DRAFT

COMMUNITY RESILIENCE FRAMEWORK

WOPPA (GREAT KEPPEL ISLAND)

Livingstone SHIRE COUNCIL

WOPPABURRA ACKNOWLEDGEMENT

Livingstone Shire Council acknowledges and pays respect to the Woppaburra custodians as the traditional owners of the Keppel Bay Islands.

This framework commits to acknowledging the history and ongoing contributions of Woppaburra people to the Livingstone region and the fundamental role they play in shaping our region.

ACKNOWLEDGEMENTS

Livingstone Shire Council would to like to acknowledge and thank the following Community Groups, Individuals and Traditional Land Owners who contributed and helped in the production of the Woppa (Great Keppel Island) Community Resilience Framework.

- *the Woppaburra people,*
- *Residents and businesses of Great Keppel Island,*
- *Central Queensland University,*
- *Great Barrier Reef Marine Park Authority,*
- *The Local Disaster Management Group; and*
- *Queensland Fire and Emergency Services.*

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INTRODUCTION

Woppa (Great Keppel Island) is located fifteen kilometres east of Rosslyn Bay, Yeppoon. The island is 1,450 hectares and is a valued, Queensland tourist destination.

Whilst only home to fifty permanent residents, the island can experience daily visitation rates of up to a thousand across holiday seasons.

The majority of the island is undeveloped and contains large tracts of bushland, a haven for native plants and animals. Tourist facilities on the island are concentrated around Putney and Fisherman Beaches.

The island has seventeen beaches, which are protected by the surrounding reefs, making them very popular for swimming, snorkelling and paddling.

Woppa includes a mix of leaseholders and freehold land holders. This includes the Woppaburra land Trust and leases from the Queensland Government.

A resort, golf course, airstrip and facilities have operated around and beyond Fisherman's Beach for many years, yet the resort is currently ineffective pending proposed developments. Since the closing of the resort in 2008, the island has lost significant tourism energy, yet has maintained a reputation as a welcoming and relaxed island destination, loved by local and international visitors.

The following map of indicates the ownership of different parcels of land on the island, noting that the majority is under the Resort Lease.

FIGURE 1. KEPPEL BAY ISLANDS (SOURCE - LIVINGSTONE SHIRE COUNCIL)

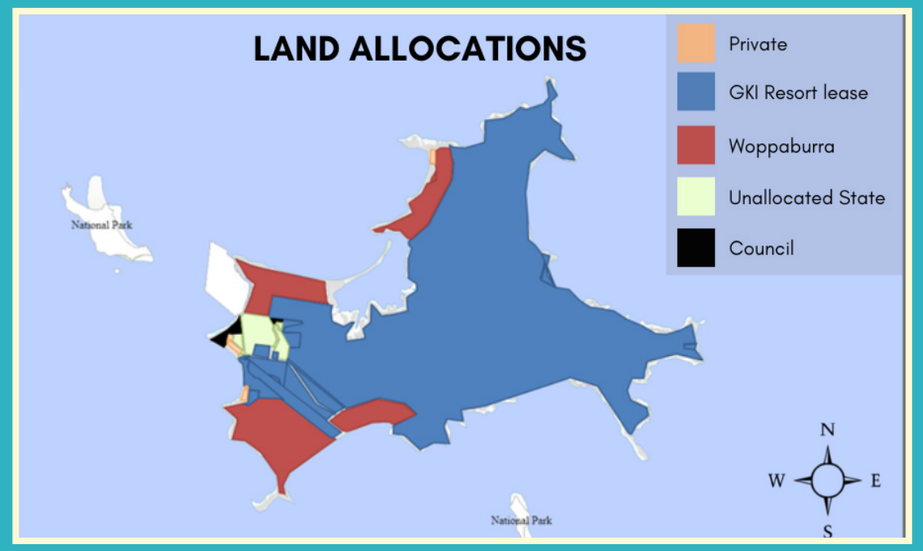


FIGURE 2. WOPPA (GKI) LAND OWNERSHIP (SOURCE - LIVINGSTONE SHIRE COUNCIL)

CLIMATE CHANGE AND RESILIENCE

Council recognises the need to take actions on climate change and will seek to recognise and understand its vulnerabilities for Woppa.

The Central Queensland region's temperature is expected to rise by an average 2.9°C by 2070 based on a high emission representative concentration pathway (RCP) of 8.5. This high-emissions scenario is regularly referred to as 'business as usual', suggesting that is a likely outcome if society does not make concerted efforts to cut greenhouse gas emissions.

The Great Barrier Reef Island communities are particularly vulnerable to the risks associated with Climate Change. The growing impacts of the recent coral bleaching events and multiple severe tropical cyclones since 2005 have caused unprecedented decline in the health of the Great Barrier Reef.

A 2011 Great Barrier Reef Marine Parks Australia study revealed that major concerns for climate change amongst the Capricorn community are mostly linked to livelihood issues and impacts on marine resources.

These include an increase in extreme weather events, the concomitant impacts of flooding, temperature increase, extreme heat wave conditions, biophysical processes (e.g., ocean acidification, coral bleaching), tourism operations and commercial fishing operations.

THE WOPPA (GREAT KEPPEL ISLAND) RESILIENCE FRAMEWORK

The Woppa (Great Keppel Island) Resilience Framework document is a whole-of-community approach. The Plan itself was a recommendation from the Great Barrier Reef Decarbonisation Pilot Program conducted for Woppa (GKI) in 2018/19.

The Pilot program developed business cases for a range of opportunities to lower emissions for numerous Resort Islands in the Great Barrier Reef. Livingstone Shire Council selected this Framework as a viable step to undertake as a suite of actions including an Education Campaign and the establishment of compost units across the island.

The Framework reflects the community's aspirations about future resilience of the island. Recent studies revealed the most valued elements of Woppa by the community are;

A collaborative and high-level framework will guide Woppa towards building resilience. To guide and implement these principles for resilience, collaboration from the community, the private sector, the Council and all levels of government required.

The Woppa (Great Keppel Island) Resilience Framework has been constructed through an aggregation of:

1. Extracts from existing plans and strategies that have been applied to Woppa
2. Feedback and input from Woppa Traditional Owners, residents, businesses and stakeholders, including visitors of Great Keppel Island.

This plan should be read in conjunction with other relevant plans, strategies and legislation. Council has developed *The Woppa (Great Keppel Island) Resilience Framework* around nine key themes.

CULTURAL HERITAGE

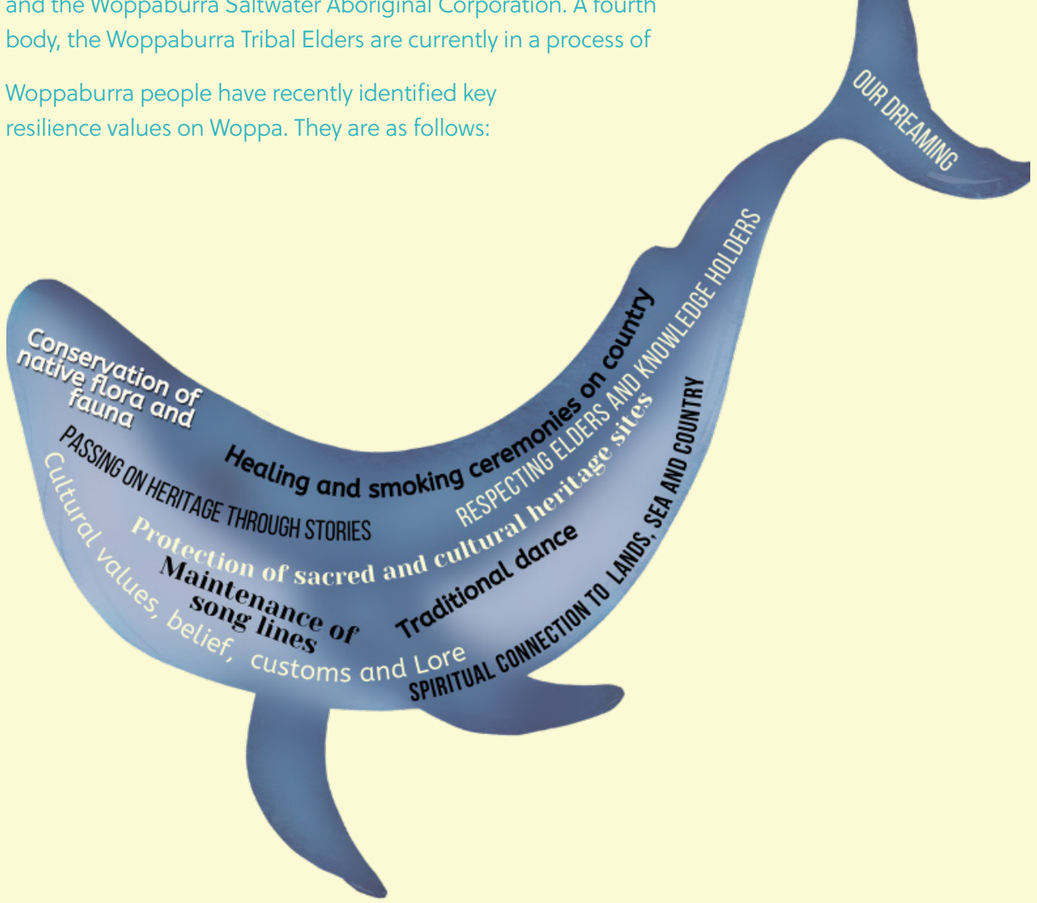
OVERVIEW

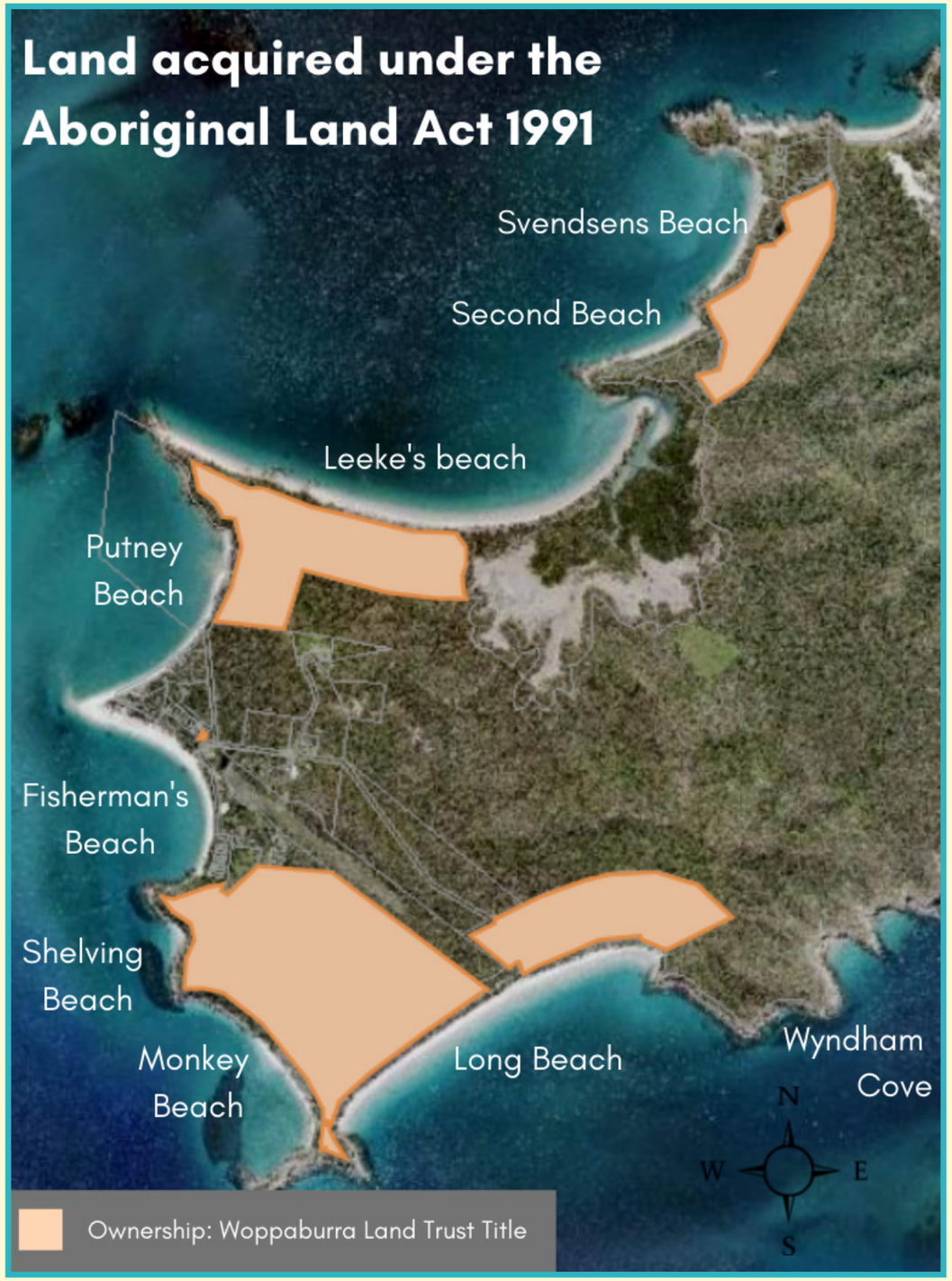
Woppaburra ancestors were the original First Nation Traditional inhabitants of the Keppel Islands. The main islands they inhabited were Konomie (North Keppel Island), Woppa (Great Keppel Island) and Burye- burye (Humpy Island). Travelling between the islands, the Woppaburra custodians were sea-faring saltwater people, specialists in living off the environment and inshore reefs and oceans.

Prior to colonisation, Woppaburra people inhabited Woppa and Konomie. During European colonisation the population was decimated. The last inhabitants were forcibly removed from the island and taken to various Aboriginal reserves and missions. Legal recognition of the traditional lands of Woppaburra came with the Native Title Determination which occurred on Konomie (North Keppel Island) on 3 December 2021.

There are three representative bodies that are currently registered and nominated by Woppaburra elders to represent the family groups, with elders on the committees. They are the Woppaburra Land Trust Executive Committee, Woppaburra Traditional Use of Marine Resources Agreement Steering Committee and the Woppaburra Saltwater Aboriginal Corporation. A fourth body, the Woppaburra Tribal Elders are currently in a process of

Woppaburra people have recently identified key resilience values on Woppa. They are as follows:





CHALLENGES

A significant challenge is having sufficient funding to advance the initiatives and projects that Woppaburra organisations wish to pursue. A range of funding models need to be considered as well as support for self-determination and sustainable income streams to support the role of traditional custodians in land and sea management.

Woppaburra descendants reside in places all over Queensland and further afield. The colonial removal of Aboriginal people away from their traditional lands contributed to their dispersal. Financial assistance for descendants to return to country and to participate in community dialogue and consultation supports traditional custodians to look after country.

Overdevelopment of the island is a potential threat to the Woppaburra people's values. The Woppaburra connection to land and sea means that the health of the natural resources is well understood. So it is a grave concern that irresponsible use of the island's natural resources is likely to result in significant environmental degradation.

Natural Resource Management is important especially in the face of threats such as climate change, erosion, natural disasters and introduced flora and fauna. Traditional custodians have important knowledge and lore that is relevant to best practice management of the environmental values of Woppa. Resources to support the implementation of better land and water management practices are required.

KEY PRINCIPLES

1. Genuine consultation with traditional owners
2. Long-term sea and land management planning that incorporates Aboriginal ecological knowledge
3. Recognise and celebrate Woppaburra's connection, identity and belonging to Woppa
4. Increase of community knowledge and understanding of the value of Woppaburra culture, histories, knowledge, and rights.

Associated Plans, Strategies and Legislation	Funding Sources
LSC Community Plan	**Community Sustainability Action Grants (Queensland Government)** Supports locally based, community driven projects which encourage real change in Queensland communities. **Looking after Country Grant Program** Funding for First Nations communities to conserve and manage environmental and cultural heritage on country. **Celebrating Reconciliation Grants** Funding for local communities to host events that encourage participation in National Reconciliation Week.
LSC Reconciliation Action Plan	
LSC Our Living Environment	
The Aboriginal Heritage Protection Act 2003	
The Aboriginal Land Act 1991	
The Environmental Protection and Biodiversity Conservation Act	
Aboriginal and Torres Strait Islander Heritage Strategy for the Great Barrier Reef	

BEST PRACTICE OPPORTUNITIES

- Establish and maintain an effective Livingstone Shire Council Reconciliation Action Plan Working Group to drive governance of the Action Plan
- Engage and consult with all three Woppaburra Cultural Protocols contacts through the Woppaburra Land Trust, TUMRA and the Woppaburra Saltwater Aboriginal Corporation
- Provide training to Island Staff about Woppaburra Native Title and Woppaburra Cultural Heritage
- Engage Woppaburra people as:-botanists/horticulturists, cultural knowledge holders and other roles to ensure community resilience
- Work collaboratively with the Woppaburra people to over time employ Woppaburra people to increase Queensland Parks Wildlife Service staff's knowledge of the significance of the management area to Traditional Owners and to provide educational opportunities to the broader community
- Develop a Bushfire Traditional Ecological Bushfire Management Plan
- Develop and install interpretive Woppaburra signage across island walking trail

COASTAL HAZARDS

OVERVIEW

Keppel Bay includes a variety of eighteen picturesque islands and many prominent rocky outcrops with pocket beaches in between. With seventeen beaches, Woppa is a popular spot for swimming, snorkelling and paddling. It contains the majority of tourist infrastructure amongst the Keppel Bay Island.

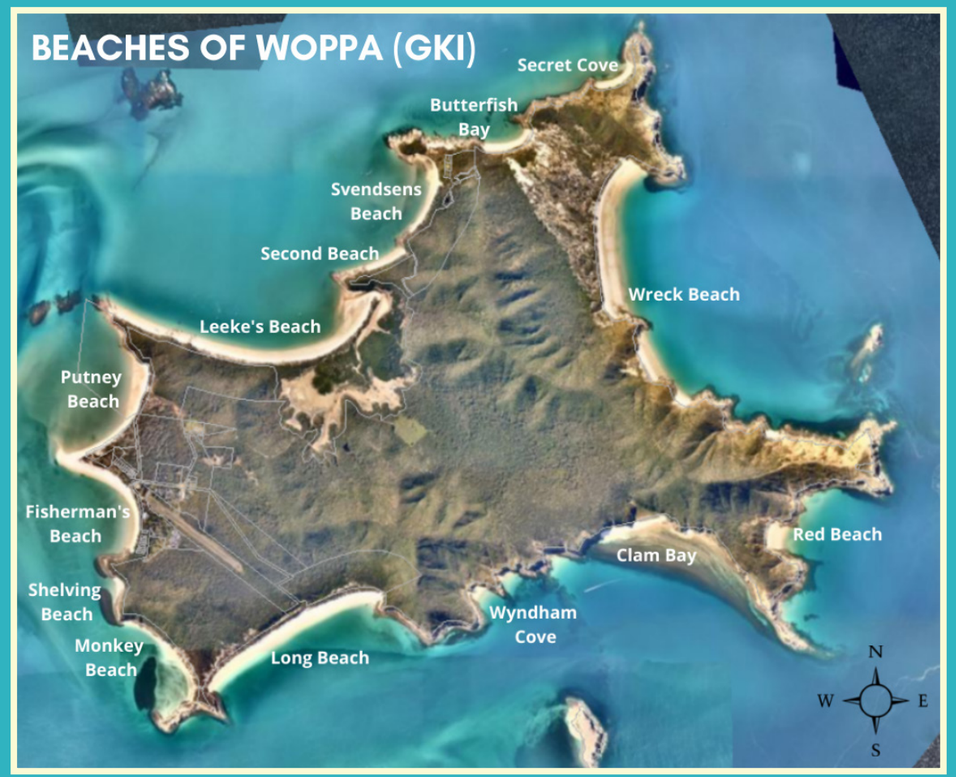


FIGURE 2. BEACHES ENCOMPASSING WOPPA (GKI) (SOURCE - LIVINGSTONE SHIRE COUNCIL)

Coastal environments are continuously changing, influenced by wind, tides, currents and varying sea level rises. Naturally, islands are their own unit of local complex coastal processes due to the high coastline to area ratio. Coastal hazards affect the region's natural and built environment and the daily livelihoods, wellbeing and the economy of residents.

THREATS AND CHALLENGES

The main resort beaches, dunes and tourist facilities on Woppa are at high risk from erosion now and into the future. The tourist area around Putney Beach is at high risk from long term erosion evident by the new vegetation patterns and dune phase building on Fisherman's Beach (supplied by Putney.) All other resort areas have low to medium risks from coastal hazards.

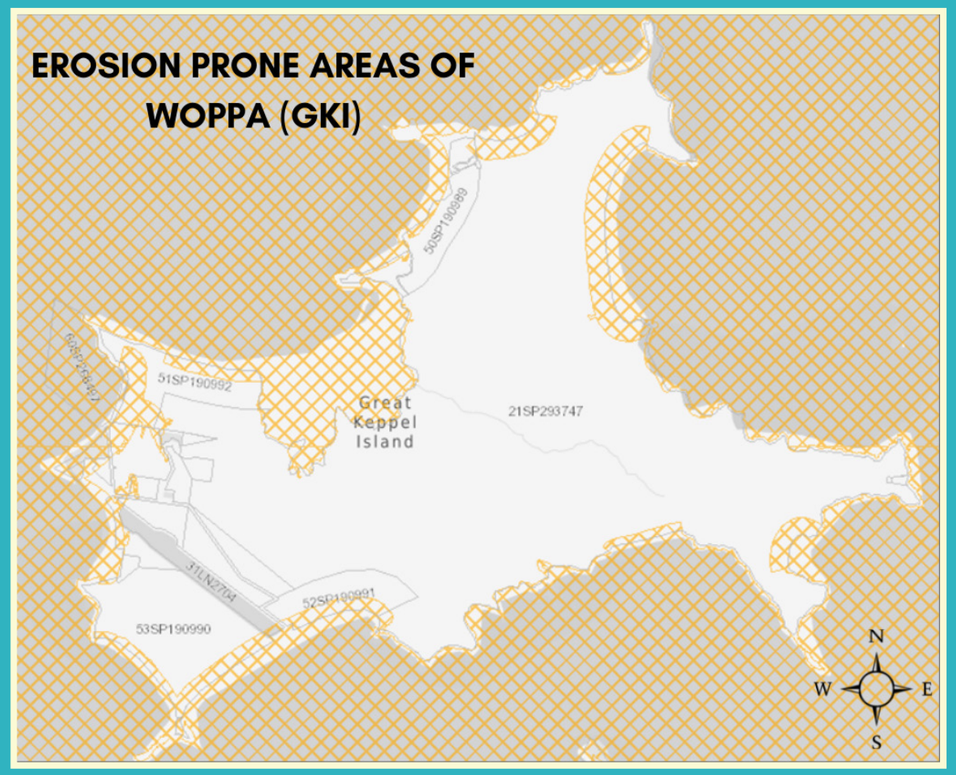


FIGURE 3. EROSION PRONE AREAS OF WOPPA (GKI) SOURCE - STATE PLANNING POLICY (2021)

The temporary revetment wall has significantly changed the amenity of the recreational beach. While the structure has prevented further damage to resort infrastructure, the revetment wall and sand relocation is not a viable long-term erosion control measure on this beach.

Important wetlands around Putney Beach, Leekes Creeks and similar natural areas throughout the Keppel Bay National Park are at high risk of long-term sea-level rise. This scenario below aligns to RCP 8.5, which has a median sea level rise of 0.84 metres by 2100. This will affect approximately 20% of the current developed infrastructure footprint, mostly around the inoperative GKI Resort area.

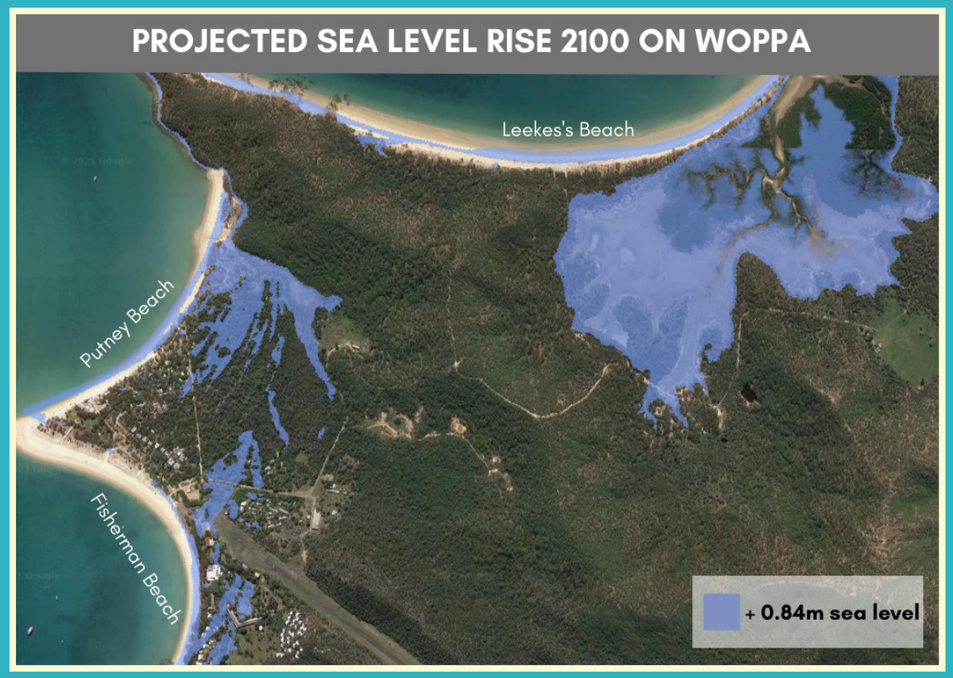


FIGURE 4. PREDICTED SEA LEVEL RISE UNDER A RCP 8.5 EMISSIONS SCENARIO. NOTE THE MAJORITY OF INFRASTRUCTURE INUNDATED.

KEY PRINCIPLES

1. Monitor long term coastal changes
2. Implement best-practice Proactive Shoreline Erosion Management
3. Develop community awareness

Associated Plans, Strategies and Legislation	Funding Sources
LSC Community Plan	**Community Sustainability Action Grants (Queensland Government)** Supports locally based, community driven projects which encourage real change in Queensland communities.
LSC Our Living Coast Strategy	
GKI Masterplan Coastal Protection and Management Regulation 2017	**Local Government Grants and Subsidies Program 2022-2024**
Coastal Protection Management Act 1995	**Works for Queensland Program 2021-2024** Supports regional councils to undertake job-creating maintenance and minor infrastructure projects.
Planning Act 2016	**Coastal Estuarine Risk and Mitigation Program 22-23**

BEST PRACTICE OPPORTUNITIES

- Monitor beach systems by utilising technologies in Aerial photography, Laser Imaging Detection Ranging (LiDAR) and citizen science to record changes in the dynamics of the island
- Facilitate annual community shoreline meetings and events to build capacity and resources on the island to protect the shorelines.
- Collaborate with state government and private industry to develop a shoreline erosion management plan for the developed beaches on Woppa

DISASTER MANAGEMENT

OVERVIEW

The risk of severe damage on Woppa is high due to immediate hazards such as cyclones, storm tide inundation, associated erosion and bushfires. The island has a recorded population of no more than 50 permanent residents and there is community acceptance that the residents will look after themselves to a degree. Yet as the island can have up to thousands of visitors at any given time, evacuation plans are essential.

Each resident and business already rely on solar energy and generators, so in the case of a power outage the community will not be affected in the short term. Telecommunications and news sources on the island are available via mobile systems, broadcast radio, free to air television and high-speed internet connections.

The Woppa Rural Fire Brigade responds to all the wildfire and structure fires until urban fire crews can attend, and the Coast Guard responds as an emergency fleet for breakdowns where time is critical. In a case of emergency, the tourist population is alerted in advance of a threatening event if possible and commercial vessels will be the main means of evacuation, with departmental officers assisting.

THREATS AND CHALLENGES

The most apparent challenge for the island's disaster management is the distance and access to the mainland's emergency groups, civil authorities and recovery services. In an event of an emergency, there are limited resources for response on island and when the urban services on the mainland are called upon, time delays for attention can be a concerning factor. Access across the island is also very limited following the closing of the GKI Resort and discontinued maintenance. Improving access is crucial for hazard reduction for residents and infrastructure.

As the island is only 1308 hectares, it is restrictive in nature, meaning that the majority of assets are almost immediately at risk if a hazard becomes present on the island. As well as this, recreational activities such as water skiing, boating and snorkelling all have the potential to be highly dangerous and result in accidents in which response times may be delayed.with departmental officers assisting.

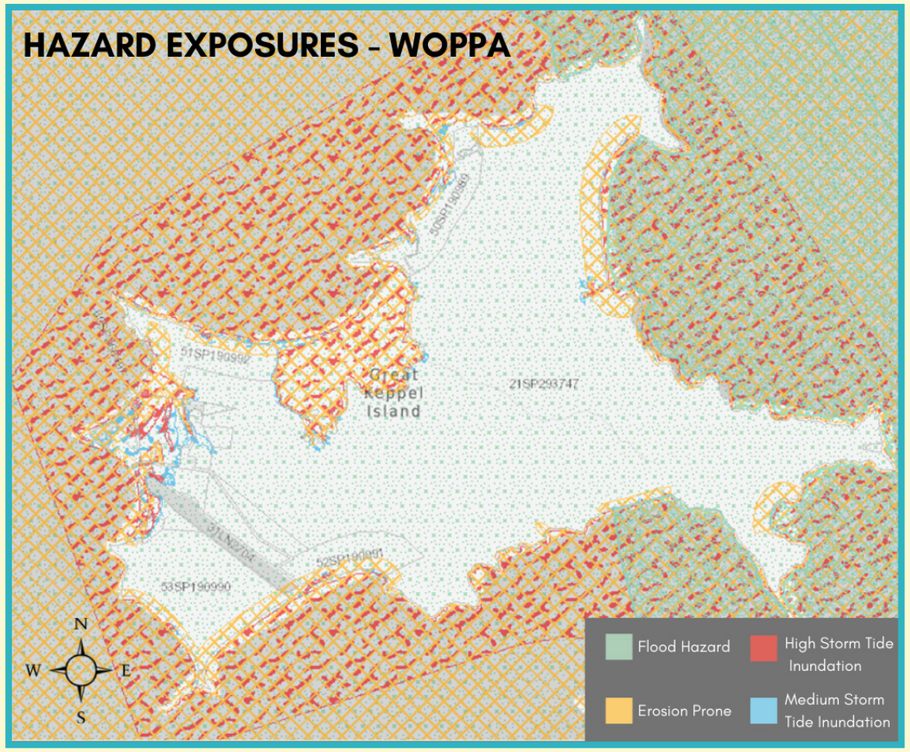


FIGURE 5. KEY HAZARD EXPOSURES TO THE ISLAND; SOURCED FROM THE STATE PLANNING POLICY (2021) ADOPTED BY LSC

KEY PRINCIPLES

1. Reduce or remove the impact of hazards
2. Strengthen the ability of the island community, resources and services to endure the occurrence of a disaster event
3. Efficiently and effectively, coordinate the response to an event in conjunction with other response agencies
4. Provide welfare support and ongoing community improvement, reconstruction and recovery activities

Associated Plans, Strategies and Legislation	Funding Sources
LSC Local Disaster Management Plan	**Community Sustainability Action Grants (Queensland Government)** Supports locally based, community driven projects which encourage real change in Queensland communities.
Disaster Management Act 2003	**QRA - Queensland Disaster Funding Arrangements** Financial assistance to help communities recover from eligible disasters.
Disaster Management Regulation 2014	**State Disaster Relief Arrangements**

BEST PRACTICE OPPORTUNITIES

- Refer to triggers in the building code for properties that are identified in the hazard map.
- Implement community education and engagement campaigns including periodical clean-up of yards/ gardens
- Establish an emergency service facility and local community coordination group/s to empower the community for all stages of disaster
- Ensure agencies participate in training as required by the Queensland Disaster Management Training Framework
- Activate evacuation plans and places of refuge. Ferry services may provide bulk evacuations and the Volunteer Coast Guard and Queensland Police Service have plans for response to mariners
- Establish a community recovery committee that includes the Keppel Bay Islands (LDMG subcommittee)

BUSHFIRE MANAGEMENT

OVERVIEW

Wildfires are a risk on dry tropical islands due to vegetation types and long dry summers prior to the wet season. The island has experienced a number of fires in the past, yet has not had a significant wildfire in decades. Domestic campfires are not permitted on the island and there have been historic reports of arson on the island. Cases of arson and green waste incineration, have prompted safety concerns for some members of the community.

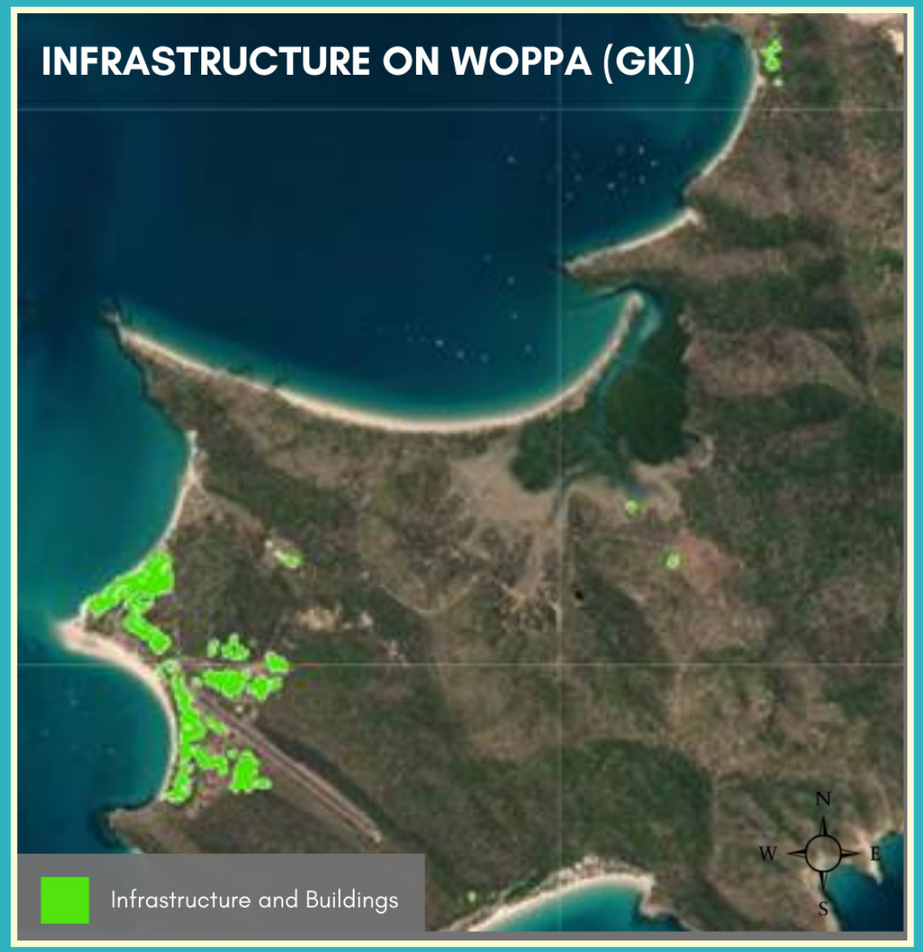


FIGURE 6. MAP SHOWING PLACES OF INFRASTRUCTURE ON THE ISLAND, SOURCED BY LSC (2021)

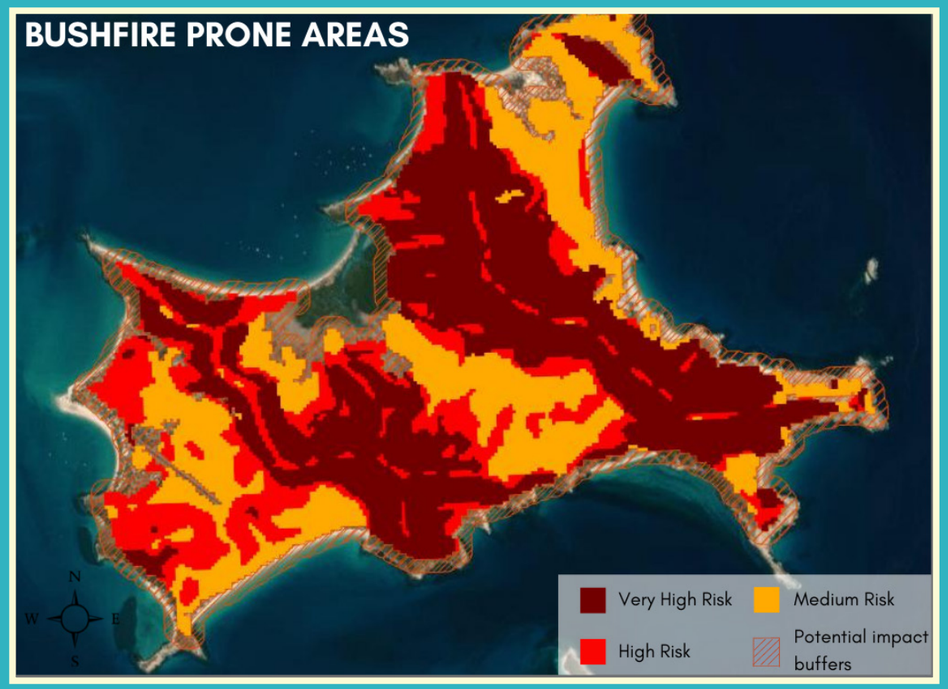


FIGURE 7. MAP SHOWING RELATIVE BUSHFIRE HAZARD LEVELS ON ISLAND; SOURCED FROM STATE PLANNING POLICY

THREATS AND CHALLENGES

A prominent challenge is the **varying land ownership and undeveloped organisational collaboration** for bushfire mitigation, response and recovery. The majority of the land is owned by differing resort operators whom, at the time of writing, currently do not have a presence on the island.

With only a small rural fire brigade, the island possesses limited resources and capacity to respond to fires.

There is lingering pressure and stress associated with activating systems as efficiently as possible in a case of a wildfire. With an abundant walking track system, **yet a very limited vehicle access system, in an instance of a fire, infrastructure, vegetation** and walkers would become quickly at risk, with limited opportunities to reach safety (other than the ocean itself).

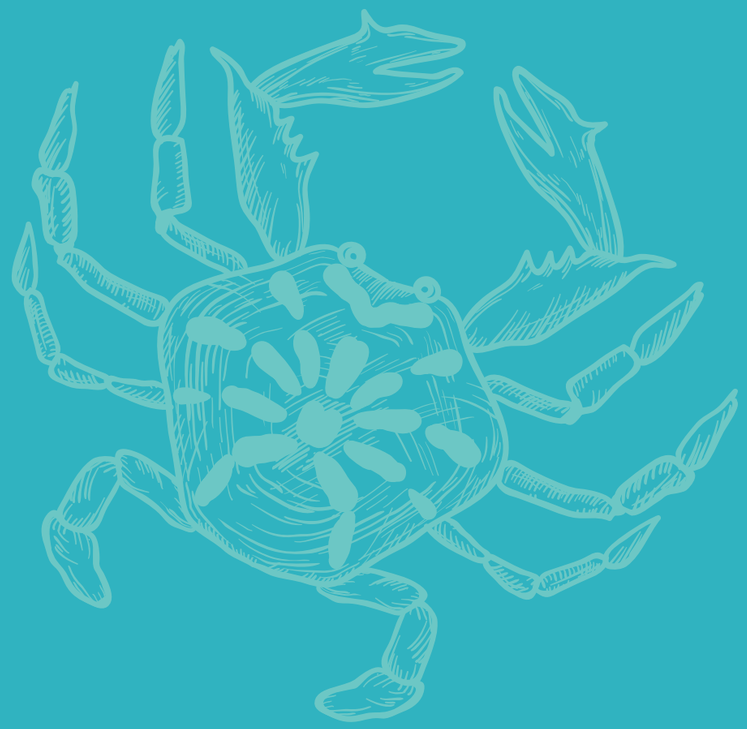
KEY PRINCIPLES

1. Reduce or remove the impact of hazards
2. Strengthen the ability of the island community, resources and services to endure the occurrence of a Bushfire Event
3. Efficiently and effectively, coordinate the response to an event in conjunction with other response agencies
4. Provide welfare support and ongoing community improvement, reconstruction and recovery activities

Associated Plans, Strategies and Legislation	Funding Sources
LSC Local Disaster Management Plan	**Community Sustainability Action Grants (Queensland Government)** Supports locally based, community driven projects which encourage real change in Queensland communities.
LSC Bushfire Management Plan	
Disaster Management Act 2003	**QRA - Queensland Disaster Funding Arrangements** Financial assistance to help communities recover from eligible disasters.
Disaster Management Regulation 2014	**State Disaster Relief Arrangements**
Fire and Emergency Services Regulation 2011	**Queensland Resilience and Risk Reduction Fund**

BEST PRACTICE OPPORTUNITIES

- Investigate opportunities to incorporate Woppaburra cultural burning practices to reduce fuel load, minimise damage, support ecosystems and cultural outcomes
- Establish a Woppa Bushfire Management Operations Plan (BMOP) that highlights roles responsibilities, priority properties, fire trail construction and roadside slashing
- Implement hazard reduction techniques such as prescribed burning, mechanical removal of vegetation, and investigate bushfire resistant landscape designs
- Advocate for individual households to develop their own Bushfire Survival Plans that detail approaches to leaving, staying and livestock and pets



WASTE

OVERVIEW

The 2018 waste results, based on household and business bin capacity estimates, revealed that GKI produced 417t of general waste, 257t of recyclable waste and 36t of green waste per year.

It can be assumed that food waste makes up at least a third of the general waste, revealing that in 2018 GKI produced approximately at least 342 kilograms of food waste per day.

GKI Residents are provided with a red-lidded and yellow-lidded wheelie bin (both 140L) that is collected by the contractor on behalf of council, once a week (general waste) and once a fortnight (recycling). Some commercial operators arrange their own waste transfers and disposal.

The green waste facility is located on Queensland State Government owned land, leased by a resort developer. Green waste is incinerated as required and monitored by the local fire brigade.

THREATS AND CHALLENGES

Without a centralised waste site, general waste and recyclables are transferred from the island via barge, to a nearby mainland landfill site. As a result, emissions and costs associated with transportation are significantly higher than waste processing and transportation is be on the mainland. With this, comes pressure on existing infrastructure when visitors to the island increases.

There are reports of public bins overflowing, lack of availability of bins for use and associated littering during busy periods.

The timing and frequency of green waste incineration in the past is an inconvenience to island patrons when there is high visitation and oncoming winds. Incineration is not a preferred waste management process in that it causes air pollution and poses a threat to health, safety and local waterways.

Dumping of waste is an ongoing challenge for the island due to the associated cost and logistics of removing it off the island as well as the limited enforcement of waste accountability. Reports of non-organic waste within the green waste area has also been a recurring challenge on the island, posing a threat to human health and the environment.

There are some locations on the island which are likely to have some level of contamination due to historic land use practices, such as the domestic landfill which closed in 1996 and the quarry landfill for green waste used by residents.

KEY PRINCIPLES

1. Avoid and reduce waste through reusable products and consumer/provider incentives
2. Protect human and ecosystem health
3. Support waste recovery innovation and modernisation

Associated Plans, Strategies and Legislation	Funding Sources
LSC Waste Reduction and Recycling Plan 2016-26 Great Keppel Island Masterplan Environmental Protection Regulation 2019 Queensland Waste Reduction and Recycling Act 2011	**Community Sustainability Action Grants (Queensland Government)** Supports locally based, community driven projects which encourage real change in Queensland communities. **Queensland Food Waste for Healthy Soils Program** Supports projects that divert nutrient rich organic material from landfill. **ARENA (Australian Renewable Energy Agency)** Funds projects ranging from research to large scale deployment including Advanced Renewable Program and an Innovation Fund. **CEFC (Clean Energy Finance Corporation)** Invests in businesses whose activities can lower Australia's emissions and contributes to a circular economy. **Regional and Remote Recycling Modernisation Fund** Provides grants of up to $500,000 for local governments and their industry partners to increase recovery and remanufacturing rates.

BEST PRACTICE OPPORTUNITIES

- Prioritise an island wide clean- up including legacy waste, backyard scrap and resort structural remains
- Arrange systems that entail proactive removal of waste (associated with machinery and furniture supply) before products arrive on the island
- Seek partnerships with universities particularly research groups to research, guide and support waste innovation
- Establish Infrastructure on the island to facilitate a Closed Loop Waste System; including a food waste dehydrator, a glass crusher and a mulcher/ biodigester
- Support or facilitate a Woppa second hand market (a centre or online exchange)
- Work with Capricorn Enterprise and ferry services to establish day-trippers waste removal by provision of reusable waste bags for collection of waste on the Island. Waste is then brought back to the mainland on return trip where bulk bins are provided at ferry terminals for disposal.

BIODIVERSITY

OVERVIEW

The Keppel Bay Islands landscape includes steep hills, cliffs, sheltered bays, quiet sand beaches, grassland, heathland, tall shady forests and dense low rainforests. Unlike its' thirteen other Keppel Bay counterparts, -Woppa is not protected under *Nature Conservation Act 1992*, yet it still contains a vast range of special biological and ecological values that are significant to the Central Queensland region.

As Woppa contains a Declared Fish Habitat Area wetland site and is surrounded by the Great Barrier Reef World Heritage Area it embodies a number of special ecological values. The *Nature Conservation Act 1992* and the *Environmental Protection* and *Biodiversity Conservation Act 1999* have listed native fauna species that are vulnerable or endangered in the Keppel Bay Island areas including the;

1. Green turtle *Chelonia mydas* (vulnerable),
2. Hawksbill turtle *Eretmochelys imbricata* (endangered)
3. Flatback Turtle *Natator depressus* (vulnerable)
4. Loggerhead Turtle *caretta caretta* (endangered)
5. Koala *Phascolarctos cinereus* (endangered),
6. Australian humpback dolphin *Sousa sahulensis* (vulnerable)
7. Western Alaskan bar-tailed godwit *Limos lapponica baueri* (vulnerable),
8. Eastern Curlew *Numenius madagascariensis* (endangered),
9. Little Tern *Sternula albirons* (enadangered)
10. Beach stone curlew *Esacus magnirostris* (vulnerable),
11. Wedge tailed shearwater *Adrenna pacifica* (vulnerable),
12. Southern Giant Petrel *Macronectes giagnteus* (endangered),
13. Red tailed tropic bird *Phaethon rubricauda* (vulnerable),
14. Dugong *Dugong Dugon* (vulnerable)

Marine mammals such as the Australian snubfin dolphins *Orcaella heinsohni*, Indo-pacific humpback dolphins *Sousa chinensis* and migrating whales appear throughout the bay.

Two endangered Regional Ecosystems (RE) are found on Woppa, they are tussock grasslands on coastal dunes and Eucalyptus *platyphylla*, *Lophostemon suaveolens* and/ or *Corymbia clarksoniana* forests. They are typically subject to weed invasion, coastal development, erosion, threatened by vehicles, feral goats, and uncontrolled pedestrian traffic.

BROAD VEGETATION GROUPS AND REGIONAL ECOSYSTEMS ON WOPPA (GKI)

Top image presents the differing Broad Vegetation groups across the island.
Bottom image shows the Regional Ecosystems that depict the differing vegetation communities in the bioregions. (Source: Biomaps, QLD Government)

Balban Dara Guya (Leekes Creek) is a declared fish habitat area that has management features are in place to provide for future limited infrastructure for the Woppaburra people and to protect essential and interconnecting habitats of Leekes Creek including Half Tide Rocks, Passage Rocks and Big Peninsular.

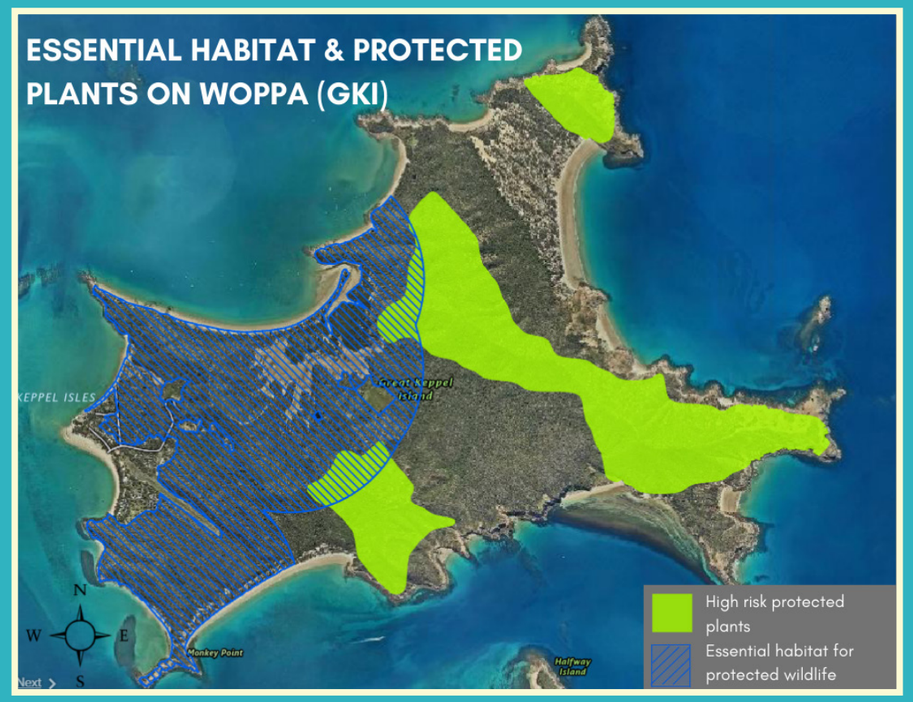


FIGURE 8. MAP SHOWING LANDSCAPE THAT PROVIDES ESSENTIAL HABITAT AND PROTECTED PLANTS UNDER THE NATURE CONSERVATION ACT 1992 (SOURCE: QUEENSLAND GLOBE)

Keppel Bay corals have remained genetically distinct due to the vast distance between other reef systems, with 167 hard coral species and many more soft corals discovered and recorded. Research on corals in Keppel Bay demonstrate that they are possibly more resilient following heatwaves than corals in different regions, due to their differing algae association and thermal tolerance.

In the Keppel Bay Island group, only 28% of the reef area is a green zone (a no-take area where extractive activities are not allowed without a permit). However, the green zones supply almost 60% of juvenile coral trout to reefs open to a 30km fishing range. Installed in 2008, No Anchoring Areas are found at Big Peninsula and Monkey Beach Reef around the island.

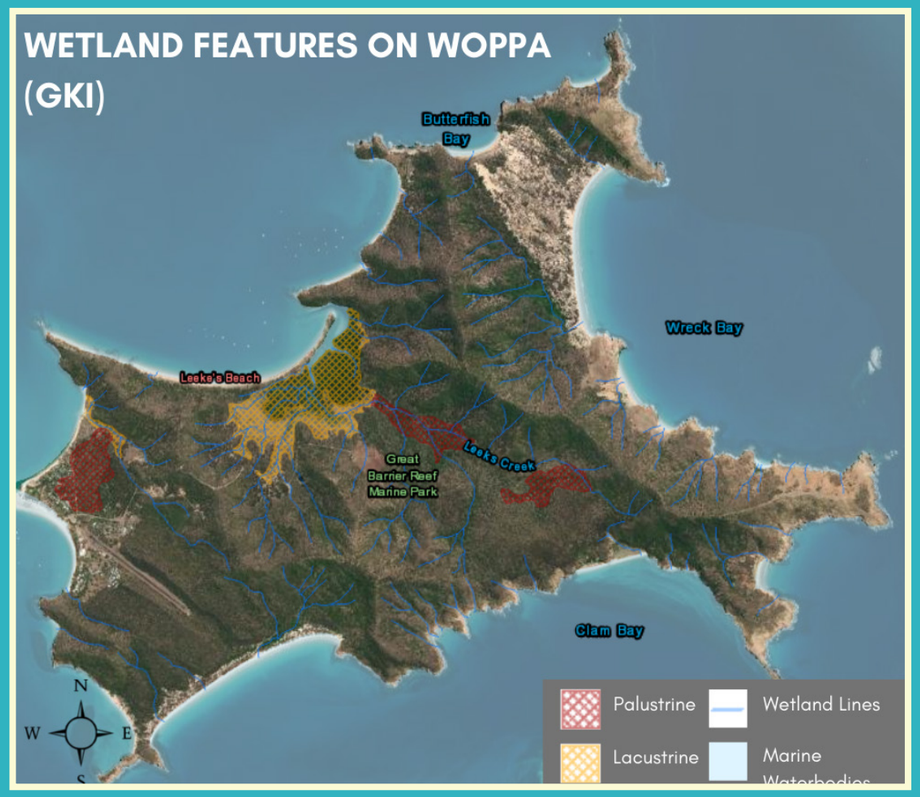


FIGURE 9. MAP SHOWING KEY WETLAND FEATURES ACROSS THE ISLAND (SOURCE: STATE PLANNING POLICY)

THREATS AND CHALLENGES

With increased usage of natural resources comes a greater pressure on the plants and animals that call Keppel Bay home. Pedestrian traffic, land clearing, urban development, domestic fire risks, sand pumping and the removal of valuable species all pose a significant threat to the biodiversity network and must be carefully considered in future development decisions.

Freshwater supply on the island is scarce, meaning that revegetation efforts are limited to irrigation capacity and rainfall. Drought seasons are predicted to be longer and more severe in the eastern areas of Central Queensland towards the end of the century. Beach scrubs and wetland communities are both low-lying habitats, vulnerable to rising sea levels and storm surges. Dominant trees in the Central Queensland Coast such as the Weeping Paperbark *Melaleuca leucadendra* and Common Paperbark *Melaleuca quinquenervia*, will be highly vulnerable to changes in temperature.

Reefs within Keppel Bay are subject to frequent disturbances including above average temperature periods, strong winds and flooding, especially noticed in regular intervals in the last twenty years. Unfortunately, some reefs in Keppel Bay are showing signs of anchor damage and minimising these impacts will help to increase reef resilience.

Pest management including the prevalence of feral goat populations is an ongoing challenge for the island's biodiversity and is discussed in the following section.

KEY PRINCIPLES

1. Establish partnerships (Woppaburra people, Natural Resource Management Groups and Universities) and drive community collaboration
2. Protect significant ecosystem values
3. Develop standards, drive regulation and ensure compliance with legislation and relevant Community Plans
4. Monitor species abundance, richness and distribution

Associated Plans, Strategies and Legislation	Funding Sources
LSC Our Living Environment	**Community Sustainability Action Grants (Queensland Government)** Supports locally based, community driven projects which encourage real change in Queensland communities. **Northern Australian Investment Fund (NAIF)** A development financier to infrastructure projects in the Northern Territory, Queensland and Western Australia.
LSC Bushfire Management Plan	
LSC Reconciliation Action Plan	
LSC Our Living Coast	
Planning Act 2016	

BEST PRACTICE OPPORTUNITIES

- Provide training to Island staff about Native Title and Cultural Heritage
- Integrate Indigenous language and culture into public information products
- Provide safe, sustainable, nature-based terrestrial and marine recreation opportunities
- Provide education around biosecurity risks to the island and advocate for the Woppa to be protected and managed like that of a Queensland National Park.
- Conduct ecological surveys that records and maps native and invasive species abundance, richness and distribution
- Support and promote community wide revegetation by providing coastal resilient plants and planting events to the island community
- Collaborate with local organisations and universities to develop events, education materials and studies on the island's ecosystem

PEST MANAGEMENT

OVERVIEW

Field investigations in 2012, identified eighty-one weed plant species in the Resort Lease area, with eight being declared pests under the *Land Protection Act*. There were concerns at the time of Giant Rat Tails Grass *Sporobolus pyramidalis*. There is widespread evidence of weeds such as Sisal Hemp *Agave sisalana*, Lantanna *Lantanna*, Mossman River Grass *Cenchrus echinatus*, Bush Violet *Acanthaceae barleria*, Common Prickly Pear *Opuntia stricta*, Rubbervine *Cryptostegia grandiflora* and Guinea Grass *Megathyrsus maximums*.

Woppa has faced a number of challenges with exotic/ pest fauna in the past including Cane Toads *Rhinella marina*. The most concerning pests currently, as expressed by residents, are feral goats, feral peacocks and possums, with the remaining exotic species reported to be under control. Peacocks became free range and had a consistent population up until the eradication of cane toads roughly seven years ago. The reduction of the cane toad population, allowed the local goanna population to improve thereby affecting the hatchling survival rate of peacock eggs as well as turtle eggs.

The introduction of goats were deliberate and have altered the contemporary perceptions of what the natural condition of Great Barrier Reef islands are. Council have conducted two recent goat activity surveys. In November- 2018, a survey that covered roughly 60% of the island found 272 goats. Following this count, in mid-2019, two-hundred goats were mustered and removed from the island. 215 goats were then counted in November-2021, following another activity survey that once again covered 60% of the island.

THREATS AND CHALLENGES

Translocation by wind, birds and feral animals along with increased visitation to the island with the development of a new resort, implies many current and future threats for ecosystem disturbance. Weeds such as Mossman river grass have altered the structure and composition of the understories and have excluded native flora.

FIGURE 10. DEGRADATION OF XANTHORRHOEA AND FOREST UNDERSTORY (SOURCE: LSC, 2021)

The dune systems provide habitats for endangered species and nesting locations. Peacocks have reportedly affected the dune systems along with goats. Whilst inhabiting the island for over a hundred years, goats are an invasive pest animal under the Biosecurity Act 2014, meaning everyone is to take reasonable and practical measure to minimise the biosecurity risks. Goats have had significant effects on the island vegetation through selective browsing by thinning out preferred understory plants and reducing the diversity of plants. Goats are casuing soil erosion and land degradation as a result of continual trampling of vegetation.

FIGURE 11. DEGRADATION OF ISLAND DUNES AT WRECK BEACH WHERE GOATS WERE PRESENT (SOURCE: LSC, 2021)

Another challenge for the residents is the lack of infrastructure to keep the pests out of their homes and prevent damage to their property. However, with the removal or reduction of goat populations, there is a lingering concern amongst some stakeholders of potential weed spread and increased fire load. Research is required into relevant solutions for vegetation management.

KEY PRINCIPLES

1. Quantify impacts of problematic populations
2. Plan for management and ecosystem consequences for removal
3. Monitor and evaluate actions

Associated Plans, Strategies and Legislation	Funding Sources
LSC Biodiversity Strategy	**Environmental Biosecurity Fund** Provides funding for eligible projects that help improve Australia's capacity to prevent, prepare for, detect, identify/diagnose and respond to exotic environmental pests, weeds and diseases.
LSC Biosecurity Plan	
LSC Goat GKI Management Plan	**Queensland Feral Pest Initiative** Supports effective invasive plant and animal management in Queensland.

BEST PRACTICE OPPORTUNITIES

- Engage and consult with relevant groups including Woppaburra Land Trust, Government agencies, Department of Agriculture and Fisheries, Island residents, Members of Parliament, Queensland Fire and Emergency Services
- Monitor population growth and movements by conducting surveys of feral goat populations
- Conduct further research around behaviours and threats to the environment if pests are removed
- Monitor and record native vegetation recovery and any negative impacts on that recovery from competing exotic species
- Investigate options for reduction of feral goat populations

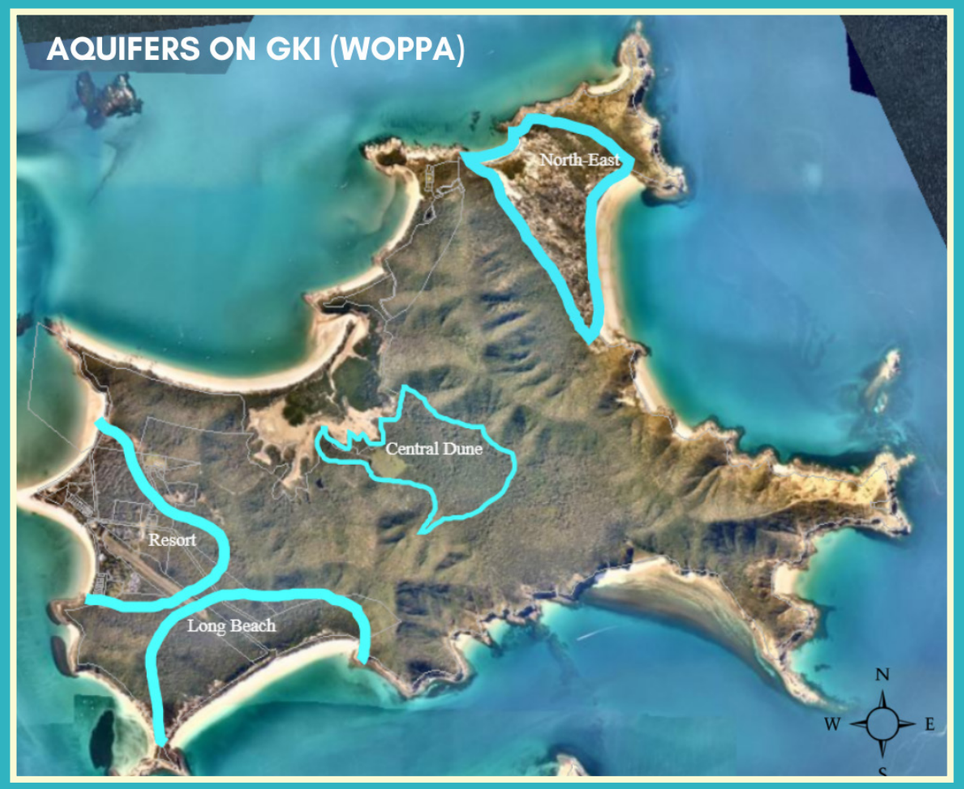
WATER

OVERVIEW

The Island does not have a potable water reticulation system and the onsite natural supplies do not provide water suited for human consumption. Freshwater on Woppa (GKI) is supplied through water tanks, aquifer bores and through containers from the mainland.

Hydrogeological investigations at the time of the GKI Revitalisation Plan Environmental Impact Statement, confirmed that the island had four aquifers that contain freshwater. The most commonly used is the old Resort Aquifer servicing the esplanade of the island. All aquifers contain Quaternary dune sand with varying depths, permeability and surface areas.

The island currently does not have a centralised Sewage wastewater treatment plant. This system needs an upgrade. The businesses and homes all rely on small sewage treatment plants or their personal septic systems.



LOCATION OF AQUIFERS ON THE ISLAND (SOURCE; LIVINGSTONE SHIRE COUNCIL, ADAPTED FROM THE GKI REVITALISATION PLAN EIS, DOUGLAS PARTNERS (2011))

THREATS AND CHALLENGES

The majority of resident's septic tanks are either very close to their bore or on top of their bore. Access to freshwater for future tourism demands will be the greatest water challenge to the island.

There have been periods where the aquifer near the esplanade experienced over extraction, especially when the old Resort was operating. There have been on- island, salinity test reports of the bore water jumping from 0.5 to 2.0 ppt over a six-month timeframe, during peak visitation season. For reference, drinking water is safe to drink below 1.0 ppt, yet should be below 0.6 ppt.

The majority of resident's septic tanks are either very close to their bore or on top of their bore. Due to the shallow depth of groundwater, highly permeable sand soils and high aquifer hydraulic conductivity there is a greater chance of surface contamination from their septic waste.

KEY PRINCIPLES

1. Avoid and reduce the use of island freshwater resources
2. Reuse and recycle on-island water where safe to do so
3. Protect human health and island ecosystems

Associated Plans, Strategies and Legislation	Funding Sources
LSC Drinking Water Quality Management Plan 2021	**National Water Grid Construction Program** National water infrastructure investments that will improve the reliability and security of water for Australia's regions and agriculture and primary industry sectors. **Queensland State Government Great Keppel Island Common-User Infrastructure Fund** **Community Sustainability Action Grants (Queensland Government)** Supports locally based, community driven projects which encourage real change in Queensland communities.
Water Supply (Safety And Reliability) Act 2008	
Public Health Act 2005	
Environmental Protection Act 1994	
Plumbing and Drainage Regulation 2019	

BEST PRACTICE OPPORTUNITIES

- Enable and facilitate water sustainable behaviours such as short showers, half flushes amongst visitors and operators, installation of water tanks
- Plant drought-resistant, native flora in island gardens and water early morning or later in the afternoon/evening
- Investigate cost-effective wastewater treatment systems
- Investifate the construction of a Whole of Island Desalination Plant
- Construct/upgrade waste water treatment plants that will meet the needs of current and future usage demands

ENERGY

OVERVIEW

Operators and residents on Woppa are currently aware of the need to be energy efficient and the majority of households generate and consume energy that is mostly sourced from renewable energy.

A whole of island energy consumption 2019 study revealed that the total energy consumption for Woppa is equivalent to 889 four-person households worth of energy per year. 5.89 x 10^6 kWh of energy is consumed per year, however around 50% of that total energy consumption is from motor vehicles, transport providers and barge operators. On the island, only 2.63 x 10^6 kWh is consumed per year, where the largest contributor (87%) is stationary fuel combustion (diesel, petrol generators and LPG).

THREATS AND CHALLENGES

Business and households are all operating and consuming energy within their current resource capabilities. The community faces great challenges because of underdeveloped water and energy infrastructure and the associated upfront capital or jump in Council rates to install, upgrade and maintain systems.

As a result of the destructive nature of cyclones, bushfires and intense storm, energy infrastructure is at fairly high risk of damage.

The Keppel Bay Islands experience on average thirty- two days of overcast weather and 194 days of partly cloudy weather. This leaves operators periodically reliant on diesel generators, sometimes days at a time. This can be an ongoing negative cost and in the rare case of reduced access to the mainland (as a result of a natural disaster) operators can be left without diesel or fuel supply.

KEY PRINCIPLES

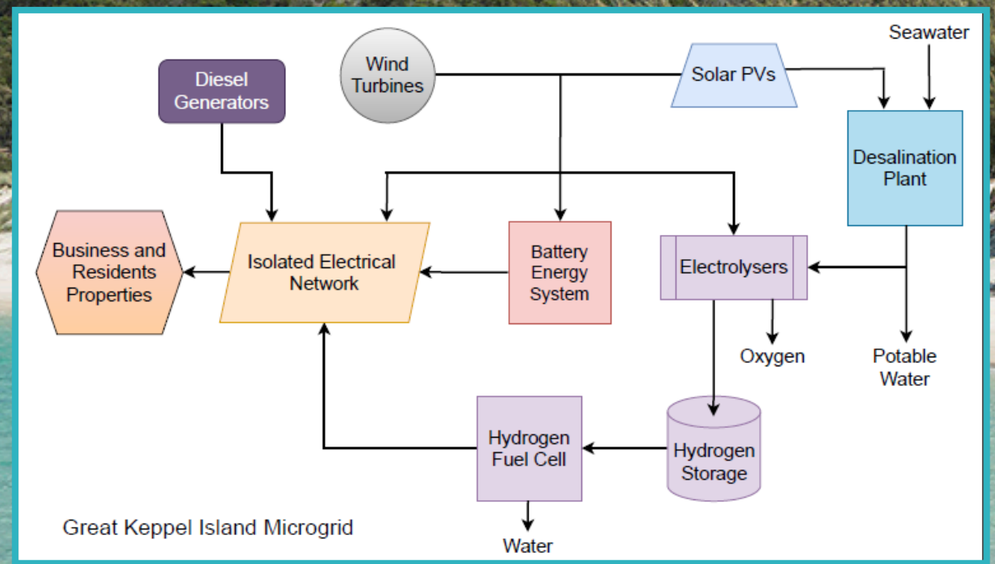
1. Avoid and reduce the use of Island energy resources

2. Explore opportunities for cost-effective energy innovation and management

Associated Plans, Strategies and Legislation	Funding Sources
LSC Drinking Water Quality Management Plan 2021	**National Water Grid Construction Program** National water infrastructure investments that will improve the reliability and security of water for Australia's regions and agriculture and primary industry sectors. **Queensland State Government Great Keppel Island Common-User Infrastructure Fund** **Community Sustainability Action Grants (Queensland Government)** Supports locally based, community driven projects which encourage real change in Queensland communities.
Water Supply (Safety and Reliability) Act 2008	
Public Health Act 2005	
Environmental Protection Act 1994	
Plumbing and Drainage Regulation 2019	

BEST PRACTICE OPPORTUNITIES

- Promote and facilitate energy sustainable behaviours such as switching off equipment, using natural ventilation, resetting thermostats, reducing car trips and rationalising equipment
- Encourage energy use reductions by implementing energy efficiency measures such as replacing light fittings with LED or other low energy lamps and installing motion sensors on lighting
- Facilitate knowledge and options for businesses and residents to either switch or expand renewable energy sources, technology and infrastructure
- Smart Green Hydrogen Based Micro Grid in liaison with CQU



A SIMPLIFIED MODEL PRESENTING A MICROGRID ENERGY SOLUTION FOR THE ISLAND (SOURCE: CENTRAL QUEENSLAND UNIVERSITY)

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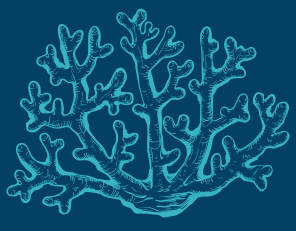

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Woppa (Great Keppel Island) Community Resilience Framework DRAFT

Version 1 - November 2020