flat black soil plains to the south and west. Its primary industry is beef with some emerging irrigated agricultural activities. Hughenden, located on the banks of the Flinders River, is the main business centre in the Shire with connections via the Flinders Highway through to Townsville in the east and Mount Isa in the west. Smaller townships of Prairie and Torrens Creek offer access to natural wonders including Kooroorinya Falls, White Mountains National Park and Moorrinya National Park.

McKinlay Shire

The 'Gateway to the Gulf of Carpentaria', McKinlay Shire is home to a productive and innovative pastoral industry largely focused on beef, sheep and wool, and minerals. With a population of around 800, the administrative center of the shire is Julia Creek. The town of McKinlay became a popular tourist destination following the legendary 1980s movie *Crocodile Dundee* which featured the Walkabout Creek Hotel. Further key towns in the region include Nelia on the Flinders Highway, as well as Kynuna, located in the south of the shire on the Landsborough Highway. McKinlay is also home to a diverse mining sector which includes silver, lead, zinc, copper and emergent vanadium mining activity.

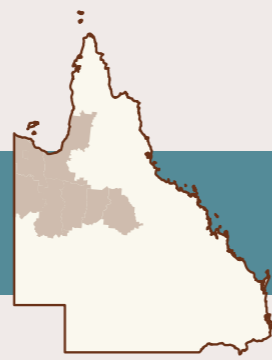
Mount Isa City

The powerhouse of the North West, Mount Isa City is situated at the far west of the state, sharing its border with the Northern Territory. The western-most town in the region, Camooweal, serves a resident population of 208 as well as stations across the broader outback Queensland and Northern Territory area. Commonly known as 'the Isa', the industrial city is home to Mount Isa Mines which is one of the most productive lead, silver, copper and zinc mines in the world. With a current population around 18,500 residents, the city expands and contracts with market cycles and is home to a significant transient workforce, including during the disaster season. Mount Isa is a major administrative and services hub for the North West region and beyond, providing essential services to many people living in remote communities. Spanning the banks of the Leichhardt River, during the wet season Mount Isa is often cut off from the rest of the region making it difficult for people to access much needed services, as well as presenting difficulties for mining industry continuity.

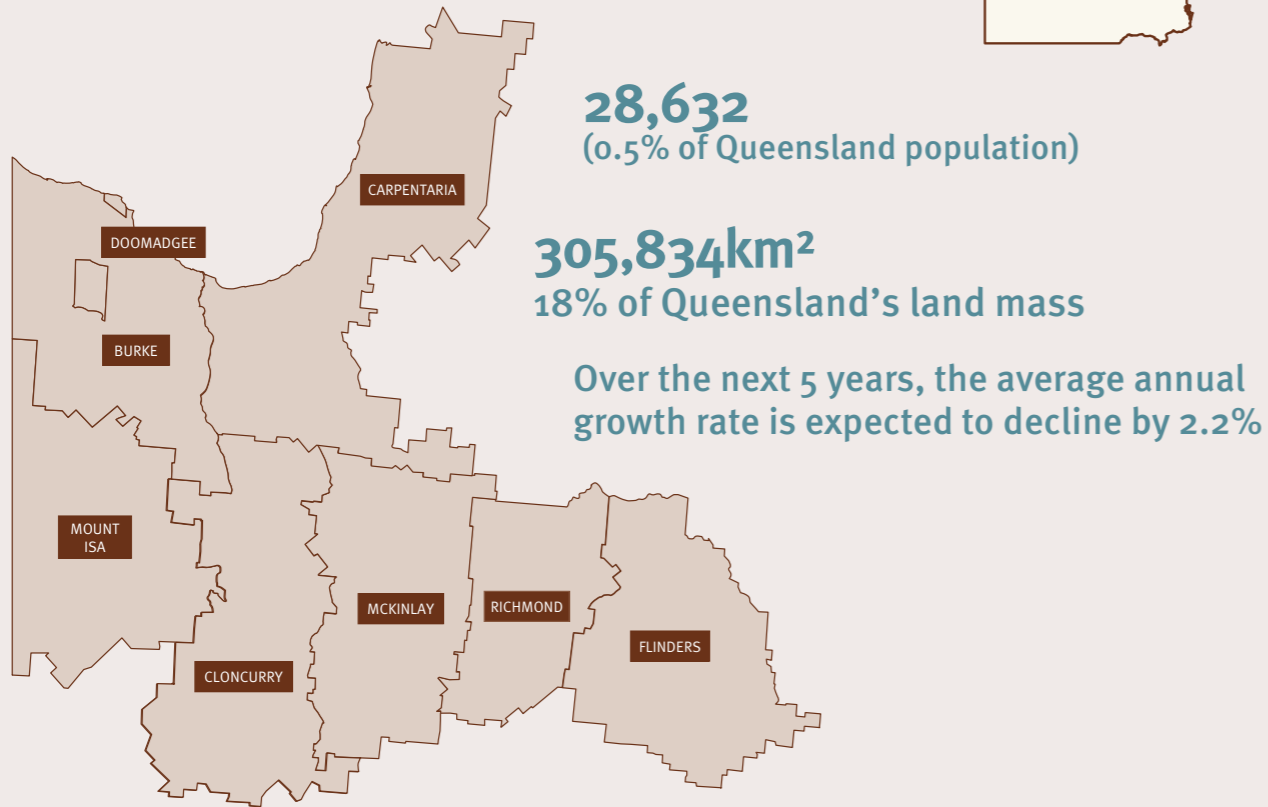
Richmond Shire

Richmond Shire largely consists of downs country as well as extensive Mitchell and Flinders grass plains, fed by the Flinders River and its tributaries. With a population of around 800 residents, the Shire is home to approximately 300 rural properties. The township of Richmond is located on the Flinders Highway and provides a service centre to the surrounding pastoral community. Famous for its marine fossil discoveries, Richmond was once part of Australia's inland sea. During the wet season, the township is often isolated from the rural properties for periods of time.

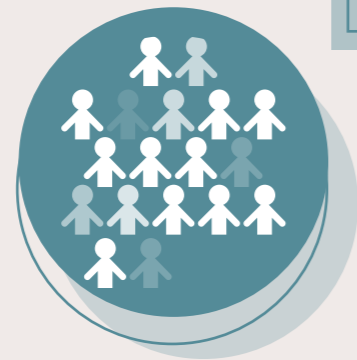
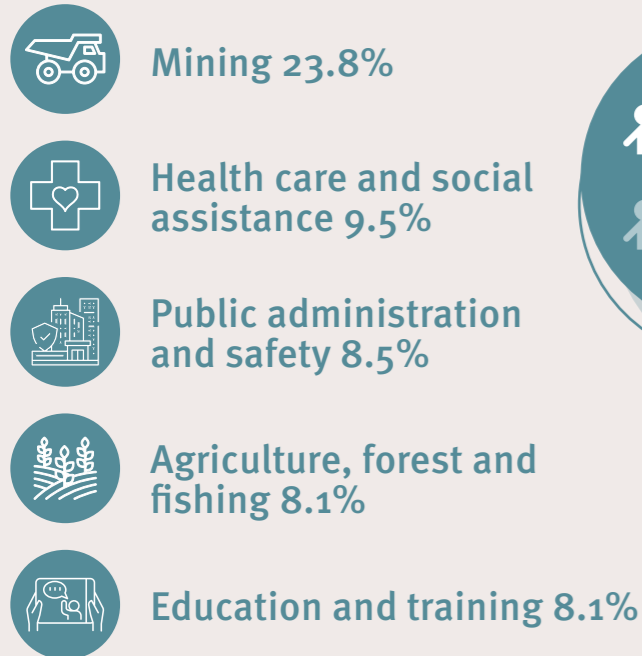
A snapshot of community characteristics



8 local governments



Top five employing industries:



40.8% migration rate

7.8% unemployment rate

24.6% in the most disadvantaged SEIFA* quintile

24.2% under 14 years old

9.2% over 65 years old

9.2% Aboriginal and/or Torres Strait Islander peoples

Median age **32.6** years

Case study: Wernadinga Wetlands

Across an area of 545,577 hectares, the Southern Gulf Aggregation is one of the largest estuarine wetlands of its type in Australia.

In 2016, the Carpentaria Land Council Aboriginal Corporation, Southern Gulf NRM and AJM Pastoral, commenced a project to 'protect the environmental and cultural values of the nationally important wetlands on Wernadinga station' which forms part of the Wernadinga Wetlands.

The project involved, establishing a biodiversity baseline, implementing improved pest and weed management practices, cattle management practices and monitoring pastoral land condition to assess the impact of change management practices.

Case study: Gulf Savannah Fire Management Guidelines

The Gulf Savannah Fire Management Guidelines prepared by the Carpentaria Land Council Aboriginal Corporation provide information on appropriate fire management practices across different landscapes of the lower Gulf of Carpentaria. The purpose is to help land managers plan hazard reduction burning and undertake planned burns for improved pasture production and conservation outcomes.

The guidelines have been developed for 17 landscape types in the Gulf Savannah. It identifies four important factors to be considered when planning for fire management including:

- fire frequency – how often should an area be burnt
- fire intensity – how hot does the fire need to be
- season – what time of year will usually provide the desired conditions for a planned burn
- burning mosaic – the percentage of ground cover remaining unburned after a fire.

Image: Muttonhole Wetlands, Carpentaria Shire.



Our landscape

From the sandstone cliffs and spectacular gorges of Boodjamulla National Park (Lawn Hill National Park) and the World Heritage Riversleigh Fossil Field to greater wetland provinces of the Southern Gulf Aggregation wetlands, our natural landscape is one of diverse beauty. Our shores provide invaluable habitat for migratory shorebirds as they make their way along the East Asian-Australasian Flyway. Our waterways are home to the Southern Gulf strain of Barramundi and our land contains some of the largest saltpans in Australia.

Much of our region is characterised by broad alluvial plains and coastal areas as well as tropical savannah woodlands and grasslands, spanning three prominent bioregions including the Gulf Plains, Northwest Highlands and Mitchell Grass Downs. Along the coastal edge of the Gulf Plains the landscape is dominated by marine plants, mangrove mudflats and saltpans whereas further inland the environment changes to open grasslands, eucalypt, melaleuca and acacia woodlands across the low-lying country dissected by a series of major river systems, encompassing clay and silty soils.

On the western edge of the region is the Northwest Highlands which is a complex landscape, dominated by metamorphic and volcanic rocky hills, weathered sandstone platforms and limestone karst systems. Considered one of the most intact areas in the state however less biodiverse, the dominant vegetation is low open woodlands with spinifex hummock grass. Towards the south, the Mitchell Grass Downs area consists of open undulating grassland country with low acacia woodlands, interspersed with drainage lines on shales and limestone.

Our river catchments perform a vast range of functions and connect the majority of our region's landscapes with the fertile coastal, estuary and marine environments of the Gulf. They also connect our region with the Lake Eyre Basin in the west and the Burdekin catchment in the east. The region spans ten river catchments including the Settlement, Nicholson, Georgina and Leichhardt which commence in the North West Highlands, the Flinders and Norman which commence in the Mitchell Grass Downs, the Morning in the Gulf Plains and the Gilbert, Staaten and Mitchell from the Einasleigh Uplands, many of which drain north towards the Gulf.

During the wet season, several of these river catchments can merge together to form one, inundating the region and limiting access for both people and animals for extended periods of time. Often resulting in damage and interruption to critical infrastructure, as well as loss of stock, and native fauna and flora.

North West Queensland Region

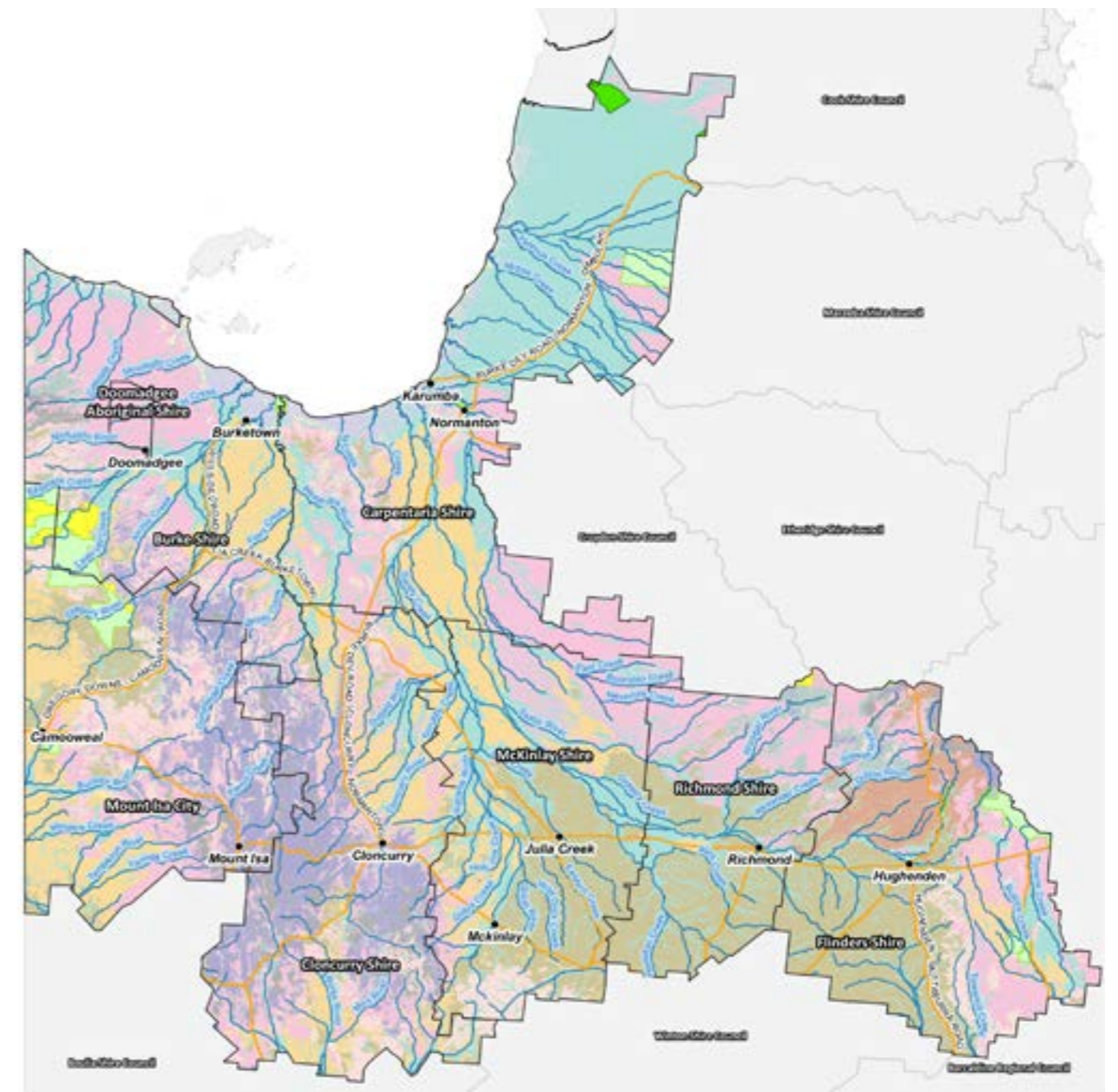


Image: Camping, Cloncurry Shire.



Our climate

Our climate is part of our everyday life and dictates the way we live in the North West. It ranges from semi-arid in the south and south west to tropical monsoonal in the north.

Monsoonal rains and cyclones in the summer months can result in prolonged wet periods. During these times it is sensible to stay put, with many parts of our region becoming isolated, sometimes for months at a time.

Our wet season from December to March is characterised by hot and humid conditions with average maximum temperatures around 36 degrees, whilst our dry season from May to November is cooler and dry with average minimum temperatures around 12 degrees.

Rainfall systems

Heavy rainfall in the North West is often caused by monsoonal systems or tropical cyclones, both of which can lead to widespread flooding, coastal hazards and wind damage.

Monsoonal rainfall can be sporadic and highly variable from year to year. At times, monsoonal rains can lead to substantial flooding across the region and in other years, it can leave the landscape drier than usual.

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 (BoM, 2012).

In late January 2019, an active monsoon trough and low pressure system made its way across North Queensland, producing extremely heavy rainfall and impacting 39 local government areas.

Areas around Hughenden, Richmond, Julia Creek and Cloncurry received the highest rainfall in the North West, with many locations experiencing well over the average annual rainfall in less than a week. Numerous daily rainfall records were broken, resulting in many isolated communities, devastation to the livestock industry, a complete standstill on freight, as well as extensive damage to infrastructure, homes and businesses.

The North West is also susceptible to tropical cyclones. A tropical cyclone is caused by a low pressure systems which forms over the sea when the surface temperature is typically above 26.5 degrees. With the right environmental conditions, a tropical cyclone can exist for many days at a time, producing heavy rainfall, large storm tides and gale force wind gusts near the centre of the cyclone of up to 90 kilometres per hour, and in severe events these wind gusts can exceed 280 kilometres per hour (BoM, 2021).

Heavy rainfall associated with a tropical cyclone usually occurs once the cyclone has made landfall and can occur hundreds of kilometres from the centre of the cyclone, while storm surge can also cause inundation in low lying coastal areas which can cause damage to buildings in close proximity to the coastline, as well as further inland areas.

In March 2006, Tropical Cyclone Larry crossed the Queensland coast near Innisfail. It was a Category 5 system and proceeded to weaken as it tracked inland towards Mount Isa, bringing with it heavy rainfall in the Leichhardt River catchment. A total of 435mm was recorded at Gereta Station (on the Leichhardt River, north east of Mount Isa) over a 24-hour period. Major flood levels were reached at Gunpowder, Lorraine and Floraville along the Leichhardt River. The heavy rainfall caused flooding along the Leichhardt River, resulting in the inundation of cattle properties. Other cyclones to impact the North West include Olga, Yasi and Fletcher.

The absence of rainfall in the region can give rise to drought conditions, however noting the higher rainfall likelihood over North Queensland.

Temperature

Summer in the North West is hot, with the region experiencing more hot days in the past 30 years compared to the years prior (BoM, 2021). This can lead to heatwave conditions which can have significant impacts on society and the environment in several ways, including human health, agriculture, economy, natural hazards and ecosystems. They are also Australia's most costly disaster in terms of human impact, with severe and extreme heatwaves being attributed to more than half of all disaster-related deaths.

The Bureau of Meteorology (BoM) identifies heatwave conditions as three days or more of high maximum and minimum temperatures that are unusual for that location. This is considered in relation to the local climate and past weather at the location.

Heatwaves are generally driven by a high pressure system which pushes hot air from the Australian interior towards the region. This pressure in the upper atmosphere stops hot from rising, causing it to stagnate over a region. Climate phenomena such as periods of El Niño produce changes in heatwave pattern and severity, resulting in significantly more heatwave days and longer and more intense events within northern and eastern Australia.

Most people have 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 for vulnerable populations and can translate to agricultural, infrastructure, economic and ecosystem impacts.

Fire weather

Fire is a natural partner of tropical savannahs. Fire is used across the North West to regenerate grasslands and woodlands and from time to time can spread uncontrolled as a result of natural, accidental or even deliberate ignition. Aside from fuel loads, our weather and climate has 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 BoM, from 1950 to 2018, annual accumulated FFDI has increased in the North West by 11 per cent. The average annual occurrence of fire weather days exceeding FFDI 50 has increased by 72 per cent since 1950 (BoM, 2019).

Fire weather conditions in the North West are both growing and becoming more frequent, heightening the risk of bushfire and grassfire across the region.

Future climate trends

Communities of the North West are regularly exposed to extreme weather and therefore are generally more prepared and have a greater ability to cope with changing circumstances. In the years to come however, our climate is predicted to change with more extreme conditions becoming more frequent and for greater periods of time.

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

- higher temperatures
- hotter and more frequent hot days
- harsher fire weather
- more intense downpours.

With coastal areas in the North West also predicted to experience:

- less frequent but more intense tropical cyclones
- rising sea level
- more frequent sea level extremes
- warmer and more acidic seas.

These likely changes to the climate of the North West will bring with it both opportunities and risks for which we will need to prepare.



Our challenges and opportunities

Living in lock step with the functions of the landscape of the North West, and the weather conditions we are accustomed to provides us a unique awareness and understanding of the implications of serious weather and disaster events. However, we also recognise that this is changing over time, and we are observing different occurrences than we have previously.

Our challenges and opportunities to continue to bolster our resilience in the face of serious weather, disasters and a changing climate are varied, having regard to aspects of the environment, infrastructure, roads and transport, people and communities, and the region's economy.

Environment

The North West region receives more rain than other western Queensland areas, largely owing to the spectrum of climate zones and susceptibility of cyclones, severe storms and lows and troughs. Despite this, periodic drought can occur for parts of the region, and can often coincide with other weather events including heatwave and fire weather conditions.

These natural processes can have adverse consequences from an environmental perspective. As invaluable as our river catchments and broad floodplains are to healthy Country, they also give rise to a range of environmental challenges, including the downstream transfer of weed and pest infestations as well as significant erosion and sediment control issues, which destabilise land and can also modify the conveyance of floodwaters over time. Managing these issues and putting in place proactive measures to avoid or reduce impacts remains a focus of regional-scale biosecurity approaches and the work of Southern Gulf NRM. These challenges do not take away from the vast environmental and economic benefits of flooding for the region.

Additional pressures are associated with broad-scale clearing, changed fire regimes (fire frequency thresholds for different vegetation communities) and much more broadly and insidious, the impacts of a changing climate.

These effects can be far-reaching for a region with diverse economic industries which rely on our abundance of natural resources.

Land and water restoration is a key opportunity for forward land management, as well as sophisticated approaches to primary production including regenerative agriculture. A concentration on Healing Country and partnerships which embrace First Nations sustainable land management practices are also tremendous opportunities with potentially significant dividends for this region.

Towns and infrastructure

Whilst we recognise that increased reliance on infrastructure can often erode resilience, in the case of the North West we see tremendous opportunity and greater economic diversification and resilience born from improved access to enabling infrastructure including reliable and cost effective energy, including renewables, and digital networks to enhance connectivity to access global markets.

The provision of baseline services ensures business confidence, investment and continued innovation without unintended stresses. It ensures a quality of life and enables access to health, education and information streams despite distance. Key needs include better access to health and ambulance services, aged care and local sewerage and drainage networks which are nearing end of life and ill-equipped to function in or after severe weather events. Many townships may also value from evacuation refuge facility upgrades which can be used year-round for community purposes, including but not limited to Cloncurry and Richmond.

Support from state and infrastructure providers in recognising challenges in locations where redundancy is limited, alternatives even less, means we can work together to do better for infrastructure that is fit-for purpose and enduring.

Roads and transport

Roads and other transport connections such as rail and air are the lifeblood of the North West. When these networks are impacted there are often no detours and no other options to connect region, and living with periods of isolation each year is acknowledged. But the more these periods extend, as impacts on connectivity grow, the more acutely the impacts can be felt. It is not only a matter of isolation but ensuring the region's economy can continue with as minimal interruption from weather events as possible, by road or rail. Equally as significant is our reliance on air services, including the valuable contribution of the Royal Flying Doctors Service to the North West.

The Flinders Highway is the key artery of the region, along with the Mount Isa railway line which connects with the port at Townsville. Other key routes connect townships across the region, and perform a vital role for communities, the economy and emergency services.

Roads are both a challenge and an opportunity, because there are many factors associated with the resilience of the road network. As locals acknowledge, 'flood-proofing' the transport network across broad-scale, low-lying parts of the region is not possible. Irrespective, road closures can be deeply felt in terms of our economy, health, ability to resupply, repair and recover, or gaining access to service centres. In Normanton, innovative resupply arrangements have been put in place over time, including a barge ramp which enables resupply to the town's doorstep via a flooded Norman River.

State and nationally significant supply routes through the region present opportunities in identifying options to bolster connectivity and supply networks through a range of approaches.



People and communities

From a social and community perspective, growing pressures on housing availability, housing options, cost and quality continue to have cascading resilience effects including on our ability to attract specialist workforces to the region. Continuity of care and the ability to age-in-place is also a key concern, with a limited availability of aged care and disability respite services and facilities. This often places stress on wider family units in terms of decision-making around a host of things, the ripples of which extend much broader beyond just those needing care. This extends to the opposite end of spectrum, and the need to provide opportunities to retain the North West's younger population.

Conversely, we welcome a high proportion of travellers, visitors and non-resident workers who are yet to understand the landscape risk as the locals do. Unlike other parts of western Queensland, the minerals activity of the region sees our non-resident population remain high not just in the cooler months, but throughout the disaster season as well. Sharing knowledge and raising awareness across multiple platforms is a key approach employed by local disaster management teams and emergency services.

Resilience is often reinforced across communities through community groups and events, including sports. These opportunities give rise to strengthened connections, positive focus, shared goals and interests and occasions to look forward to. Its value is deeply entrenched across the North West, and is a strong indicator of the commitment to community which drives the prosperity of the region.

Economy

Our region enjoys a level of economic diversity drawn from unique and breathtaking landscapes, rich mineral deposits, fertile floodplains, abundant grasslands and nutrient-rich estuaries and coastal environments. These natural assets support vibrant tourism, mining, grazing, primary production including cropping, and fishing industries.

A continued eye to further industry diversification will help sustain the region's economic baseline into the future, in the face of any economic and climate uncertainty. Other aspects of resilience such as housing availability, mortgage deposit thresholds for regional areas, cost of construction, access to infrastructure and digital networks also support the region's economic baseline. These challenges can present obstacles to potential new residents and families moving to the region.

Access to vocational and tertiary education opportunities within the region is a further potential growth opportunity, addressing skills shortages and upskilling existing workforces, whilst providing discernible career pathways for local young people within the region without the need to relocate.

Income across the region is generally higher than the state average, particularly in Mount Isa where personal income is almost 30 per cent higher, but with a contrasting rate of homelessness at triple the state average.

Opportunities to diversify local and regional economic activities are a key focus of the North West Strategic Blueprint and the North West Diversification Strategy.

Climate influences

Climatic challenges include projections of higher temperatures, hotter and more frequent hot days and nights, harsher fire weather and more intense downpours. 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 been the case in the past. The quantity of cyclones each year is not projected to increase 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 episodes could increase agricultural vulnerability in terms of flood inundation, increased potential for erosion and a reduced infiltration effect with lowered pasture growth.

Rises 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 primarily impact our people, health and lifestyle. It will also lead to flow on effects in terms of the availability and use of evaporative cooling or refrigerated air conditioning. Both options have costs in energy and water and implications for increased demand on these networks from both residential and commercial uses.

Economic costs of heat may see a reduction in the tourism season rather than the desired lengthening. 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.

Our environment may experience changed behaviours of pest and weeds with impacts on native species abundance and locations. Grazing animals may require more shade, are likely to travel shorter distances and require water at closer intervals, while feral animals may extend their reach and be more destructive.

Fire hazard will grow as fire weather conditions become more frequent and more intense, making bushfires and grassfires in the region more difficult to contain and suppress. This is significant noting the greatest fire risk is an economic one, which will require immediate, on-property intervention of grassfire ignitions to protect valuable pasture and fodder. Likewise, it will require detailed awareness of when not to put fire onto the landscape, which could inadvertently damage sensitive grasslands.

Cumulatively, these changes add to the baseline of resilience and to avoid unwarranted stresses, maintaining and maximising collaborative, grassroots approaches will be paramount. The opportunities for resilience stem from technology, innovation, commitment and collaboration.



Our exposure and risks

A critical element in understanding risks are the elements of exposure and vulnerability which exist at both a micro and macro scales. For example, specific bridge or culvert assets may be exposed and/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 North West 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

Cyclone exposure is largely associated with events which cross the coast from the Gulf of Carpentaria, or in some cases those which travel inland from the east coast, as was the case with TC Larry and TC Yasi. Whilst the energy of a cyclone will dissipate the further inland it travels as it transitions into a low pressure system, it can still pack a punch and lead to considerable damage. The highest levels of vulnerability of course are the coastal shires of Carpentaria, Burke and also Doomadgee.

Vulnerability to cyclone and extreme wind is a key factor in both Carpentaria and Burke, particularly with regard to the age of building stock and ability to withstand wind pressure. This includes critical assets like the hospitals and healthcare clinics in Normanton and Burketown, as well as emergency services facilities.

Image: Tropical Cyclone Yasi 2011 (NASA Visible Earth).

Despite the elevated risk for coastal locations on the Gulf of Carpentaria, the vulnerability of assets and building stock to severe wind remains a risk for the entire North West region.

Tropical cyclones and the effects of climate change also drive coastal hazards. In the case of cyclone and severe storms, these systems can cause the sea to rise in what is known as storm surge. These powerful ocean movements are caused by strong winds pushing water up against the coast on the approach of cyclones and severe storms. This is often one of the most dangerous aspects of cyclone and storm events as it catches people unaware. In addition, storm tide can swamp low-lying areas along coastlines, and is the combination of storm surge and the normal (astronomical) tide. Large parts of Carpentaria and Burke shires are only metres above sea level, including Karumba as well as Burketown and Normanton which are located between 30 and 40 kilometres inland from the coastline.

Permanent tidal inundation of these areas as a result of a rising sea level is also anticipated over time and both Burke Shire and Carpentaria Shire have completed Coastal Hazard Adaptation Strategies to inform pathways forward.

Heavy rainfall associated with the passage of a tropical cyclone, low pressure system or monsoon trough can produce extensive flooding, including flooding in areas which are a long distance from where the cyclone made landfall, or where rainfall-producing systems pass over.



Flood hazard

Across the North West, prevailing hazard exposure is dominated by flooding, and the cascading hazards and risks associated with these events. Whilst some townships are directly exposed, and most of the region encounters almost annual isolation as a result of flooding, it is the productive lands of the region which are most exposed. This is significant noting that North West Queensland is among Australia's most productive beef regions.

Flowing north from the catchment headwaters, the region becomes a series of flat, expansive floodplains which is punctuated by a small number of jump-ups and ranges. Every so often in larger-scale events, some floodplains across the region will merge together.

Flooding can almost be banked on happening every year, and graziers work hard in preparation for the annual monsoon season to move stock to higher ground and more protected areas, or out of the region altogether. But it is not every year where floodplains will merge together, inundating what is normally higher ground. These occasions are hard to predict and when they occur, there is little opportunity to stem the loss. Stock losses are also not necessarily as result of flood inundation, but from exposure to what can be sudden and drastic changes in weather.

Airports, airstrips and helipads are enormously vital during these situations for medical care, re-supply and in some case, evacuation. These facilities are isolated from wider townships in some locations across the region during flood events of certain magnitudes, but continue to offer connectivity from broader areas into the region and remain a vital lifeline. Townships across the region are regularly isolated during more frequent, localised flooding events. In major events, assets and homes in towns can be inundated.

Image: Flooding, Carpentaria Shire, 2012.

Roads, bridges and other infrastructure assets such as electricity networks, mobile phone towers and internet exchanges are exposed to flood hazard across region. Other assets such as hospitals, healthcare clinics and emergency services facilities are also exposed. Road access to Normanton hospital is impacted in certain magnitude events, and the Ernest Henry Bridge in Hughenden is closed when flood levels reach 3.9 metres, for example. In Burketown, the community relies on a diesel generator to provide electricity. This provides a level of reliability for energy supply in Burketown which might not otherwise be achieved by other arrangements, noting the same situation exists for Doomadgee, Gregory and surrounds.

In addition to the generator which powers Doomadgee, Ergon Energy has also installed a 264 kilowatt solar farm to offset approximately eight per cent of the diesel generation used by the Doomadgee community. This is set to be increased with the amount of solar photovoltaic being fed into the mini-grid to 1.26 megawatts, reducing energy costs and alleviating the amount of fuel needed to be stored in case of extended wet seasons when this community can be isolated for up to half of the year.

A further aspect of flooding is overland flow, which can cause inundation to homes and businesses as sheet water makes its way to creeks and tributaries during heavy downpours. This can occur in parts of Mount Isa City. It is usually a fast-run event which is as over as quickly as it starts but can leave behind a reasonable clean-up task.



Heat and heatwave hazard

Heat is something we deal with year-round living in our part of Queensland. The interior of our region can experience around 180 days above 35°C and up to 50 days above 40°C each year. But increasing intensity and frequency of heatwaves means we will experience longer periods of increased temperatures.

In the summer months we often experience heatwaves which bring temperatures above what we are used to. In December 2018 and January 2019, our region experienced a prolonged period of persistently hot weather, combined with low-intensity and severe heatwaves. During this event, many extremely long runs of hot days occurred across the region, breaking numerous records. Most notable was in Cloncurry, which experienced a 43-day run of 40°C or above from 16 December 2018 to 27 January 2019, surpassing the previous Queensland record of 31 days. Cloncurry's highest recorded temperature was 53.1°C.

The region currently sees an average of around 30 heatwave days per year, higher for Mount Isa, Cloncurry and Carpentaria. Under changing climate conditions, the number of heatwave days per year at 2090 fluctuates across local government areas but is projected to increase across all. The increase is sharper for the coastal and western local government areas in the region, projected to rise by between 40 and 68 heatwave days per year, depending on the climate model scenario.

The opposite of heatwaves are cold snaps, of which the regional also has a long history, including a 1976 event which led to extensive stock loss in parts of the region.

Bushfire and grassfire hazard

Bushfire and grassfire hazard remains synonymous with savannah, grassland and woodland country, whilst exposure of roads, bridges and infrastructure is present, the threat of economic loss is perhaps the greater risk associated with fire in the North West in terms of potential loss of grazing pastures, fodder, sheds and equipment having regard to the proportion of productive lands which are subject to bush or grassfire.

Whilst fire weather conditions across the North West region are becoming more frequent and intense, the availability of fuel to burn is a critical factor. Vegetation across the North West is largely sparse but does become more dense in areas, with grassfire presenting the predominant risk on the basis of the dominance of grasslands and downs country.

Timber bridges across the region are particularly susceptible to both bushfire and grassfire, and more broadly, fire flanking roads and railway lines may force closures due to potential for flame contact, radiant heat exposure and reduced visibility due to smoke. Whilst these occasions may be short-lived, they can create challenges for the flow of goods. Impacts on airstrips and ability for aircraft movement can also occur in some situations, and vulnerable facilities like hospitals may be exposed. In 2012, patients were evacuated from Cloncurry hospital as a grassfire burnt quickly towards town from near the Flinders Highway before being contained.

Rural fire brigades are deployed across the region, not only in response to ignitions but also to undertake critical hazard reduction. On-property skills and equipment are equally crucial to replenish and maintain healthy grasslands but also provide timely response to unplanned ignitions.

Traditional approaches to fire management are strong across the North West, with comprehensive Indigenous fire management guidelines prepared for the region by the Carpentaria Land Council Aboriginal Corporation, and cultural burning activities are employed across the region by Traditional Custodians and land management bodies to care for Country and mitigate risk.

Earthquake hazard

The North West region is located within Seismic Hazard Source Zone 34. The Queensland State Earthquake Risk Assessment identifies the region is exposed to an 88.95 per cent probability of 5.35 magnitude earthquake occurring over the next 100 years.

This represents the highest level of probability of anywhere in Queensland.

The risk assessment identifies the 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 assets. Damage to this infrastructure can yield significant cascading effects in terms of availability of water, sanitation and public health and disease.

Fuel and gas storages are also exposed, both those located underground as well as those which are above ground but without baffling. Underground mining activities are also a key consideration in terms of exposure in the North West.

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.



Case study: Glenmoan Station erosion management

Before the monsoon trough event of 2019 set in over the towns of Richmond, Julia Creek and Cloncurry, a 12-hour burst of heavy rainfall led to substantial erosion of the banks of Flinders River at Glenmoan Station, east of Hughenden.

Approximately 100 metres of riverbank was lost to the river, creating more damage in a single day than had occurred over the past 30 years.

Southern Gulf Natural Resource Management (NRM) received funding via the Disaster Recovery Funding Arrangements to facilitate a major erosion restoration and management project, designed by engineers, to stabilise the river banks using pile-fields to control the flow of water down the river. The piles are driven deep into the ground and set at different heights to accommodate flood events of varying magnitude.

The pile-fields have been tested in smaller flood events throughout 2021 which has helped to further re-establish the river bank.

Source courtesy of ABC North West Qld / By Eric Baker.

Case study: North West Queensland Flood Warning Infrastructure Project

The North West Queensland Flood Warning Infrastructure (FWIN) Project helps to support Queensland communities in their recovery following the North and Far North Queensland Monsoon Trough disaster event (25 January to 14 February 2019).

The \$8 million FWIN Project was approved as part of the \$242 million Category C and D Disaster Recovery Funding Arrangements (DRFA) package, jointly funded by the Australian and Queensland Governments. The overall project covers three areas of operation including Far North Queensland, North West Queensland, and Townsville and surrounds.

Stakeholders worked together with the Bureau of Meteorology (BoM) and local communities to analyse the existing flood warning rainfall and river height gauges and identify additional priority locations requiring additional flood warning infrastructure.

The North West Queensland FWIN Project is working towards keeping our communities safe by delivering:

- suitable flood warning infrastructure upgrades to the most appropriate locations throughout the flood-impacted area
- improvements to BoM services to support primary producers and communities
- a range of assets to support better information being made available including the use of flood cameras at strategic locations.

Images: Construction on a new rain and river gauge, Sandy Creek, Burke Shire.

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 North West, the doing same, doing different and doing better model encompasses the following examples:

- continuing existing work, collaboration and partnerships across the region, for example, the regional biosecurity Strategy
- mitigating repeated impact hot spots along road networks to improve outcomes, rather than maintain existing conditions
- focusing on skills and education development in the region to retain population, enhance local capability and provide new lifestyle opportunities for existing and new residents.

Image: Cloncurry Shire.

Regional Strategic Pathways

The Australian Government 'After the flood: A strategy for long-term recovery' (After the Flood Strategy) sets out a series of focus areas and actions for long-term flood recovery. This Strategy aligns to the focus areas in that Strategy, and supplements this with pathways and actions for the other key hazards in the region.

The strategic pathways identified below form a 'blueprint' for coordinated resilience action for the North West region and complement the After the Flood Strategy objectives. Action and efforts at the local level are calibrated to work toward the achievement of regional goals, and the objectives of the After the Flood Strategy.

Each strategic pathway is mapped to its corresponding QSDR objective, referenced by coloured triangles.

After the Flood Strategy focus areas

-  Broadening the economic base
-  Building more resilient infrastructure
-  Building prosperous enterprises
-  Fostering connected and cohesive communities
-  Supporting information enabled regions

	Resilient society	Resilient towns and infrastructure	Resilient transport	Resilient economy	Resilient environment
Doing same	Celebrate cultural connection 2	Prioritise energy self-sufficiency 4	Implement the regional transport plan 4	Foster cross-industry partnerships 2	Continue successful partnerships with NRM bodies and traditional custodians 2
	Support for sporting and community groups 4	Improve local infrastructure services 3	Bolster resupply arrangements 2 Provide road education for tourists 3	Ensure sustainable management of natural resources 4	Continue regional approaches to shared issues 2
Doing better	Consider heatwave mitigation strategies 1	Support fit-for-purpose evacuation refuge infrastructure 4	Improve communications across road network 4	Retain local workforce through skills and education opportunities 4	Establish environmental monitoring programs 4
	Support for ageing populations 4	Prioritise local asset/utilities risk mitigation 3	Mitigate repeated impact locations 4		
	Attract talent 3	Address housing shortage 3			
Doing different	Explore alternative food security 3	Embrace new technology (e.g. energy) 4	Invest in local priority roads 4	Expand income streams (micro/macro) 4	Support healthy country 4
	Enable coordinated health services 2	Explore cooler and greener towns 4	Reduce road closure times 4		Protect and enhance environmental qualities 3

- 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 provide the broad themes that address the region's identified resilience needs. Staging and 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, during and after an event) 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 following an event which enables post disaster efforts to be better coordinated and streamlined.

The phased approach, demonstrated by the figure above, 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.

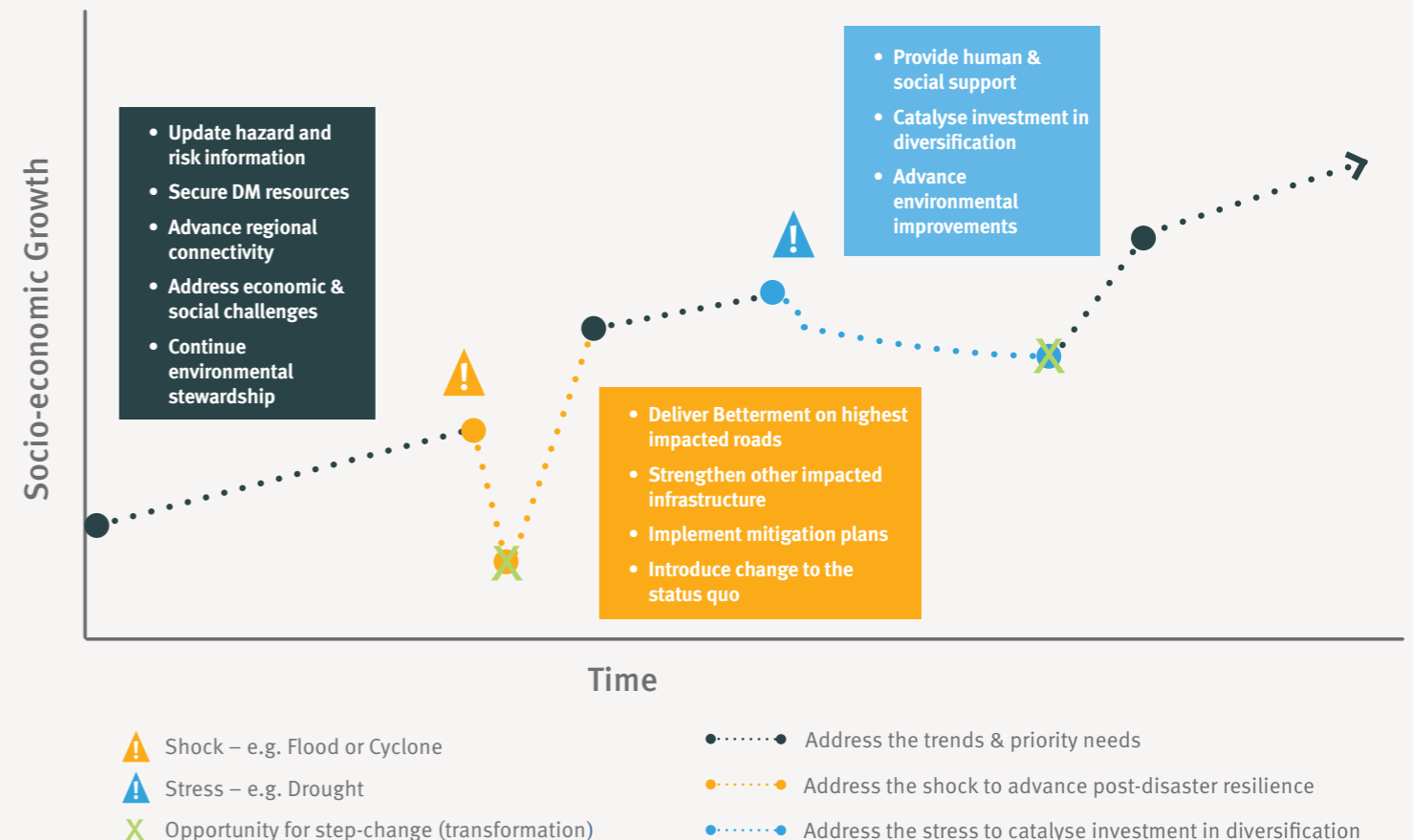
Action planning

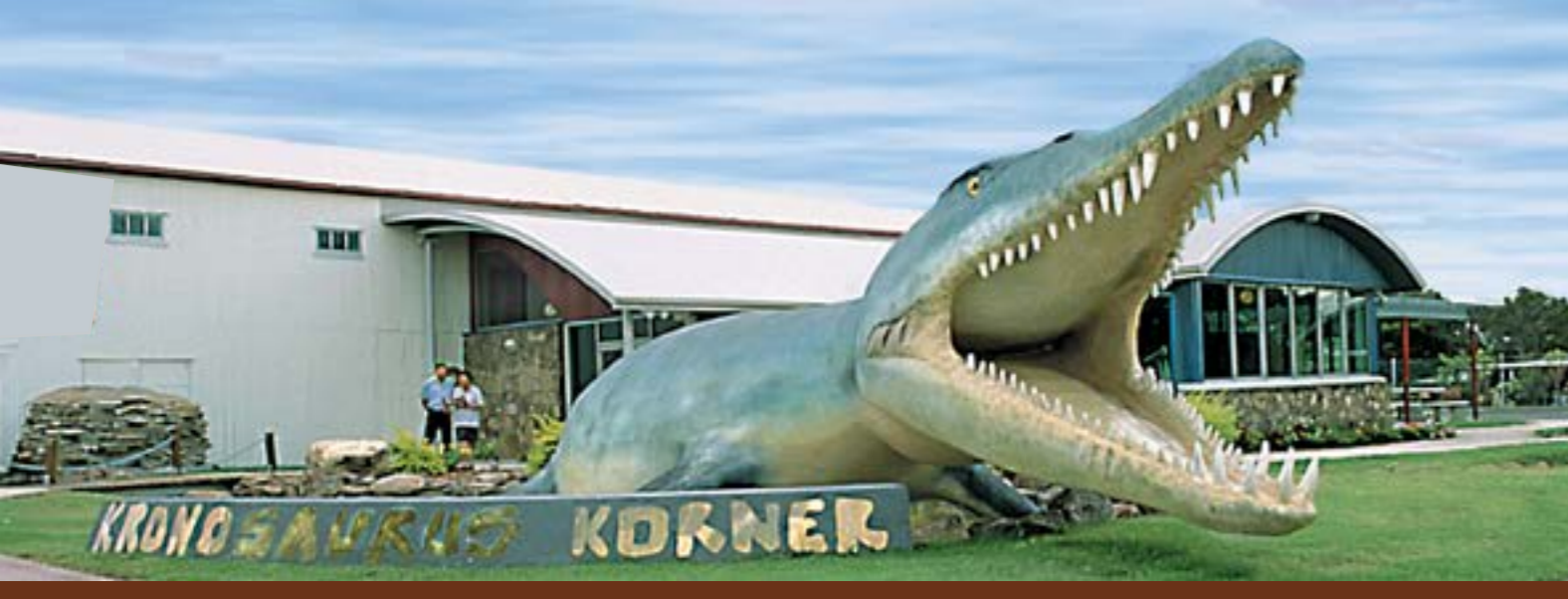
A local action plan relative to each local government in the region supports the implementation of this Strategy. The action plan identifies a suite of potential projects, that if implemented, would contribute to improving resilience to natural hazards at both the local and regional level. It is calibrated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

Each local government will be 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.

Future Action and Investment Priorities and Phasing

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





Implementation

Working together to implement the Strategy

The eight local governments of the North West region will implement the Strategy in partnership. Actions will be driven through local leadership and regional resourcing under the direction of the North West Queensland Regional Organisation of Councils (NWQROC), with appropriate support from other coordinating bodies and entities including District Disaster Management Groups, 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 support how local governments, and stakeholders work together to achieve common resilience outcomes for the North West region. It seeks to inform strategic and coordinated approaches to climate-related disaster resilience activities to align funding and action.

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 the implementation of resilience actions over time
- a clear understanding of how resilience arrangements interplay with QDMA
- greater collaboration between government and non-government 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.

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.

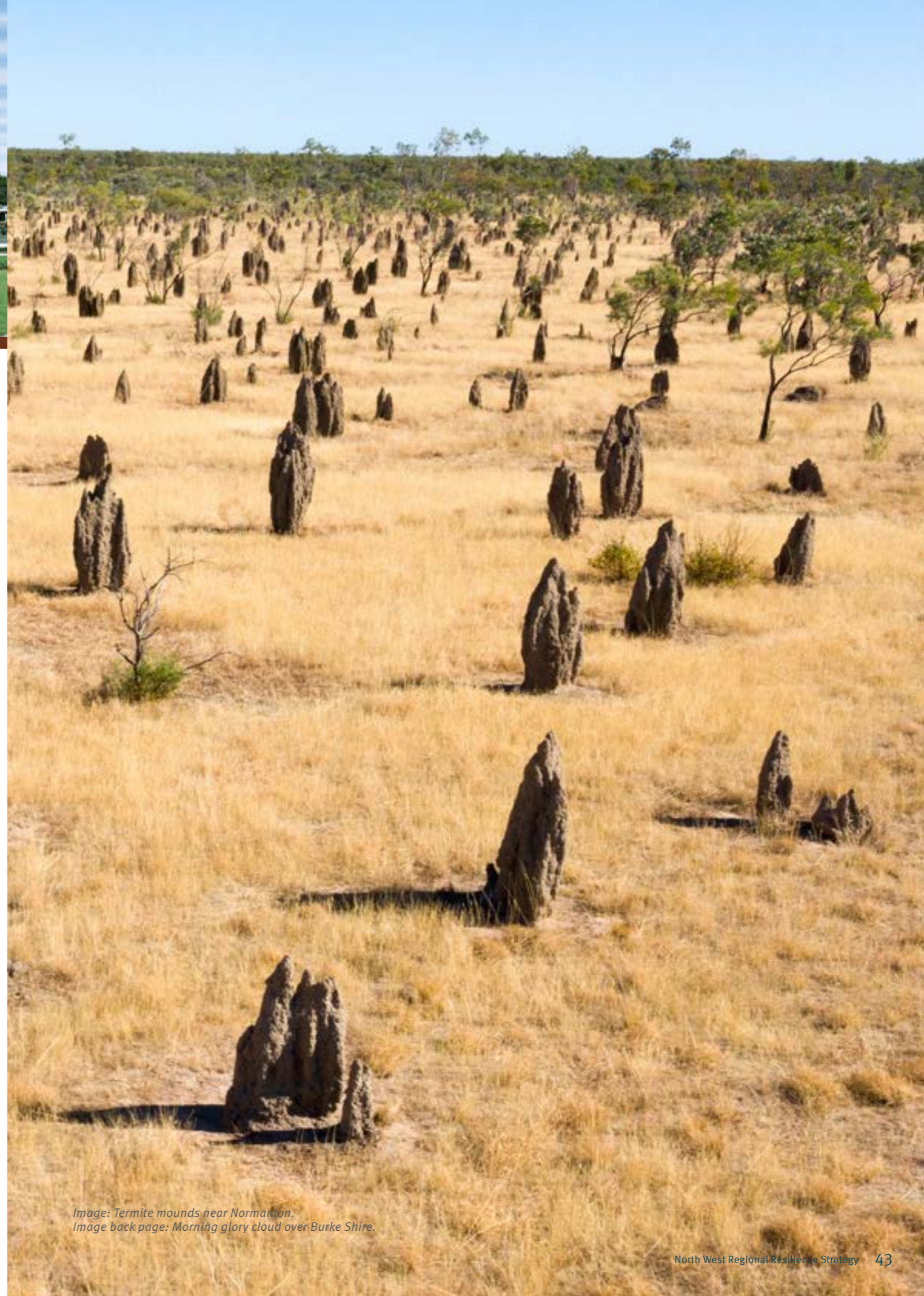
Regional coordination

Regional coordination through the NWQROC with a strong link to other existing related governance arrangements such as the relevant DDMGs. An opportunity also exists to leverage the existing SWQROC's Regional Resilience Officer to drive the Strategy outcomes.

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/coordination of support that can assist implementation.

Image: Kronosaurus Korner, Richmond Shire.



*Image: Termite mounds near Normanton.
Image back page: Morning glory cloud over Burke Shire.*



www.qra.qld.gov.au/regional-resilience-strategies/north-west