Palm Island

Decarbonisation of Great Barrier Reef Islands – Whole of Community Pilot Project

January 2021

EarthCheck ARUP Regional Economic Solutions Queensland Tourism Industry Council The Voice of Tourism

Acknowledgement

This Report acknowledges the Traditional Owners and those people with Historical Association to the land which now forms the Palm Island Aboriginal Shire Council (PIASC) area. This Report also acknowledges that their customs and traditions have nurtured and managed the land for centuries.

The project team would like to thank all contributors and collaborators who have provided invaluable assistance throughout this project. Special thanks to the Palm Island Aboriginal Shire Council (PIASC) Councillors and staff, the Palm Island Community Company, the Palm Island Community Development Program, the Men's Shed, Saint Michael's School, Ergon Energy and all other parties involved for their continued support and collaboration. The project team acknowledges the Queensland Government for the funding of the project as well as the Department of Environment and Science, the Department of Aboriginal and Torres Strait Partnerships as well as the Department of Housing and Public Works for their ongoing input and support in the delivery of project outcomes.

Finally, thank you to all the members of the Palm Island community, who welcomed us into their community, their homes, their country and took the time to have a yarn with us. We are extremely grateful and touched by the community's trust and openness with the whole team.

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Project Team

EarthCheck
Since 1987, EarthCheck has provided frameworks, tools and Standards for the public and private sector to achieve sustainable development outcomes using world leading science, demonstrated methodologies and performance driven approaches to innovation. EarthCheck has three elements of key focus in driving innovative practice in Sustainability: advice and consulting sustainability services, certification of an operation's or destination's sustainability as well as benchmarking and performance tools.

Regional Economic Solutions
Regional Economic Solutions (RES) is a majority owned First Nation Business. RES is dedicated to bridging the economic and social gap between Indigenous Australians and the rest of the community. RES achieved this by partnering with organisations whose projects impact indigenous communities and work to ensure those impacts are positive, delivering social and economic outcomes that are sustainable, ethical and responsible.

Arup
Arup is an independently-owned, multi-disciplinary firm specialising in issues in the built environment. Arup is a global network of engineers, designers, scientists, economists, planners and technical specialists.

Queensland Tourism Industry Council
Queensland Tourism Industry Council (QTIC) is the peak industry body for tourism in Queensland, acting as The Voice of Tourism. QTIC is a not-for-profit, private sector, membership-based organisation representing the interests of Queensland's tourism and hospitality industry.

Document guide

Final Report:

This document outlines the overarching project approach and key findings. The Final Report has the following appendices:

Appendix 1: Final Project Options

17 Final Project Options for the Palm Island community across the five project themes of energy, water, waste, transport and resilience.

Appendix 2: Option Recommendations

Options that have not progressed through to the options shortlist, but which have merit and potentially represent areas for future consideration.

Appendix 3: Discounted Options

Other options put forward by the community and stakeholders that were assessed, but ultimately not determined to constitute a viable project option or option recommendation.

Appendix 4: Stakeholder Register:

List of engaged stakeholders throughout the project lifecycle.

Technical Appendix 1: Sustainability Assessment and Risk Assessment

As a separate document to the Final Report, this is a detailed Sustainability Assessment and Risk Assessment for the Palm Island community. This contains the detailed project findings and data which are referred to in the Final Report.

Technical Appendix 2: Options Report

As a separate document to the Final Report, this is a detailed report on the shortlisting of options from the Long List to determine the Final Project Options.

List of Figures and Tables

Executive Summary

To address the risk of climate change and protect the Great Barrier Reef, there is a need for Great Barrier Reef island communities to decarbonise in line with Queensland's emission reduction goal. This report provides an overview of the findings and results of the Decarbonisation of Great Barrier Reef Island – Whole of Community Pilot project for the Palm Island community. The project aimed to collaboratively develop project options for a range of community benefits including decarbonisation and resilience-building community and stakeholder-led initiatives spanning the project areas of energy (generation and efficiency), water (supply and treatment), waste, transport (inter and intra-island), and resilience to the effects of climate change.

This project was supported by the Queensland Government, which made a $1.73 million election commitment in 2017 to assist Great Barrier Reef islands transition to a low or zero carbon future and become more resilient to changes in climate. The project team was constituted of EarthCheck, Arup, Regional Economic Solutions and the Queensland Tourism Industry Council.

In order to reach the project objective, a collaborative engagement process with the community was established and maintained, harnessing The Regional Economic Solutions Moon-Da-Gatta Yarning Framework. This project deeply engaged and connected with the Palm Island community in order to support the community reclaim, revitalise and restore cultural tradition.

Executive Summary

Community and stakeholder-led ideas and initiatives were at the heart of this project. It is recognised that it is the community who are best positioned to action sustainable and impactful change towards decarbonisation and building capacity to respond to climate change at a local scale. n Options Longlist was collated and the options most aligned with community needs and the decarbonisation and resilience-building objectives were selected by the community to be shortlisted for project options.

The extensive research and relationships developed throughout this project support the 17 final project options developed for the Palm Island community. The number of final project options per project theme are presented in Figure 1. The cumulative upper estimates for potential emissions reductions, annual savings, full time equivalent jobs as well as total investments are also identified in this figure. The full final project options can be found in Appendix 1: Final Project Options.

Throughout this process, a range of ideas, initiatives and projects were documented for future consideration and are collated as further recommendations in Appendix 2: Option Recommendations of this report. The privileged access to community and perspective gleaned throughout this project enabled the project team to highlight specific policy recommendations aimed at governmental agencies. These are outside the scope of the project options developed in this project and provide tangible opportunities for community development and wellbeing.

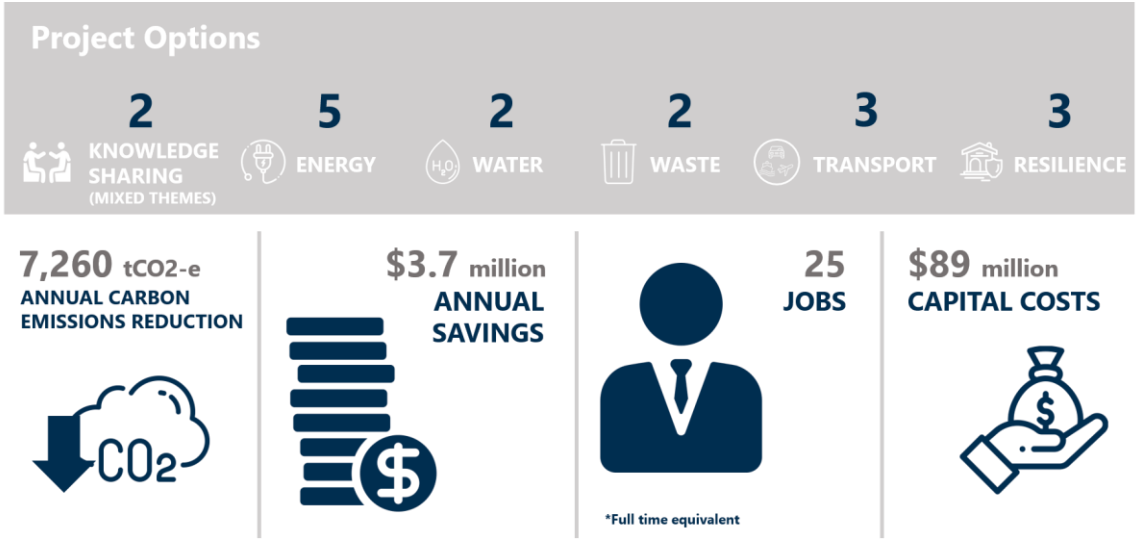


Figure 1: Key Findings and Project Summary*

*Figure totals have been calculated by summing the maximum figure for each final project option aspect. Note that where final project options do not have an associated figure (e.g. to be determined by a study), there have been no savings or costs included for that project option.

Executive Summary

The developed final project options provide the potential for significant investment into the Palm Island community, the opportunity for full time equivalent (FTE) positions to be created, as well as important decarbonisation potential presented as carbon reductions. The table below presents the final project options developed for Palm Island. For the complete final project option documents, please refer to Appendix 1: Final Project Options.

Table 1: Final Project Options for Palm Island

Project Option	Carbon Reduction (tCO^2-e)	Investment ($)	FTE	Delivery Time (Years)	Funding Opportunities
 **1. Community Market Garden** This project is to start the community garden again to produce fresh food in the community. This could include composting for food and garden scraps	N/A	100,000	1 - 3	0.5 - 1	• Funding under future round of W4Q • Round 3 - Community Sustainability Actions Grants, Queensland Government Department of Environment and Science • Social Reinvestment Grant, Department of Aboriginal and Torres Strait Islander Partnerships • Drought Communities Programme, Department of Infrastructure, Transport, Regional Development and Communications • Community Led Grants Department of the Prime Minister and Cabinet • DSDMIP Resource Recovery Industry Development Program • 1000 Jobs Package, National Indigenous Australians Agency • Work with/through TAFE to offer appropriate courses on an ongoing basis
 **2. Living better at home and saving money** A program to help community identify more opportunities to live well and reduce costs.	N/A	50,000 – 100,000	1	1 - 2	• Round 3 - Community Sustainability Actions Grants • Social reinvestment • Indigenous Languages and Arts GO3720 • 1000 Jobs Package (Tranche Two) • Community Led Grants • The Container Refund Scheme Small Scale Infrastructure Grants Program (Queensland Government) provides up to $10,000 in infrastructure and equipment to set up collection points for the newly introduced container deposit scheme. • Potential for Ergon to incorporate costs of education materials regarding electricity usage and billing transparency as part of their community business objectives

Executive Summary

Project Option	Carbon Reduction (tCO^2-e)	Investment ($)	FTE	Delivery Time (Years)	Funding Opportunities
3. Caring for Our Sea Countries Caring for our sea country's health to maintain a thriving environment for future generations.	1.3 – 1.7/HA	210,000 (10 hectares of mangroves) 6,900,000 (10 hectares of seagrass)	N/A	1 - 3	• Philanthropy and private funds (as an environmental and social cause) • Blue carbon has been identified in the Queensland Carbon Farming Industry Roadmap • Other federal, State and local government funding may apply such as Queensland Community Sustainability Action grants and the Queensland Attracting Tourism Fund • Partners who might be able to fund their own activities/contributions, e.g. research activities by universities might be funded by PHD scholarships, volunteers from volunteer organisations like Seagrass Watch, Mangrove Watch or Conservation Volunteers Australia
4. Community bus service This project is to start an environmentally friendly bus service for community transport.	0.002 – 0.006/100km	100,000	1	0.5 - 1	• Climate Solutions Fund – Emissions Reduction Fund • Clean Energy Finance Corporation – Reef Funding Program • Australian Renewable Energy Agency – potential funding through exploration of innovative electric vehicle charging infrastructure • Ergon – potential funding and becoming partner on project due to EV charging infrastructure • Local Government Grants and Subsidies Program - potential capital funding after feasibility study completed • Department of State Development, Manufacturing, Infrastructure and Planning – could align with similar electric vehicle charging infrastructure investments
5. Solar Power on the ground with batteries Study to build a solar farm in Coolgaree Bay.	0 – 4,900	250,000 (feasibility study) 15,000,000 (solar farm/ battery)	More than 3	0.5	• Clean Energy Finance Corporation - Reef Funding Program: funding available for emission reduction projects in Great Barrier Reef catchment area • Regional and Remote Communities Reliability Fund • Climate Solutions Fund – Emissions Reduction Fund
6. Put Solar Power on the roof Putting solar panels on the roof of your home to produce some of your own electricity.	780	1,400,000 (phase 1) 4,000,000 (phase 2)	1 – 2 days per installation	1 - 2	• Small-scale technology certificates for solar PV systems through Small-scale Renewable Energy Scheme – from the Clean Energy Regulator (Australian Government) • Clean Energy Finance Corporation - Reef Funding Program: funding available for emission reduction projects in Great Barrier Reef catchment area • Regional and Remote Communities Reliability Fund • Climate Solutions Fund – Emissions Reduction Fund • North Australia Infrastructure Fund

	Project Option	Carbon Reduction (tCO^2-e)	Investment ($)	FTE	Delivery Time (Years)	Funding Opportunities
	**7. Building confidence in the community's water supply** This project seeks to engage with the community to re-build community trust in the safety and reliability of the water supply.	N/A	200,000 – 400,000	N/A	Less than 1	• The project is aligned at some level to several existing funding programs including Building our Regions Program (Department of State Development, Tourism and Innovation), Queensland Disaster Resilience Fund (Queensland Reconstruction Authority), and Remote Area Boards Program, and the Indigenous Councils Critical Infrastructure Program (Department of Local Government, Racing and Multicultural Affairs) • Given the criticality of the work and alignment to multiple Departmental priorities, it is recommended that key stakeholders including Palm Island Aboriginal Shire Council, Department of Local Government, Racing and Multicultural Affairs, Department of Aboriginal and Torres Strait Islander Partnerships and Department of Environment and Science to collaboratively review funding opportunities • There may be an opportunity combine this project with project #17 (Plastic Free Places Initiative) for funding application purposes
	**8. Indigenous Ranger Program** This is to fund an Indigenous ranger program to care for land and sea countries.	N/A	120,000 – 200,000 annual costs 80,000 – 130,000 capital costs	2	1 - 3	• Indigenous Land and Sea Ranger Program • Looking after Country Grant program, Queensland Department of Environment and Science • 1000 Jobs Package, National Indigenous Australians Agency • Community Led Grants, Department of the Prime Minister and Cabinet • Queensland Indigenous Land and Sea Rangers Program, Queensland Department of Environment and Science • Queensland Feral Pest Initiative, Queensland Department of Natural Resources, Mines and Energy • Animal Management in Rural and Remote Indigenous Communities One Health Programs
	**9. New Solar Hot water systems** Better solar hot water systems on houses to improve hot water supply.	480	2,500,000 – 3,900,000	1 – 3 per installation	1 - 2	Existing funding opportunities: • Could seek modification to existing Department of Housing funding to account for upgrade of SHW systems. New funding opportunities: • Small-scale technology certificates for solar hot water systems through Small-scale Renewable Energy Scheme – from the Clean Energy Regulator (Australian Government) • Clean Energy Finance Corporation - Reef Funding Program: funding available for emission reduction projects in Great Barrier Reef catchment area • Regional and Remote Communities Reliability Fund • Climate Solutions Fund – Emissions Reduction Fund

Executive Summary

	Project Option	Carbon Reduction (tCO^2-e)	Investment ($)	FTE	Delivery Time (Years)	Funding Opportunities
	**10. Improving walkways around Palm Island** Improve paths for walking and cycling to promote active transport around Palm Island by improving shade, lighting, and path quality.	9	100,000 – 200,000 (plan) 1,500,000 – 6,000,000 (infrastructure)	N/A	0.5 - 1	• Seek to include Palm Island in the next update of the Principal Cycle Network Plans so as to align with Queensland Government strategies for Cycling and Walking, including the potential to obtain funding through the mechanisms outlined in the strategies, such as The Cycle Network Local Government Grants Program
	**11. Cooling options for homes** Improve comfort and livability in homes through cooling options such as: heat reflective roof paint, installation of insulation, and better ventilation. An audit will identify options for consideration.	203 – 406	500,000 – 2,000,000	2 – 4 per year	2	• The No Interest Loans Scheme • Energex PeakSmart air conditioning program
	**12. Improve Energy Use in Houses** Improve energy use in houses through options for more efficient kitchen and laundry appliances and lights. An audit will identify options for consideration.	204 – 406	1,000,000	2 - 4	1 - 2	• The No Interest Loans Scheme offers individuals and families on low incomes access to safe, fair and affordable loans for purchasing appliances and some other essential household expenses • Ergon rebates are available for payment card residences • For newly built community housing, a partnership with the Clean Energy Finance Corporation should be explored • Partnership with Department of Housing and Public Works should be explored
	**13. Options for replacing diesel for the Ferry and Barge Services** Looking at options for replacement of diesel fuel for the ferry and barge services, including electricity, hydrogen, and bio-fuels.	0 - 240	50,000 – 100,000 (feasibility study) 40,000,000 (barge) 4,000,000 (ferry)	To be determined in the study*	To be determined by the study*	• Climate Solutions Fund – Emissions Reduction Fund • Clean Energy Finance Program - Reef Funding Program • Australian Renewable Energy Agency – potential funding through exploration of innovative emission reduction measures • Ergon – potential partner on project due to electric vehicle charging infrastructure
	**14. Improving the Waste Management Site** Improving the rubbish site so waste can be better separated into different kinds of waste and stored properly for transport and recycling off island.	0 - 5	2,000,000	2	1 - 2	• State Development, Manufacturing, Infrastructure and Planning - Resource recovery industry development program • Department of Agriculture, Water and the Environment – Reef Trust – Great Barrier Reef Foundation Partnership Grant

*To be determined (TBD) by the study indicates that a feasibility study is needed for this project option in order to ascertain the figure.

	Project Option	Carbon Reduction (tCO^2-e)	Investment ($)	FTE	Delivery Time (Years)	Funding Opportunities
	**15. Water and wastewater plan** A plan to highlight opportunities to improve long term water quality, community self-sufficiency, as well as ongoing wastewater management for the island.	N/A	250,000 – 500,000	N/A	1 - 2	• No specific funding opportunities have been identified for this project • The project is aligned at some level to several existing funding programs including Building our Regions Program (Department of State Development, Tourism and Innovation), Queensland Disaster Resilience Fund (Queensland Reconstruction Authority), and Remote Area Boards Program, and the Indigenous Councils Critical Infrastructure Program (Department of Local Government, Racing and Multicultural Affairs) • Given the criticality of the work and alignment to multiple Departmental priorities, it is recommended that key stakeholders including Palm Island Aboriginal Shire Council, Department of Local Government, Racing and Multicultural Affairs, Department of Aboriginal and Torres Strait Islander Partnerships and Department of Environment and Science to collaboratively review funding opportunities • There may be an opportunity combine this project with project #7 (Re-building Community Confidence in Water Supply) for funding application purposes
	**16. A tourism plan for Palm Island** A plan to support the community to benefit from the opportunities that tourism can provide in a cultural, ethical, social, and economical way.	N/A	100,000 – 200,000	1	1	• Round 3 - Community Sustainability Actions Grants, Queensland Department of Environment and Science • Social Reinvestment Grant, Department of Aboriginal and Torres Strait Islander Partnerships • Community Led Grants, Department of the Prime Minister and Cabinet • Growing Indigenous Tourism Fund, Queensland Department of Innovation and Tourism Industry Development
	**17. Help community to stop using plastic items commonly found in rubbish** Finding better alternatives for shops to switch away from plastic items commonly found in rubbish - straws, coffee cups/lids, takeaway containers, food ware (cups, plates, cutlery etc.), bags and water bottles.	N/A	400,000	1	2	• Application for funding through the Department of Environment and Science for support of the Plastic Free Places initiative on Palm Island. Department of Environment and Science are currently undertaking an Indigenous Waste Strategy and associated infrastructure planning, in line with the Queensland Waste and Resource Management Strategy. The development of this Indigenous Waste Strategy and infrastructure plans may provide opportunity for funding for remote communities such as Palm Island for Container Refund Scheme and plastic free places initiative. • This project should form part of the Regional Action Plan to be developed under the Indigenous Waste Management Strategy so that project identification and development can be undertaken in a coordinated way.

Project Phases

This section presents the project phases undertaken.

Project Phases and Engagement Framework

The Regional Economic Solutions Moon-Da-Gatta Yarning Framework was employed to appropriately engage and connect with the community and is illustrated in the figure below. This Framework is a strength-based cultural yarning process emphasizing revitalising, restoring and reclaiming culture and tradition through a stepped approach. This project, through its different phases, tackled the first three steps of this engagement framework. There is an understanding that this project constitutes one piece of a process.

Listening to Hear aimed to identify the best of the current situation as well as community strengths. This step aligned with the Sustainability Assessment of the project. Individuals, stories, places, ways of being as well as practice are the pillars of this step and set the tone for conversations to come.

Dreaming Big identified the dreams and the goals of the community. Conversations around what might be as well as ideas fostering and developing hope in the community are central to this step. For this project, this step aligned with the development of the Options Longlist.

Finally, Whichway Now is a step focusing on grouping themes, consolidating ideas and deciding on which actions to take forward. For this project, this step manifested in the development of the project options.

This process is critical in developing common understanding around projects and driving community-led change. The next step in the Moon-Da-Gatta Yarning Framework is the What. As mentioned above, this step is the continuation of this work beyond this project. The Taking Stock and Yarn up the Future section in this report tackles how community may choose to employ these next steps.

The next pages describe the Moon-Da-Gatta Yarning Framework steps and how they were carried out throughout this project.

Figure 2: Moon-Da-Gatta Yarning Framework (RES)

Phase 1
Listening to Hear
(Sustainability Assessment)

The *Listening to Hear* phase focused on two main elements, establishing and strengthening relationships within community and data collection, to inform the Sustainability Assessment.

Firstly, harnessing established relationships and family connections to best understand the cultural context were critical success factors. Establishing relationships and a mutual trust during the first trip to Palm Island was a key consideration at this stage. This was achieved through conversation and connecting with community leaders. Important elements identified by the community on Palm Island were caring for country, caring for family, as well as reclaiming, revitalising and restoring culture and community. Caring for country, caring for the land, ecosystems and the environment of the island manifested through ideas like a native garden, caring for the reef and the mangroves as well as tackling the weeds and other harmful invasive species. Caring for family as well as reclaiming, revitalising and restoring culture and community came through ideas like elders transferring knowledge to younger community members, cultivating cultural identity grounded in culture for next generations, as well as connecting youth and elders to country.

Secondly, data and information was captured through stories and conversations with community and stakeholders. This was on the themes of energy, water, waste, transport and resilience were key parts of the conversations with community and stakeholders. Combined with consultation with council and the various community organisations and service providers on the island, a wide range of information was collected in order to inform the subsequent project phases.

Over 40 community members and stakeholders provided input into the Sustainability Assessment through an online survey, two drop-in sessions in the town centre, and a variety of one-on-one meetings. The need to be physically present and for a conversation-based engagement approach was highlighted during this phase, as the survey tool which was developed had a very limited reach. The sustainability assessment data collection process was led by EarthCheck (supported by Regional Economic Solutions (RES) and Queensland Tourism Industry Council (QTIC)) and targeted the five key areas of energy (generation and efficiency), waste, water (supply and treatment), transport (inter and intra-island), and self-sufficiency/resilience in relation to climate change adaptation.

Phase 1 was conducted from 24th of June 2019 to 23rd of September 2019. The first island visit was conducted on the 26th, 27th and 28th of August 2019.

Refer to Technical Appendix: Sustainability Assessment and Risk Assessment for the full methodology community and stakeholder consultation approach, and project findings.

Phase 2
Dreaming Big
(Options Longlist)

The *Dreaming Big* phase involved thinking about what might be, imagining what helps make the community happy, excited about the future as well as increase community well-being under future climatic conditions.

This phase aimed to develop a plausible list of options that incorporated feedback from the community and engaged stakeholders. This included council, service providers and community organisations (PICC, CDP), the schools as well as different subject matter experts. This longlist included 66 distinct options across the project themes of energy, waste, water, transport and resilience. Community consultations during the second on-island visit sought community and stakeholder input into each of the options, guidance around island context and opportunities as well as the identification of potential barriers.

Trust-based relationships that were established were the foundation of this second phase. Over 80 community members provided input on the options through individual discussions as well as three drop-in sessions located at community hubs. Many of the community members and stakeholders who contributed to this phase had been engaged with in phase 1.

The ideas most aligned with community needs as well as the decarbonisation and resilience-building objectives were selected by the community to progress to project options. This process is further detailed in Appendix 2: Option Recommendations.

The second phase highlighted the eagerness of the community to see change enacted on Palm Island as well as the importance of community and cultural development. Engaged community members were supportive of the options and were interested in seeing increased economic activity on the island combined with environmental care initiatives.

Phase 2 was conducted from 2nd of September 2019 to 3rd of February 2020. The second island visit was conducted on the 5th, 6th and 7th of November 2019.

Refer to Technical Appendix: Options Report for the options longlist methodology, full options long list and gateway results.

Phase 3
Whichway now?
(Project Options)

Following *Dreaming Big*, the *Whichway Now?* phase of engagement aimed to further narrow down the list of ideas to develop detailed project option for each. The most important ideas were identified based on discussed community needs and preferences, project objectives and feasibility for implementation on Palm island.

The community were engaged through the relationships previously established. Relationships and community confidence was still being developed and this third visit contributed to further consolidate links between the project team and the community. Two community drop-in sessions were held at the Mall and Men's Shed, involving over 120 individuals.

The level of individual engagement and input on the project from community members was highly variable, but the drop-in sessions provided a space for discussion about the project and established a presence within the community.

Informed by the detailed information and data generated through the two previous phases, final project options were developed for 17 distinct projects on Palm Island. These final project options identify how options can be implemented in an impactful and sustainable manner, the different benefits each provides to community as well as how each project may be funded. The final project options also provide an estimate of costs, potential carbon emissions reductions as well as local employment opportunities. Where appropriate, the potential for cultural and community development is also highlighted.

Phase 3 was conducted from 3rd of February 2020 to 27th of April 2020. The third island visit was conducted on the 2nd, 3rd and 4th of March 2020.

Refer to the Final Project Options Summary section of this report for a list of the final project options and Appendix 1: Final Project Options for the full final project options.

Handing the knowledge and findings back to the community

The fourth and final project phase focused on handing the project knowledge and findings back to the community, PIASC and local stakeholders in a targeted and appropriate manner aligned with the RES Moon-da-gatta Yarning Framework. This phase sits outside the RES Moon-da-gatta Yarning Framework, as it represents the end of this project and the passing on of the knowledge and results for future work. It is recommended that the continuing work resulting from this process follow the RES yarning framework.

Appropriate and effective transference of knowledge was a key consideration throughout this project and is of particular importance at this point in order to ensure project success. This process involved socialising the project outcomes and distributing the findings to the engaged stakeholders.

This phase was initially planned to be conducted on-island in the form of a physical handover through presentations and a launch event. However, due to the COVID-19 health requirements and travel restrictions a different approach was required. The established community and stakeholder network was harnessed to distribute the project deliverables throughout the Palm Island community. Council, community members, and key stakeholders were engaged in this final phase in order to ensure dissemination of the project outcomes and empower local stakeholders to progress the final project options to fruition.

This handover was conducted throughout December 2020 and January 2021.

Palm Island Background

This section presents background information about Palm Island and its community which helps contextualise the project and its outcomes.

Location

Palm Island, sometimes referred to as Great Palm Island or the traditional name Bwgcolman, is situated 60km north-east off the coast of Townsville in the Great Barrier Reef World Heritage Area and the Great Barrier Reef Marine Park[1].

The island group is made up of ten islands and covers a total area of 70.9km^2. Great Palm Island forms a large majority of the total area, covering 55km^2. At its highest point, Palm Island reaches 548m in altitude at Mount Bentley[1]. The island is located in the north-eastern region of the dry tropics characterised by Townsville and other lower rainfall pockets between Ingham and the Whitsundays. Palm Island's location and key infrastructure is presented in Figure 3. Almost all settlements are concentrated in the western portion of Palm Island, the rest of the island is mainly uninhabited and undeveloped.

Environment

Palm Island harbors multiple vegetation types. A large portion of the island is occupied by eucalyptus, melaleuca forests and woodlands with a small area of grasslands. Small areas of mesophyll, notophyll and palm-leaf forests are found on the island as well as larger areas of notophyll and microphyll thickets. Other habitats include estuarine such as mangroves and related tree species, as well as a salt flats and saltmarshes[2].

In terms of topography, the island is relatively mountainous, with few low-lying areas[2]. There are risks of flooding during severe weather events in these areas, which are typically more densely inhabited. These are situated in Coolgaree Bay, Butler bay (airport) as well as areas in the town center.

Palm Island is located in the North Queensland Dry Tropics Regional NRM body, but in the Wet Tropics Bioregion and in the Herbert Biogeographic sub-region. Palm Island experiences a humid and high-temperature climate with rainfall concentrated in the summer months. The island is subject to tropical cyclones and heavy rains between October-April each year. The average annual rainfall on the island is 1056mm, daytime average temperatures vary between 22 and 27 degrees for most of the year and the prevailing winds are north easterly during summer and south easterly during winter[3].

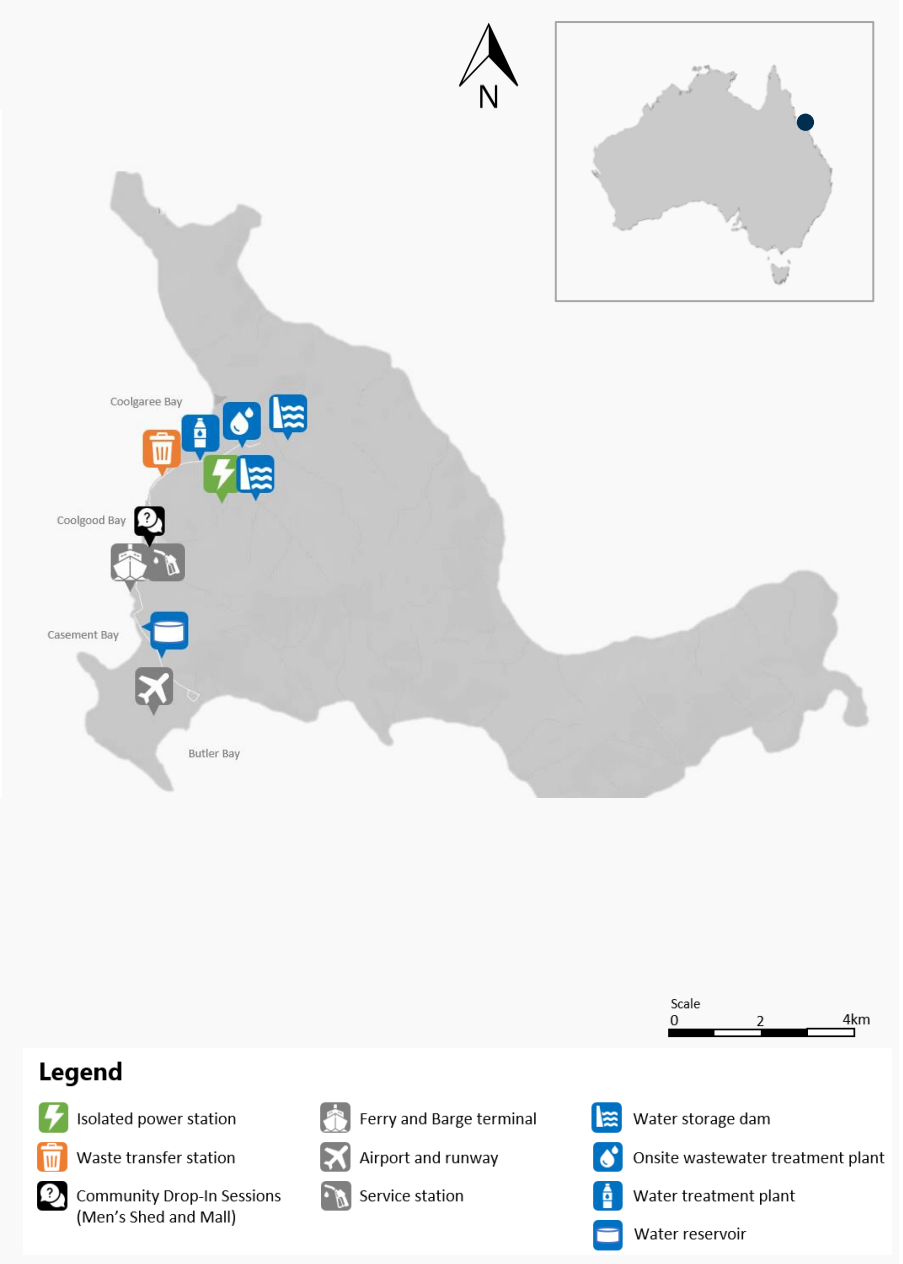


Figure 3: Palm Island Location and Key Infrastructure

Climate

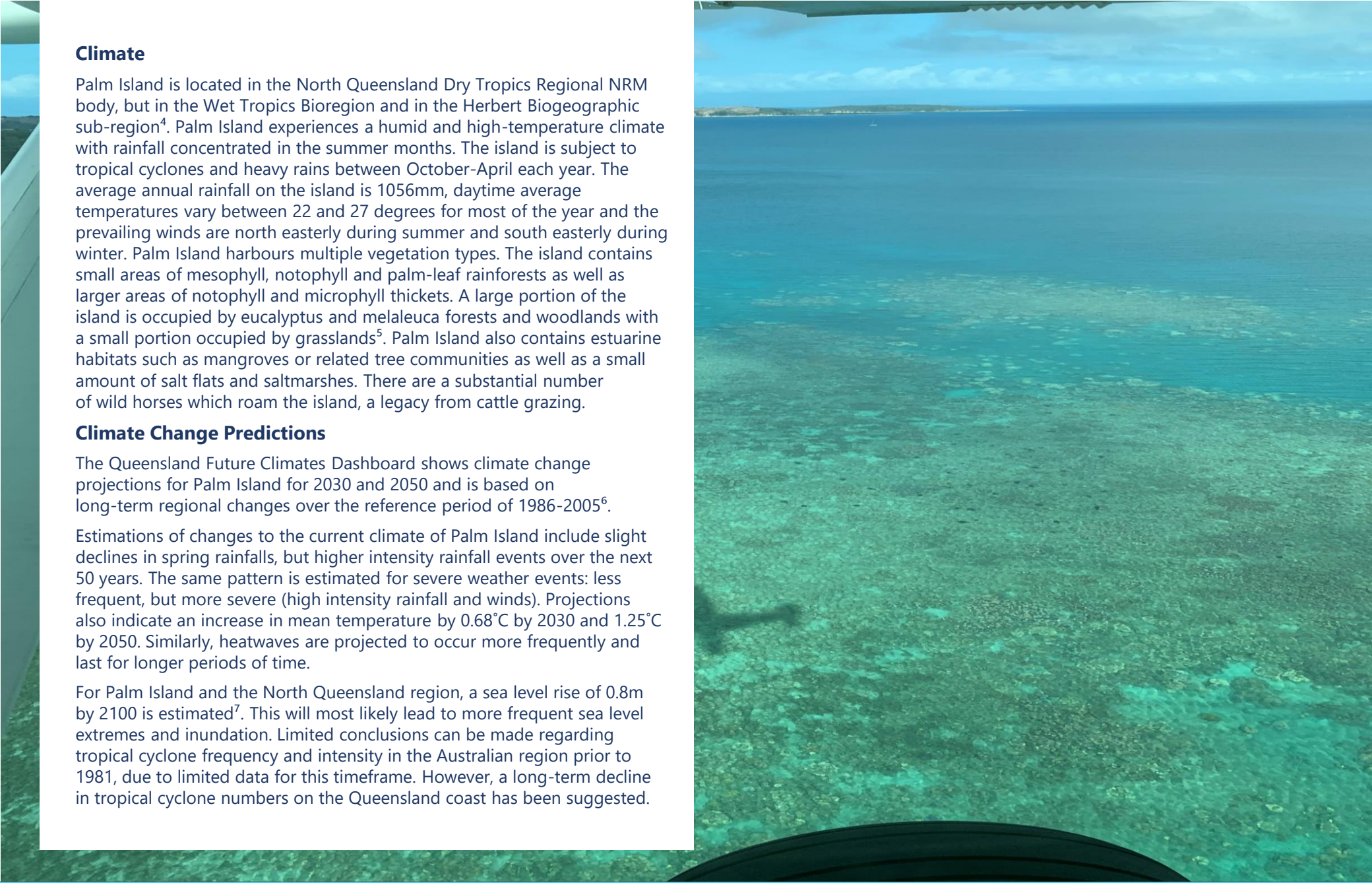
Palm Island is located in the North Queensland Dry Tropics Regional NRM body, but in the Wet Tropics Bioregion and in the Herbert Biogeographic sub-region[4]. Palm Island experiences a humid and high-temperature climate with rainfall concentrated in the summer months. The island is subject to tropical cyclones and heavy rains between October-April each year. The average annual rainfall on the island is 1056mm, daytime average temperatures vary between 22 and 27 degrees for most of the year and the prevailing winds are north easterly during summer and south easterly during winter. Palm Island harbours multiple vegetation types. The island contains small areas of mesophyll, notophyll and palm-leaf rainforests as well as larger areas of notophyll and microphyll thickets. A large portion of the island is occupied by eucalyptus and melaleuca forests and woodlands with a small portion occupied by grasslands[5]. Palm Island also contains estuarine habitats such as mangroves or related tree communities as well as a small amount of salt flats and saltmarshes. There are a substantial number of wild horses which roam the island, a legacy from cattle grazing.

Climate Change Predictions

The Queensland Future Climates Dashboard shows climate change projections for Palm Island for 2030 and 2050 and is based on long-term regional changes over the reference period of 1986-2005[6].

Estimations of changes to the current climate of Palm Island include slight declines in spring rainfalls, but higher intensity rainfall events over the next 50 years. The same pattern is estimated for severe weather events: less frequent, but more severe (high intensity rainfall and winds). Projections also indicate an increase in mean temperature by 0.68˚C by 2030 and 1.25˚C by 2050. Similarly, heatwaves are projected to occur more frequently and last for longer periods of time.

For Palm Island and the North Queensland region, a sea level rise of 0.8m by 2100 is estimated[7]. This will most likely lead to more frequent sea level extremes and inundation. Limited conclusions can be made regarding tropical cyclone frequency and intensity in the Australian region prior to 1981, due to limited data for this timeframe. However, a long-term decline in tropical cyclone numbers on the Queensland coast has been suggested.



Traditional Owners and those with Historical Association

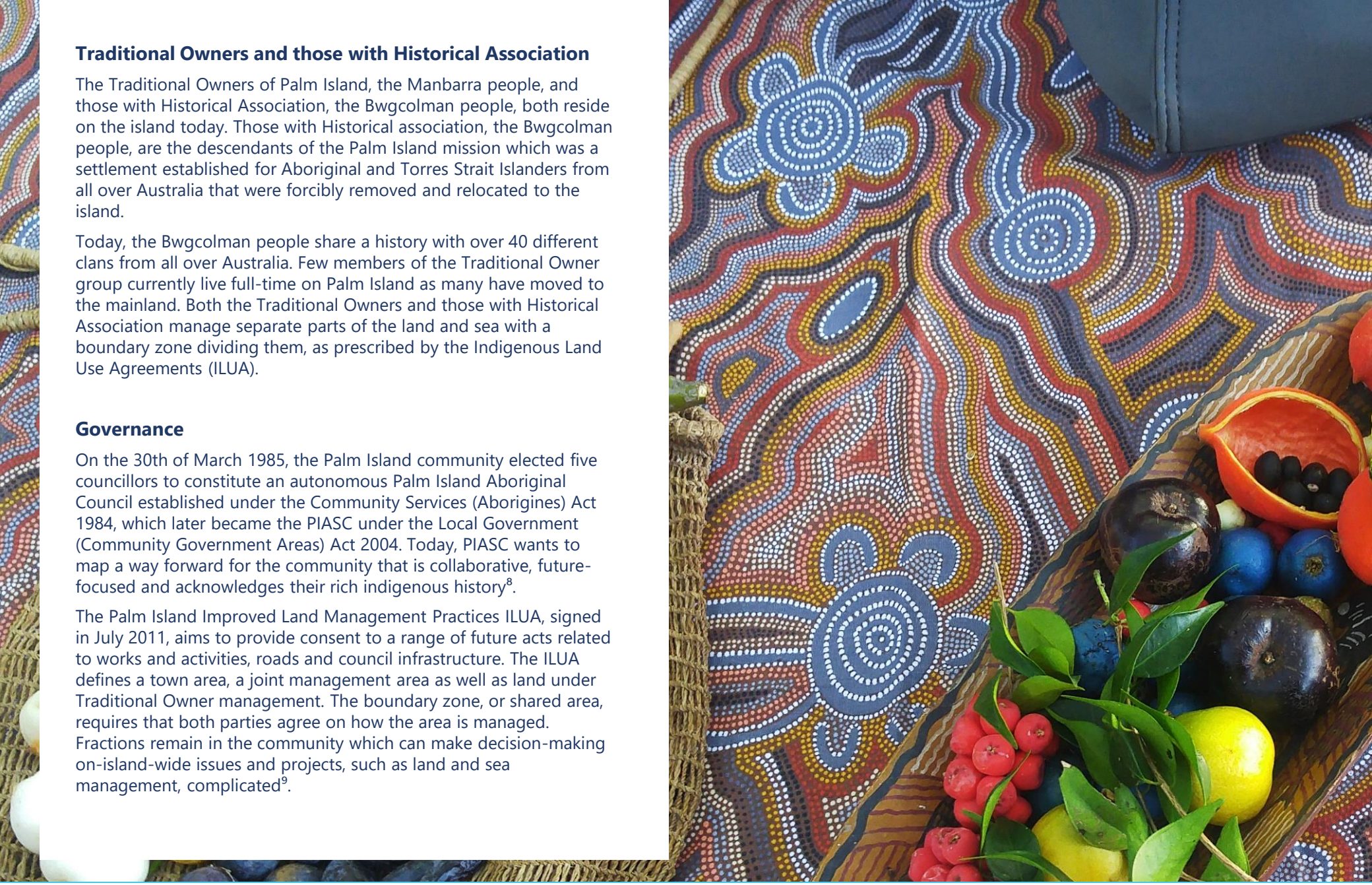
The Traditional Owners of Palm Island, the Manbarra people, and those with Historical Association, the Bwgcolman people, both reside on the island today. Those with Historical association, the Bwgcolman people, are the descendants of the Palm Island mission which was a settlement established for Aboriginal and Torres Strait Islanders from all over Australia that were forcibly removed and relocated to the island.

Today, the Bwgcolman people share a history with over 40 different clans from all over Australia. Few members of the Traditional Owner group currently live full-time on Palm Island as many have moved to the mainland. Both the Traditional Owners and those with Historical Association manage separate parts of the land and sea with a boundary zone dividing them, as prescribed by the Indigenous Land Use Agreements (ILUA).

Governance

On the 30th of March 1985, the Palm Island community elected five councillors to constitute an autonomous Palm Island Aboriginal Council established under the Community Services (Aborigines) Act 1984, which later became the PIASC under the Local Government (Community Government Areas) Act 2004. Today, PIASC wants to map a way forward for the community that is collaborative, future-focused and acknowledges their rich indigenous history[8].

The Palm Island Improved Land Management Practices ILUA, signed in July 2011, aims to provide consent to a range of future acts related to works and activities, roads and council infrastructure. The ILUA defines a town area, a joint management area as well as land under Traditional Owner management. The boundary zone, or shared area, requires that both parties agree on how the area is managed. Fractions remain in the community which can make decision-making on-island-wide issues and projects, such as land and sea management, complicated[9].



Socio-economic Profile

The ABS reports that the Palm Island community is one of the most disadvantaged areas in Australia based on its Index of Relative Socio-Economic advantage and disadvantage access based on material and social resources, and ability to participate in society[10]. Of the estimated 4,000 residents on Palm Island, the ABS estimate that 29.6% are unemployed, though many sources estimate this number to be over 50%. Comparatively, national unemployment averages 7.6%[11].

Most of the workforce is employed by government funded programs and services, as there are very few local businesses. Employers include primary education, hospitals, other allied health services and police services[11]. There are 11 businesses currently operating on Palm Island which include the shops, gas station, and restaurants[12].

Housing

The majority of homes on Palm Island are public housing (91.7%) that are rented out to the community with the remaining portion of houses being for government and other workers[13]. High demand for housing and limited space for new developments on the island promotes overcrowding which is a substantial issue with an average household size of 8 persons per dwelling[1]. During island visits, it was suggested this number can reach 14 persons per household.

Furthermore, access to housing is an issue, with some residents reporting waiting over 20 years for public housing. Based on community testimony, there are currently 400 people on the waiting list for public housing. The DATSIP Masterplan has flagged potential areas for new housing developments.

Additionally, it has been reported that there are up to 120 family camps scattered around the island and the coast. Some of these are occupied full-time by families who cannot or decide not to access government-provided housing. These are typically self-constructed structures or camps that families will occupy during holidays.

Tourism

Palm Island boasts incredibly beautiful landscapes, a network of walking trails, bush tucker, pristine waters as well as a deep and diverse cultural heritage. Tourism development on the island presents a unique opportunity to bolster the local economy and a real opportunity for self-led community development if undertaken in an appropriate and culturally sensitive manner. There is currently no official recreational tourism on the island. The only visitors are visiting community members, extended family, friends, governmental workers, and various contractors.

The Palm Island Community and Business Profile is summarised in Figure 4.

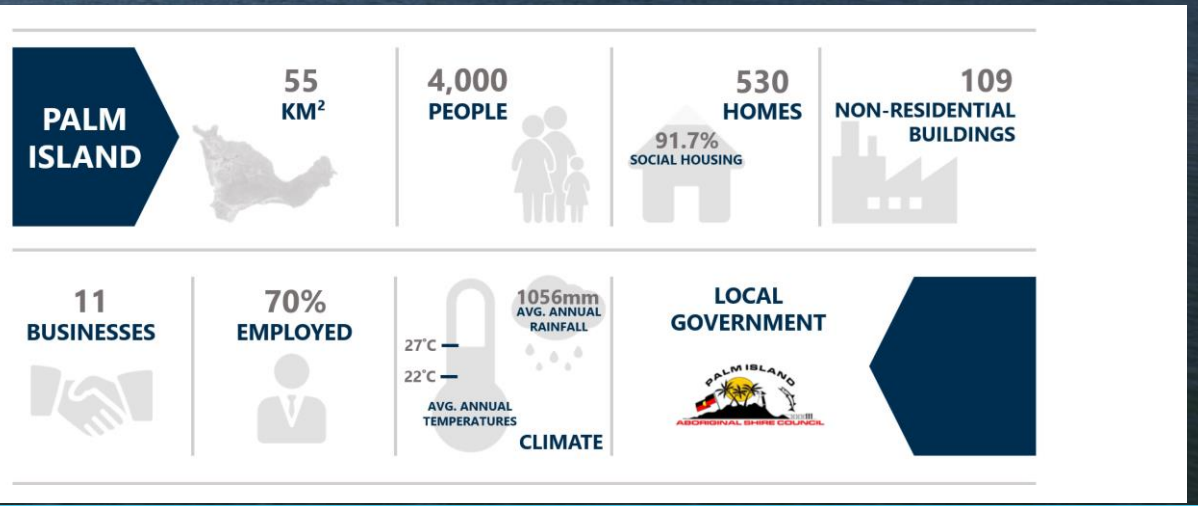
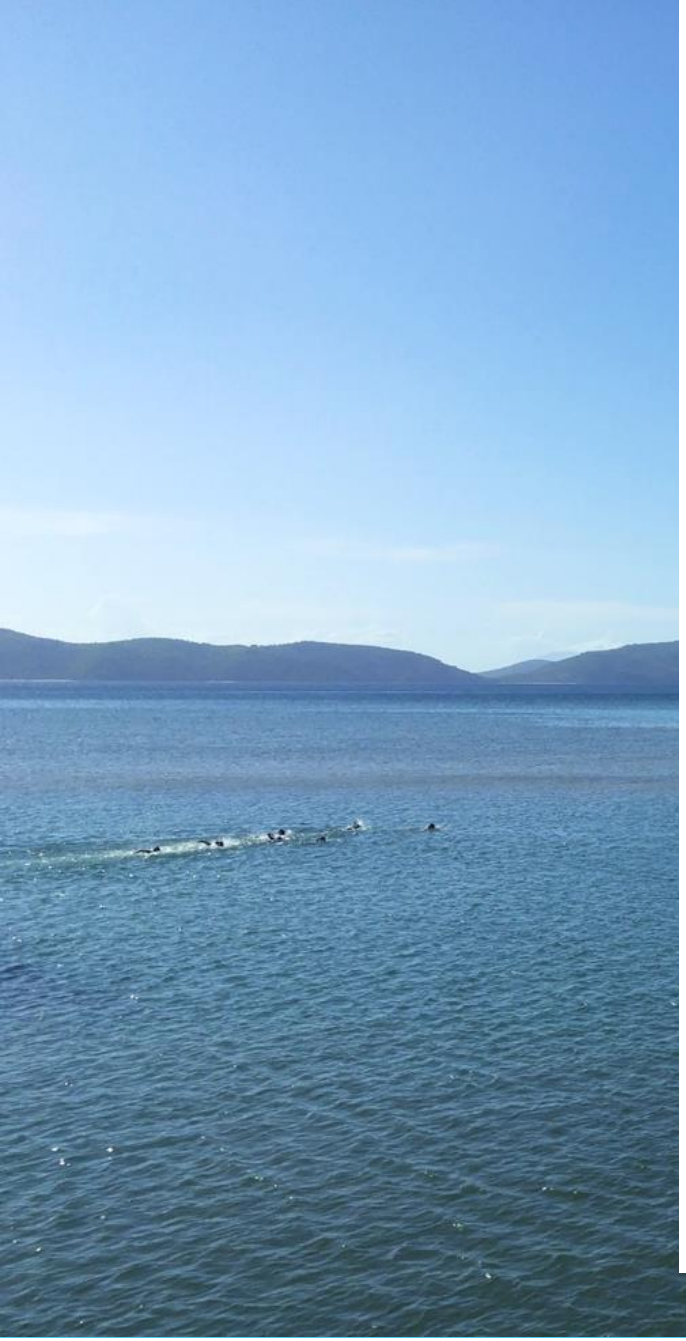


Figure 4: Palm Island Community and Business Profile



Furthermore, the Museum of Underwater Art was projected to open an installation just off the shores of Palm Island in late 2020 or early 2021. This is forecast to create a potential 5,000 annual visitors to Palm Island (low estimate of 2,500 and high estimate of 10,000)[14]. Increases in visitation could provide new job and upskilling opportunities but maintaining of community well-being must be considered in all developments.

Despite council and widespread community support for tourism development, it remains unclear to what degree different groups in the community fully understand and desire tourism, including its benefits and impacts. Previous efforts by the council to develop this industry have not been successful. Furthermore, during community consultations, it was raised that tourism has a loaded past on Palm Island and has not always been positive for the Palm Island community as it was exploitative of residents and culture.

Thus, the development of the tourism industry requires careful consideration and a well thought out approach ensuring community well-being as well as full community ownership throughout the process.

There is also a dire need to develop properly managed tourism products, services as well as the capacity to host overnight visitors. Currently, the Palm Island Motel is the only tourism appropriate lodging option on the island and has approximately 20 rooms. The motel is not currently open on the weekends and is often fully-booked hosting workers who fly in on a weekly basis.

Health

Sadly, as a consequence of past government policies, intergenerational trauma manifests in various ways for individuals and their families. High levels of drug and alcohol along with other health issues impacting the community include diabetes and kidney failure related illnesses. The Palm Island Health Action Plan 2018-2028 identifies the inequality in health status and highlights the need for the Palm Island community to have access to health services that are equal in standard to those used by the wider Australian population[15].

The Palm Island community are serviced by a public hospital and a medical centre which is part of the Townsville Health District. The Palm Island Health Action Plan 2018-2028, in which a new primary health care centre is proposed, states that this facility will include general practice consultations, family health, chronic disease treatment, dental, hearing, and mental health among many other practices[15].

There is currently a low-care aged care service on the island which is planned to be delivered as a high-care service upon approval as part of the Action Plan.

Among many other initiatives, the Plan aims to visually display education materials about risk factors and chronic conditions. Wellness Wednesdays are held in the local mall through community liaison health care which focuses on chronic disease, health and wellness. Other health services currently working with the community include the Flying Doctor Service and Queensland Rescue Service helicopter which operate on an as needed basis[15].

Listening To Hear

Sustainability Assessment Report Findings

The Sustainability Assessment studied the Palm Island community through the lens of five key areas: energy, wastewater, transport, and resilience. This enabled the project team to develop an emissions profile for the community, conduct a community-wide risk assessment, as well as lay a solid foundation for the development of the project options.

The Sustainability Assessment findings are presented in the following pages of this report. For the full Sustainability Assessment, please refer to the Technical Appendix: Sustainability Assessment and Risk Assessment.

Total Carbon Emissions

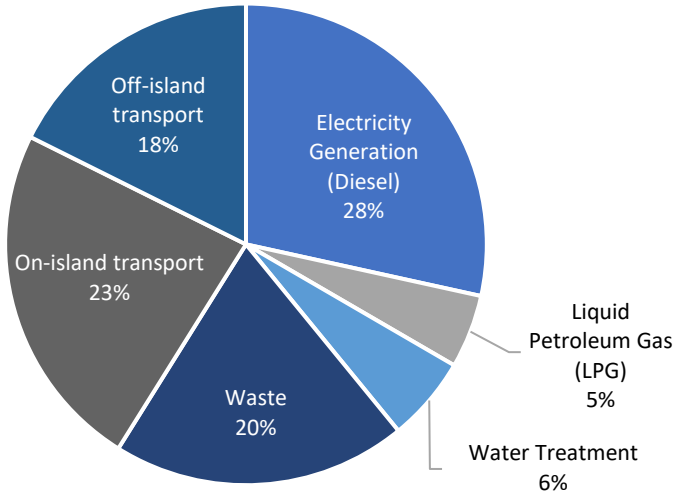
Total carbon emissions for Palm Island were calculated at **6,530t CO2-e per annum** (for an average year)[16]. The emissions related to each emission category closely align with the island's energy profile.

Electricity generation by Ergon Energy's isolated network is the single largest producer of emissions for the community (Figure 5). The carbon emissions are directly linked to the use of diesel to power the generators, which is considered an emissions intensive process. This accounts for 28% of community emissions.

The second biggest emitter is on-island transport (23%). This includes all vehicles, personal and commercial as well as machinery (diesel and Opal fuel).

Waste sent to landfill (20%), off-island transport (marine and air) (18%) followed by water treatment (6%) and LPG (5%) make-up the remaining emission categories.

Figure 5: Carbon emissions profile of Palm Island[16]



Island Energy Profile

The energy profile for the Palm Island community was estimated at **73,447GJ** per annum or **18.3GJ** per capita per year (for an average year)[16]. The energy profile represents the sum of all energy consumed on the island as well as transport to and from the island (Figure 6).

Electricity generated by the Ergon Energy plant, which uses diesel generators, makes up 36% of the island's annual energy profile. Almost all electrical energy consumed on Palm Island comes from the plant's diesel generators.

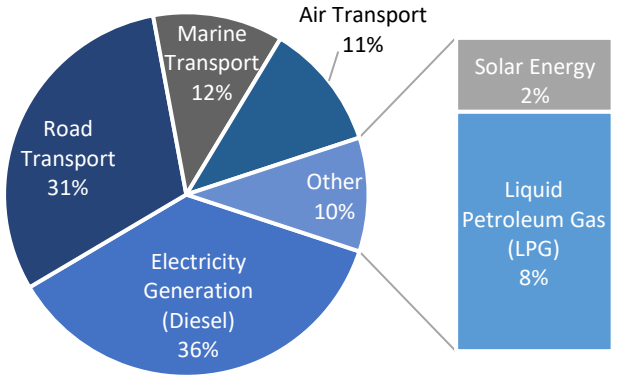
The next most significant emissions source is road transport, which includes diesel and Opal fuel consumed by various vehicles (cars, trucks and machinery).

Air transport includes the flights between Townsville and Palm Island and represent 11% of island emissions. Marine transport includes both the ferry and the barge services. Combined, they account for 12% of emissions.

LPG is used on Palm Island for cooking as many homes have gas stoves, accounting for 8% of energy usage on the island.

Finally, solar power is estimated to represent up to 2% of the island's energy profile. The actual percentage is most likely lower due to some systems not currently operating properly.

Figure 6: Energy profile of Palm Island[16]



Energy

Electrical energy is produced on-island by Ergon Energy at the 3.56MW diesel generation isolated power station. This plant was upgraded in 2017 to meet increased demand and increase the potential renewable energy penetration into the grid (up to 20% of total or 712kW. Currently under 4.5%).

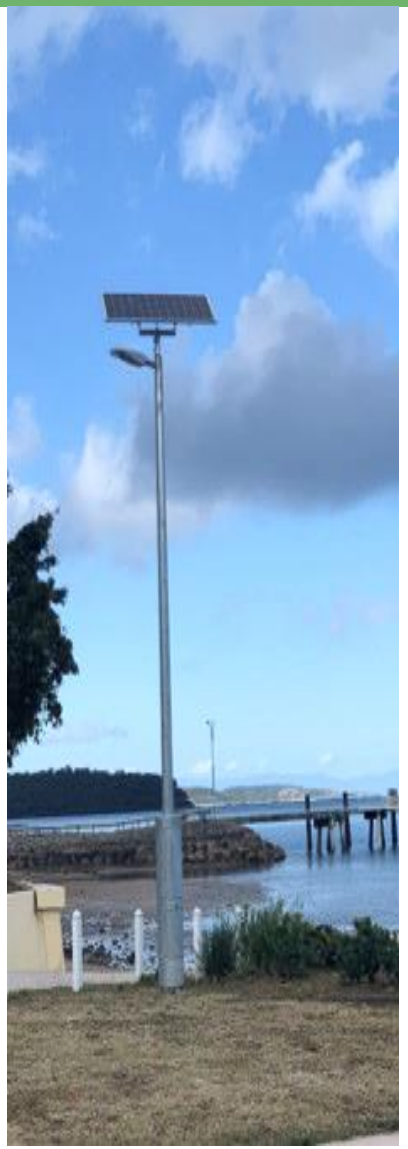
Total annual electricity consumption for Palm Island is 26,766GJ which corresponds to approximately 0.01% of Queensland's total electricity consumption[16].

A 2018 PIASC audit found there are nine solar PV installations on the island (162.2kW) corresponding to an average maximum potential of 1,754GJ of energy production per year. Half of these systems were not connected or functional at the time of this project. Current grid maximal renewable energy penetration allows for substantially more solar to be developed on Palm Island.

Consistent access to affordable energy has been identified as a critical issue limiting community development as well as a health issue, cooling being essential in the tropical environment.

What was said:

Energy plays a central role in the community's livelihoods, as it is used for water treatment and distribution, to power homes, air conditioning and many other purposes. The high cost of energy has been identified as a key issue and an obstacle to community economic development.



The average household on Palm Island uses more energy than the average Queensland household (Figure 7)[17]. Palm Island's per capita residential energy consumption is low when considering the average household size on the island, which is over three times higher than the state average[11]. When household size is considered, the Queensland annual consumption per person is 2.4 times higher than the average Palm Islander individual consumption.

All DPHW homes are equipped with solar hot water systems. These have been found to often be insufficient for the needs of the residents.

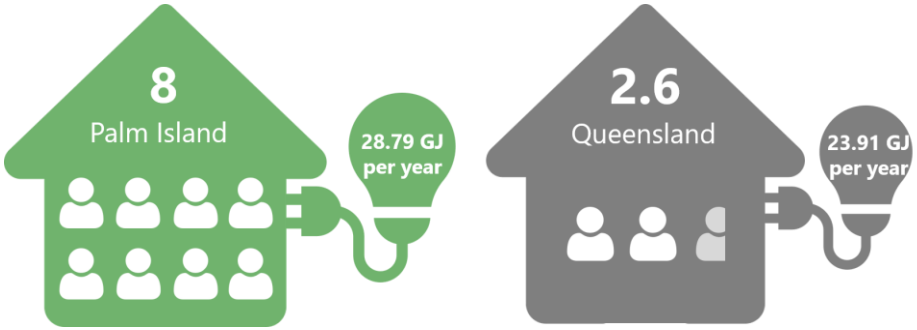


Figure 7: Annual electricity consumption for an average Palm Island household compared with an average Queensland household

Energy

Fluctuation of grid energy consumption peaks during February and March, potentially due to increased air conditioning needs during these hotter months (Figure 8). The average daily energy demand is 828.51kW[16].

Residential consumption makes up the highest proportion of the energy consumed on-island (Figure 9)[16]. Non-residential consumption includes council offices, schools, hospital, community organisations and council infrastructure, such as the water and wastewater treatment plants.

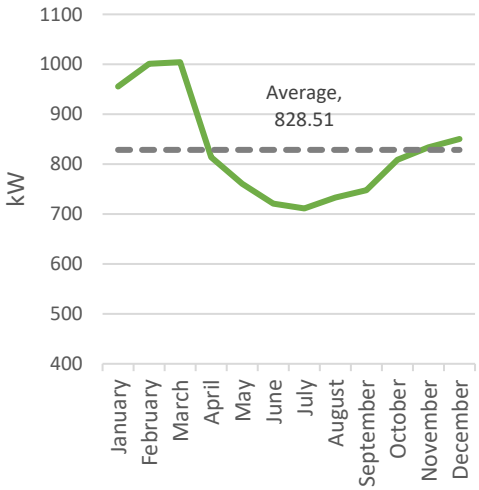


Figure 8: Average daily energy demand per month (Ergon Energy, 2017)

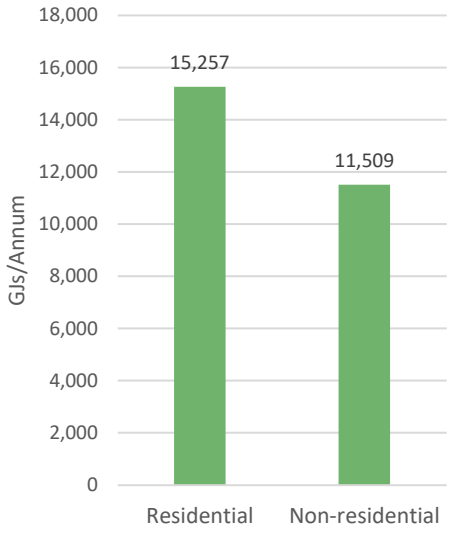


Figure 9: Electricity consumption for residential buildings compared with non-residential buildings (Ergon Energy, 2019)

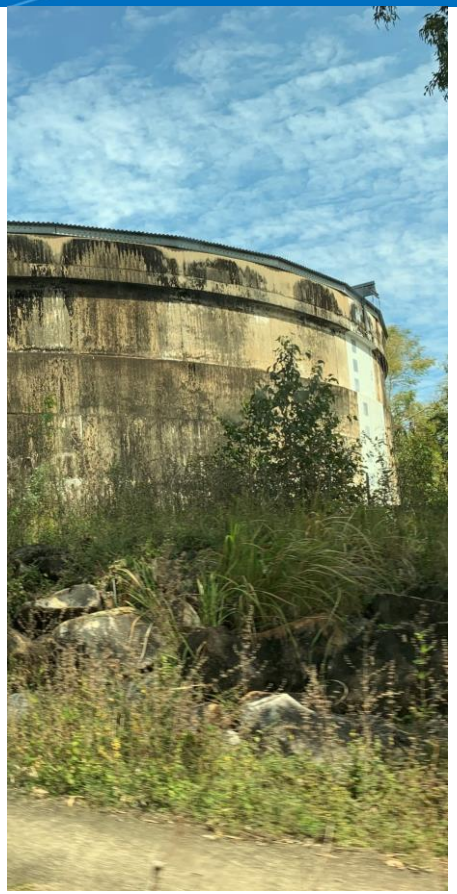
Key findings

- **Energy generation:** Energy is produced by an Ergon Energy 3.56MW isolated diesel generator power station. There are also 162.2kW of solar PV installations on Palm Island, but only half of these are functional.
- **Solar PV:** There have been significant investments in solar energy infrastructure across the island on council and government buildings, but many of these assets are not being used due to damage or connectivity issues. Solutions are currently being investigated by PIASC.
- **Power Cards:** Community members pay for energy with a power card on a "pay-as-you-use" basis.
- **Cost of energy:** The cost of energy is a burden for the community, even though Community Service Obligation (CSO) ensures similar pricing as rest of state, as average wages on the island are lower than the rest of the state. Different community organisations provide power cards to people in need, but residents can often be left without energy.
- **Solar hot water:** Almost all homes (over 500) are equipped with solar hot water systems. The hot water supply has been identified as insufficient for the community, potentially due to aging systems, excessive shade and/or their insufficient size.
- **Energy consumption:** Overcrowding in homes contributes to an increase in per-household energy usage compared to the state average.
- **Building types and design:** Most homes have limited or lack of insulation, natural lighting, shading and air circulation, and other energy efficiency considerations. This jeopardises the comfort of the residents and contributes to high energy costs.

Water

Water supply and quality has been an issue on Palm Island for many years. This has been linked to different causes including limited resources, a dated and damaged reticulation system as well as high demand on the water treatment infrastructure which is typical for tropical non-urban communities. In 2017, a new water treatment plant was installed to address the issue of poor water quality[18]; however, poor water quality continues to impact the community. There is currently a major water infrastructure project underway to address this. The possibility of adding a desalination plant to Palm was investigated in 2016 to provide a temporary solution to water supply shortages[19]. The option was not implemented, as the drought subsided, and the dams were replenished.

There are presently no water management or monitoring systems in place or restriction measures for periods of water shortage. Furthermore, Palm Island residents do not pay for water, the cost is absorbed by council.



Palm Island households use approximately 2830L* per day[16] compared with the Queensland average of 556L per day[20] (Figure 10).

Non-urban, remote and isolated Indigenous communities typically have a high per capita water consumption. This combined with the large household size greatly contributes to Palm Island's high household water consumption figures.

All houses on Palm Island are connected to the council wastewater treatment plant. The plant operates by aeration and chemical dosage with a 9,000kL capacity. Sludge is stored onsite as there is currently no removal from the island and the liquid effluent is disposed of at a licensed discharge point, which drains out to sea from Francis Creek.

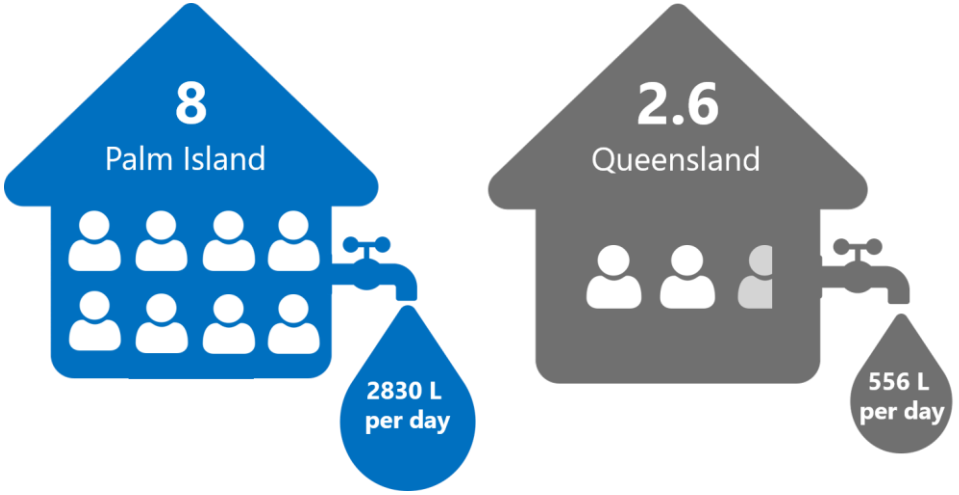


Figure 10: Average annual water consumption for an average Palm Island household compared with an average Queensland household

What was said: *Access to clean potable water as well as sufficient reserves are the most important issues for the Palm Island community.*

* This includes residential and non-residential water usage such as visitors, council, and commercial usage, as no portioned water usage is measured on Palm Island.

Water

Three reservoirs contain the community's reserves of potable water which is supplied from the water treatment plant. These are located on Kalkadoon Road and two smaller reservoirs in Butler Bay. When full, the reservoirs hold three days supply of water at current demand levels.

The water treatment plant is reportedly running at 100% capacity currently, which just covers community demand. The pumps from the water station are used to provide pressure to the mains, as the main water tank is only used when needed and requires a reversing of flow. This has been linked to water quality issues, as it can dislodge sediment in the mains piping.

Average daily water demand is **1.5ML** with peak reaching 2.5ML per day

=

375L per person per day reaching 625L at peak

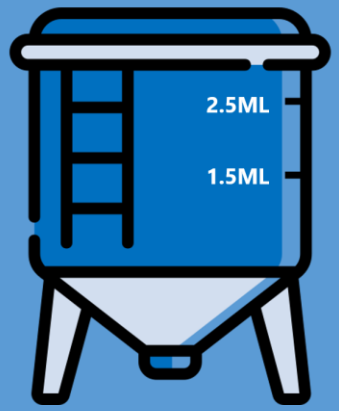


Figure 11: Maximum daily water demand and average daily per person* water demand for Palm Island for an average year[16]

* This includes residential and non-residential water usage such as visitors, council, and commercial usage, as no portioned water usage is measured on Palm Island.

Key findings

- **Water supply:** Water for the community comes from two dams (Solomon and Francis Creek) and stored in tanks which provide 3 days of reserves. This has been identified as a key risk for the community.
- **Water quality:** The island has been experiencing significant water quality issues for years (discoloration and sediment) accompanied by water boiling alerts. This has forced many Islanders to boil water, use filters or purchase bottled water at great expense.
- **Wastewater treatment:** The existing wastewater treatment plant is nearing capacity (5,000 people). Wastewater biosolids are a potential contamination issue as they are currently disposed of on-island and are accumulating.
- **Water usage and efficiency:** The community is supplied with treated water free of charge without the use of water meters. Water is also used to cool yards and buildings. Bottled water is used extensively throughout the island, often associated with affluence.
- **Communications and education:** Based on community testimony, there is a lack of communication and education around water quality, usage and efficiency measures.

Waste

High costs related to off-island transport of waste, faulty equipment and limited council resources have created a complex and unsustainable waste management situation for the Palm Island community.

General waste is collected five days a week in the community and is transported to the waste transfer station. From here, all general waste is barged to Lucinda and then sent to landfill in Hinchinbrook Shire. On an annual basis, the Palm Island community produces an estimated 3,477m^3 of waste, 91% of it being residential waste (Figure 12)[16].

What was said:

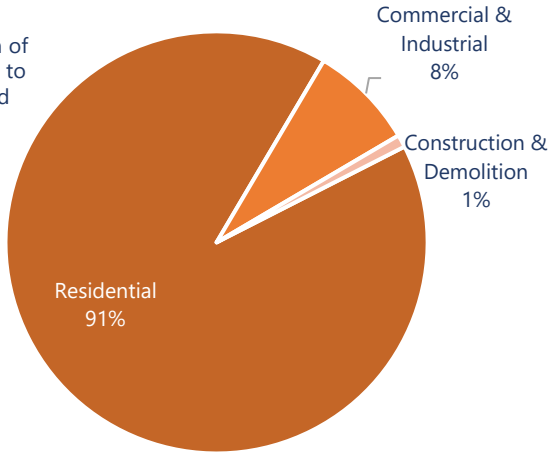
Community have stated waste management as one of the most important issues for Palm Island, specifically plastic pollution across the island as well as the lack of recycling services.

Many of the community's waste management issues reportedly stem from the insufficient waste transfer station, which is not properly gated, is unstaffed and lacking a functioning waste compactor. This results in waste being disposed at the transfer station site and at the old landfill in a disorganised manner, causing environmental contamination.

White goods, electronics, oil, car bodies and other large items are stored and are accumulating at the transfer station. PIASC receives some funding for metal waste removal, however, this funding is reportedly not sufficient and does not include the removal of larger items such as car waste off the island. General waste is loaded into skips for transport to the mainland to be sent to landfill. Current waste management is unsustainable, expensive and an inefficient activity for the community. Council have repeatedly applied for funding to resolve these issues but has so far been unsuccessful.

There is no council-run recycling initiative on the island, though there is a container collection initiative run by the pub and community material re-use. Consequently, all waste is comingled and collected in a single wheelie bin. There were recycling and container collection initiatives run by the previous CDP, though these initiatives fell through when the contractor changed in early 2019 and have not been reinstated since.

Figure 12: Breakdown of waste types disposed to landfill for Palm Island



Waste

As illustrated below, average Queensland residents produce more than twice as much waste than residents on Palm Island (Figure 13)[16]. The difference in waste per capita production between Palm Island and Queensland aligns with the existing correlation between socioeconomic profile and waste production, where lower socioeconomic communities typically produce less waste than higher socioeconomic regions. This difference is also exacerbated by the remoteness of the community, topography, size of the system and low population density, likely making the supply of goods more expensive and therefore less accessible.

Figure 13: Residential waste disposed to landfill per person per average year for Palm Island compared with the Queensland average[16]

Key findings

- **Waste management:** Waste management is expensive for PIASC, specifically due to the lack of a functional waste compactor resulting in uncompacted waste being barged off the island. Council is currently billed by volume by the barge company.
- **Green waste:** Green waste is reportedly incinerated at the waste transfer station on-island.
- **Waste transport:** All general waste is barged to the mainland five days a week to be sent to landfill (Hinchinbrook Shire Council).
- **Waste transfer station:** The available space at the waste transfer station is limited, restricting the capacity to stockpile and effectively manage waste streams. Lack of security on the premises results in disorganised and illegal disposal, increasing costs for the council.
- **White goods**: White goods are stockpiled at the waste transfer site. Refrigeration units' (air conditioners and fridges) gases are not appropriately treated, resulting in significant environmental contamination risks.
- **Existing actions to reduce waste**: There is currently no recycling occurring on Palm Island though community reuse many different materials such as pallets, wood, pipes, etc. There is a small-scale container collection and refund scheme being run by the local pub.

Transport

Palm Island is located 65km Northeast of Townsville and 35km Southeast of Lucinda. It is well serviced in terms of transport options and is accessible via barge, ferry and small plane.

On-island most people walk and those who have access to a car drive or rideshare (Figure 15)[11]. Some residents are transported by service providers and employers to and from work and appointments.

There are few bikes on the island and some residents reportedly use horses as a means of transport. There is no public transportation system on Palm Island, however, there is a private shuttle mini-bus business which operates like a taxi. The limited transport options result in community connectivity restrictions as the different suburbs are located up to 4km from the town centre, on difficult and steep terrain as well as connected by deteriorating roads with limited lighting.

What was said:

Transport and accessibility are important issues for community on Palm Island, especially for the elderly and mobility impaired. Pedestrian safety is a concern for residents, due to lack of streetlighting between community hubs, degraded roads, and insufficient pedestrian paths.

There are approximately 337 cars registered on Palm Island owned by approximately 46% of the total population (Figure 14)[11]. The costs associated with operating a vehicle are quite high as Opal petrol and diesel prices average $2.50 per L. Transporting vehicles to the island is also expensive, costing approximately $200 per trip to the mainland according to the community consultation. There is a garage on the island for mechanical maintenance.

Figure 14: Household vehicle ownership on Palm Island (ABS, 2016)

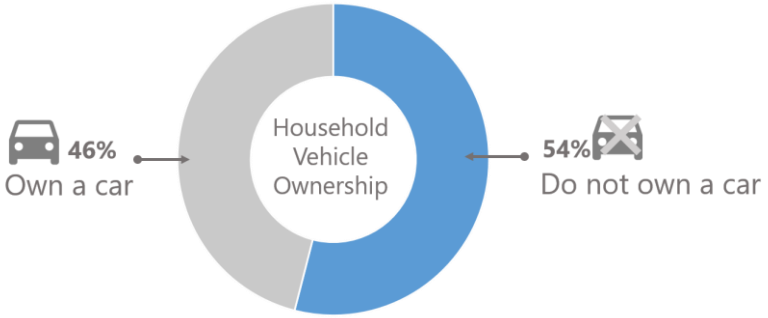
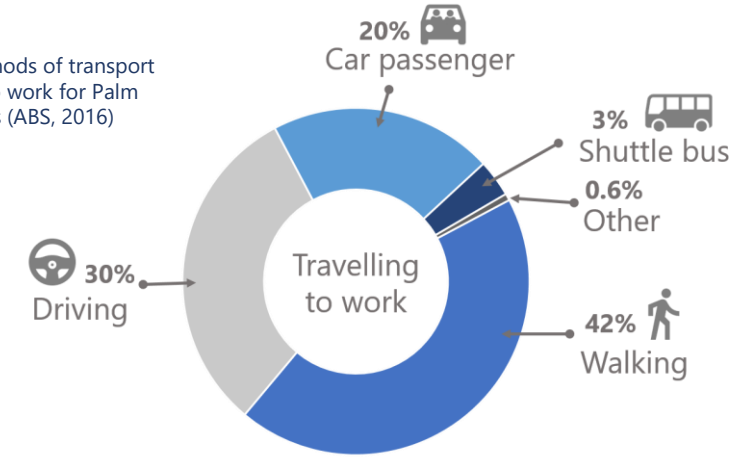


Figure 15: Methods of transport for travelling to work for Palm Island residents (ABS, 2016)



Transport

In terms of off-island transport, Hinterland Aviation operates 57 return trips per week from Monday to Friday between Townsville and Palm Island (Figure 16)[16]. In terms of marine transport, SeaLink operates five return trips per week between Townsville and Palm Island[16].

The Palm Island Barge company runs the main barge service connecting Lucinda to Palm Island, operating 5 return trips per week[16]. SeaSwift transports diesel for the Ergon Energy generators every 6 weeks on average[16].

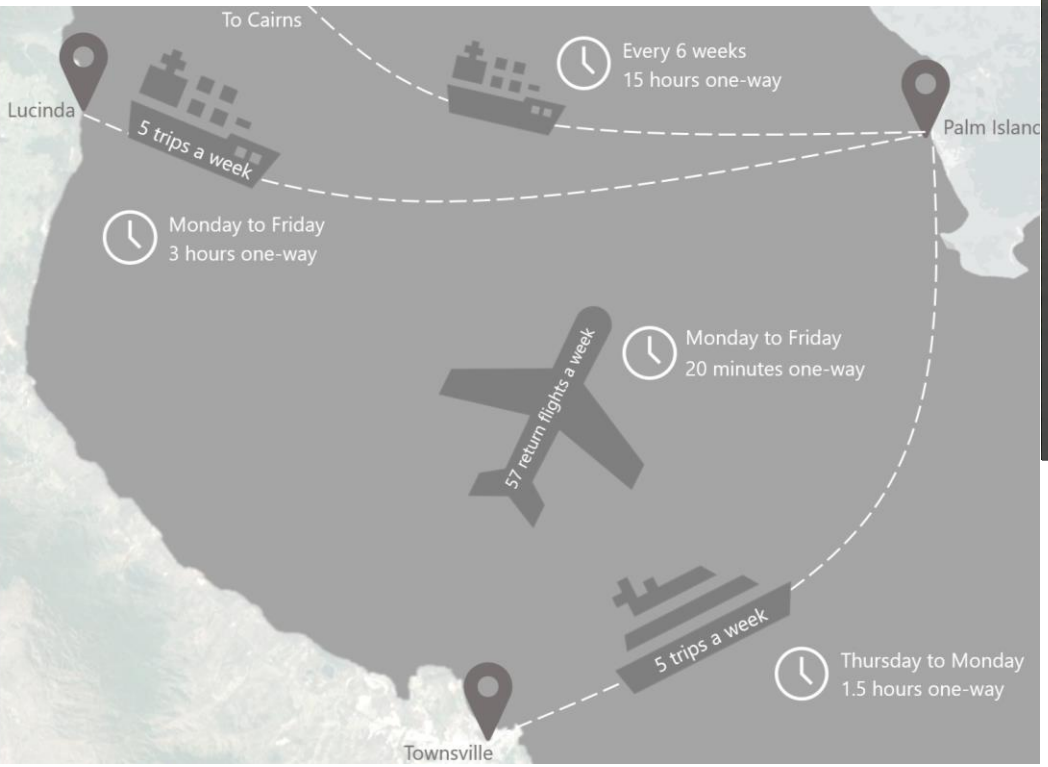


Figure 16: Transport modes for travelling to Palm Island including frequency and travel time

Key findings

- **On-island transportation:** Transportation on the island is mainly achieved by foot, car, bicycle or horse. There are 337 cars registered on Palm Island, equating to approximately 0.6 per household. Cars may be owned by organisations, not only community owned.
- **Public transport:** There is no public transportation system on Palm Island, but there is a private shuttle/taxi service. Organisations such as health services, schools and community groups often have their own vehicles or buses to promote community participation and access to their services.
- **Air transport:** Palm is serviced by 57 return flights to Townsville per week. The bulk of the passengers are estimated to be workers flying in from Townsville to work on the island.
- **Barge:** The community is concerned about the lack of competition in passenger barge services driving up prices. This has been flagged as an important obstacle for economic development across the community.
- **Ferry:** The high cost of ferry tickets as well as the safety of passengers waiting on the jetty are concerns to the community. The jetty is currently being upgraded to increase the safety of travelers.

Resilience

Traditional knowledge and practices relating to a long history of occupying and managing the land bolster the Palm Island community's resilience and self-sufficiency capacities.

Over time, community have adapted to the limited financial resources in the community and found ways to manage. Developed community networks and kinship groups, cultural and traditional knowledge, sharing and support systems as well as some level of capacity to rely on the bush (bush tucker) and the natural environment during periods of need, which underpins the community's resilience capacities.

For Palm Island, resilience and self-sufficiency also hinges on the community's capacity for risk management around the current climate, climate change projections and associated impacts, experienced events, resilience of island infrastructure, community preparedness as well as self-sufficiency.

What was said:

Economic opportunity and upskilling are critical to elevate community's quality of life. Becoming more self-sufficient from the mainland in terms of energy production, food production and access to potable water were identified as key issues for Palm.

From a western governance and climate change perspective, the community on Palm Island is faced with multiple resilience issues. These multiple risks and challenges (energy security, clean water supply, resources, telecommunications, infrastructure, roads, etc.) are considered critical. Limited access to resources, the high relative costs of energy, historic water quality issues, limited access to employment, as well as poorly performing infrastructure are all ongoing issues for Palm Island. Council has very limited resources and the island's utility systems are strained.

Due to the effects of climate change, the current climate of Palm Island is estimated to show light declines in spring rainfalls, but higher intensity rainfall events over the next 50 years[6]. The same pattern is estimated for severe weather events: less frequent, but more severe (higher intensity rainfall and winds) (Figure 17)[6]. This may impact dam levels, which have been known to get extremely low, straining community water reserves. A long-term decline in tropical cyclone numbers on the Queensland coast has been suggested.

Furthermore, for Palm Island and the North Queensland Region, a sea level rise of 0.8m by 2100 is estimated[21]. This will most likely lead to more frequent sea level extremes and inundation in the low-lying areas of the island, which are also the most populated (town centre, Coolgaree Bay and Butler Bay).

Community resilience concerns

- Potable water
- Access to energy
- Infrastructure damage
- Isolation during severe weather events
- Environmental degradation

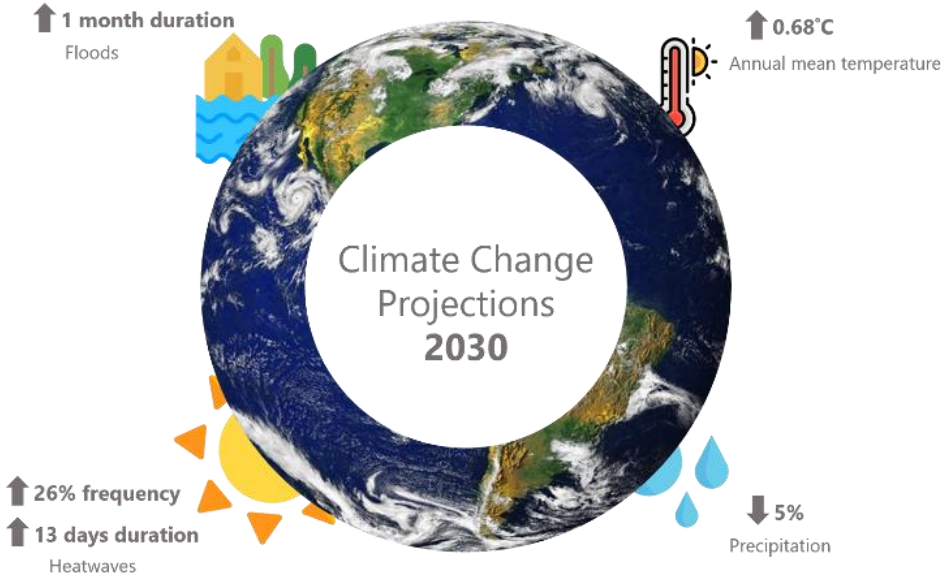


Figure 17: Climate change projections for 2030, Palm Island[6]

Key findings

- **Fossil fuel dependence:** Community resilience and self-sufficiency on Palm Island is closely tied to energy security and fuel supply, due to:
  - Heavy reliance on the diesel-powered barging of goods and supplies from the mainland, as there is no food production on the island. The island can become isolated from the mainland during severe weather events.
  - The community depend on diesel-powered generators provide all electricity and operate the water treatment plant and the pump system for potable water supply.
- **Housing:** The government housing is reportedly not suitable for the average household size of 8 persons per house. There is also a long wait list for housing on the island. Combined with high interior temperatures caused by lack of air-conditioning and ill-adapted housing design, this causes stress on the community's health. It is estimated that 18% of homes were built before 1982 and thus not designed to meet Queensland Government cyclone building standards or have no records demonstrating compliance.
- **Environment:** A range of invasive species such as wild pigs and weeds (Chinese burr) apply pressures on native flora and fauna, significantly impacting the ecosystem on the island[22].
- **Climate change and severe weather events:** Severe weather events have caused damage to coastal areas, such as road damage and sand accumulation. There is currently no cyclone shelter on the island.
- **Community health and housing:** Overcrowding is a key concern for Palm Island community members and has an impact on community health and well-being.
- **Telecommunications:** Telstra is the only cellular/internet provider with coverage on Palm Island. Cellular reception covers approximately 60% of the island and most of the population hubs, though connection is unreliable and can be very slow[23]. Connectivity issues have been identified as an obstacle to community development as well as to timely and effective response in emergency events.
- **Island mode:** The limiting factor in terms of self-sufficiency are the potable water reserves, which is only 3 days. There is also a complete reliance on the barging of supplies from the mainland which may be hindered or slowed during regional emergencies.

Risk Assessment

The risk assessment, carried out alongside the sustainability assessment, provides an overview of Palm Island's climate and environment-related risks. High, severe, and extreme risks which have little to no minimisation or mitigation strategies are identified in the table below. For the full risk assessment, including its methodology, refer to section 8 of Technical Appendix: Sustainability Assessment and Risk Assessment.

Risk Evaluation	Potential Impact(s)	Current Minimisation / Mitigation Strategy Observed
High	Potential increase in diesel/ petrol cost to affect energy price causing financial accessibility issues for on-island stakeholders.	No current mitigating strategies observed
	Operating costs of inefficient and/or outdated equipment causing financial strain.	No current mitigating strategies observed.
	Use of diesel generators as back-up during peak loads, increasing greenhouse gas (GHG) emissions.	No current mitigation strategies observed.
	Insufficient consideration of climate change risks in land use planning and development causing damage to property and infrastructure.	Insufficient consideration of climate change risks in land use planning and development causing damage to property and infrastructure.
	Dependency on ferry company for waste removal, which if Palm Island is cut off from the mainland leads to an issue in the capacity of the current disposal site.	Limited waste storage capacities at transfer station No current mitigating strategies observed.
	Wild animals damaging local ecosystems through manuring and spreading weeds.	Other than the recent horse cull and removal, no other current mitigating strategies observed.
	High costs associated with removing waste off-island as there is no on-island waste treatment facility.	No current mitigating strategies observed.
	Greenhouse gas emissions from waste from the island sent to landfill on the mainland.	No current mitigating strategies observed.
	High reliance on food delivered from the mainland as limited food grown on Palm Island. High cost of food through the state-owned supermarket.	No current mitigating strategies observed.

Table 2: High, Severe and Extreme Risks

Severe	Energy use and costs from inefficient non-functioning equipment including the solar installation on the wastewater treatment plant and council administration building.	No current mitigating strategies were observed to manage the lack of working infrastructure.
	Use of non-renewable fuel consumption in transportation to and from the island contributing to climate change.	SeaLink has increased efficiency of vessels but still a heavy reliance on diesel.
	Potential for ozone depleting substances to release gases harmful to human health (e.g. from fridges, air conditioning equipment etc.).	No current mitigating strategies observed – air conditioning in most houses. Many unmanaged refrigeration and air conditioning units at the transfer stations – white goods potentially managed by DES waste project.
	Sludge is stored onsite as there is no local treatment and the costs of transporting this to the mainland are prohibitive. This is likely to impact local ecosystems and provides further risks in severe weather events.	No current mitigating strategies observed.
	Reliance on external transport providers to bring visitors, workers and local residents on and off the island, including evacuations during severe weather events.	No current mitigating strategies observed.
Extreme	Significant contamination on the disposal site (e.g. engine oil, asbestos etc.) with likely soil contamination and opportunity for the rubbish to end up in the ocean during cyclone and flooding events. There is no surveillance, monitoring of management of disposal site on Palm Island, and wild horses frequent the site.	Waste compactor needed but not yet procured No current mitigating strategies observed.

Table 2: High, Severe and Extreme Risks (continued)

Dreaming Big

Options Shortlisting

The Dreaming Big phase involved thinking about what might be, discussing what may contribute to happiness and getting community members excited about the future, as well as understanding how to increase community well-being under future climatic conditions.

Project option summaries are presented in the following pages of this report. For the full final project options, please refer to Appendix: 1: Final Project Options.

Options Shortlisting

Phase 2 encapsulates the options longlisting and shortlisting process. The development of the options assessment approach was undertaken by Arup in an interactive and collaborative manner with the wider project team. The assessment has been informed by community and stakeholder consultations, technical workshops, desktop review and the Sustainability Assessment.

Through this process, a longlist of options was developed by the community, the project team, as well as other project stakeholders such as State Government and service providers. With input from the Palm Island community and stakeholders, this options longlist was filtered down to a shortlist of initiatives to be taken forwards. The options shortlisting process was conducted through a series of steps outlined in Figure 18 on the following page.

Gate 3 consisted of a multi-criteria analysis, which is shown in Table 3. This multi-criteria analysis was developed in order to ensure that options filtered through to the options shortlist meet project objectives as well as ensure outcomes are aligned with the community's needs and vision for the island. The outcome of the option analysis process, including the multicriteria analysis is the final shortlist of 17 options which have been progressed into final project options, which enable the community to action and implement the identified initiatives.

The full options report, which provides more detail around the longlisting and shortlisting process, as well as the rationale behind option selection can be found in Technical Appendix: Options Report.

Table 3: Multi-criteria analysis

Objective Category	#	Criteria	Proposed weighting
Economic development	1	Potential to support economic opportunity	15%
	2	Potential to support local job creation, skills development and/or capacity building (including consideration of NIRA objectives)	15%
		Total (economic development)	***30%***
Social development and culture	3	Promotion of community self-sufficiency and/or resilience (including consideration of NIRA objectives)	15%
	4	Protection of cultural heritage and assets	15%
		Total (social development and culture)	***30%***
Environmental protection	5	Extent of decarbonisation potential	25%
	6	Preservation of environmental, ecological and/or natural resources	15%
		Total (environmental protection)	***40%***
		TOTAL	**100%**

Options Shortlisting

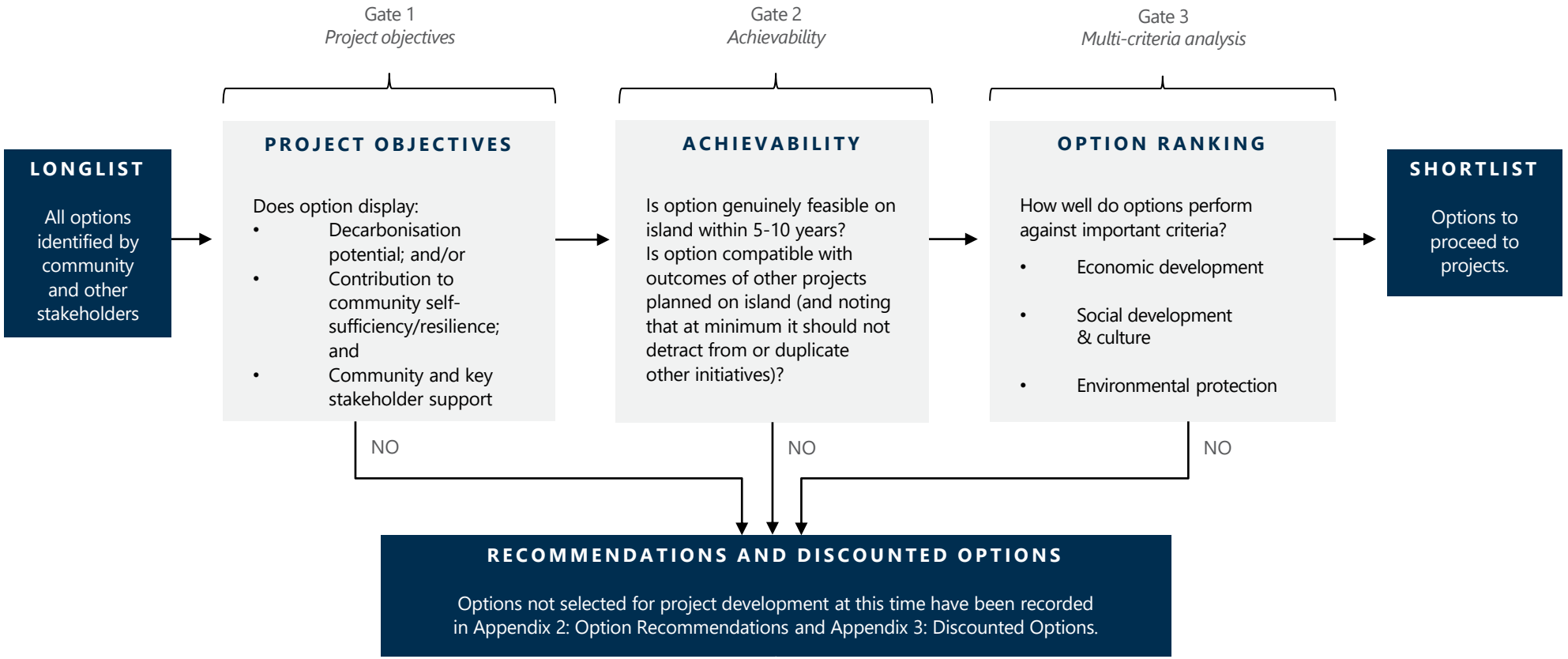


Figure 18: Options analysis process

Whichway Now?

Project Options and Project Outcomes

The most important ideas were identified based on discussed community needs and preferences, project objectives and feasibility for implementation on Palm island. This section also presents overarching project learnings and policy recommendations, which aim to raise awareness around key issues identified throughout the project.

Project option summaries are presented in the following pages of this report. For the full final project options, please refer to Appendix 1: Final Project Options.

Project Options and Project Outcomes

Throughout this project, the knowledge collected and used within the various project options, as well as the findings compiled in the Sustainability Assessment, have been shared with the project team by the Palm Island community and local stakeholders. The project team recognises that this knowledge was shared openly by different members of the community with the expectation that tangible and appropriate actions be enacted from the outcomes of the project.

The delivery of this report and accompanying final project options is a step towards community-driven action that will aid Palm Island in developing a low carbon and resilient way of life, and a thriving community.

The outcomes of this project presented in this report encompass the final project options, the options recommendations, the overarching project learnings and policy recommendations, and supporting technical appendices.

Final Project Options

The final shortlisted project options are the culmination of the project, drawing on the different stages of data capture and analysis, and the collaboration between the project team and the community. The following final project options provide the Palm Island community with the detail and information to pursue the different decarbonisation and resilience projects best suiting the island's needs. Some projects have natural owners, such as council and other government bodies, while others are community or business-driven and owned.

The final project options are summarised in the next pages and the detailed final project options are provided in Appendix 1: Final Project Options.

Options Recommendations

The option recommendations are options that have not progressed through to the options shortlist, but which have merit and potentially represent areas for future consideration. These do not include options which were not supported by the community or were found to be infeasible. There are a variety of reasons why options from the longlist may not have progressed to final project options, these include:

- Where work was already planned through initiatives external to the project
- Where it was considered to be out of scope of this project
- Where the required technologies are not likely to be market ready in the short- to medium-term
- Where the existence or maturity of required supply chains represent a barrier to option success

The additional project options recommended for future consideration are listed in Appendix 2: Option Recommendations.

Overarching Project Learnings and Policy Recommendations

Finally, the overarching project learnings and policy recommendations form an assembly of learnings generated by the project team throughout the project lifecycle. These are informed by discussions with members of the community, council, service providers, government agencies as well as observations during the island visits.

These learnings and recommendations are important to address in this report due to the intricacies and complexities of Palm Island and its community. These learnings and recommendations include issues or solutions which must be applied from a government level, project options implementation considerations such as order of execution or other dependencies as well as other learnings.

The Overarching Project Learnings and Policy Recommendations are presented on the following page.

Overarching Project Learnings and Policy Recommendations

Through this project and the RES engagement framework the project team identified a great number of strengths, opportunities, and risks within the Palm Island community. The project options provide an opportunity for the community and stakeholders to collaboratively action change in order to decarbonise and bolster resilience throughout Palm Island.

In order to address key issues which were beyond this project's scope, the following overarching project learnings and policy recommendations complement the project options. They identify key issues which were observed throughout the project and suggest resolution approaches.

Recommendation 1: Community-based governance and ownership framework

Community ownership as well as local community governance structures are key elements for project success as well as sustained community engagement, acknowledging that First Nation communities operate within their own multi-faceted cultural governance systems and also within western governance paradigms. It is proposed that a whole-of-community governance and ownership structure be implemented in the Palm Island community, based on the wants and needs of the Palm community. This involves facilitating and accelerating community engagement, empowerment and involvement in decision-making and future projects across the island in a culturally and traditionally appropriate manner. A key consideration for this recommendation is the protection of community intellectual property as well as traditional governance styles. Implementing a community-based ownership and governance framework will ensure the successful implementation of the projects outlined in the final project options, holistically involving the community in both present and future initiatives.

Recommendation 2: On-island, community-based Sustainability Officer

The various actions recommended through this project, though aligned in intent, are diverse in nature, scope, and impact. A common theme throughout the project options are the benefits they offer the local community, the island's environment as well as maintaining cultural succession. For the proposed initiatives to have an increased chance of succeeding and benefiting the community, the appointment of a sustainability officer with roots in the community is recommended. This resource will be invaluable to generate community input, engagement as well as ensure compatibility with community needs and expectations. This role can promote and execute the projects included in this report as well as other sustainability initiatives. The benefits of having someone on-island, in addition to implementation of projects, if they are continued and maintained. This role could be linked to the existing ranger program on Palm Island with a governance model co-designed by representatives across the community acknowledging and embracing the cultural diversity of Palm Island and western governance paradigms.

Recommendation 3: Procurement and contracting considerations

Reportedly, PIASC have upskilled some council workers to signal during roadwork but state procurement policy has, in some cases, made it difficult to use council workers, requiring workers
to be flown-in to fill signaling roles. This situation illustrates a frustrating situation for PIASC and the Palm Island community where mainland policy (state and federal level) is ill-suited for the realities in remote communities like Palm Island with high unemployment rates. It is proposed that the uniqueness of Palm Island's situation be considered and that exceptions be implemented to maximise the use of the local workforce. Engaging community in employment and microbusiness opportunities have many co-benefits for supporting community wellbeing including healing centers, supporting tourism opportunities, engaging youth and intergenerational connections. Furthermore, such considerations offer a potential for decarbonisation, as not having to fly in workers from the mainland will reduce transport related emissions.

Recommendation 4: Increase service provision timelines to encourage investment in lower emission technologies

Transport providers working with Palm Island have reported that investment in lower emission technologies is hindered by the short length of the service provision contracts allocated by the Queensland Government. These technologies include higher efficiency motors or alternative fuels for boats (hybrid/electric/hydrogen) and opportunities for other technologies further investigated when commercially available. There are opportunities to combine strategic investments, such as water supply infrastructure (dams or diesel plants) to be combined with energy options such as solar, Pumped Hydro Electric Storage (PHES), tidal generation or wind. If contracts were longer, confidence in return on investment could increase, facilitating increased investment in efficiency gains.

Recommendation 5: On-island Resilience Plan

While the carbon footprint of the island is not large relative to Queensland or Australia's emissions, disproportionate impacts from climate change can be significant. An on-island resilience plan is recommended to ensure aligned efforts and that initiatives not be carried out at the expense of community resilience and well-being. For example, within a resilience plan, there could be a section outlining new housing codes needed for a suitable
to climate. Furthermore, this plan could include the better use of existing resources and infrastructure such as the connection and repair of existing solar panels throughout the community. The nature and scope of this plan is for the Palm Island community as a whole to outline and an excellent opportunity to align land management discussions between the Traditional Owner groups and those with Historical Association.

Recommendation 6: Review of existing water infrastructure and usage practices

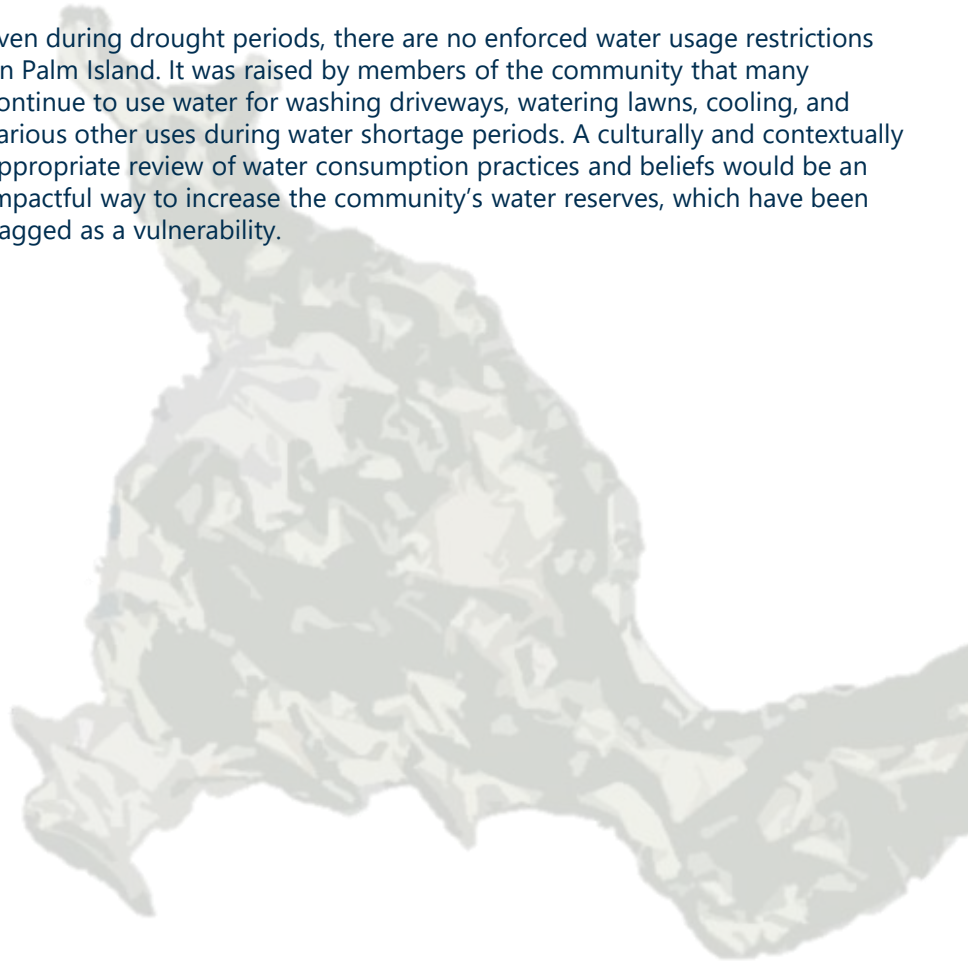
Water management and water infrastructure are high priorities for the Palm Island community. It is understood that a water infrastructure upgrade project has been funded and is being undertaken by GANDEN consultants (this situation has changed in 2020, refer to council for an update on the situation). Below are a list of other water-related findings and accompanying recommendations.

- A need for ameliorated stormwater management was raised by the community in order to decrease the risks of leakage and environmental contamination during heavy rainfall. This could include non-return valves and overflow traps in the reticulation system.

- Palm Island community members raised that some sections of the sewage system are deteriorating, potentially resulting in sewerage escaping the system. To reduce environmental damage and risks to community health, an inspection and repair of the sewage network is necessary. Furthermore, it is understood that the existing wastewater treatment plant is nearing capacity (5,000 people), requiring an eventual upgrade.

- The old water treatment plant infrastructure is still in place after being replaced by the new system due to the high cost of removing the cement lagoons and other equipment. This infrastructure could be removed or repurposed in order to free the land for uses which will be more useful to the community.

- Even during drought periods, there are no enforced water usage restrictions on Palm Island. It was raised by members of the community that many continue to use water for washing driveways, watering lawns, cooling, and various other uses during water shortage periods. A culturally and contextually appropriate review of water consumption practices and beliefs would be an impactful way to increase the community's water reserves, which have been flagged as a vulnerability.



Final Project Options

The project team recognises that many of the identified final project options stem from the Palm Island community and are not new propositions. Many have been the subject of discussion for some time.

Many of the proposed final project options are complementary and deliver on different community aspects which, together, form a cohesive community development pathway. As the structure of funding often requires a more granular approach, synergies between projects may be hindered. Interdependencies can be due to scheduling or logistical links between final project options. On a larger scale, benefits to island communities can be clustered together, such as the impact of GBR Islands recycling their waste. Please refer to the project option alignment identified in individual final project options.

The 17 final project options developed through this project are an opportunity for the community and stakeholders to collaboratively action change in order to decarbonise and bolster resilience and self-sufficiency throughout Palm Island. The final project options which are summarised on the following pages in Table 4: Final Project Options for Palm Island, span the five themes (as well as knowledge sharing options including multiple themes) of this project, as presented below in Figure 19. **Refer to Appendix 1: Final Project Options** for the full detail on the final shortlisted project options.

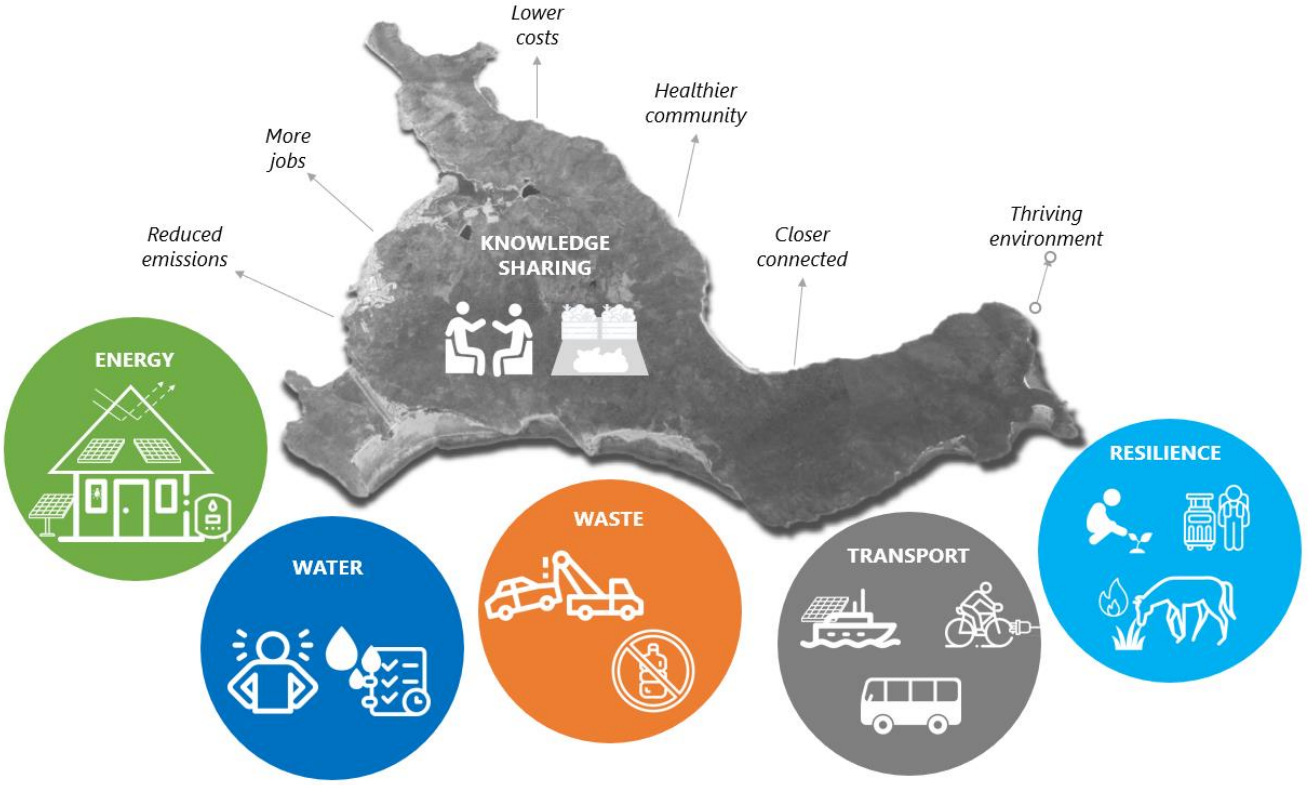


Figure 19: Summary of Final Project Options

Final Project Options

Table 4: Final Project Options for Palm Island

Project Option	Carbon Reduction (tCO^2-e)	Investment ($)	FTE	Delivery Time (Years)	Funding Opportunities
1. Community Market Garden This project is to start the community garden again to produce fresh food in the community. This could include composting for food and garden scraps	N/A	100,000	1 – 3	0.5 - 1	• Funding under future round of W4Q • Round 3 - Community Sustainability Actions Grants, Queensland Government Department of Environment and Science • Social Reinvestment Grant, Department of Aboriginal and Torres Strait Islander Partnerships • Drought Communities Programme, Department of Infrastructure, Transport, Regional Development and Communications • Community Led Grants Department of the Prime Minister and Cabinet • DSDMIP Resource Recovery Industry Development Program • 1000 Jobs Package, National Indigenous Australians Agency • Work with/through TAFE to offer appropriate courses on an ongoing basis
2. Living better at home and saving money A program to help community identify more opportunities to live well and reduce costs.	N/A	50,000 – 100,000	1	1 - 2	• Round 3 - Community Sustainability Actions Grants • Social reinvestment • Indigenous Languages and Arts GO3720 • 1000 Jobs Package (Tranche Two) • Community Led Grants • The Container Refund Scheme Small Scale Infrastructure Grants Program (Queensland Government) provides up to $10,000 in infrastructure and equipment to set up collection points for the newly introduced container deposit scheme. • Potential for Ergon to incorporate costs of education materials regarding electricity usage and billing transparency as part of their community business objectives
3. Caring for Our Sea Countries Caring for our sea country's health to maintain a thriving environment for future generations.	1.3 – 1.7/HA	210,000 (10 hectares of mangroves) 6,900,000 (10 hectares of seagrass)	N/A	1 - 3	• Philanthropy and private funds (as an environmental and social cause) • Blue carbon has been identified in the Queensland Carbon Farming Industry Roadmap • Other federal, State and local government funding may apply such as Queensland Community Sustainability Action grants and the Queensland Attracting Tourism Fund • Partners who might be able to fund their own activities/contributions, e.g. research activities by universities might be funded by PHD scholarships, volunteers from volunteer organisations like Seagrass Watch, Mangrove Watch or Conservation Volunteers Australia

Final Project Options

Project Option	Carbon Reduction (tCO^2-e)	Investment ($)	FTE	Delivery Time (Years)	Funding Opportunities
 **4. Community bus service** This project is to start an environmentally friendly bus service for community transport.	0.002 – 0.006/100km	100,000	1	0.5 - 1	• Climate Solutions Fund – Emissions Reduction Fund • Clean Energy Finance Corporation – Reef Funding Program • Australian Renewable Energy Agency – potential funding through exploration of innovative electric vehicle charging infrastructure • Ergon – potential funding and becoming partner on project due to EV charging infrastructure • Local Government Grants and Subsidies Program - potential capital funding after feasibility study completed • Department of State Development, Manufacturing, Infrastructure and Planning – could align with similar electric vehicle charging infrastructure investments
 **5. Solar Power on the ground with batteries** Study to build a solar farm in Coolgaree Bay.	0 – 4,900	250,000 (feasibility study) 15,000,000 (solar farm/battery)	More than 3	0.5	• Clean Energy Finance Corporation - Reef Funding Program: funding available for emission reduction projects in Great Barrier Reef catchment area • Regional and Remote Communities Reliability Fund • Climate Solutions Fund – Emissions Reduction Fund
 **6. Put Solar Power on the roof** Putting solar panels on the roof of your home to produce some of your own electricity.	780	1,400,000 (phase 1) 4,000,000 (phase 2)	1 – 2 days per installation	1 - 2	• Small-scale technology certificates for solar PV systems through Small-scale Renewable Energy Scheme – from the Clean Energy Regulator (Australian Government) • Clean Energy Finance Corporation - Reef Funding Program: funding available for emission reduction projects in Great Barrier Reef catchment area • Regional and Remote Communities Reliability Fund • Climate Solutions Fund – Emissions Reduction Fund • North Australia Infrastructure Fund

Final Project Options

Project Option	Carbon Reduction (tCO^2-e)	Investment ($)	FTE	Delivery Time (Years)	Funding Opportunities
7. Building confidence in the community's water supply This project seeks to engage with the community to re-build community trust in the safety and reliability of the water supply.	N/A	200,000 – 400,000	N/A	Less than 1	• The project is aligned at some level to several existing funding programs including Building our Regions Program (Department of State Development, Tourism and Innovation), Queensland Disaster Resilience Fund (Queensland Reconstruction Authority), and Remote Area Boards Program, and the Indigenous Councils Critical Infrastructure Program (Department of Local Government, Racing and Multicultural Affairs) • Given the criticality of the work and alignment to multiple Departmental priorities, it is recommended that key stakeholders including Palm Island Aboriginal Shire Council, Department of Local Government, Racing and Multicultural Affairs, Department of Aboriginal and Torres Strait Islander Partnerships and Department of Environment and Science to collaboratively review funding opportunities • There may be an opportunity combine this project with project #17 (Plastic Free Places Initiative) for funding application purposes
8. Indigenous Ranger Program This is to fund an Indigenous ranger program to care for land and sea countries.	N/A	120,000 – 200,000 annual costs 80,000 – 130,000 capital costs	2	1 - 3	• Indigenous Land and Sea Ranger Program • Looking after Country Grant program, Queensland Department of Environment and Science • 1000 Jobs Package, National Indigenous Australians Agency • Community Led Grants, Department of the Prime Minister and Cabinet • Queensland Indigenous Land and Sea Rangers Program, Queensland Department of Environment and Science • Queensland Feral Pest Initiative, Queensland Department of Natural Resources, Mines and Energy • Animal Management in Rural and Remote Indigenous Communities One Health Programs
9. New Solar Hot water systems Better solar hot water systems on houses to improve hot water supply.	480	2,500,000 – 3,900,000	1 – 3 per installation	1 - 2	Existing funding opportunities: • Could seek modification to existing Department of Housing funding to account for upgrade of SHW systems. New funding opportunities: • Small-scale technology certificates for solar hot water systems through Small-scale Renewable Energy Scheme – from the Clean Energy Regulator (Australian Government) • Clean Energy Finance Corporation - Reef Funding Program: funding available for emission reduction projects in Great Barrier Reef catchment area • Regional and Remote Communities Reliability Fund • Climate Solutions Fund – Emissions Reduction Fund

Final Project Options

Project Option	Carbon Reduction (tCO^2-e)	Investment ($)	FTE	Delivery Time (Years)	Funding Opportunities
10. Improving walkways around Palm Island Improve paths for walking and cycling to promote active transport around Palm Island by improving shade, lighting, and path quality.	9	100,000 – 200,000 (plan) 1,500,000 – 6,000,000 (infrastructure)	N/A	0.5 - 1	• Seek to include Palm Island in the next update of the Principal Cycle Network Plans so as to align with Queensland Government strategies for Cycling and Walking, including the potential to obtain funding through the mechanisms outlined in the strategies, such as The Cycle Network Local Government Grants Program
11. Cooling options for homes Improve comfort and livability in homes through cooling options such as: heat reflective roof paint, installation of insulation, and better ventilation. An audit will identify options for consideration.	203 – 406	500,000 – 2,000,000	2 – 4 per year	2	• The No Interest Loans Scheme • Energex PeakSmart air conditioning program
12. Improve Energy Use in Houses Improve energy use in houses through options for more efficient kitchen and laundry appliances and lights. An audit will identify options for consideration.	204 – 406	1,000,000	2 - 4	1 - 2	• The No Interest Loans Scheme offers individuals and families on low incomes access to safe, fair and affordable loans for purchasing appliances and some other essential household expenses • Ergon rebates are available for payment card residences • For newly built community housing, a partnership with the Clean Energy Finance Corporation should be explored • Partnership with Department of Housing and Public Works should be explored
13. Options for replacing diesel for the Ferry and Barge Services Looking at options for replacement of diesel fuel for the ferry and barge services, including electricity, hydrogen, and bio-fuels.	0 - 240	50,000 – 100,000 (feasibility study) 40,000,000 (barge) 4,000,000 (ferry)	To be determined in the study*	To be determined by the study*	• Climate Solutions Fund – Emissions Reduction Fund • Clean Energy Finance Program - Reef Funding Program • Australian Renewable Energy Agency – potential funding through exploration of innovative emission reduction measures • Ergon – potential partner on project due to electric vehicle charging infrastructure
14. Improving the Waste Management Site Improving the rubbish site so waste can be better separated into different kinds of waste and stored properly for transport and recycling off island.	0 - 5	2,000,000	2	1 - 2	• State Development, Manufacturing, Infrastructure and Planning - Resource recovery industry development program • Department of Agriculture, Water and the Environment – Reef Trust – Great Barrier Reef Foundation Partnership Grant

*To be determined (TBD) by the study indicates that a feasibility study is needed for this project option in order to ascertain the figure.

Final Project Options

	Project Option	Carbon Reduction (tCO^2-e)	Investment ($)	FTE	Delivery Time (Years)	Funding Opportunities
	**15. Water and wastewater plan** A plan to highlight opportunities to improve long term water quality, community self-sufficiency, as well as ongoing wastewater management for the island.	N/A	250,000 – 500,000	N/A	1 - 2	• No specific funding opportunities have been identified for this project • The project is aligned at some level to several existing funding programs including Building our Regions Program (Department of State Development, Tourism and Innovation), Queensland Disaster Resilience Fund (Queensland Reconstruction Authority), and Remote Area Boards Program, and the Indigenous Councils Critical Infrastructure Program (Department of Local Government, Racing and Multicultural Affairs) • Given the criticality of the work and alignment to multiple Departmental priorities, it is recommended that key stakeholders including Palm Island Aboriginal Shire Council, Department of Local Government, Racing and Multicultural Affairs, Department of Aboriginal and Torres Strait Islander Partnerships and Department of Environment and Science to collaboratively review funding opportunities • There may be an opportunity combine this project with project #7 (Re-building Community Confidence in Water Supply) for funding application purposes
	**16. A tourism plan for Palm Island** A plan to support the community to benefit from the opportunities that tourism can provide in a cultural, ethical, social, and economical way.	N/A	100,000 – 200,000	1	1	• Round 3 - Community Sustainability Actions Grants, Queensland Department of Environment and Science • Social Reinvestment Grant, Department of Aboriginal and Torres Strait Islander Partnerships • Community Led Grants, Department of the Prime Minister and Cabinet • Growing Indigenous Tourism Fund, Queensland Department of Innovation and Tourism Industry Development
	**17. Help community to stop using plastic items commonly found in rubbish** Finding better alternatives for shops to switch away from plastic items commonly found in rubbish - straws, coffee cups/lids, takeaway containers, food ware (cups, plates, cutlery etc.), bags and water bottles.	N/A	400,000	1	2	• Application for funding through the Department of Environment and Science for support of the Plastic Free Places initiative on Palm Island. Department of Environment and Science are currently undertaking an Indigenous Waste Strategy and associated infrastructure planning, in line with the Queensland Waste and Resource Management Strategy. The development of this Indigenous Waste Strategy and infrastructure plans may provide opportunity for funding for remote communities such as Palm Island for Container Refund Scheme and plastic free places initiative. • This project should form part of the Regional Action Plan to be developed under the Indigenous Waste Management Strategy so that project identification and development can be undertaken in a coordinated way.

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Appendix 1: Final Project Options

This section includes the full Final Project Option documents.

Palm Island | Multiple themes

1 Community Market Garden

This project is to start the community garden again to produce fresh food in the community. This could include composting for food and garden scraps.

Description and overview

The Palm Island community are currently reliant on imported groceries from the mainland by the Government-operated supermarket to meet their food supply needs. As in many remote communities, fresh produce is often reported to cost more and be of a poorer quality and lesser variety than on the mainland due to a variety of factors including transport, storage and logistical challenges.

Whilst local fishing and some individual gardens exist in the community such as at Saint Michael's school, the bush tucker at Bwgcolamn school, and in some community members' yards, much of the previous food production operations that were in place during Missionary period and subsequently as part of commercial and research initiatives, no longer exist on the island, although some of the knowledge is retained with individuals on the island. Previous food production included a chicken farm, mango and vegetable produce garden with root vegetables, coconut tree grove, aquaculture for clams, and mussels.

Members of the community have also identified that the re-introduction of a community garden would reinstate meaningful and enjoyable opportunities for social connectedness, cultural knowledge sharing, skill development and potential to grow local favourite foods. If successful, the community garden could potentially be scaled up to a commercial operation over time which would increase food security and self-sufficiency, providing healthy fresh produce choices with reduced associated transport costs and carbon footprint.

This project seeks funding to reinstate a community garden to grow, initially starting small with input from community champions. Key steps that need to be completed include a plan detailing key project objectives and practical details such as acquiring land lease, infrastructure needs, likely workforce training needs and appropriate governance arrangements for a community-led scheme e.g., potential structuring as a community cooperative. Following initial community engagement, the first stage of operations may include the following food streams: chickens, bananas, coconuts, mangos, yams, and/or sweet potatoes. It should be noted that a member of the Palm Island community has developed a business plan for a community garden already and should be referenced with any ongoing project development.

Between 500 – 1,000m^2 is proposed as an approximate size as either raised garden beds, planter boxes or directly in-soil planting. A detailed guide on potential options was released by Anthea Fawcett as part of the Closing the Gap initiative in 2013 *Food and other gardens in and about remote communities. A guide-planning considerations and project opportunities*[1]. Further phases of the community garden may consider expansion of the garden size and food types grown and may include incorporation of other aligned methods such as permaculture or hydroponics.

A green waste composting scheme is included as part of this project, reducing waste and carbon emissions associated with landfilling green waste products and producing compost for use in the garden, and can be sized and expanded to match future garden scale and wider community need.

[1] Horticulture Innovation Australia, 2018, 'Nursery Industry Statistics and Research Final Report'

Project summary

Item	Units	Total
Estimated annual emissions reduction	t-CO_2-e	N/A*
Estimated payback period	Years	N/A
Estimated annual cost savings/revenue	$ mil	N/A
Estimated capital costs	$ mil	0.1
Estimated ongoing expenses	$ mil	0.005 - 0.01**
Net present value (simple)	$	N/A
Timeframe to deliver project	Years	0.5 - 1
Estimated FTE	No.	1 - 3

*Decarbonisation benefit largely attributed to transport-related carbon emissions
** Based on $5000 worth of sale annually

Key project objectives

Carbon assessment
- Importing less produce will reduce emissions associated with packaging, cool storing and transporting these goods
- The emissions associated with the disposal and break down of the garden's green waste will be avoided through composting

Community self-sufficiency and resilience
- On-island production of food will increase the self-sufficiency, resilience and food security of the Palm Island community, reducing their dependence on mainland supplies and vulnerability to price spikes or supply deficits in the current food supply chain
- Community-led operation would also focus on providing opportunities for social inclusion, healthy eating education, employment, skill development and knowledge sharing for the community (in particular from elders and other leaders)
- The garden would act as a recognised pathway for elders to connect and mentor youth, particularly vulnerable youth

Alignment with other initiatives

Alignment with other projects
- 2. Living better at home and saving money
- 14. Improving the Waste Management Site
- 15. Water and wastewater plan

Alignment with external initiatives or investments
- Not-for-profit looking to start giant clam aquaculture on island[2]
- Aquaculture study underway (CSIRO, JCU, PIASC 2020)
- Healthy food in indigenous communities program (Department of Health)
- Opportunities with Department of Employment, Small Business and Training (DESBT) to provide certificate training to local people to build capacity
- Keeping Queenslanders Healthy (KQH) Roadmap under Our Future State: Advancing Queensland's Priorities

Co-benefits

Economic
- The creation of a new industry on the island will provide economic, upskilling and employment opportunities, which was identified as a severe risk in the project risk assessment, for the local community to work and manage the garden
- Potential to sell produce to local community and tourists as well as form the backbone of future food service industries centred around the health of the community, and tourism (hotel, restaurant, food trucks etc.)
- On-island agriculture will reduce vulnerability to price spikes and increased costs for produce for the community

Social and cultural
- Access to fresh produce provides nutrition and health benefits to the community
- Opportunity for healthy eating education and agricultural skills development
- Opportunity for knowledge sharing within the community, in particular from elders and other leaders to at risk youth
- Physical and mental health benefits of being outdoors and growing local produce
- Social inclusion and civic participation
- Access to fresh produce has the potential to drive a range of social activities centring around the gardens, including community cooking classes, partnerships with the school, or food service delivery to aged/disabled in the community
- Increased self-sufficiency during severe weather events which was identified as a high risk in the project risk assessment

Environmental (General)
- Circular economy principles of composting garden waste for reuse at the garden, as well as avoiding carbon emissions associated with alternatively breaking down organic waste in landfill
- Shortening the supply chain will reduce food waste created through transportation
- Cultural shift to lower processed foods will provide a reduction in waste on the basis of type of food (and packaging) transported to the island

Environmental (impacts to Great Barrier Reef)
- Reduced transport of food supply and associated impacts e.g. potential shipping damage to reef, water and air quality impacts from hydrocarbon oils/fuels
- Use of compost will avoid the potential for chemical fertilisers to run off into the ocean
- A reduction of greenhouse gas emissions could contribute to the global effort to reduce emissions which are impacting the reef through increased temperatures and ocean acidification

Risks and opportunities

Barriers
- On-island business and technical management skills to build and manage on-island garden
- Local growing conditions, resources and technical challenges limits the produce that is thought to likely be successful in the community garden initially to egg laying chickens, mangos, bananas, coconuts and root vegetables
- Composting technology options can vary in complexity and cost. Initially low-tech recommended e.g. biodigesters require expertise to operate
- Land tenure and leasing complexities with Deed of Grant in Trust land (DOGIT) property rights
- Setting up community ownership structure is complex, requires legal advice and significant consultation and ongoing management, which will add to cost, complexity and potential project delays. There may be a misalignment with community expectations in timing of implementation of this option.

Risks
- Climate hazards affecting crop yields e.g. intensified storm surges, cyclones etc.
- Water availability and quality for watering the garden (3-day water reserves in the event of power loss/system failure)
- Economically non-competitive with imported produce and goods
- Long-term committed management ensuring secure finance, resource permissions and viable workforce, technical management and credible routes to the market
- Serious health risks associated with composting scheme if operated incorrectly such that pathogens are not eliminated from the compost
- There have been similar projects on the island in the past. It is important to understand why they are no longer running to ensure this project is viable

Opportunity
- Provide health, environmental and sustainability education workshops and training in the garden in partnership with schools (healthy lunches)
- Collaboration with Community Development Programs (CDP), local community groups and schools
- Collaboration with other initiatives such as native plant nursery and aquaculture
- Using native food crops to celebrate traditional knowledge and history
- Rainwater harvesting at garden to combat water security issues
- Provision of volunteer roles and training to broader community as part of operations
- Expand operations in future years to increase yields, increase variety of produce
- Potentially provide support to development of household food gardens to increase household self-sufficiency and cost of living
- Composting system to be expanded to include chicken, horse manure, green waste from elsewhere on island and potentially household organic waste if appropriately separated in future

[2] **Relevant projects**
Biowicked garden project https://campbellpage.com.au/palm-islands-biowicked-garden-project-is-well-and-truly-underway/
Retail business precinct https://www.abc.net.au/news/2020-02-15/palm-island-retail-precinct-brings-hope-for-better-future/11958072

Assumptions

- Green waste will be composted and reused in the garden
- Structure of ownership and management of community garden to be confirmed. No financial or market analysis has been conducted to assess the commercial viability of the community garden.
- No climatic modelling or soil testing has been completed to assess the productivity of potential crops
- No market study has been completed to understand the community demand for particular produce

Costs and funding considerations

Capital costs

Approximate total capital cost: $100,000

- Includes consultant support for confirming site location and broad layout design and services connection identification. ~$25,000
- Gardening equipment, garden beds, shade cloth and structures and direct inputs such as mulch fertiliser and seeds: ~$20,000
- Irrigation systems, rainwater tank ~$10,000
- Chicken fencing and shed (5 sqm per hen with 23cm perch per hen) to keep them contained and safe from predators, nesting boxes (40cm x 40cm), 8-10 hens (~$40 each) and one rooster ($20 - $100)
- Large bins for storage and composting system – three large compost bins with lids (~$300/bin)
- 4 x community workshops with to plan the garden and subsequently for composting and food growing knowledge sharing Coordinated by sustainability officer (external consultant support, materials preparation) ~$40,000
- Seed stock, hand tools, shade cloth, and stakes ~$2,500

Costs and funding considerations cont.

Ongoing costs

- Operations and maintenance expenses
- Land lease costs, if required
- Insurance fees (approximately $750 - $2,000)
- Establishing infrastructure connections to electricity and water and ongoing supply and usage costs
- Consistent supply of chicken feed (120g of layers pellets/day/chicken – retail price $24 - $30 /20kg)

Potential cost savings or return on investment

- Community garden not initially aimed at commercial returns however food produced would equate to savings as unlikely to produce revenue beyond ongoing costs to cover salaries and ongoing costs due to economies of scale
- Enterprise would need ongoing financial supplement to cover costs of operation, salaries
- 1000 Jobs Package could provide a wage subsidy of up to $51,000 if CDP aligned as a partner

Funding opportunities[3]

- Funding under future round of W4Q
- Round 3 - Community Sustainability Actions Grants, Qld Gov Department of Environment and Science
- Social Reinvestment Grant
- Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP)
- Drought Communities Programme, Department of Infrastructure, Transport, Regional Development and Communications
- Community Led Grants Department of the Prime Minister and Cabinet
- Department of State Development, Tourism and Innovation (DSDMIP) Resource Recovery Industry Development Program
- 1000 Jobs Package, National Indigenous Australians Agency
- Work with/through TAFE to offer appropriate courses on an ongoing basis

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Palm Island local community				
Traditional owners				
CDP				
Palm Island Aboriginal Shire Council				

Implementation and timeframes

Investment readiness

- There is land availability to build the market garden on-island
- This is being proposed as a community cooperative project

Next steps

- Identify availability of local resources to develop and implement project

Considerations for implementation

- Availability of social, cultural, organisational and natural resources
- Appropriate crop selection to suit climate conditions and community demand
- A garden model that best suits the interests, skills and capacities of the local community who will be involved
- Involve local people as project leaders and champions, using locally available resources
- Local growing conditions to maximise crop productivity
- Household food scraps as a feedstock source for chickens and composting system

Timeframes to deliver solutions

- Phasing of market garden project activities to demonstrate success and value to the community and funders, solidifying their investment and support for future project stages
- Timeframe to implement could be up to one year to allow for transport and shipment of materials

[3] Grant funding opportunities are subject to application rounds and may not be available on an ongoing basis.

Palm Island | Multiple themes

2. Living Better at Home and Saving Money

A program to help community identify more opportunities to live well and reduce costs.

Description and overview

This project aims to develop and implement a community co-designed engagement program to help residents identify opportunities to live sustainably and reduce cost of living expenses through knowledge sharing and education.

Cost of living in remote communities like Palm Island are high, and impact upon residents' ability to consistently afford and access essential services such as electricity, hot water and transport. The resultant community health and wellbeing impacts are compounded by the overcrowding of extended families living in housing and current lack of public transport or active transport (e.g. bicycle) services.

The Palm Island community has deep cultural knowledge, understanding and relationship with the land and sea country of Palm Island. It is recognised that this knowledge can be drawn upon to benefit the community in *Caring for Country*[1] *and Caring for Family*[2], to live sustainably and at lower cost.

Central to this initiative is that the engagement program is co-designed and delivered with community over a period of time, not just a one-off. The process of how ideas are shared and how the community is engaged needs to be considered. The process would seek to understand where the challenges lie within the community regarding sustainability in their home, and designing the knowledge sharing program to support. Topics may include:

- Electricity efficiency improvements; solar panel and solar hot water system use optimisation through optimal maintenance and timing of appliance use education;
- Sustainable transport options and education on efficient vehicle use;
- Sustainable consumer behaviour and waste management for a cleaner environment with less waste and litter (e.g single use drink containers);
- Improved water usage and management including consideration of rainwater tanks;
- Increased understanding and transparency on how power cards work, and the cost of electricity billed; and
- Improved amenities such as tree planting for shade or food options – e.g. fruit tree or vegetable patch.

While the program is community led, it is acknowledged that this program of work will complement other programs and initiatives being led on island by others.

Project summary

Item	Units	Total*
Estimated annual emissions reduction	t-CO_2-e	N/A*
Estimated payback period	Years	N/A*
Estimated annual cost savings	$	N/A*
Estimated capital costs	$ mil	0.05 – 0.1**
Timeframe to deliver project	Years	1 - 2
Estimated FTE	No.	1

* Individual household outcomes for cost savings, emissions reduction and sustainable living will vary
** Based on 250 – 500 hours

[1] Caring for Country is a term used to describe the different sustainable land management practices and initiatives that Aboriginal and Torres Strait Islander peoples undertake, and the key role these practices play in continuing culture.
[2] Caring for Family is a term used to describe the strong family values and extended family structure in Aboriginal and Torres Strait Islander peoples which differs to typical western culture.

Key project objectives

Carbon assessment

- Increasing household and community energy efficiency will avoid electricity usage from the grid, which is sourced from carbon intensive diesel generators. Responsible energy use combined with gradual decarbonisation of the electricity grid using solar energy, will grow energy availability for the community whilst minimising carbon emissions.
- Reduced water consumption by community as well as increased adoption of rainwater harvesting will reduce electricity used at the Water Treatment Plant (WTP) and to transport water to households
- Increased uptake in active or public transport will reduce greenhouse gas emission production
- Improvement of waste management practices to divert waste from landfilling can reduce carbon emissions

Community and climate resilience

- Improved energy efficiency and use of residential solar power (with grid back up) has the potential to increase energy resilience and reduce electricity household bills
- Sustainable water management practices are essential to any resilience plan for water supply
- Education around the safe use and maintenance of water tanks to restore a cultural connection and sense of resilience around water, increasing water quality and efficiency (potable water supplies of Palm are currently at 3 days)
- Education around how electricity is currently billed by Ergon and what drives the majority of costs when pay as you go electricity cards are utilised
- Improved waste management including separation provides greater opportunities for recycling and reuse on-island
- Limiting of waste to the island from both the servicing of the community and future tourism through improved resource consumption

Co-benefits

Economic

- Costs savings for community members from reducing their energy consumption which was identified as a high risk in the project risk assessment
- Skills development, capacity building and potential job creation. Unemployment was graded as a severe risk in the project risk assessment
- Rainwater tank, solar panel maintenance as a job opportunity
- Improved waste separation could provide increased opportunities for reuse or recycling of resources and therefore new industries to be established on the island
- Reduced costs associated with waste disposal and transportation from reduced waste production

Social and cultural

- Celebration of traditional culture and knowledge
- Increased awareness of environmental protection and sustainable consumer behaviour (e.g single-use drink bottles)
- Fostering a sense of place and a sustainable and harmonious community
- Better understanding of electricity costs
- Liveability benefits from reduced spending, improved amenity (litter reduction) and usage of energy, water and other resources
- Integration of modern technology-based sustainability concepts with a cultural narrative commonly unwritten by sustainability

Environmental (General)

- Reduced environmental impact of the community regarding waste production, resource consumption, water usage and energy usage
- Reduced litter into the environment in line with Queensland Government's education and awareness around litter

Environmental (impacts to Great Barrier Reef (GBR))

- Reduced litter entering oceans and the GBR
- Improved local air quality impacts from decreasing use of diesel generators from reduced electricity usage and more efficient vehicle usage

Other

- Reduced demand on water and electricity use on the island

Risks and opportunities

Barriers

- Detailed engagement and communications strategy needed to be rolled out to target the engagement needs of each household including consideration of household demographics and living situation. Communication methods selected need to also take into account availability of communication mediums e.g. internet access and phone coverage is not available to all residents
- Capacity, availability and interest of the community to develop and deliver the program
- No allocated facility to undertake education and knowledge sharing activities
- High initial establishment cost for installation of sustainable living infrastructure such as solar power, energy efficient appliances, rainwater tanks etc

Risks

- Community are not sufficiently consulted or collaborated with, which will jeopardise the longevity of this initiative
- Loss of interest, funding and support over time, restricting its longevity

Opportunity

- Partnering with local schools as a platform for delivering education and knowledge sharing
- Creating an education program across multiple Indigenous communities to mutually benefit from the development and delivery of the engagement program

Alignment with other initiatives

Alignment with other project options

- 1. Community Market Garden
- 10. Improving walkways around Palm Island
- 12. Improve Energy Use in Houses
- 15. Water and wastewater plan
- 17. Help community to stop using plastic items commonly found in rubbish

Alignment with external initiatives or investments

- Potential for collaborative partnerships with NGO's like Keep Australia Beautiful, Community Sustainability Grants. Schools - EcoMarine Warriors
- Queensland Department of Health - Aboriginal and Torres Strait Island Environmental Health Plan
- DES education initiatives on Indigenous Waste Strategy/Policy
- Under Our Future State: Advancing Queensland's priorities and KQH, the Department of Health is working with the Department of Housing and Public Works to identify opportunities to progress Healthy Homes initiatives

Assumptions

- Strengthening and supporting the transfer of traditional knowledge and culture across the community will directly support skills development, capacity building, and the potential for job creation
- Traditional knowledge and culture holds resilience, decarbonisation, and other environmental/ecological benefits
- Overall ownership of the program will sit with the Palm Island Aboriginal Shire Council, however responsibility for the programs development and implementation sit with the community members employed to run the program in consultation with traditional owners. There are external Indigenous owner energy companies that may also form part of the partnership that are responsible for the program content, delivery and review.
- The community elders will be sharing the narrative and sustainability knowledge with the broader community.

Costs and funding considerations

Costs

- Engage suitably qualified consultants (technical and Indigenous community engagement) to engage with community and key stakeholders to develop 'living in homes better' engagement program to be co-designed with community
- Engage community members to upskill and co-designed program
- Supporting education materials / brochures
- A nominal budget based on a consultant @ $200p/h for 250 – 500 hours has been assumed for a total cost of $50,000 - $100,000

Potential cost savings or return on investment

- Cost savings for households from reduced energy and water use
- Financial benefits to the Queensland Government through Community Service Obligation payments as the community moves away from diesel-based energy generation to solar and battery

Funding opportunities

- Round 3 - Community Sustainability Actions Grants
- Social reinvestment[3]
- Indigenous Languages and Arts GO3720[4]
- 1000 Jobs Package (Tranche Two)[5]
- Community Led Grants[6]
- The Container Refund Scheme Small Scale Infrastructure Grants Program (Queensland Government) provides up to $10,000 in infrastructure and equipment to set up collection points for the newly introduced container deposit scheme.
- Potential for Ergon to incorporate costs of education materials regarding electricity usage and billing transparency as part of their community business objectives

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Palm Island community	■			■
Palm Island Aboriginal Shire Council		■	■	■
Queensland Government – DHPW, DES, DNRME		■	■	■
Future tourism operators		■	■	
NGOs		■	■	
Ergon Energy	■	■	■	

Implementation and timeframes

Investment readiness

Palm Island local community desire to reduce electricity bills and gain access to secure potable water sources.

Next steps

- Formulate appropriate scope, linkages and delivery format
- Consult with the local community to understand and identify priority areas that can be a key focus of the knowledge sharing
- Evaluate what areas of sustainability are high impact for this community and align education with these issues
- Identify the most appropriate methods of sharing knowledge i.e. yarning circles, workshops, signage, Facebook groups etc. in consultation with the community
- Selection of an appropriate facility to host knowledge sharing and education activities

Considerations for implementation

- Partnerships with other non-government organisations (NGOs) or community groups active in this space to consolidate and make efforts more efficient. Potential partners are Keep Australia Beautiful, Community Sustainability Grants and Schools - EcoMarine Warriors.
- Undertake regular workshops with stakeholders across the island to encourage adoption of sustainable and cost saving initiatives
- Ascertain mobilisation readiness of community members to deliver this program

Timeframes to deliver solutions

Initially six months are to be spent developing materials, collaborating with NGOs, planning the delivery of the program and attaining funding to support the employment of an individual to deliver the program. Once the program has officially begun it will have enduring benefit.

[3] Queensland Government, n.d., 'Social Reinvestment;, https://www.grants.services.qld.gov.au/#/service-details/60201?answers=1003,-2000,4002,4004,-3000,-5000&sortBy=status&sortDir=desc
[4] Australian Government, 2020, 'Indigenous Languages and Arts, Grant Round 2020', https://www.grants.gov.au/Go/Show?GoUuid=BB2FC895-D3FE-2FFC-0E7C-DA3CA4B70D5F
[5] Australian Government, 2019, '1,000 Jobs Package (Tranche Two) Grant Funding Round', https://www.grants.gov.au/Go/Show?GoUuid=156490D8-ADBE-EF76-3EF1-03EFE89750B2
[6] Australian Government, 2017, 'Community Led Grants', https://www.grants.gov.au/Go/Show?GoUuid=CB0C770F-0EF5-AD48-6E9F-D6BC2E458366

Palm Island | Resilience

3 Caring for Our Sea Countries

Caring for our sea country's health to maintain a thriving environment for future generations.

Description and overview

Blue carbon refers to the carbon stored in marine and coastal ecosystems such as mangroves, tidal marshes and seagrass meadows, which sequester and store more carbon per unit area than terrestrial forests. Conversely, if these ecosystems are degraded or destroyed, their carbon storage capacity is impacted and stored carbon is released, shifting from a storage to a source. They also provide essential benefits to the environment and society including coastal protection and wildlife habitat, which in turn reduces impacts on communities and helps secure local food supply. The coastal ecosystems on the islands of the Great Barrier Reef are essential parts of the Great Barrier Reef itself as well as an important source of food for the residents of Palm Island.

Blue carbon farming also has potential to be a source of revenue in the future. While most blue carbon units traded to date are in voluntary markets, work around the world is progressing to align methodologies for inclusion in carbon trading markets, including work by the Australian Government with the Emissions Reduction Fund (ERF). Currently no methodology exists within the ERF to apply for carbon credit units however this may change in the future.

A program for conservation and restoration of Palm Island's coastal ecosystems would ensure they continue to function as long-term carbon storages and provide their many other services/benefits for the local community. Previous desktop assessment has identified mangroves and seagrass beds occur at Palm Island. Project phases will include: planning ecosystem restoration works and acquiring equipment/materials, implementation of restoration works, performance assessment, dissemination of assessment results and ongoing adaptive management.

The program should focus on conserving existing ecosystems and restoring degraded ecosystems at selected sites on the island. Conserving existing ecosystems may include monitoring programs for adaptive management and environmental education. Restoration of degraded ecosystems may include plantings, modifying tidal flow or reducing environmental stressors (e.g. human activities).

There are opportunities to support local employment and local skills building, mainly employment of local Indigenous people to manage and implement program activities, as well as provision of environmental education for local people and visitors (which could also help to support sustainable tourism).

Project summary

Alignment with key project objectives	Low	Med	High
Decarbonisation impact	■		
Community resilience	■		
Extent of co-benefits			
Economic development	■		
Social development and cultural	■	■	
Environmental protection	■	■	■

Item	Units	Total
Estimated annual emissions reduction	t-CO_2-e/HA	1.3-1.7
Estimated payback period	Years	<0
Estimated annual cost savings	$	N/A
Estimated capital costs (10 hectares), mangroves	$ mil	0.21
Estimated capital costs (10 hectares), seagrass	$ mil	6.9
Net present value (simple)	$	N/A
Timeframe to deliver project	Years	1-3
Estimated FTE	No.	0

Key project objectives

Carbon assessment
Blue carbon ecosystems can store carbon quicker and much longer (thousands of years) than terrestrial 'green carbon' ecosystems. Loss or decrease of habitat for coastal ecosystems has two pitfalls for decarbonisation – releasing the carbon stored in the destroyed vegetation (adding to climate emissions) and also losing habitat for carbon storage until it is returned.

Actual carbon storage capacity will ultimately depend on the site and the specific vegetation communities targeted, e.g. different types of mangrove forest or seagrass beds.

- On an area-specific basis, mangrove forests store more carbon than other ecosystems like seagrass and salt marsh, with the average carbon storage rate estimated to be 174g C m−2 y−1.
- Carbon storage rates in seagrass meadows vary depending on the species, sediment, and depth of the habitats, but on average the carbon burial rate is approximately 138g C m−2 yr−1.

From a desktop review, Palm Island appears to have various pockets of dense mangroves scattered around the island as well as small pockets on the other islands, with substantial seagrass beds to the south west of the island where the coastline is more protected. The Palm Island local government area is estimated to have a 0.4 km^2 area of mangroves, which is around 36% of its total area of wetlands (from QLD wetland mapping using 2017 extents)[1].

Based on 10,000m^2 of restoration an annual carbon sequestration amount of 1,380kg – 1,740kg of CO_2-e could be expected.

Community and climate resilience
Coastal communities such as the community of Palm Island are vulnerable to coastal hazards and current/future climate change. Blue carbon projects to conserve and protect coastal ecological resilience will allow adaptation and mitigation to these threats, as well as promote the wellbeing of the residents (refer to the list of co-benefits of such projects).

Co-benefits

Environmental (impacts to Great Barrier Reef)
Opportunity for carbon sequestration through restoration of coastal vegetation (mangroves and seagrasses). Also, the coastal ecosystems on the islands of the Great Barrier Reef are essential parts of the Great Barrier Reef itself and have important ecological interactions with the coral ecosystems, including exchange of abiotic materials (sediments and nutrients, influencing water quality) and marine biota (e.g. nursery grounds for many different fish and crustacean species). A reduction of greenhouse gas emissions could contribute to the global effort to reduce emissions which are impacting the reef through increased temperatures and ocean acidification.

Environmental (general)
Coastal ecosystems provide important or critical habitat for a diversity of wildlife adapted to coastal conditions. Conservation and restoration efforts are likely to support ecosystem resilience and key ecosystem services like fisheries. It would also support policies for environmental conservation and create protected habitat, e.g. fish habitat protected under the Queensland *Fisheries Act 1999* and habitat for nationally protected migratory shorebirds.

Economic and social
Opportunities for employment and community development include employment of local Indigenous people to manage and implement program activities, as well as provision of environmental education for local people and visitors (which can help to support ecotourism). Conservation and restoration of coastal ecosystems may also support the maintenance of coastal resource dependent livelihoods (to be investigated during community consultation) and help support tourism (attractiveness and education for visitors).

Coastal ecosystems can play a critical role in reducing the unique vulnerabilities of the local community to coastal hazards and climate change, through their natural impacts on the coastal environment such as erosion reduction and the mitigation of storm surges, which were identified as a severe risk in the project risk assessment. Economic benefits include avoiding potential costs through enhanced protection from climate related events afforded by expanded mangrove forests, which was highlighted as an extreme risk.

Cultural
Conservation/restoration of coastal ecosystems will likely support Indigenous values within the local community, through community engagement and enhancement of the local environment.

Risks and opportunities

Barriers and Risks

- May be a challenge to achieve sustainable funding. Need long-term management (restoration and conservation are continuous processes), plus difficult to predict costs and timeframes.
- Lack of standardised method/metrics to estimate blue carbon offsets and returns/benefits, uncertainty about financial mechanisms and returns, unclear legal/policy setting.
- Needs to align with existing coastal management with local government/residents.
- Lack of local capacity, requiring training/external support to fill knowledge gaps.
- Land ownership and community ownership around coastal resources may conflict.
- Operational risk – unsuccessful conservation and restoration efforts. Might have multiple causes, e.g. poor project management, cannot access needed materials, lack of ecological understanding and planting of wrong species, unsuitable sites were selected or uncontrollable factors like weather events.
- Risk of costs of conservation/restoration being higher than the returns (also benefits like coastal protection or fish nurseries or improved water quality can be hard to quantify)
- Risk of limited or passive engagement from the local community

Opportunities

- Opportunity for blue carbon restoration to be used in existing environmental impact offset frameworks or a blue carbon offsetting scheme
- Opportunity for employment of local people, leverage local knowledge and upskilling
- Clustering opportunities with other islands to collaborate and gain efficiencies in managing carbon sequestration, ecological restoration and potential carbon offsetting initiatives
- May be a future opportunity investigate carbon credit generation. Further literature review and investigation into the methodology, metrics and markets for blue carbon trading would be required. There are existing, international methodologies such as the UNESCO ocean carbon method[2]. It is noted that the Australian government is in the process of convening a Blue Carbon Method Working Group to address appropriate approach for Australia.

Alignment with other initiatives

Alignment with other project options

- 8. Indigenous Ranger Program (protecting coastal systems from further impacts).
- 16. A tourism plan for Palm Island - potential to incorporate coastal environmental education for locals and visitors (supporting ecotourism).

Alignment with external initiatives or investments (to be investigated)

- Sea Ranger program
- Strategic alignment with State and Federal Government initiatives such as the International Partnership for Blue Carbon, Great Barrier Reef Marine Park Authority (GBRMPA), Office of the GBR, Land Restoration Fund (LRF), Australia's Biodiversity Conservation Strategy and the QLD Carbon Plus Fund which supports the Aboriginal Carbon Fund. As discussed previously, Reef Credits are being trialled in the Johnstone Catchment
- Partnership opportunities: potential to work with SeagrassWatch and MangroveWatch in monitoring programs, researchers for pilot ecosystem studies (e.g. from University of Queensland, James Cook University), support from environmental groups or Conservation Volunteers Australia which conducts restoration activities
- Rangers program, native plant nursery, aquaculture and capacity building on-island through TAFE

[1] Queensland Government, 2019, 'Wetland Maps', https://wetlandinfo.des.qld.gov.au/wetlands/facts-maps/get-mapping-help/wetland-maps/
[2] UNESCO, 2015, 'Coastal Blue Carbon step by step – A new manual for measuring, assessing and analysing carbon in the field and lab', https://en.unesco.org/news/coastal-blue-carbon-step-step-new-manual-measuring-assessing-and-analyzing-carbon-field-and-lab

Assumptions

- Assumes the coastal ecosystems on Palm Island require dedicated conservation and restoration efforts in the first place, e.g. may already be in healthy condition. Will require baseline ecological data to assess.
- The specific conservation and restoration methods that may apply to Palm Island's coastal ecosystems are not yet known (need to fit social, environmental and economic realities)
- Assumes that there are suitable sites for dedicated conservation and restoration efforts – these sites need to fit the long-term/permanent nature of a blue carbon project
- Assumes availability of reliable methods, metrics and tools for implementing conservation and restoration (and monitoring). Uncertainty may lead to unattractiveness for investment.
- Assumed limited opportunity for salt marsh or coral reef restoration, however these other forms of blue carbon may be investigated during ecological assessments (recommended).
- Detailed analysis of coastal ecosystems on Palm Island not conducted – based on desktop review of known coastal vegetation, e.g. wetland info.

Costs and funding considerations

Costs will depend on many unique factors, including the specific conservation and restoration methods used. Some formats in which coastal restoration costs have been analysed include the cost per acre; costs for specific restoration tasks; costs for input (e.g. labour, equipment). The costs of any restoration project is significantly influenced by unique factors such as geography, climatic conditions, proximity to urban areas etc

Costs of coastal ecosystem restoration are difficult to estimate (highly project specific). To provide some indication, a coastal restoration cost and feasibility study[3] (which looked at projects worldwide) estimated that the total restoration costs are:

- Median of $3,572 AUD (US$2,508) and average of $21,394 AUD (US$15,017) per hectare (2020 FX rate 1.42) for mangroves; and
- Median of $546,611 AUD (US$383,672) and average of $996,644 AUD (US$699,525) per hectare for seagrass.
- 10 hectares of mangrove restoration would cost approximately $213,940 and $6,995,250 for seagrass

Costs and funding considerations cont.

Capital costs

- Costs for project planning and restoration design
- Initial costs for training, labour, equipment and materials

Ongoing costs

- Specific ongoing conservation and restoration tasks
- Environmental testing as part of monitoring and assessments (e.g. water quality, expanded mangroves and seagrass beds)
- Replacement costs for equipment and materials
- Project management costs

Potential cost savings or return on investment

- Natural coastal protection and climate change adaptation benefits
- Ecosystem services (e.g. healthy fisheries, more resilient natural environment)

Funding opportunities and linkages to consider

- Philanthropy and private funds (as an environmental and social cause)
- Blue carbon has been identified in the Queensland Carbon Farming Industry Roadmap
- Other federal, State and local government funding may apply such as Queensland Community Sustainability Action grants and the Queensland Attracting Tourism Fund
- Partners who might be able to fund their own activities/contributions, e.g. research activities by universities might be funded by PHD scholarships, volunteers from volunteer organisations like Seagrass Watch, Mangrove Watch or Conservation Volunteers Australia

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Local community				
Government				
External partners, e.g. universities and NGOs				

Additional information

- There are examples of mangrove restoration/rehabilitation projects in Queensland, e.g. Coomera Rivers Mangrove and Intertidal Rehabilitation project

Implementation and timeframes

Investment readiness

These data gaps are key (but not an exhaustive list of potential requirements for readiness):

- Ecological baseline studies of the mangrove and seagrass communities at Palm Island, as well as the habitats that they occupy. Restoration success depends primarily on the ecosystem, site selection, and techniques applied rather than on money spent. Successful restoration projects involve a sound understanding of the site conditions. The studies will support selection of suitable sites and site-specific conservation/restoration methods
- Extensive consultation with the local government and local community and traditional owners.
- Inclusion of the Traditional Stories and understanding these stories to assist with introducing the Blue Carbon Concept in community
- More detailed investigation into potential partners and funding, including consultation and confirming accessibility to potential funds

Timeframes to deliver solutions

Benefits to coastal ecosystems could be shown in short timeframes of 3-5 years, e.g. increased area of mangroves and seagrass. However, achieving a successful blue carbon project (with resilient social, environmental and economic systems) is likely to require many more years. The true costs and benefits of coastal restoration projects can take decadal time scales.

Next Steps

Next steps will include the actions outlined above to plug critical data gaps and provide further analysis of the project's viability from the financial, ecological and social perspectives.

Considerations for implementation

- Adoption of international or national standards could warrant delay of implementation
- Blue carbon project activities may trigger need for permits and approvals. For example, the surrounding marine areas are within the Great Barrier Reef Marine Park and blue carbon project activities may trigger a permit for activities within the marine park.
- The current COVID-19 environment, including biosecurity measures and restrictions should be considered in implementation, e.g. training and external people going to/from the island.

[3] The cost and feasibility of marine coastal restoration. Elisa Bayraktarov Megan I. Saunders Sabah Abdullah Morena Mills Jutta Beher Hugh P. Possingham Peter J. Mumby Catherine E. Lovelock, 2015

It is critical to bear in mind that blue carbon is a relatively new concept and this issue is related to lack of information/guidance about implementing blue carbon projects, metrics to measure benefits, best practice, costs, etc

Palm Island | Transport

4 Community Bus Service

This project is to start an environmentally friendly bus service for community transport.

Description and overview

The community need for an on-island public transport service, to improve accessibility and connectivity for the island's residents, has been identified. There is currently a locally operated on-call shuttle service available which provides a point-to-point trip service for visitors and community e.g airport transfers, however it was noted that this service was cost-prohibitive for much of the community and underutilised.

Implementing a reliable public transport service can increase the community connectivity on the island, which could be operated by the existing shuttle company or as a separate service. It is proposed that the service be implemented as a low emissions public transport (e.g. an electric vehicle (EV), hybrid, or alternative fuel –biodiesel, renewable diesel or hydrogen fuel cell) that can provide a decarbonisation benefit against a diesel equivalent.

A further feasibility study would be required to confirm the vehicle selection, proposed routes, fares and other operational components. It should be noted that a proposed route has been developed by Council. For this project it is currently assumed that an initially single EV vehicle would be in operation with associated charging and bus stop infrastructure. Indicative shuttlebus operation could be as follows:

- Capacity of shuttlebus: 12 – 15 passengers
- Route length: 30 minutes, 8km route from Klub Kuda to Palm Island Airport
- Operating hours: 7:30am to 6:30pm daily

Introducing an EV for a daily shuttlebus service could decrease the overall emissions per year when compared with a diesel equivalent due to the inefficiencies of internal combustion engines, especially with the stop, start nature of a shuttlebus. The specific emissions reduction depends on multiple operational factors, however literature highlights this could be in the order of 10-25% (~2 to 6kg CO_2e / 100km) of the current grid and has the potential to be increased with higher penetration of renewables and scheduled recharging.

There are additional co-benefits of the service to the community such as increasing community connectivity and social cohesion, as well as access to essential services such as shopping, employment and social events. Implementing fares or stable ongoing funding is required to make this project feasible. A potential route servicing the main communities on the island (see maps) has been identified based on informal discussions with various community members and would be refined as part of the project implementation. This project has been based on an initial single bus however it has been noted that up to two vehicles could be required to achieve a reasonable loop time around the island. An immediate opportunity exists to operate a low emissions shuttle bus service on Palm Island.

Project summary

Alignment with key project objectives	Low	Med	High
Decarbonisation impact	■		
Community resilience	■	■	
Extent of co-benefits			
Economic development	■	■	
Social development and cultural	■	■	■
Environmental protection	■	■	

Item	Units	Total*
Estimated annual emissions reduction	kg-CO_2-e / 100km	2-6
Estimated payback period	Years	>20
Estimated annual cost savings	$	5,300
Estimated capital costs	$ mil	0.1+
Net present value (simple)	$	N/A
Timeframe to deliver project	Years	0.5-1
Estimated FTE	No.	1

* Note that the feasibility study will determine optimum project details. An estimate of potential project costs and benefits is provided in this project outline overleaf.

Key project objectives

Carbon assessment

Introducing an EV for a daily shuttlebus service could decrease the overall emissions per year when compared with a diesel equivalent due to the inefficiencies of internal combustion engines, especially with the stop, start nature of a shuttlebus. The specific emissions reduction depends on multiple operational factors, however literature highlights this could be in the order of 10-25% (~2 to 6 kg CO2e / 100 km) of the current grid and has the potential to be increased with higher penetration of renewables and scheduled recharging[1, 2, 3]

The emissions from the EV would be due to charging from the diesel-powered grid on Palm Island. If the renewable energy penetration of the grid were to be maximised, the emissions from implementing an EV shuttlebus could eventually be effectively zero.

A dedicated solar PV and battery charging system could also ensure low emission operation. Sizing and costing of this charging system is suggested to be explored further after the shuttlebus' operating times and methodology are confirmed, however indicative numbers are provided in the capital costs section.

Community and climate resilience

Increased community connectivity, encouraging more community engagement and freedom of movement for the community, including during weather events when unpleasant or unsafe to travel by foot.

The hilly terrain, safety and availability of paths in hot and monsoonal north Queensland climate pose challenges to uptake of active transport options such as walking and cycling on the island. Community members with health issues preventing them from using active transport options are also likely to benefit from the shuttlebus service.

Introducing an EV shuttlebus is an enabler for other EVs and electric modes of transport on the island in the future, due to the possibility of sharing EV charging infrastructure and maintenance management.

Co-benefits

Economic

- An EV option provides a lower operational cost compared to that of a diesel shuttlebus, due to expensive diesel prices on the island, relative to electricity cost to appropriately charge EVs
- Full economic benefits obtained dependent on funding obtained or whether community members are charged a nominal fare (e.g. $2 - $3; which could either be paid by cash or a smart card system) for use, paid positions for driver(s) and maintenance personnel could be available addressing the severe risk of unemployment identified in the project risk assessment. Current on-call services start at $15.

Social and cultural

- An accessible public transport service could increase community connectivity, encouraging more community engagement, access to essential services and freedom of movement within the island community. Absence of public transport on the island was identified as a high risk. The shuttlebus could be used for specific services such as helping transport children or elderly.
- Further community consultation is required to determine a suitable shuttlebus route, operating hours and operating style; including ownership structure, which satisfies the Palm Island's community needs.

Environmental (General)

- An EV could provide emissions reduction in comparison to a diesel counterpart, which was identified as a severe risk in the project risk assessment. The full possible emissions reduction is not quantifiable without further detailed assessment of bus routes and analysis.
- Reduced use of personal vehicles may yield additional emissions reductions. Reduced dependence on individual vehicles could also long-term reduce metal waste, a noted problem on regional islands.

Environmental (impacts to Great Barrier Reef)

- A reduction of greenhouse gas emissions through utilisation of EVs could contribute to the global effort to reduce emissions which are impacting the reef through increased temperatures and ocean acidification. Any reduction in the shipping of diesel across the reef will directly benefit the reef through reduced shipping impacts and reduced chance of spillage.

Risks and opportunities

Barriers

- Full decarbonisation benefit requires a corresponding increase in renewable energy and storage into the grid electricity and installation of charging infrastructure.
- Disability / wheelchair access for standard high-floor shuttlebus may be limited. Wheelchair access could be achieved through custom modifications to layout of bus interior; likely increasing capital cost and reducing total passenger seats.

Risks

- Residents and visitors not embracing or utilising service. This risk can be mitigated by effective consultation during the planning phase, and effective promotions.
- Timing of service not properly aligning with ferry arrivals.
- Wider risk to implementing EVs on grid - may charge at night when solar unavailable.
- Servicing and repairs of electric vehicle on Palm Island could be limited depending on skilled labour available.
- Project reliant on initial capital expenditure and ongoing operational expenditure subsidy as on-island demand and likely price-point insufficient.

Opportunity

- Alternatively could use standard diesel vehicle with a low-emissions diesel fuel when available on market or alternative vehicle type- hybrid (electric and diesel) or hydrogen powered vehicle. These technologies were not detailed due to lack of available vehicles on the local market for the 12-15 passenger capacity size, however they may be available in the next 5-10 years.
- Other alternative opportunities include utilising smaller vehicles, or variations from traditional cars such as golf-carts / tuk-tuks or vehicle types which may be suited to the size of the island
- Opportunity to link up with health services to provide critical transport needs.

Alignment with other initiatives

Alignment with other project options

- 5. Solar Power on the ground with batteries
- 6. Put Solar Power on the roof
- 10. Improving walkways around Palm Island

Alignment with external initiatives or investments

- Aligned with existing Palm Island 'on-call' shuttle service – to ensure services do not conflict and rather complement each other for the benefit of the community. An on-call service has its own unique service offerings, however the community has identified the cost is too high for daily use.
- The installation of charging infrastructure for the electric shuttlebus would need to align with Ergon's planned network upgrades, considerations surrounding increased grid demand are also required to be made

[1] Vrije Universiteit Brussel (VUB) university in Brussels for Non-Governmental Organisation (NGO) Transport & Environment (T&E), 2017, 'Life Cycle Analysis of the Climate Impact of Electric Vehicles'
[2] Australian Capital Territory (ACT) Government, 2019, 'Alternative Fuel Buses in the Transport Canberra Bus fleet'
[3] Multiple authors, 2019, 'Life cycle greenhouse gas emissions of Electric Vehicles in China: Combining the vehicle cycle and fuel cycle'

Assumptions

- Calculations based on a shuttlebus running daily and continuously from 7:30am to 6:30pm and route of approximately 7-10.5km
- EV shuttlebus utilising Ergon's EV Home Charging Plan (Ergon tariff 33 rates)
- Carbon reduction estimates have been assumed from;
  - Vrije Universiteit Brussel (VUB) university in Brussels for Non-Governmental Organisation (NGO) Transport & Environment (T&E). Life Cycle Analysis of the Climate Impact of Electric Vehicles, 2017
  - Australian Capital Territory (ACT) Government, Alternative Fuel Buses in the Transport Canberra Bus fleet, 2019
  - Life cycle greenhouse gas emissions of Electric Vehicles in China: Combining the vehicle cycle and fuel cycle, 2019
- Using manufacturers performance specifications for both diesel and electric shuttlebuses – assumption that any inefficiencies and variance due to conditions of route are equally applicable to both vehicles
- Project created using the performance specifications and costing estimate of the SEA Electric E4B Commuter Bus (EV) and the Toyota HiAce Commuter (diesel)
- Cost of diesel on-island taken as $2/Litre
- No transport or traffic modelling has been conducted. No usage modelling conducted.
- No vehicle (diesel / electrical power) efficiency analysis has been conducted.
- Timeframe to deliver solution estimate and assumes continuous working towards solution.
- Vendor quotes specific to Palm Island not obtained for vehicles or energy systems
- Solar PV costed on ~$1,300 / kW and battery systems costed on ~$1,500/kWh, which includes a regional escalation factor based on Rawlinson's Construction Handbook 2020
- Solar PV and battery cost estimates include supply and installation; location of potential solar PV and battery installation not determined

Costs and funding considerations

Capital costs

- Total capital cost: ~$102.5k
  - Electric Vehicle: ~$100k
  - EV Charging Unit: ~$2,500[4]
- Costs do not include storage location for vehicle, insurance, suitable vehicle parking and associated structure costs to be determined in next phase
- Cost of community consultation to refine operational structure, storage location design to be determined.
- Cost of optional renewable energy charging infrastructure;

Operating Case	Daily Charge	Solar PV, Battery	Capital Cost
150 km / day	56 kWh	15 kW, 60 kWh	~$110k

Ongoing costs

- Cost of power to charge the vehicle (based on indicative route): ~$12 / day
- Servicing of electric vehicle: $1,000 - $2,000 / year[5]
- Wages of drivers and training costs to be determined in next steps alongside operating time confirmation

Potential cost savings or return on investment

- Less diesel petrol required in comparison to power required to charge EV
- Annual savings of ~$5,300 in comparison to equivalent diesel shuttlebus
- Implementing fee to utilise service could offset driver and power consumption costs for EV charging - $2 to $3 dollar service fee suggested by members of community

Funding opportunities

- Climate Solutions Fund – Emissions Reduction Fund
- Clean Energy Finance Corporation (CEFC) – Reef Funding Program
- Australian Renewable Energy Agency (ARENA) – funding through exploration of innovative EV charging infrastructure
- Ergon – potential funding and becoming partner on project due to EV charging infrastructure
- Local Government Grants and Subsidies Program (LGGSP) - potential capital funding after feasibility study completed
- Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) – could align with similar EV charging infrastructure investments

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Palm Island Shuttle (or other supplier)	■	■		
Local Council / Government	■	■		■
Ergon Energy / Energy Qld			■	
Residents & visitors				■

Additional information

- The terrain could benefit regenerative braking, where energy can be recovered from breaking, further increasing the benefit of an EV
- A suitable location for secure undercover storage and further assessment into EV charging infrastructure would need to be explored
- If deemed suitable, solar PV and battery charging system deemed suitable, solar PV could be installed on roof of undercover storage
- Publicly available EV charging infrastructure could help other residents transfer to EV usage

Implementation and timeframes

Investment readiness

- Further consultation and development of feasibility is needed with the existing Palm Island Shuttle to confirm if they are interested in owning and operating the new service

Next steps

- Analysis of proposed route, potential customer basis and design of EV charging station and storage
- Community consultation is required to determine appropriate operating times in association with Palm Island Shuttle and local council

Considerations for implementation

- Analysis of proposed route, potential customer basis, confirmation of sizing of vehicle and design of EV charging station and storage. Community consultation is required to determine appropriate operating times

Timeframes to deliver solutions

- Timeframes for delivering an appropriate vehicle and charging infrastructure will vary but may take between 6 months and a year. A community consultation exercise would be conducted within 3 months from when funding is secured.

[4] Ergon Energy, September 2020, 'Charging your electric vehicle', https://www.ergon.com.au/network/smarter-energy/electric-vehicles/charging-your-electric-vehicle
[5] Canstar Blue, June 2019, 'Electric Car Servicing Explained', https://www.canstarblue.com.au/vehicles/electric-car-servicing/

Palm Island | Energy

5 Solar Power on the Ground with Battery

Study to build a solar farm in Coolgaree Bay.

Description and overview

The addition of a centralised renewable energy system to supplement the existing diesel-powered electricity generation would increase the energy self-sufficiency of the island and contribute to decarbonising the island's energy generation system. The project is seeking initial funding for a feasibility study of a centralised renewable energy system comprising a utility scale solar farm and battery facility.

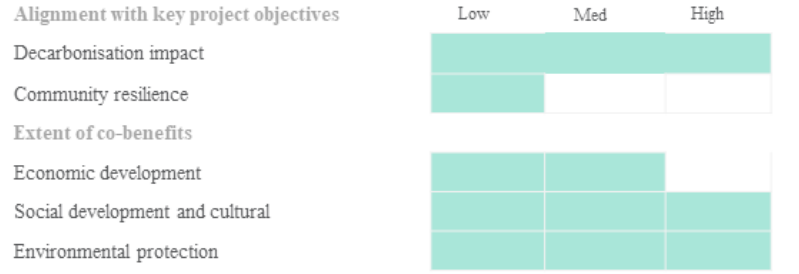
There is an opportunity to implement a renewable energy system in the Coolgaree Bay area, as preliminarily identified in the Palm Island Master Planning document 2019. At the site, there is approximately ~80,000m^2 of land which would be sufficient for the system size proposed.

Preliminary sizing indicates a 5MW solar PV system paired with a 6MWh battery could increase the renewable energy penetration to ~80% of total energy demand. Palm Island's total annual power consumption is 7,435GWh. A renewable system of this size could reduce annual emissions by ~4,900t CO_2e. The estimated cost of this system is ~$15M.

The next step would be a feasibility study to determine; optimum sizing of a solar farm PV and battery system, refined project costs, land suitability, and environmental conditions. This is to be conducted in conjunction with Ergon as the incumbent energy system operator, including an appropriate site selection process. Potential ownership structures including Ergon, community-owned or third party need consideration, it has been assumed that Ergon would lead this project. Planning and stakeholder engagement is required to determine the direct benefit to the community for this project, as well as determining if community acceptance can be achieved.

If the island were to maximise renewable penetration, the diesel generators could primarily be utilised for voltage and frequency control, these functions could also potentially be provided by batteries and associated auxiliary equipment, increasing the power security of the island. It should be noted that major upgrades to the network on the island by Ergon may be needed to make this project feasible.

Project summary



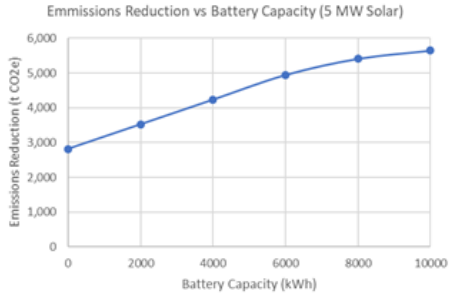
Item – 5 MW Solar Farm	Units	Total
Estimated annual emissions reduction	t-CO_2-e	0 - 4,900
Estimated payback period	Years	5
Estimated annual cost savings	$ mil	3
Estimated capital costs (study)	$ mil	0.25
Estimated capital costs (solar farm/battery)	$ mil	15
Net present value (simple)	$ mil	5 – 10*
Timeframe to deliver project	Years	0.5
Estimated FTE (project)	No.	> 3

Note that the feasibility study will determine optimum project details. An estimate of potential project costs and benefits is provided in this project outline overleaf.

*10 years, 5% discount

Key project objectives

Carbon assessment
Introducing a solar farm into the network could majorly reduce the island's dependence on diesel generation and could cut annual emissions by ~4,900t of CO_2 (5MW solar PV with 6MWh battery system).



Emissions reductions shown above with varying battery sizing. Significant battery systems and network upgrades could be required to reach possible decarbonisation benefits of a solar farm due to network security requirements.

Community and climate resilience
Additional benefits to the community could be realised by training residents in the maintenance of the solar PV systems. This presents social and economic co-benefits for capacity building, skills development, and potential job creation, and could reduce the lead time on maintenance of underperforming systems.

A solar farm would reduce the reliance on mains grid power throughout the day, less strain on the network and greater reliability of power for residents may be achieved with complimentary storage and network upgrades.

Less dependence on diesel generators will mean the existing diesel storage could last the community for a longer duration, augmenting supply and providing higher resilience as a backup system.

Co-benefits

Economic
Depletion of natural energy resources through consumption of fuel was identified as a severe risk in the project risk assessment. Any solar generated on the island could have a direct correlation in diesel reduction from the generators that supply the island. An increase in solar generation corresponding with a reduction in diesel usage could directly benefit Ergon who maintain the generators and fuel levels as an input cost. The full economic benefits of the project are dependent on ownership structure which is yet to be determined.

Additional engagement with Ergon is required to realise the cost benefits of installing a centralised system to the community.

Social and cultural
Helping the island move towards more renewables and potential storage to displace diesel generators powering the grid. Setting an example for other island communities.

Training locals in maintenance and installation of the solar PV systems could reduce lead time on fixing any systems and the community could benefit from job creation.

Utilising a solar farm as opposed to rooftop solar may be easier to secure and less likely to face vandalism or poor shading/orientation of rooftop conditions.

Environmental (General)
Reduced diesel generation through increased solar generation will have a positive impact on greenhouse gas emissions as well as diesel particulates sulphur oxide and nitrous oxide.

Costs of disposal and end of life recycling should be considered as part of the feasibility study.

Environmental (impacts to Great Barrier Reef)
While it will take some time to fully remove reliance of diesel, ultimately this will have an impact on emissions associated with shipping diesel to the island as well as any risk of spills.

Risks and opportunities

Barriers
- The capacity of the current network may limit the ability to add high levels of renewable penetration
- Stakeholders agreeing on development of project; including Traditional and Historical Owners
- Funding obtained for further project phases
- Suitable ownership structures for the systems

Risks
- Vandalism affecting performance of systems
- Lead-time on maintenance
- Grid impact, effect of diesel generators from increased ramping up and down
- Location near marine environment in tropical setting damaging equipment, furthermore possible negative impact to marine environment
- Community acceptance of solar farm not obtained due to lack of price benefits
- Recyclability/sustainability of solar PV panels and battery technology installed

Opportunity
Ergon's currently predicted 2021 solar hosting capacity limits constrains the island to an additional 700kW solar PV, unless battery systems are included. Any large renewable system would require close consultation with Ergon to develop an appropriate solution and in line with any proposed network upgrades.

There is an opportunity to assess wind generation as it has previously been mentioned by the community, however this would require a separate feasibility study to determine generation performance and a suitable location. Additionally in the future commercial drop-in renewable or bio-diesel alternative fuels may provide a decarbonised fuel source for diesel generators.

Alignment with other initiatives

Alignment with other project options
- 6. Put Solar Power on the roof: Installations on residencies rooftops may restrict the size of solar farm possible for installation – if upgrades to Ergon's network are limited
- 9. New Solar Hot water systems: Upgraded SHW systems may alter the power demand requirements of the island.

Alignment with external initiatives or investments
Aligns with Department of Housing residential solar hot water systems installation and maintenance – affects power consumption of residents on island and subsequently suitable solar farm sizing.

Assumptions

- Seasonal performance of solar PV averaged historically
- Power consumption remaining similar to historical numbers – growth rate of island not modelled
- Solar farm all operational and appropriate repairs and replacements made over lifespan
- Main solar farm option presented assumes modifications to Ergon's network to allow for increased solar PV in network
- Costing was conducted on industry benchmarking for Australia with regional mark-up
- Solar PV costed on ~$1,150 / kW and ~11 m^2/kW solar farm area requirement
- Battery costed on $1,500 / kWh, however likely to differ based on battery manufacturer
- Minimum load ratio of diesel generators and performance not modelled
- Assumption it costs $2 / L for Ergon to purchase and transport diesel to Palm Island, note: value not provided by Ergon rather industry benchmarked, excluding fuel tax rebates
- Detailed analysis of solar PV or battery performance not conducted, all emissions and performance parameters based on assumptions and subsequent theoretical calculations
- No structural or orientation analysis of solar farm has been conducted
- Costing based on Australian industry benchmarking, as opposed to vendor quotes
- Suggested solar PV and battery sizing not optimised, only to be used as example of potential high-level costing and emissions reduction
- Suggested project timeline assuming commitment of all stakeholders, and no notable delays in project development

Costs and funding considerations

Capital costs
- Approximate capital cost of solar PV: ~$6M (5MW)
- Approximate capital cost of battery: ~$9M (6MWh)
- Costs include the supply of solar panels and battery system
- Costs could be altered if local members of the community trained in the installation and maintenance of the solar panels instead of / or in combination with external contractors. Potentially higher costs upfront due to training required, however long-term reduced costs due to local workforce.
- Vandal proof security fencing
- Costs for network upgrades required not included
- Required feasibility study to cost ~$250k

Ongoing costs
- Maintenance of solar PV systems
- Replacement costs
- Resulting Ergon network modifications

Potential cost savings or return on investment
- Less diesel consumption and transportation required
- Annual savings of ~$3M / year savings from Ergon for reduced diesel transportation and purchasing
- ~5-year simple payback period
- Further savings could be achieved if a carbon tax/price was introduced

Funding opportunities
- Clean Energy Finance Corporation (CEFC) - Reef Funding Program: funding available for emission reduction projects in Great Barrier Reef catchment area
- Regional and Remote Communities Reliability Fund
- Climate Solutions Fund – Emissions Reduction Fund

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Ergon Energy				
Local Government				
Residents & Businesses				
Solar farm technicians				
Land lease/traditional owners				
DNRME				

Additional information

The land suitability and availability for a solar farm is yet to be confirmed for the currently identified location in the masterplan, this is a major consideration and should be made prior to funding being sought.

If the island were transitioned to a completely renewable grid, then the diesel generators could be utilised almost purely as backup power, increasing the power security of the island.

Implementation and timeframes

Investment readiness
- The project is ready for investment to commence feasibility study into the renewable energy system

Next steps
- Further analysis of solar PV output taking into consideration the unique losses due to the tropical and marine environment should be conducted, in addition to vendor engagement to confirm pricing of systems and ongoing maintenance costs
- The ownership structure and funding methodology requires further consideration
- Consultation and engagement with Ergon to determine appropriate planning

Considerations for implementation
- Ability to train locals in the maintenance of the systems
- Maintenance and future installations of systems could be achieved more efficiently with help from trained locals

Timeframes to deliver solutions
- The timeframe to deliver the project is related to the approval of funding and completion of feasibility study in consultation with Ergon, a time estimate for this study is ~6 months

Palm Island | Energy

6 Put Solar Power on the Roof

Putting solar panels on the roof of your home to produce some of your own electricity.

Description and overview

Palm Island's electricity supply is primarily provided from diesel-powered generators. The project is for the provision of renewable energy to households by installing solar photovoltaic (PV) panels on rooftops of residential properties. Any reduced use of diesel mains power provides a direct decarbonisation benefit to the island.

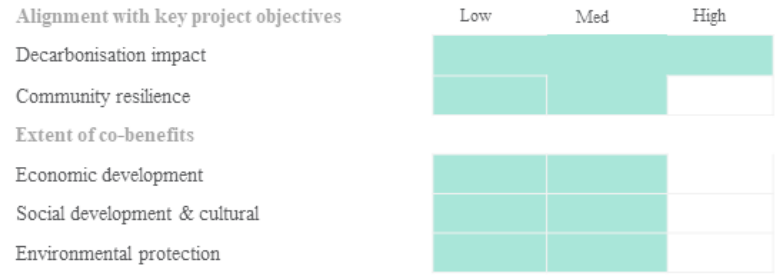
Rooftop solar providing electricity directly to residents (behind the meter) would enable households to generate their own power to provide reliable affordable access to electricity for families, reduce electricity bills and increase self-sufficiency. Additional benefits to the community by upskilling local workers to install and maintain systems, and can offer ongoing job creation, however a suitable ownership structure for the systems still needs to be confirmed.

Almost all residents on Palm Island live in housing provided by the Department of Housing and Public Works (DHPW) and is maintained under contract by Palm Island Aboriginal Shire Council (PIASC) with electricity supply services provided by Energy Queensland / Ergon. Collaboration between all parties will be required for the success of this project. Precedence exists for renewable energy in Queensland remote communities such as Doomadgee, Mapoon and Lockhart River areas, and lessons learned should be applied to benefit future projects going forward.

Ergon has advised that the current network is unable to host any further renewable energy connections however that upgrades are proposed for 2021 to increase the network's solar hosting capacity. The first phase of the project proposes to install ~700kW (~1.3kW per residency) new solar PV which is the maximum amount permissible based on the proposed Ergon upgrades. This project could see an annual electricity cost saving of up to $470 per residence and a total annual emissions reduction of ~780 tonnes of CO_2.

Future phases may see increased renewable energy if Ergon network hosting capacity is upgraded or systems are not connected to the network. Ergon have indicated that potential future upgrades could increase the total solar PV installed to 2,650kW (~5kW per residency), providing up to ~$950 annual reduction in energy bills per residence and an annual emissions reduction of ~1560 tonnes of CO_2 with additional payback from solar feed-in possible. Additionally battery energy storage should be considered in the future, as suitable technology evolves, maintenance staff are available and battery costs decrease to reduce payback period to improve value for money.

Project summary

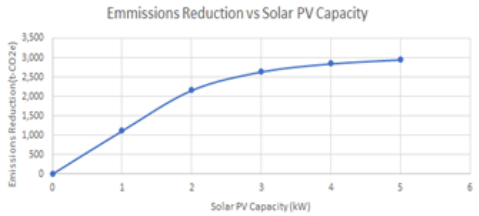


Item – Phase 1: 700 kW solar PV	Units	Total*
Estimated annual emissions reduction (island)	t-CO_2-e	780
Estimated annual emissions reduction (residence)	t-CO_2-e	1.5
Estimated payback period	Years	~5
Estimated annual cost savings	$ / resident	470 (per residence)
Estimated capital costs (phase 1)	$ mil	1.4
Estimeated capital costs (phase 2)	$ mil	4
Timeframe to deliver project	Years	1 - 2
Estimated FTE	Days per installation	1 – 2*

* Approximately 530 residencies

Key project objectives

Carbon assessment
Maximising the amount of solar in the network will reduce the island's dependence on diesel generation and could directly cut annual emissions by ~780 tonnes of CO_2.



The above graph shows the emissions reductions achievable from each residential installation of rooftop solar. Over a 20-year lifespan, and accounting for a two-year payback period for embedded emissions in manufacturing the panels, the solar installations in phase one would reduce the island's emissions ~28,100 tonnes of CO_2.

Community and climate resilience
Additional benefits to the community could be realised by training residents in the installation and maintenance of the solar systems. This presents social and economic co-benefits for capacity building, skills development, and potential job creation, and could reduce the lead time on maintenance of underperforming systems.

Less dependence on diesel generators will mean the existing diesel storage will last the community for a longer duration. An increase in renewable generation will also provide more resilience against future carbon taxes, if introduced.

Co-benefits

Economic
Solar-generated electricity would meet most household electricity demand while panels are actively generating power throughout the day. This has the potential to significantly reduce household energy bills which was identified as a severe risk in the project risk assessment.

Upskilling local workers in the maintenance and installation of systems could reduce operational lead times and costs for fixing any underperforming or non-operational systems.

The island has its own qualified electrician who has taken on some commercial contracts, Housing and Public Works maintenance as well as assisting with fit outs for new properties. Palm Island does not however have a Clean Energy Council (CEC) accredited electrician, needed to maintain and repair the multiple defective solar panel installations on the island.

Any solar generated on the island could have a direct, corresponding reduction in diesel-generated power.

Social and cultural
By reducing the cost of electricity, more income is in the hands of the island residents. Moving the island towards more renewables and potential storage to displace diesel generators powering the grid.

If locals were trained in the maintenance and installation of the solar systems, the community could also benefit from job creation.

Environmental (General)
Reduced diesel generation due to increased solar generation will reduce greenhouse gas emissions, as well as diesel particulates, sulphur oxides and nitrogen oxides. Greenhouse gas emissions was identified as a high risk in the project risk assessment.

Environmental (impacts to Great Barrier Reef)
While it will take some time to fully remove the need for diesel, ultimately this will have an impact on emissions associated with shipping diesel to the islands as well as any risk of spills.

Risks and opportunities

Barriers
- The capacity of the current network will limit the ability to host additional rooftop solar PV in the short term
- Future behind the meter solar PV and battery systems would help mitigate the network limitation barrier, however, have much greater capital costs
- Suitable ownership structure of the solar PV systems and any future battery hosting still to be confirmed
- Possible issues with maintenance of household systems, capacity issues with existing electricity grid, and the viability/cost of upgrading the network.
- High initial establishment cost to Government of installation of household solar power generation/storage systems for social housing.

Risks
- The structural integrity of buildings to support rooftop installations has not been confirmed
- Adverse weather conditions damaging systems
- Shading conditions may reduce the performance of systems
- Unpredictability of weather leading to varying day-to-day generation performance

Opportunity
- Potential to bring forward additional rooftop PV installation and batteries, assuming additional hosting capacity can be provided and with funding support and stakeholder agreement
- In the future there may be opportunity to target commercial buildings
- Inclusion of new residential builds in scheme, on the condition that the solar hosting capacity will not be exceeded

Alignment with other initiatives

Alignment with other project options
- 4. Community bus service: Greater penetration of renewables could increase carbon benefit of an EV shuttlebus
- 5. Solar Power on the ground with batteries: Solar hosting capacity limits may be reached alternatively by centralised solar farm not constrained by Ergon grid management limits – i.e. solar farm in direct competition with rooftop solar
- 9. New Solar Hot water systems: Frames and other structural work for solar panels could be coupled with SHW installation. Based on average household rooftop area there will be sufficient area to house both SHW and solar systems. SHW systems not constrained by Ergon grid management limits.

Alignment with external initiatives or investments
- Aligns with existing DHPW funding for reroofing and solar hot water systems installation and maintenance.

Assumptions

- Ergon's planned network upgrade for 2021 occurs before installation of the solar PV is conducted – predicted solar PV hosting capacity is realised
- Seasonal performance of solar PV averaged based on historical Global Horizontal Irradiance (GHI)
- Modelled on current power consumption – growth rate of island not modelled
- Solar PV all operational and appropriate repairs and replacements made over lifespan
- Solar PV operation is not restricted by Ergon
- Calculations are based on average household power consumption. Using 530 residencies, and 57% residential and 43% commercial energy split of total island consumption provided by Ergon.
- Solar PV costed on ~$2,000 / kW (for 1.3 kW), $1,300 / kW (for 5 kW system), and ~5 m2/kW area requirement for rooftop mounted systems
- Battery systems, including inverter and charger for integration with solar PV, costed on ~$2,000 / kWh (for 4 to 8 kWh systems)
- Detailed analysis of solar PV performance for each residency not conducted, all emissions and performance parameters based on assumptions and subsequent theoretical calculations
- No structural or orientation analysis of residency roofs has been conducted
- Residencies currently with solar PV may not see the same level of cost benefits from installing more solar PV
- Costing based on Australian industry benchmarking, as opposed to vendor quotes
- Potential solar feed-in tariff cost returns not included

Additional information

De-centralised (residential) battery systems could reduce the dependence of each residency on grid power consumption providing further financial return, however, would not provide Ergon with the same level of control as a centralised solution and may pose a potential risk to network security if not adequately managed.

Solar and battery sizing should be conducted in collaboration with Ergon to ensure network security is improved instead of adversely affected, regardless of which battery (none, centralised, de-centralised) is selected.

Costs and funding considerations

Capital costs

- Phase 1 total capital cost: ~$1.4M (~$2,000 / kW)
- Complete project capital cost: ~ $4M; combined phase 1 and 2 (solar PV 2,650 kW)
- Costs include the supply and install of solar panels
- Costs could be altered if local members of the community trained in the installation and maintenance of the solar panels instead of / or in combination with external contractors

Ongoing costs

- Maintenance of solar PV systems
- Replacement costs
- Resulting Ergon network modifications
- Distribution of ongoing costs to be confirmed with ownership structure

Potential cost savings or return on investment

- Annual savings of ~$500 per residency
- Simple payback period of ~5 years, not including any provided subsidy. I.e. if a 50% subsidy on the purchase and installation of solar PV systems were to be offered to residents than the payback period would also be halved to ~2.5 years

Funding opportunities

- Small-scale technology certificates for solar PV systems through the Small-scale Renewable Energy Scheme – from the Clean Energy Regulator (Australian Government)
- Clean Energy Finance Corporation (CEFC) - Reef Funding Program: funding available for emission reduction projects in Great Barrier Reef catchment area
- Regional and Remote Communities Reliability Fund
- Climate Solutions Fund – Emissions Reduction Fund
- North Australia Infrastructure Fund (NAIF)

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Residents	■	■	■	■
Energy Qld/Ergon	■	■	■	
DHPW	■	■	■	
PIASC		■	■	
Solar PV Installers			■	

Implementation and timeframes

Investment readiness

- The project is ready for investment to commence the planning process for rooftop PV systems, however preliminary spending should be held off until confirmation that Ergon's planned 2021 network upgrade will occur and that the additional solar PV can be connected
- Behind the meter solar PV and battery systems could also be considered, which would be ready for investment independent of Ergon's upgrades
- The ownership structure of the project is still to be confirmed, whether residents, DHPW, or otherwise owned

Next steps

- Further analysis of solar PV output taking into consideration the unique losses due to protective caging should be conducted, in addition to vendor engagement to confirm pricing of systems and ongoing maintenance costs
- The ownership structure and funding methodology requires further consideration
- Consultation and engagement with Ergon to determine appropriate planning

Considerations for implementation

- Ability to train locals in the installation of the systems should be considered in combination with considerations regarding minimising overall cost and time taken for each installation
- Training may delay the project in the short-term, however the maintenance and future installations of systems could be achieved more efficiently with help from trained locals
- Battery implementation should be considered on a case by case basis

Timeframes to deliver solutions

- The timeframe to deliver the project is largely dependent on the required upgrade to the Ergon network, supply and installation of the panels. The installation of these systems could take from 1 – 2 days each and there are 530 recorded residencies on Palm Island. This could take in the 1 - 2-year range depending on the availability and efficiency of qualified technician(s) to install the rooftop solar PV systems.

Palm Island | Water

7 Building Confidence in the Community's Water Supply

This project seeks to engage with the community to re-build community trust in the safety and reliability of the water supply.

Description and overview

Water security on Palm Island is highly dependent on seasonal rainfall, and there have been occasions in recent years where water storages have dropped to critically low levels, triggering the need to activate emergency drought responses[1] (e.g. severe water restrictions, banning non-essential visitors[2], importing water from mainland, and investigating groundwater and desalination options). Other infrastructure and operational issues have also led to water quality incidents (e.g. discolouration of water and boil water notices). This has impacted on the community's trust in the safety and reliability of the drinking water supply. It is estimated by community service providers (CDP) that the community spend up to $300,000 annually on bottled water as a result of water quality issues. It is also noted that the hospital has its own chlorination and water filtration facilities, providing resilience in the provision of health services to the community in times of poor water quality.

The Queensland Government has committed funding to improve water supply infrastructure through the Indigenous Councils Critical Infrastructure Program (ICCIP)[3], and further capacity building programs by Queensland Health and others. Together with longer term improvements to asset management, operation and maintenance approaches, these proposed works will significantly improve drinking water quality and reliability on Palm Island into the future, however further work will be required to re-build community confidence.

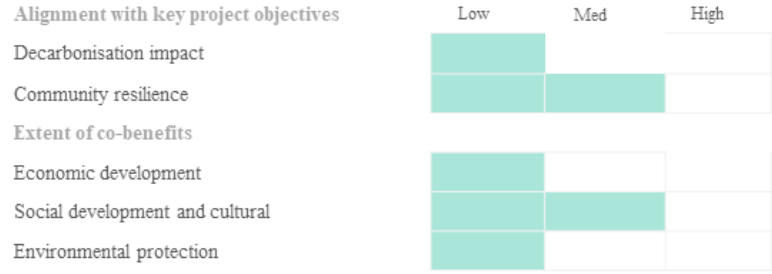
This project seeks to implement *co-designed and delivered initiatives to better engage the community in water service provision*, and re-build community trust, as existing issues are resolved. The project will include:

- Communication of the major water supply and wastewater system improvements delivered;
- Targeted engagement to provide council with a better understanding of community attitudes and values toward water, which can be built into its customer service standards, decision making and planning;
- Community education (including in schools) on the value of water and importance of water conservation and promoting tap water not bottled drinks as the healthy drink of choice in the community; and
- The provision of regular feedback to the community on the performance of the water supply system (e.g. digital public notice boards to communicate dam levels, recent water quality results, and water restrictions.

The project may also incorporate physical, iconic installations to further reinforce messaging. One such opportunity identified by stakeholders involved installation of solar powered, chilled drinking water fountains in the community to promote clean drinking water as the beverage of choice in community and displace plastic bottled drinking water which contributes to waste.

To deliver the intended outcomes, this project must be delivered in conjunction with other initiatives to 1) address critical water and wastewater infrastructure deficiencies; 2) build capacity within Palm Island Aboriginal Shire Council (PIASC); and 3) develop and implement a holistic long-term plan to maintain service levels into the future (see project #15).

Project summary



Item	Units	Total
Estimated annual emissions reduction	t-CO_2-e	N/A
Estimated payback period	Years	N/A
Estimated annual cost savings	$	N/A
Estimated capital costs	$ mil	0.2 - 0.4
Net present value (simple)	$	N/A
Timeframe to deliver project	Years	<1
Estimated FTE	No.	N/A

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[1] Queensland Government, 2016, 'Long term water solution developed for Palm Island', http://statements.qld.gov.au/Statement/2016/10/5/long-term-water-solution-developed-for-palm-island
[2] Timms, P., 2015, 'Health fears as Palm Island Aboriginal community risks running out of water', https://www.abc.net.au/news/2015-10-16/health-fears-as-palm-island-risks-running-out-of-water/6861988
[3] Queensland Government, 2020, 'Indigenous Councils Critical Infrastructure Program (ICCIP)', https://www.dlgrma.qld.gov.au/local-government/grants/current-programs/indigenous-councils-critical-infrastructure-program

Key project objectives

Carbon assessment
- Reduced per capita water consumption/ production and associated reduction in water asset power
- Potential for reduction in plastic water bottle usage and the associated carbon emissions from approx. 300,000 bottles bought each year on Palm Island

Community and resilience
- Increased resilience of water supply through improved community response to a co-designed engagement on the water management strategy (including demand management initiatives)
- Reliable and safe water supply is key to the ongoing health and wellbeing, resilience and self-sufficiency
- Confidence in water is key to promoting health and lifestyle choices (drinking water over alternative beverages, and healthy hygiene practices)

Alignment with other initiatives

Alignment with other project options
- 2. Living better at home and saving money
- 15. Water and wastewater plan

Alignment with external initiatives or investments
- While the program is community led, it is acknowledged that this program of work will complement other programs and initiatives being led on island by others
- Indigenous Councils Critical Infrastructure Program – Palm Island Water and Sewerage Infrastructure Works
- Other water and wastewater infrastructure programs
- Queensland Health Safe and Healthy Drinking Water in Indigenous Local Government Areas Program

Co-benefits

Economic
- Increased utilisation of town supply for drinking water (over imported bottled water)
- Decreased waste disposal costs associated with plastic water bottles
- Better management of water demand, reducing ongoing infrastructure costs
- Water supply resilience able to support economic development (increased water demand from additional dwellings, tourism etc.)

Social and cultural
- Increased community trust in water supply and wastewater services
- Better understanding within community of the challenges and costs associated with water and wastewater service provision
- Effective, community-based water demand management initiatives tailored toward the community specific values and attitudes toward water
- Increased awareness of value of fresh water as a commodity of limited supply on the island which was identified as a severe risk in the project risk assessment
- Better collaboration between community and council on water and wastewater issues (e.g. reporting of water quality incidents, faults and overflows)

Environmental (General)
- Decreased waste to landfill from bottled water
- Increased community reporting of incidents with the potential to cause environmental harm (e.g. wastewater overflows)
- Education in water usage and importance
- Reduced overflows from wastewater network (through better reporting)

Environmental (impacts to Great Barrier Reef)
- Reduced risk of requirement to mobilise emergency mobile desalination and associated brine wastewater

Risks and opportunities

Barriers
- Initiative must be coupled with demonstrated improvement to infrastructure and management approaches (e.g. through the ICCIP, the Queensland Health (QH) Safe and Healthy Drinking Water in Indigenous Local Government Areas Program and other means), as well as address issues with discolouration of water
- Anecdotally there is a perception that installation of water filters on houses will address water quality issues. Whilst water filters can provide some benefit this does not address fundamental infrastructure upgrade needs being undertaken to the water supply

Risks
- Proposed infrastructure upgrades to the Palm Island water supply do not occur within expected timeframes and/or do not fix the perceived water supply problems
- Relatively small issues (e.g. minor or perceived water quality incidents) can impact level of trust in community
- Vandalism needs to be considered as part of the broader project
- To be effective, the initiative must be co-designed and implemented with the community and be ongoing (not once-off). If not designed and implemented appropriately, there is a risk of adverse outcomes

Opportunity
- Targeted engagement will provide council with a better understanding of community attitudes and values toward water, which can be built into its customer service standards, decision making and planning
- Opportunity to align with and leverage outcomes from the QH Safe and Healthy Drinking Water in Indigenous Local Government Areas Program, which has reportedly been very successful
- Opportunity to better engage with whole of community including residents, business, service providers, schools and the hospital. Large water users such as the schools and hospital represent key opportunities for demand management.
- There may be an opportunity combine this project with project #15 for funding application purposes

Assumptions

- A high-level scope has been outlined based on limited information
- Detailed scope would need to be developed and refined in consultation with key project stakeholders
- Initial project anticipated to be delivered with consultant support, in collaboration with the community, PIASC and key stakeholders
- Following an initial project, ongoing program delivered through dedicated community engagement officer within PIASC (potentially in shared role)
- To deliver the intended outcomes, this project must be delivered in conjunction with other initiatives to 1) address critical water and wastewater infrastructure deficiencies; 2) build capacity within PIASC; and 3) develop and implement a wholistic long-term plan to maintain service levels into the future (see project #15).

Costs and funding considerations

Capital costs
- Project scope and costs could be scaled to meet available budget
- A nominal budget of ~$200k - $400K (including community engagement strategy development and implementation and dependent on infrastructure needs number of drinking fountains, digital board etc.) is proposed subject to confirmation of project priorities and scope

Ongoing costs
- Ongoing budget to fund community engagement officer and community engagement initiatives
- Ongoing maintenance of water fountains expected to be minimal

Potential cost savings or return on investment
- Indirect cost savings associated with reduced water demand
- Potential health benefits associated with use of improved water quality in terms of drinking, bathing etc.

Funding opportunities
- No specific funding opportunities have been identified for this project
- The project is aligned at some level to several existing funding programs including Building our Regions Program run by Department of State Development, Tourism and Innovation (DSDTI), Queensland Disaster Resilience Fund run by Queensland Reconstruction Authority (QRA), and Remote Area Boards Program, and the Indigenous Councils Critical Infrastructure Program run by Department of Local Government, Racing and Multicultural Affairs (DLGRMA)
- Given the criticality of the work and alignment to multiple Departmental priorities, it is recommended that key stakeholders including PIASC, DLGRMA, DATSIP and DES to collaboratively review funding opportunities

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Palm Island Community				
Palm Island Aboriginal Shire Council (PIASC)				
Department of Local Government, Racing and Multicultural Affairs (DLGRMA)				
Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP)				
Department of Environment and Science (DES)				
Queensland Health (QH)				

Implementation and timeframes

Investment readiness
- High – could be commenced within 3 months of sufficient improvement of water supply infrastructure (e.g. completion of ICCIP works)
- Works in community may be impacted by COVID-19 restrictions (planning/ scoping could commence ahead of restrictions being lifted)

Next steps
- Consultation with key stakeholders to confirm scope
- Development of consultant brief
- Consultant procurement

Considerations for implementation
- Refer to previous pages

Timeframes to deliver solutions
- Delivery within 12 months
- Timing must consider when the water supply/ water quality improvement works have been completed

Palm Island | Resilience

8 Indigenous Ranger Program

This is to fund an Indigenous ranger program to care for land and sea countries.

Description and overview

Palm Island faces many challenges posed by introduced species such as pigs, horses and weeds on the island, including the degradation of land, community health hazards and impacts to native species. It is recognised dogs also pose some challenges in the community however this is not the focus of the ranger program.

This project seeks to fund the development and implementation of an Indigenous ranger program to re-establish and restore traditional land management practices across the island. Initially this program will focus on community-co-designed responses to introduced species and bush fire management plans.

Re-establishment of indigenous burning regimes can bring environmental benefits including protection of native species, management of weed species and lower carbon emissions particularly associated with cool mosaic burning regimes.

This project will involve establishment of an Indigenous ranger program to support the community in implementing traditional land management practices and other environmental management programs. This would provide employment opportunities for the local community and encourage the sharing of indigenous land management knowledge and techniques.

Central to this initiative is that the Indigenous ranger program is co-designed and delivered with community over a period of time, not just a one-off, and builds upon existing knowledge and undertakings in the community. The process of how ideas are shared and how the community is engaged needs to be considered. The process would seek to design the knowledge sharing program to enable deeper understanding and appropriate application of the traditional methods of land management. Consideration of intellectual property rights for Indigenous people must also be addressed.

It is acknowledged that this program of work will complement other initiatives being led on island by others and build upon work being undertaken in other Indigenous communities.

Project summary

Item	Units	Total
Estimated annual emissions reduction	t-CO_2-e	N/A
Estimated payback period	Years	N/A
Estimated annual costs	$	$120 - $200K*
Estimated capital/ongoing costs	$ mil	0.08 – 0.13**
Timeframe to deliver project	Years	1 - 3
Estimated FTE	No.	2

* Ongoing salary and overhead costs of approximately $60K - $100K per annum per ranger
** $70,000, training for one week at $200/hr, co-design input of two traditional owners at $200/hr over 2 days

Key project objectives

Carbon assessment
- The management of introduced species will reduce their degradation of the land and therefore avoid the destruction of organic material that acts as carbon sinks
- Appropriate and proactive bushfire management regimes can reduce carbon emissions through regular cool burnings reducing fuel loads. The reduction in emissions is highly geographically dependant on factors such as annual rainfall, prevalence of open savannah grassland, historical bushfire patterns and so it is difficult to quantify for Palm Island.

Community and climate resilience
- Managing introduced species and improving environmental conditions will provide the community with opportunities to utilise that land for other uses. E.g. tourism, native plant bush tucker trails etc.
- Mitigating community risks to future bushfire events in the future, proactively increasing the community's resilience
- Rangers will be working with the community and traditional owners to share knowledge and practices

Alignment with other initiatives

Alignment with other project options
- 1. Community Market Garden
- 2. Living better at home and saving money
- 3. Caring for Our Sea Countries
- 7. Building confidence in the community's water supply
- 16. A tourism plan for Palm Island

Alignment with external initiatives or investments
- Aligns with the Indigenous Land and Sea Ranger Program and the Junior Ranger program run by DES
- Palm Island junior ranger program and bush tucker trail and nursery (champion: Tafe, and local Brad Foster)

Co-benefits

Economic
- Effective utilisation of previously degraded land can provide revenue and economic opportunities in new industries e.g. tourism, rehabilitation of native species, carbon farming opportunities
- Upskilling, training and employment opportunities for community members to deliver the management plan

Social and cultural
- Improvements to environmental health for the community
- Celebration of Indigenous knowledge and management techniques, reconnecting the community with their culture
- Reduces damage to Indigenous cultural heritage
- Cultural burning protects indigenous sites and clears access to country for cultural uses

Environmental (General)
- Increased biodiversity and protection of native species
- Cultural burns have improved biodiversity outcomes that provide fauna enough time to escape during bushfires as well as making it possible for young trees to survive
- Regular burning is also an effective weed control for introduced species
- Improved air quality through retention of vegetation
- Improved water quality by controlling invasive plant and animal species around reservoirs which was identified as a severe risk in the project risk assessment

Environmental (impacts to Great Barrier Reef)
- Mitigating land degradation by improving environmental outcomes (invasive species, etc.) will reduce sediment run-off into the GBR

Other
- Improved perception of Palm Island regarding health and cleanliness

Risks and opportunities

Barriers
- Capability and capacity to develop and deliver the introduced species and bushfire management plans
- Large upfront costs to develop and implement management plans
- Potential for disparate views between displaced community and traditional owners regarding cultural management

Risks
- Management plans are not successful
- Attaining long-term funding to support Indigenous ranger roles to develop and implement the management plans
- Community and traditional owners are not supportive of the management plan for introduced species considering their attachment to particular species
- Community does not take long-term ownership of this project and it gets discontinued

Opportunity
- Upskilling community members and providing employment
- Restore land and provide economic opportunities for new ventures and businesses
- Revegetation and restoration of land degraded by introduced species

Assumptions

- Introduced animal species will be managed appropriately, and with community and cultural sensitivity in mind
- Initial target species will be pigs and feral horses and weeds/ non-endemic vegetation
- There is sufficient capacity and knowledge on the island to implement the introduced species and bushfire management plans, which can be supported by wider indigenous community experiences and knowledge throughout Australia
- Ownership and management of Indigenous ranger program to sit within the Queensland Indigenous Land and Sea Rangers, managed by DES

Costs and funding considerations

Capital costs

- Engagement of an environmental consultant to develop the introduced species management plan and bushfire management plan (can be two different consultants for each plan if necessary) in collaboration with Indigenous rangers
- Formal training of Indigenous rangers - $200/hr for trainer over one week
- Equipment for Indigenous ranger team i.e. vehicles ~$70,000[1] for a new Toyota Land Cruiser 70
- Funding for traditional knowledge holders for the co-design input/engagement i.e. $200/hr for 15 hours[2]
- Administration costs of government agency to initiate and take ownership of the program

Ongoing costs

- Ongoing plan implementation and monitoring will be 10% of capital costs
- Salary of Indigenous rangers (e.g. 2 rangers) - Ongoing salary and overhead costs of approximately $60K - $100K per annum per ranger (2), potential for CDP to provide subsidised salaries for workers
- Acknowledging and integrating traditional knowledge inclusive of men's and women's business (1 FTE based on community needs, $60K - $100K per annum)

Costs and funding considerations cont.

Potential cost savings or return on investment

- Delivering an integrated management plan that covers a range of target species (horses and pigs) is more cost effective than individual plans
- 1000 Jobs Package could provide a wage subsidy of up to $51,000
- Each dollar spent on weed and pest management can deliver $6.40 in benefit, with the public receiving up to $3.70 in benefits for every dollar[3]

Funding opportunities

- Indigenous Land and Sea Ranger Program
- Looking after Country Grant program, Qld Department of Environment and Science
- 1000 Jobs Package, National Indigenous Australians Agency
- Community Led Grants, Department of the Prime Minister and Cabinet
- Queensland Indigenous Land and Sea Rangers Program, Qld Department of Environment and Science
- Queensland Feral Pest Initiative, Qld Department of Natural Resources, Mines and Energy
- Animal Management in Rural and Remote Indigenous Communities (AMRRIC) One Health Programs

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Palm Island local community	■	■	■	■
Palm Island Aboriginal Shire Council	■	■	■	■
Queensland Government - Department of Environment and Science / Parks & Wildlife			■	

Implementation and timeframes

Investment readiness

- There may be some resistance from the community regarding introduced species
- Both local and state governments are invested in managing introduced species

Next steps

- Comprehensive community consultation to develop the management plan in line with their expectations

Considerations for implementation

- Adequate funding in the long-term to support Indigenous ranger roles
- Transparent and regular communication with the community regarding the management plan implementation to retain their support
- Indirect impacts on other introduced or native species i.e. ensuring poison baits are not consumed by native fauna
- Integrated approach to maximise biodiversity benefits for the investment
- Humane management techniques
- Setting key indicators to measure and communicate success to the community
- Alignment with local, regional, state and national legislation, plans and strategies
- Selection of rangers that can manage potential disparate views between the community and traditional owners
- Safety of rangers regarding resistance from community around introduced species

Timeframes to deliver solutions

Consultation would occur over several months. Induction would be required for Indigenous rangers. The plan should be reviewed every three months (frequency to be confirmed) to confirm effectiveness, with clear and defined opportunities made for feedback and changes where required. Timeline to set up initial project will run over three years, with a plan to complete a major review of the project a year prior to completion to transition the program into longer term management.

[1] Toyota, https://www.toyota.com.au/landcruiser-70
[2] Assumed two days worth of traditional owner consultation (two people) worth $200/hr per traditional owner ~$6,000
[3] Parliament of Australia, https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/Completed_inquiries/2004-07/invasivespecies/report/c04

Palm Island | Energy

9 New Solar Hot Water Systems

Better solar hot water systems on houses to improve hot water supply.

Description and overview

This project is proposing the upgrade of solar hot water (SHW) systems on residential dwellings to improve supply of affordable hot water to residents.

Access to adequate supply of hot water at an affordable cost was identified as an issue for residents during the community engagement undertaken in 2019 for this project. Department of Housing and Public Works (DHPW) advised that the majority of their Palm Island housing is already fitted with solar hot water systems however many are old, damaged or undersized. It is understood that any additional hot water used beyond what is supplied from the available SHW is supplemented by electric boosters using electricity from the Ergon grid and paid for by residents using the pay card system.

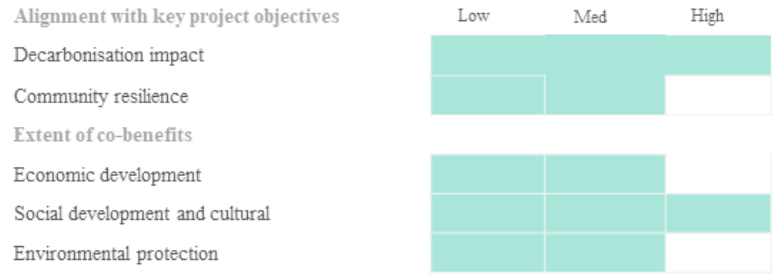
According to the Palm Island Master Plan[1] the average household has ~8 occupants (up to 14) as opposed to the ~5 occupants recorded on the official census, highlighting that the standard solar hot water systems are likely undersized. The installation of new larger SHW systems, combined with re-purposing existing SHW systems, would supply the majority of residential hot water needs from solar, improving household access to affordable hot water and reducing reliance on the electricity grid power for hot water. The Ergon electricity grid is currently powered by diesel generators and there would be a resultant decarbonisation benefit to any reduced use. Installation of SHW systems could be subsided due to reduction in electricity for heating, either directly from Ergon or through the Queensland Government's Community Service Obligation (CSO).

An additional funding avenue is through the DHPW who have allocated $1.7m to remove old hot water systems, re-roof and install new systems when they fail. This project could directly utilise this funding to allow for the upgraded SHW systems that are sized appropriately.

The size and operability of each system, together with suitability for installation on housing type is to be inspected on a case by case basis and confirmed prior to proposed upgrade.

Access to sufficient quantities of hot water has been raised as an important issue throughout the Palm Island community. Many residents perceived hot water to be expensive, however, over 90% of houses have solar hot water systems and residents do not pay for water usage. The expense related to hot water is most likely tied to the need for larger quantities of hot water than the systems can produce due to the reported overcrowding, underperforming systems or need for better understanding of actual energy costs associated with the booster use.

Project summary



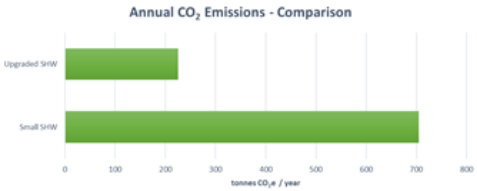
Item	Units	Total
Estimated annual emissions reduction	t-CO_2-e / all residencies	480
Estimated payback period	Years	7*
Estimated annual cost savings	$ / residency	240
Estimated capital costs	$ mil	2.5 - 3.9
Timeframe to deliver project	Years	1 - 2
Estimated FTE	No. / installation	1 - 3

* Estimated ~7-year payback period compared to currently installed smaller SHW systems, assuming can be re-used and are not sunk cost. If smaller SHW systems are sunk cost, simple payback period becomes much greater at ~27 years

[1] Cardno, October 2019, 'Palm Island Master Plan'

Key project objectives

Carbon assessment
Upgrading all the SHW systems installed on the island to systems with 300L tanks and 4m^2 of solar panels, could provide an annual emissions reduction of ~480 tonnes CO_2e compared to an undersized SHW system.



Due to the embedded carbon emissions from producing new SHW systems, these annual emission reductions would not be realised until a two-year emissions payback period has passed, over a ten-year period a total emissions reduction of ~3,800 tonnes CO_2e could be achieved.

Community and resilience
Upgraded SHW systems will increase the availability of hot water to residents of the islands without having to enable the electric boost of the system and cost them financially.

Upgraded SHW systems may also reduce reliance on mains grid power for hot water, providing cheaper hot water to residents with a decarbonisation benefit, but also reducing reliance on grid during peak times (demand management). Increasing the consistency of access to power can also reduce health risks posed from limited or inconsistent power supply.

More resilience against future rising of electricity cost, if eventuated.

Co-benefits

Economic
The economic benefit will be directly seen by the residents of the island, with possible reduction to their power bills due to less dependence on using electric boosters for hot water. Operating costs associated with outdated systems was identified as a high risk in the project risk assessment. Each residency could see a power bill reduction of ~$240 / year, a combined saving of $126,000 / year for all residencies on the island. These savings are incremental compared to the suggested undersized SHW systems.

Queensland government's Community Service Obligation (CSO) payments, around ~$450 million per year, to ensure subsidised power to regional communities could be reduced.

Social and cultural
Residents will have more consistent access to hot water without having to endure a wait for the electric boost system to operate and associated financial cost.

Improved access to hot water may improve health outcomes as hot water for food preparation, cleaning, bathing and washing are key to managing health for families.

Further education of residents in most efficient use of system could also help ensure maximum cost and grid reliability benefit is gained by residents.

Environmental (General)
Potential reduction in carbon emissions associated with increased use of renewable solar energy and any reduction in diesel powered electricity usage.

Environmental (impacts to Great Barrier Reef)
A reduction of greenhouse gas emissions through increased utilisation of SHW systems will contribute to the global effort to reduce emissions which are impacting the reef through increased temperatures and ocean acidification.

Risks and opportunities

Barriers
- Hot water use and energy use education for residents and visitors
- Efficiency losses due to shading including vandal proofing or poor orientation of solar panels

Risks
- Costs still being endured by residents on days with poor solar resources or high usage
- If grid power on Palm Island achieves a lower carbon intensity over time, emissions reductions suggested might be lower than suggested however resilience benefits still realised

Opportunities
- Re-use of existing SHW systems – consolidating existing systems installed on homes i.e. SHW capability of homes will be doubled by installing new systems or by combining recently installed systems. Reduced wastage of installed systems and possible capital cost reduction.
- Possible alternative technologies such as boiler systems, heat pumps
- Upskill and job creation for members of local community by provided training for locals in maintenance and installation of systems
- Expansion of SHW installations to cover commercial buildings. ~110 commercial premises on island could provide additional decarbonisation and cost benefits to local business owners.

Alignment with other initiatives

Alignment with other project options
- 2. Living better at home and saving money
- 6. Put Solar Power on the roof: Frames and other structural work for solar PV panels could be coupled with SHW installation. Based on average household rooftop area there will be sufficient area to house both SHW and solar PV systems. SHW systems not constrained by Ergon grid management limits.
- 7. Building confidence in the community's water supply: increasing security of access to energy hot water could further increase community confidence

Alignment with external initiatives or investments
- It has been noted that the Department of Housing, currently have $1.7m to remove old hot water systems, re-roof and install new systems when they fail. Increase to existing funding could be proposed for installation of upgraded SHW systems that satisfy average household size.

Assumptions

- Calculations based on assumed hot water consumption and associated electricity consumption for average household (530 residencies)
- Assuming that currently installed SHW system is similar in effectiveness to Solahart L Series 180L model
- 90% of households currently have SHW systems installed with funding already approved to provide the remaining residencies with systems - emissions and cost reductions presented assuming all households have functional SHW systems
- Assumed that 200 SHW systems are relocated from existing roofs to 200 other residencies that have an undersized SHW system
- Cost to relocate a SHW system is assumed at $500
- Assumed additional 330 new SHW systems are required to fit all 530 residencies with appropriately sized SHW systems
- Supply and installation of new SHW system: $7,300 per new unit
- Structural integrity is satisfactory for upgraded SHW systems
- Additional SHW system efficiency losses due to protective caging installed over panels
- Costing are from Rawlinson's Construction Handbook including regional mark-up, not based on actual vendor quotations
- Hot water usage analysis for each residency on island not complied or analysed, all emissions and performance values based on assumptions and subsequent theoretical calculations
- Specifications of currently installed electrical hot water systems not utilised in calculations
- Confirmation with Solahart on technical suitability of operating systems in parallel required
- The structural integrity of roofs on the island, shading conditions or no available roof space for a residency i.e. apartment blocks not considered in possible cost/emissions reductions estimations
- Small-scale technology certificate (STC) estimate calculated for SHW system of 300L[2]
- Bulk purchasing and installation agreements have not been factored into costings, however could show a reduction in capital costs required if such agreements are made for the scheme.

Costs and funding considerations

Capital costs

- Approximate total capital cost: $2.4 to 3.9 million
  - $2.5 million – includes 330 new SHW systems ($6,300 per unit) and 200 relocated SHW systems to supplement undersized systems
  - $3.9 million ($6,300 per unit) each household requires brand new SHW system
- New unit presented: 300L and 24m^2 solar panel
- Costs reduction for STC's: ~$1,000 per new unit
- Cost do not include ongoing maintenance or replacement costs
- Supply and installation: $7,300 per new unit

Ongoing costs

- Maintenance of SHW systems
- Cost of electricity on days of poor solar availability or high hot water usage

Potential cost savings or return on investment

- Savings of ~$240 / year per residency
  - Savings additional to smaller SHW systems
- Less on-island diesel generation required
- Estimated ~7-year payback period compared to currently installed smaller SHW systems, assuming can be re-used and are not sunk cost
- If smaller SHW systems are sunk cost, simple payback period becomes much greater at ~27 years

Existing funding opportunities:

- Could seek modification to existing Department of Housing funding to account for upgrade of SHW systems. (to be confirmed with DHPW)

New funding opportunities:

- Small-scale technology certificates for SHW systems through Small-scale Renewable Energy Scheme – from the Clean Energy Regulator (Australian Government)
- Clean Energy Finance Corporation (CEFC) - Reef Funding Program: funding available for emission reduction projects in Great Barrier Reef catchment area
- Regional and Remote Communities Reliability Fund
- Climate Solutions Fund – Emissions Reduction Fund

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator/ maintenance	Potential partner	End user
Palm Island Residents				■
DHPW	■	■	■	
PIASC		■	■	
Ergon Energy		■	■	
SHW Manufacturers / Installers		■		
Queensland Government			■	

Additional information

One of the major benefits of utilising SHW systems as opposed to electric systems coupled with solar PV panels is that the SHW systems are not constrained by Ergon's network solar PV hosting capacity limits and can therefore be installed on every residency without network limitation.

Options to re-use currently installed SHW systems could also include re-installing them in other remote areas with smaller average household size and hot water demand.

Implementation and timeframes

Investment readiness

SHW systems are currently already managed on Palm Island by DPHW, their existing SHW scheme could be modified to allow for the installation of upgraded SHW systems, making the project investment ready. Existing technology with on-island proven track record.

Next steps

Further analysis of the size of existing SHW systems and future SHW systems required through a detailed site audit, this should be conducted to confirm appropriate sizing to achieve the desired decarbonisation, cost and grid management benefits.

Considerations for implementation

- Re-use of current SHW systems from Palm Island
- Opportunity to train locals in the installation of the systems
- Overall cost and time taken for each installation.

Timeframes to deliver solutions

Dependent on the supply of the SHW systems and labour required to install upgraded systems on the ~530 residencies. This could take in the 1- 3-year range depending on the availability and efficiency of qualified technicians to install the SHW systems.

[2] Clean Energy Regulator, September 2020, 'Solar water heater STC calculator', https://www.rec-registry.gov.au/rec-registry/app/calculators/swh-stc-calculator

Palm Island | Transport

10 Improving Walkways Around Palm Island

Improve paths for walking and cycling to promote active transport around Palm Island by improving shade, lighting and path quality.

Description and overview

This project recommends the development of an active transport plan for Palm Island to support walking, cycling and other means of non-vehicular transport (including electric bikes and foot scooters) on the island, facilitating a wider variety of active transport and reducing current and future reliance on private vehicles (cars). It is an efficient, cost effective, sustainable, healthy and accessible form of transport, that provides a range of community and individual benefits.

The majority of personal journeys currently made on Palm Island are walked. Ridesharing of vehicles is common as there is only approximately 330 vehicles on island for the 4,000 residents, with fuel transported to the island by a private barge service. There is currently no public transport on the island, with only a privately run shuttle service providing a taxi-type service. A 2019 study commissioned by the Palm Island Aboriginal Shire Council (PIASC) identified a general lack of pathways suitable for walking journeys throughout the community. The recently constructed coastal walkway was observed to be well utilised during project visits in 2019, and stakeholder feedback received indicated that new paths and walking trails would be utilised by the community[1].

There is an opportunity to undertake further planning to identify community appetite for active transport options, including consideration of future tourism activities. The plan will identify and prioritise primary infrastructure (including pathways and equipment) and secondary infrastructure needs and opportunities (lighting, shade trees, shaded rest areas, signage, drinking fountains, tourism specific signage, artwork etc). Infrastructure options that may be considered have been identified as part of previous studies[1,2].

Some approximate costs for the provision of up to 10km of additional pathways have been provided for context.

A plan currently exists for the development of some bush tucker trails on the island which could potentially be coupled with a new pathways network.

Project summary

Alignment with key project objectives	Low	Med	High
Decarbonisation impact	■		
Community resilience	■	■	
Extent of co-benefits			
Economic development	■		
Social development & cultural	■	■	
Environmental protection	■		

Item	Units	Total
Estimated annual emissions reduction	t-CO_2-e	9
Estimated payback period	Years	>10
Estimated annual cost savings	$	N/A
Estimated capital costs (plan development)	$ mil	$ 0.1 – 0.2
Estimated capital costs (infrastructure)	$ mil	1.5 - 6
Timeframe to deliver project	Years	0.5 - 1
Estimated FTE	No.	N/A

[1] Flanagan Consulting Group, 4 September 2019, 'Palm Island Community Prioritisation Plan: Strategic Plan for the Prioritisation of Community Infrastructure', Palm Island Aboriginal Shire Council
[2] AECOM, 16 June 2017, 'Transport Infrastructure Assessment and Access Strategy', Palm Island Aboriginal Shire Council

Key project objectives

Carbon assessment
An increase in uptake of active transport will reduce the number of trips taken in private motor vehicles. In particular, active transport options may typically replace short (<5km) journeys, which tend to produce a greater rate of emission per kilometre due to the temperature of the engine upon start[3]. Based on the average emission intensity of passenger vehicles[4], a reduction in passenger vehicle use by one 1km trip per vehicle per week may correspond to an emissions reduction of 9 t-CO_2/year (based on 0.6 vehicles on island per dwelling)[5].

Community and resilience
The uptake of active transport on Palm Island may have the following impact on community and climate resilience:

- Improved health and fitness of those undertaking active transport regularly, including the potential for reduced risk of cardiovascular disease, type 2 diabetes and all-cause mortality in adults[6]
- Reduction in the community's reliance on fuel shipped to the island from the mainland by the private barge service and increase in the community's resistance to fuel supply chain shocks
- Improved community connectiveness for trips that would not have otherwise been undertaken
- Employment opportunities for construction phase and ongoing tourism micro-business

Alignment with other initiatives

Alignment with other project options
4. Community bus service
8. Indigenous Ranger Program
16. A tourism plan for Palm Island

Alignment with external initiatives or investments
Foreshore Revitalisation (PIASC), Bush Tucker Trail (Palm Island Community Company), Road Resealing and Rehabilitation Project (PIASC), Transport and Main Roads (TRM) Queensland Cycling Strategy (TMR), Queensland Walking Strategy (TMR) including State Heatwave Risk Assessment, Palm Island Transport Plan (AECOM), Palm Island Tourism Plan

Co-benefits

Economic

- A reduction in vehicle journeys may lead to a reduction in maintenance costs for road infrastructure. This reduction would be net of maintenance costs for new active transport infrastructure including pathways.
- A reduction in vehicle use may result in a reduction in cost of living for the community through reduced fuel and vehicle maintenance costs, which was identified as a high risk in the project risk assessment
- Economic opportunities associated with potential tourism businesses – walking trail, bike hire, pedi-cab etc. The availability of an enjoyable walking and riding environment may enhance Palm Island's appeal as a tourism destination
- Employment opportunities during construction. Unemployment was identified as a severe risk to Palm Island in the project risk assessment.

Social and cultural

- An increase in pedestrian traffic through the most populous areas of the island may lead to an increase in social cohesion and community engagement
- Active transport infrastructure will improve mobility for those on the island who are unable or unwilling to use passenger vehicles, including those unemployed, under the age of 17 or elderly

Environmental (General)

- The adoption of active transport will reduce Palm Island's contribution to greenhouse emissions through the reduction in use of emissions from passenger vehicles for short journeys, which was identified as a severe risk in the project risk assessment
- In addition, reduction in passenger vehicle use may reduce waste from abandoned vehicles on the island and air and noise pollution in the populous areas of the island

Environmental (impacts to Great Barrier Reef)

- A reduction in vehicular emissions on Palm Island will contribute to the global effort to reduce emissions which are impacting the reef through increased temperatures and ocean acidification. The reduction in fuel to be shipped to the island will directly benefit the reef through a reduction in requirement for barge journeys and reduce chance of fuel spillage.

Risks and opportunities

Barriers

- Age of participant may dictate whether the community is more likely to adopt walking, cycling, electric bike or foot scooter options
- The warm climate of Palm Island may be a barrier for use of active transport, with participants choosing to avoid strenuous walks or cycle journeys in hotter rainy weather
- Ineffective support and ancillary infrastructure such as lighting, seating, rest areas, drink fountains, directional signage can be a limiting factor for active transport uptake
- Public education and awareness may be a limiting factor in the uptake of active transport. If people are unaware of the availability and advantages of active travel, they may be less likely to partake in it.

Risks

- Depending on the final strategy and design (i.e., infrastructure along a carriageway or separate, narrow footpaths or poor crossing facilities), there may be an increased risk to active travellers when compared to car transport, including trip hazards, inadequate path width, location of power/lighting, and paths not accessible for wheelchairs, prams and elderly persons[7]
- There is the potential that increased active transport will result in an upswing of crash risk. According to the Australian Transport Assessment and Planning Guidelines, crash risk for active travellers is eight times riskier than private motor vehicle transport with pedestrians being higher than cycling. Typically, most fatal cyclist crashes involve a motor vehicle. This risk can be mitigated through selection of location and design for infrastructure[7].
- Risks to infrastructure from vandalism
- Active travellers can be more vulnerable to other risks from attack (dogs, humans etc.) and the environment (heat, wind, etc.)

Opportunity

- Explore low-cost active transport options (including walking and cycling) in the short-term, alongside further work to establish demand for higher cost options (including electric bike and scooters) in the future e.g., tourism. The consideration of short-term infrastructure should not preclude the potential for installation of charging infrastructure for future options.
- Align with Queensland Government strategy for Cycling and Walking, including the potential to obtain funding through the mechanisms outlined in the strategies
- Second-hand bicycle shop and repair workshop on the island
- Tourism walking trail to be developed with appropriate signage, artwork etc.
- Walking tour, pedi-cab or bike hire small businesses for tourism
- An active lifestyle and regular use of active transport (e.g., walking, cycling) can help people to maintain naturally high levels of heat acclimatisation
- Design considerations for enhanced heat resistance should include materials that reduce heat retention

[3] City of Ipswich, December 2016, Active Transport Action Plan: Technical Report https://www.ipswich.qld.gov.au/about_council/corporate_publications/igo/igo-active-transport-action-plan]
[4] National Transport Commission, June 2019, Carbon Dioxide Emissions Intensity for New Australian Light Vehicles 2018: Information Paper https://www.ntc.gov.au/sites/default/files/assets/files/Carbon%20dioxide%20emissions%20intensity%20for%20new%20Australian%20light%20vehicles%202018.pdf
[5] Australian Bureau of Statistics, Palm Island (S) (LGA) (35790)
[6] The Heart Foundation, 2019, Blueprint for an Active Australia, Third Edition
[7] Transport and Infrastructure Council, August 2016, Australian Transport Assessment and Planning Guidelines: M4 Active Travel https://www.atap.gov.au/sites/default/files/m4_active_travel.pdf

Assumptions

- Palm Island Population: 4,000 (working estimate)
- Average carbon dioxide emission of new passenger vehicle in Australia: 180.9g/km[5]
- Depending on the type of pathway to be installed and the nature of the surrounding infrastructure, cost of construction of footpath can lie between ~$150 - $650 per linear metre constructed

Costs and funding considerations

Capital costs
The cost to develop an Active Transport Plan is estimated to be approximately $100,000 to $200,000 through the employment of an external consultancy. Key locals would be casually employed to co-design the plan and infrastructure.

The level of investment in path infrastructure required is to be determined in the planning process, including upgrade requirements for existing infrastructure and construction of new infrastructure. As an indication of the costs that may be involved, upgrade or install of 10km of pathway would draw capital costs of between $1.5M-$6M depending on condition and surrounds.

Ongoing costs
This may be determined as part of the planning process.

Maintenance costs associated with the replacement of existing pathways are assumed to draw no net ongoing costs above existing.

Potential cost savings or return on investment
This may be determined as part of the planning process.

Funding opportunities
Seek to include Palm Island in the next update of the Principal Cycle Network Plans so as to align with Queensland Government strategies for Cycling and Walking, including the potential to obtain funding through the mechanisms outlined in the strategies, such as The Cycle Network Local Government Grants Program[8].

Further funding opportunities are to be investigated in the planning process.

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Palm Island Aboriginal Shire Council	■	■		
Palm Island Community				■
Planning Consultant	■			
Tourists				■
State Government (TMR)			■	
Indigenous Entrepreneurs and Tourism Providers			■	

Additional information
The rationale for selection of infrastructure for development should be investigated in the planning stage of the project, through multi-criteria analysis prior to option design or through cost-effectiveness or cost-benefit analysis once detailed costs are known.

Implementation and timeframes

Investment readiness
The readiness for development of infrastructure will be determined through the planning and prioritisation process.

Next steps
Engagement of consultant to develop detailed active transport plan, including stakeholder engagement, options development and filtering, cost estimation, prioritisation and consideration of education and promotion of active transport to Palm Island community.

Considerations for implementation
- Selection of consultant to develop active transport plan
- Disruption to road network caused by construction of infrastructure
- Inclusion of disadvantaged members of community, including aged and disabled, who are commonly excluded from active transport
- Engagement with other organisations including Heart Foundation

Timeframes to deliver solutions
The development of an Active Transport Plan would take approximately 6 months from procurement and engagement of an external consultant.

[8] TMR, 2019, Cycling Infrastructure Grants https://www.tmr.qld.gov.au/Travel-and-transport/Cycling/Cycling-infrastructure-grants

Palm Island | Energy

11 Cooling Options for Homes

Improve comfort and liveability in homes through cooling options such as: heat reflective roof paint, installation of insulation, and better ventilation. An audit will identify options for consideration.

·Description and overview

The tropical climate of Palm Island means that cooling is a key consideration for both comfort and cost of living for households and other buildings for much of the year. There are various building styles observable throughout the island with variable consideration of climatic conditions apparent in the design. Many business and community buildings having been upgraded with air-conditioning systems to cool internal spaces. It is estimated that approximately 10% of all Department of Housing and Public Works (DHPW) residential housing have been retrofitted with air-conditioning by residents, usually inefficient window styles, at their own cost to install and operate. It is estimated that cooling can contribute up to 40% of energy usage in households in tropical climates. These issues are exacerbated by the overcrowding/ large average household size (~8 people, up to 14 in some cases) on Palm Island.

This project seeks funding to identify and implement cooling improvements to buildings to improve energy efficiency, costs and carbon emissions (from grid electricity), and comfortability in living standards. It will include an audit of existing building conditions and seeks funding to implement recommended options which may include:

- Improvements to building ventilation- skylights, breezeways, window augmentation and installing roof fans etc.;
- Using heat reflective roof paint to minimise absorption of solar energy;
- Installation of insulation, which has the co-benefit of providing noise reduction (another issue which was identified by the community); and
- Installation of solar air-conditioning with usage of high-efficiency air conditioning units for residential properties.

This project would require collaboration with and likely led by the DHPW before modifications to their assets would be possible.

Project summary

Item	Units	Total
Estimated annual emissions reduction	t-CO_2-e	203 - 406
Estimated payback period	Years	8 - 16
Estimated annual cost savings	$ / household	125 - 250
Estimated capital costs	$ mil	0.5 - 2
Timeframe to deliver project	Years	2
Estimated FTE	FTE / year	2 – 4

Key project objectives

Carbon assessment

- EarthCheck and Ergon Energy have reported that the average residential dwelling on Palm Island consumes 7,996kWh of electricity annually (see Assumptions). Around 40% of home energy is expended on heating and/or cooling (national average). The average residential household on Palm Island consumers 3,198kWh on heating and/or cooling. The Palm Island Power Plant generates electricity through diesel generators which have an approximate emission factor of 0.8kg CO_{2eq}/kWh (taking into account the diesel energy content, the diesel emissions factor and generator efficiency). Therefore, the average Palm Island residential dwelling currently emits ~2,559kg CO_{2eq} for heating and/or cooling. Typically, a residential energy audit will identify measures that reduce energy usage by 15-30%. Meaning the average Palm Island residential dwelling could reduce their annual heating and/or cooling electricity consumption by ~479-959kWh, abating ~383-766kg CO_{2eq}.
- It should be noted that the carbon assessment is based off the typical measures a residential energy audit would identify. Being that this reduction is an average, the carbon abatement across each household will vary.

Community resilience

- Cooling improvements increase climate resilience as they are in anticipation and preparation for global warming. As Australia is predicted to experience more extreme heat events, implementing cooling improvements will allow residents to better cope with the heat when these events occur.
- Educating residents on energy efficiency benefits the community by increasing understanding and autonomy. Residents will be equipped to understand the mechanisms behind power failure which enables them to tailor their behaviour accordingly during demand peaks.
- By minimising energy consumption, the community will increase their resilience against supply issues and future carbon taxes, if introduced.

Co-benefits

Economic

- Passive cooling measures reduce the need to utilise mechanical space conditioning (i.e., air-conditioners) which in turn reduces energy and/or gas bills. Energy use and costs were identified as a severe risk in the project risk assessment.
- Reducing electricity consumption could defer any future upgrades of the Palm Island power station
- Installation of solar air conditioners would decrease energy bills and associated carbon emissions from the grid
- This initiative may provide for employment of between 2 to 4 people for up to 2 years, based on approx. 530 dwellings for audit and delivery of improvements

Social and cultural

- Increased liveability through enhanced comfort
- Reduced reliance on community spaces during extreme weather events (e.g., shopping centres etc.)
- Increased vulnerability to heat such as the young and elderly
- Increased consumer awareness regarding the way people think about and use energy

Environmental (General)

- Reduction of greenhouse gas emissions through reduced diesel fuelled electricity consumption

Environmental (impacts to Great Barrier Reef)

- A reduction of greenhouse gas emissions through increased solar and/or reduction in diesel fuelled electricity use will contribute to the global effort to reduce emissions which are impacting the reef through increased temperatures and ocean acidification. Any reduction in the shipping of diesel across the reef will directly benefit the reef through reduced shipping impacts and reduced chance of spillage.

Other

- Solar air conditioners favour residents and the community as a whole, as they reduce reliance on the grid therefore decreasing the likelihood of blackouts in extreme heat events

Risks and opportunities

Barriers

- Complications regarding the upgrade of rental properties – likely to be a significant barrier for Palm Island as 94% of dwellings are rental properties[1]
- Potential for the Government to incur a high cost for improvements made to social housing

Risks

- Each building has differing characteristics, meaning audit complexity will vary. Excluding the structural similarities between social housing dwellings. Benefits from bulk purchasing or economies of scale are likely to be realised, but perhaps not to the maximum extent possible.
- Effective and transparent coordination will be key to reduce the risk of miscommunication between building owners, residents, auditors and installers
- Air conditioners are utilised in the evening after sunlight hours, potentially reducing cost savings realised for homes in the absence of a battery system. Similarly, evening electricity peaks driven by air conditioning may not be diminished and corresponding emissions not reduced.

Opportunity

- There is an opportunity for a template approach across social housing dwellings
- There is opportunity to consider or otherwise make allowances for the potential future installation of solar battery systems to complement solar air conditioning improvements
- Complementary education programs for residents and business owners on electricity usage and other measures to save money
- Opportunity to engage the same energy audit supplier for projects across Magnetic Island and Palm Island

Alignment with other initiatives

Alignment with other project options

- 2. Living better at home and saving money
- 5. Solar Power on the ground with batteries
- 6. Put Solar Power on the roof
- 12. Improve Energy Use in Houses

Alignment with external initiatives or investments

- Australian Government small-scale renewable energy scheme (small-scale solar photovoltaic up to 100kW) in the case where a solar air conditioner is installed
- Any initiative undertaken needs to align with the Palm Island Master Strategy
- Townsville City Council white roof and sustainable living programs

[1] Australian Bureau of Statistics, 2016 Census QuickStats https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/LGA35790#mortgage-rent

Assumptions

- It is assumed that the residential properties eligible for this project would vary in terms of their building characteristics (e.g., size, age, installed appliances etc.)
- Average residential dwelling on Palm Island consumes 7,996kWh of electricity annually (7,435,040.22 @ 57% residential x 530 residencies (Ergon))
- Capital costs are approximate, for more accurate values further research is required
- The cost listed for the energy audit was precured from a conversation with Tropical Energy Solutions - an organisation that operates out of Townsville, for Magnetic Island. It is assumed that an energy audit on Palm Island would be a similar cost.
- For insulation, the material supply cost was assumed to be $8-16 per m^2 and the installation cost $8-10 per m^2
- For heat reflective roof paint assumed to cost $13 per m^2
- Average square metre of a residential roof is assumed to equal 160m^2
- The area of the walls was calculated using the perimeter formula (P=4a) and the average height of a wall (2.4m) assuming that the average area of the roof would be the same as the floor
- The potential cost savings purely related to the money saved on space conditioning expenses
- The timeframes are assumptions based on general knowledge

Costs and funding considerations

Capital costs

- Calculated by using data received from Ergon Energy (530 residential dwellings) where residential dwellings receive $2,000 to subsidise a cooling improvement

The fixed funding amount could subsidise the items listed in the table below:

Item	Ave. Residential Building
Energy Audit	$200
Roof insulation & installation	$2,560 – 4,160
Wall insulation & installation	$1,536 – 2,496
Heat reflective roof paint*	$2,080
Solar Air Conditioning	> $2,000
Skylights	$400 – 1,300 per window
Roof fan	$ 200 - 400

Approximate total capital cost (supply only): ~$1,060,000

Ongoing costs

- Cost of additional energy audit (e.g., after 1 year) to monitor performance; maintenance costs of building improvements; operational energy consumption (e.g., solar air conditioning and ceiling fans). This additional audit is of benefit to DPHW; therefore, the cost should logically be incurred by the relevant government department and not the resident.
- Maintenance of the installed cooling improvement

Potential cost savings or return on investment

- Around 40% of home energy is expended on heating and/or cooling. Typical audits identify measures to reduce usage and costs by 15-30%. The average Palm Island dwelling could reduce annual consumption by 479 - 959kWh. At a usage charge of 0.26 $/kWh*, each household could save $125-250 annually, equating to a payback period of 8-16 years.

Funding opportunities

- The No Interest Loans Scheme (NILS)[2]
- Energex PeakSmart air conditioning program[3]

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Palm Island Community	■	■	■	■
Ergon Energy		■	■	
Government			■	
Palm Island Aboriginal Shire Council		■	■	■
DHPW	■	■	■	
Local business			■	

Additional information

About Palm Island:

- Data from Ergon Energy revealed that there are 530 residential dwellings on Palm Island. The 2016 Census Quickstats reports that 94% of the dwellings are rented[1]
- The Palm Island power station uses diesel generators to generate electricity
- The Palm Island Aboriginal Shire Council have an economic strategy for the Palm Island Master plan

Implementation and timeframes

Investment readiness

- This project is in concept and feasibility phase, with funding required to progress to planning and design

Next steps

- Creating a scheme structure detailing priorities and pilot audit approach
- Development and submission of funding application
- Identifying and procuring auditing entity capable of rolling out the program, preferably located in the Townsville region to ensure local context is retained
- Work with council to ensure alignment to the Palm Island Master Plan

Considerations for implementation

- The scheme will fund the energy audit and part of the building improvement

Timeframes to deliver solutions

- It is expected that the process may take up to 2 years to complete. The planning and scheme design, and procurement rollout of audits is likely to take up between 6 months to 1 year. Depending on improvements required, delivery of may occur between 6 months to 1 year following audit finalisation.

[1] Australian Bureau of Statistics, 2016 Census QuickStats https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/LGA35790#mortgage-rent

[2] The No Interest Loans Scheme (NILS) offers individuals and families on low incomes access to safe, fair and affordable loans for purchasing appliances and some other essential household expenses.

[3] The PeakSmart program may provide eligible households, businesses, builders, developers and retailers with financial incentives of up to $400 for purchasing and installing a PeakSmart air conditioner or converting an existing air conditioner to PeakSmart. Eligibility criteria may expand to enable greater uptake over time, and this should be monitored.

* It should be noted that electricity on Palm Island is subsidised by the Government, therefore the true usage charge is higher than 0.26 $/kWh meaning the payback period is lower than the value calculated above.

Palm Island | Energy

12 Improve Energy Use in Houses

Improve energy use in houses through options for more efficient kitchen and laundry appliances and fixtures and lights. An audit will identify options for consideration.

Description and overview

Residents have identified that electricity costs are a significant burden, contributing to high household living expenses on the island. This project focuses on opportunities for incentivising upgrading to energy efficient appliances to reduce energy use and bills. Any reduction in grid electricity use (diesel-fuelled) will have a corresponding decrease in carbon emissions.

This final project option is for a scheme to provide financial assistance for a fixed amount (e.g., $2000 per home) to:

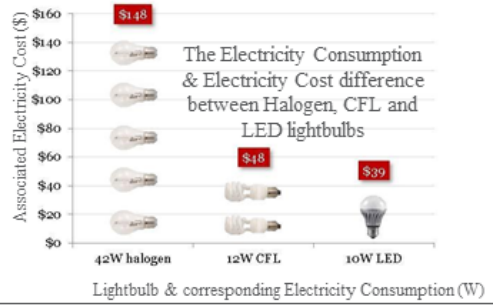
- Fund building appliance audits (including new-builds) to determine recommendations for purchasing energy efficiency/demand management appliances
- Fund the highest priority appliance purchase(s)

On average appliances typically contribute to 30% of household energy usage and lighting contributes 10%. Palm Island residents living in Department of Housing and Public Works (DHPW) housing are responsible for their own lightbulb and appliance supply (except for hardwired appliances). These are available for purchase at the supermarket and other mainland suppliers but are of varying levels of efficiency.

This project outlines a residential audit to identify where benefit could be gained from reducing energy use and upgrading appliances. Community consultation and co-design of the audit and incentive scheme are vital to success and community ownership and support. This will be key to achieving effective and ongoing, demand-side management.

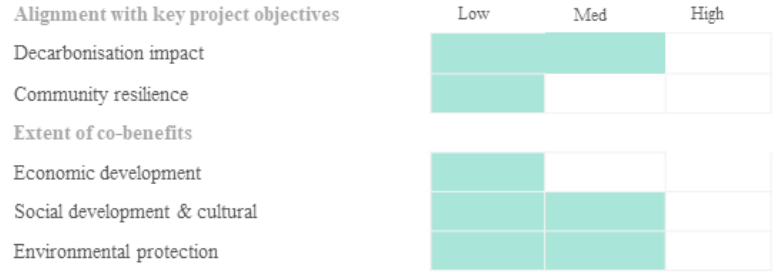
The project may include:

- Replacement of lighting systems with light-emitting diode (LED) globes
- Replacement of appliances with high efficiency units (e.g., refrigerators and air conditioners)



© https://www.energyrating.gov.au/

Project summary



Item	Units	Total
Estimated annual emissions reduction	t-CO_2-e	204 - 406
Estimated payback period	Years	6 – 12
Estimated annual cost savings	$ / household	125 - 250
Estimated capital costs	$ mil	1*
Timeframe to deliver project	Years	1 – 2
Estimated FTE	FTE	2 – 4

* Supply and/or subsidy of high efficiency light bulbs and other appliances to residents will need to be investigated as capital costs are likely to be an issue

Key project objectives

Carbon assessment

- The average residential dwelling on Palm Island consumes 7,996kWh of electricity annually
- Around 40% of home energy is expended on appliances and lighting (national average), meaning the average residential household on Palm Island consumers 3,198kWh on appliances and lighting
- Electricity greenhouse factor of 0.8kg CO_{2eq}/kWh (taking into account the diesel energy content, the diesel emissions factor and generator efficiency)
- Therefore, the average Palm Island residential dwelling currently emits ~2,559kg CO_{2eq} on appliances and lighting. Typically, a residential energy audit will identify measures that reduce energy usage by 15-30%, meaning the average Palm Island residential dwelling could reduce their annual electricity consumption by ~479-959kWh, abating ~384-767kg CO_2-e (530 houses = 203-406t-CO_2-e).

Current asset	New Asset	Carbon saving
Halogen globe	LED globe	Use 25-80% less energy
Fridge	ENERGY STAR Fridge	Up to 9% less energy
Air Conditioner	ENERGY STAR Air Conditioner	Up to 40% less energy
Manually controlled	Home automation system	Up to 15%

- There are additionally several behavioural measures households can employ to reduce the energy consumed by their appliances, such as correctly setting the air conditioner thermostat (users can save up 10% for each degree you increase/decrease for air conditionings' temperature).

Community resilience

- Improving the energy efficiency of Palm Island dwellings increases the community's' resilience to power failure

Co-benefits

Economic

- Reducing electricity consumption could defer future upgrades of the Palm Island power station
- Reducing electricity consumption subsequently reduces energy bills, which was identified as a severe risk in the project risk assessment
- Potential for employment and capacity building for energy auditors and electricians
- Given the number of buildings on Palm Island, it is likely that the project would take between 1 to 2 years to pass through planning, audit delivery, and implementation of building improvements. This has the potential to support up to 2 to 4 full time equivalent jobs.

Social and cultural

- Increased consumer awareness regarding the way people think about and use energy
- The installation of a home automation system could increase the adoption of energy saving measures, removing variables related to consumer behaviour
- Operational cost savings are enhanced when combined with behavioural changes

Environmental (General)

- Reduction of greenhouse gas emissions through reduced electricity consumption and increased energy efficiency, which was identified as a severe risk in the project risk assessment
- LED globes have a longer life when compared to halogen globes, meaning less resources are consumed and less globes are landfilled

Environmental (impacts to Great Barrier Reef)

- A reduction of greenhouse gas emissions through reduced diesel-powered grid electricity use could contribute to the global effort to reduce emissions which are impacting the reef through increased temperatures and ocean acidification

Risks and opportunities

Barriers

- DHPW lease majority of the dwellings on Palm Island, as such any changes to the housing stock will need approval from DHPW
- Need to develop understanding around community/Indigenous power usage habits, beliefs and constraints
- Implementing incentive schemes in an equitable yet effective manner can be difficult to achieve and requires detailed planning
- Behaviour change in all consumers takes time and effort. It is harder to ensure they will be successful.
- Appliances can be costly to replace even considering potential subsidies or incentive programs. Palm Island has a higher proportion of households with low income when compared to the average Australian household.
- Purchasing an appliance that is sized correctly to an individual home is paramount to energy efficiency. This may be a barrier to economies of scale.

Risks

- Each studied building has varying building characteristics meaning the complexity of the energy audit and incentive scheme appliance upgrade varies from building to building
- Coordination between DHPW, residents, energy audit conductors and installers
- Air conditioning is only effective at saving energy if the occupant has correctly programmed the system

Opportunity

- Reduction in power consumption, and therefore electricity bills and environmental impact
- Educating residents and owners on electricity usage and saving measures
- Opportunity to engage the same energy audit and equipment suppliers for businesses and other buildings on Palm Island and could cluster with other islands to gain efficiencies
- Recycling initiatives should be explored for the replaced appliances
- Any air conditioning installed could be programmed to run at the most energy efficient setting and information given to the occupant on how to keep the settings optimal for energy consumption

Alignment with other project options

- 2. Living better at home and saving money
- 5 Solar Power on the ground with batteries
- 6 Put Solar Power on the roof
- 9. New Solar Hot water systems
- 11. Cooling options for homes

Assumptions

- Capital costs are approximate, for more accurate values further research is required
- The cost listed for the energy audit was precured from a conversation with Tropical Energy Solutions - an organisation that operates out of Townsville. The quote was obtained for Magnetic Island and is assumed to be the same for Palm Island.
- The timeframes are assumptions based on industry knowledge

Additional information

About Palm Island:

- Data from Ergon Energy revealed that there are 530 residential dwellings on Palm Island[1]. The 2016 Census Quickstats reports that 94% of the dwellings are rented[2].
- The Palm Island power station uses diesel generators to generate electricity
- The Palm Island Aboriginal Shire Council (PIASC) have an economic strategy for the Palm Island Master plan
- For an energy efficient home, it is suggested that the installation of energy efficient appliances and lighting are prioritised before home automation systems
- Usage of electricity will differ in regional Indigenous communities compared to mainland urban communities

Costs and funding considerations

Capital costs

Approximate total capital cost: $1M (530 homes, $2,000/home)

- Community engagement and co-design and delivery of audit
- The calculations have been based on the example of 530 residential dwellings and an allowance of up to $2,000/household to subsidise the energy audit, LED globes and subsidising energy efficient appliance incentive scheme upgrade

Item	Upgrade Cost	Cost saving
Energy Audit	$ 200 per dwelling	15 – 30% reduction in energy bill
Upgrade to LED globes	$ 370 per dwelling	$ 1,200 – 2,400 over 10 years
ENERGY STAR Fridge	$ 600 – 2,500	<9% reduction in energy bill
Home automation systems	> $ 1,000	Up to 15%

Ongoing costs

- An additional energy audit (e.g., 1 year post initial audit) to measure success. This additional audit is of benefit to DHPW; therefore, the cost could be incurred by DHPW or Ergon as a direct beneficiary of reduced energy demand but not the resident
- General maintenance costs associated with the upkeep of major appliances such as air conditioners and refrigerators

Potential cost savings or return on investment

- Appliances may account for 30% of home energy use and lighting for 10%. Typically, a residential energy audit will identify measures to reduce energy usage and related costs by 15-30%. Therefore, the average Palm Island dwelling may reduce their electricity consumption by approx. 479-945kWh annually. Applying an average usage charge of 0.26* $/kWh, each household could save $125-250 on their electricity bill annually, equating to a payback period of 6-12 years.

Funding opportunities

- The No Interest Loans Scheme (NILS) offers individuals and families on low incomes access to safe, fair and affordable loans for purchasing appliances and some other essential household expenses
- Ergon rebates are available for payment card residences[3]
- For newly built community housing, a partnership with the Clean Energy Finance Corporation (CEFC) should be explored
- Partnership with DHPW should be explored

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Palm Island Residents	■		■	■
Ergon Energy		■	■	
Government			■	
Palm Island Aboriginal Shire Council (PIASC)			■	■
Department of Housing and Public Works (DHPW)	■		■	
Local business			■	

Implementation and timeframes

Investment readiness

- Currently this project is in the concept and feasibility phase, no funding has been procured
- To progress this project, the project scheme needs to be planned and designed, and funding needs to be secured
- Palm Island residents have identified that electricity costs are a significant burden, residents are seeking means to reduce their electricity bills

Next steps

- Creating a scheme structure which details the project priorities and course of actions
- Reaching out to organisations with energy audits capabilities, preferably in Townsville or Indigenous companies who specialise in energy audits, to better understand the feasibility of conducting numerous audits across the island for differing building structures
- Work with the PIASC to ensure the program plan is aligned to the Palm Island Master Plan and Department of Aboriginal and Torres Strait Islander Partnerships

Considerations for implementation

- Currently it is envisaged that this program will begin with an energy audit. The results of the energy audit will determine which appliances need to be upgraded. The scheme will fund the energy audit and potentially all the highest priority appliances/fixtures.

Timeframes to deliver solutions

- Community engagement and co-design and delivery of audit ~ 6 -12 months
- A typical energy audit takes less than 1 day to complete per household
- To replace a household's halogen lights with LED lights an electrician would need to be engaged for a day or less. An electrician would similarly need to be engaged to install a new air conditioner.

[1] Data received from Ergon Energy
[2] Australian Bureau of Statistics, 2016 Census QuickStats https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/LGA35790#mortgage-rent
[3] Ergon Energy, n.d., Card-operated meter customers https://www.ergon.com.au/retail/residential/billing-and-payments/card-operated-meter-customers
* It should be noted that electricity on Palm Island is subsidised by the Government, therefore the true usage charge is higher than 0.26 $/kWh meaning the payback period is lower than the value calculated above.

Palm Island | Transport

13 Options for Replacing Diesel for the Ferry and Barge Services

Looking at options for replacement of diesel fuel for the ferry and barge services including electricity, hydrogen and bio-fuels.

Description and overview

Palm Island is currently serviced by a ferry from Townsville operating once daily Thursday-Monday and operated by SeaLink, or a passenger barge from Lucinda operating once daily Monday – Friday that is operated by Palm Island Barge Company.

Both are currently diesel powered and therefore low-emission technology and fuel options represents a significant opportunity to reduce island transport emissions. Low emission technologies and fuels are developing quickly and up to date market information is required to inform procurement and to consider substantial lead times for delivery of craft. This project proposes investment in an independent review of available marine transport alternative energy/fuel technologies to inform low-emission focussed procurement of these services and therefore future investment in low-emission marine transport on these routes and the wider Great Barrier Reef transport network (e.g., adjacent Magnetic Island route).

This would involve direct engagement with ferry operators and manufacturers (local and international), potential research programs and other new technologies including: Electric; Hydrogen (in both fuel-cell and combustion applications); solar; biodiesel / renewable diesel and combination options. A route investigation, energy fuel requirements, schedule (i.e., charging, refuelling timing options) would be taken into consideration for the assessment.

This project is to be aligned with the Magnetic Island project #16 (Low emission marine transport).

© Water-Go-Round

Project summary

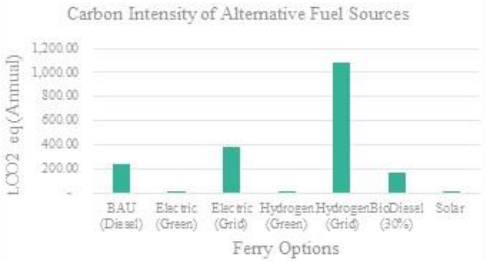
Item	Units	Total
Estimated annual emissions reduction (installed)	t-CO_2-e	0 – 240*
Estimated payback period (in the case of an installed electric ferry)	Years	To be determined by the study
Estimated annual cost savings (in the case of an installed electric ferry)	$ mil	<$0
Estimated capital costs (feasibility study)	$ mil	0.05-0.1
Estimated capital costs (barge)	$ mil	40+
Estimated capital costs (ferry)	$ mil	4+
Timeframe to deliver project	Years	To be determined by the study
Estimated FTE	No.	To be determined by the study

*Note that the technology and market assessment will determine optimum project details. An estimate of potential project costs and benefits is provided in this project outline overleaf. Cost savings from switching from diesel are likely to be negative due the current costs of alternative fuels when compared to diesel.
Emissions reductions are dependent on the type of fuel used and the supply chain carbon intensity of the fuel creation. Carbon emissions have been based on replacing the fuels with either a carbon neutral fuel compared to diesel or a drop in biofuel.

Key project objectives

Carbon assessment

- The realised greenhouse emissions reductions will be dependent on the alternate energy source selected and the emissions currently emitted by the ferries and barge whilst operating the studied route
- To maximise emission reduction a clean energy source would need to be utilised for electric or hydrogen ferries
- The most common blends of biodiesel have a composition mix of 5-20% biofuel which would be a direct reduction in baseline greenhouse gas emissions
- For an estimated 100km ferry journey once a day (return trip Townsville to Palm Island – 50km each way), the approximate yearly diesel fuel consumption is 88,452L (~238- CO_2e)
- A high-level comparison for the annual CO_2 equivalent has been conducted. For the electric and hydrogen cases, the source of electricity will impact the overall carbon impact. If sourced from green electricity then the carbon is negligible, if sourced from the current electricity grid across Queensland the carbon intensity is higher than the current scenario. This would need to be further explored in the independent review.



Community resilience

- By minimising diesel consumption, the community will increase their resilience against diesel supply issues and increases in prices related to future carbon related taxes, if introduced

Co-benefits

Economic

- New technology will be initially more expensive than existing diesel and it is expected that subsidy will be needed for capital expenditure
- Potential change in operational costs associated with alternative fuel / power cost and alternative maintenance regime will depend on option selected
- Any potential reduction in operational costs could translate to lower ticket prices
- Potential unique tourism selling proposition

Social and cultural

- Potential to upskill Palm Island residents to operate new energy infrastructure

Environmental (General)

- Use of diesel fuel generates emissions which was identified as a severe risk in the project risk assessment. A ferry that utilises a renewable fuel source will provide an emissions reduction when compared to its diesel fuel. If the ferry was to be charged using grid power, emission reductions could be achieved and will be dependent on % renewables.
- Due to the inefficiencies of diesel engines, there could be some emissions reductions even when compared to carbon intensive grids. Investigation into where potential alternative fuel is sourced from would be a key focus point in the independent review.
- The implementation of this watercraft could abate the environmental impact diesel shipping currently causes i.e., air pollution, water pollution, noise pollution and oil pollution

Environmental (impacts to Great Barrier Reef)

- By removing diesel boats from the water there is reduced emissions and potential for spills within the ocean.

Other

- Can be included in wider hydrogen and electric studies and alternative fuel use for decarbonising the region including Townsville mainland generation and refuelling options to supply island transport

Risks and opportunities

Barriers

- Significant upfront cost likely required from operator - recommendations of assessment may not be financially viable
- Availability of grant funding to support new technology innovation and implementation at scale
- Current marine operators have recently acquired a new ferry specifically for this route

Risks

- Any feasibility assessment recommendations not undertaken due to expense
- Any option selected must ensure reliability and safety of service is paramount
- High capital costs associated with new ferry and/or associated energy infrastructure
- Issues surrounding suitable location and available site for refuelling facilities at port locations
- Further investigation into the efficiencies of electric ferries and the currently used diesel engines is required

Opportunity

- Large scale decrease in emissions if electric, hydrogen or solar options are pursued
- Progressing the decarbonisation of a typically hard to encourage industry
- International showcase for early uptake of cutting-edge technology
- Potential unique tourism selling proposition
- Seeding wider uptake of low emission transport technology for the Great Barrier Reef Islands and wider region

Alignment with other initiatives

Alignment with other project options

- 4. Community bus service
- 5. Solar Power on the ground with batteries
- Magnetic Island: 16. Low Emission Marine Transport

Alignment with external initiatives or investments

- International Maritime Organisation (IMO) Strategy to Reduce Greenhouse Gas (GHG) Emissions
- Queensland Climate Transition Strategy – Zero Net Emissions Transport Roadmap

Assumptions

Carbon Assumptions

The following assumptions were utilised in the carbon intensity calculations:

Input	Value	Input	Value
Distance	50km each way	EV Battery Eff	95%
Diesel	0.88m L	QLD Grid	0.81kg/kWh
Diesel LHV	37.5MJ/L	Hydrogen LHV	141MJ/kg
Diesel CO2	0.07kg/MJ	Hydrogen FC Eff	60%
Ferry Engine Eff	50%	Hydrogen Energy Required	70kWh/kg

Note: The carbon intensity of the Queensland grid has been utilised over the intensity of the Palm Island grid as charging infrastructure is more likely to be located on the mainland. However, if both ferries and barges transitioned to alternate fuels, the feasibility of charging infrastructure on the island would increase. This point would be explored further in the market and technology assessment. The carbon intensity of diesel-powered electricity is comparable to the Queensland grid.

Additional information

Key route details:

- Townsville - Palm Island
- Journey is approximately 1 hour and 45 minutes long (approx. 60km)
- Lucinda - Palm Island
- Journey is approximately 6 hours long (approx. 50km)
- Solar powered ferries have been investigated in Queensland before, there is currently a proposal for a hybrid solar-powered vehicle ferry to form part of the Daintree River Ferry Crossing fleet

Costs and funding considerations

Capital Costs

There are two main costs that should be considered when assessing this project:

1. The first is the fee to develop the independent current technology, market assessment and the potential transition to alternate fuel sources. This independent review would include analysis of the route, fuel type, current ferry technology utilised, and the available suppliers and costs of an alternative fuelled ferry for Palm Island. The independent review would cost between $50-100k.
2. The second is the approximate total capital costs/operating costs associated with the new ferry and barge. Approximate total capital cost of an electric ferry is approx. $4M[1] and for a barge is $40M which represents approximately 40% CAPEX increase to conventional diesel vessel.

Ongoing costs

- If this ferry is to replace existing service, then these costs are removed/reduced
- Wages of drivers/captains and training costs
- Port/dock access
- Boat storage
- Maintenance
- Cost of alternative fuel

Potential cost savings or return on investment

- Potential to reduce on-going costs associated with fuel by 80% if an electric ferry[2]
- Detailed savings and cost comparison to be determined during the independent review

Funding opportunities

- Climate Solutions Fund – Emissions Reduction Fund
- Clean Energy Finance Program - Reef Funding Program
- Australian Renewable Energy Agency – potential funding through exploration of innovative emission reduction measures
- Ergon – potential partner on project due to electric vehicle charging infrastructure

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Current operators				
Palm Island Community				
Palm Island Aboriginal Shire Council				
Government				

Implementation and timeframes

Investment readiness

- Currently this project is in the concept phase, no funding has been procured. To progress this project, funds needs to be procured. The assessment is ready to be undertaken.
- Current market ready low emission ferries require investigation into availability and/or development for an Australian context.
- Pilot projects using alternative technologies and fuels require government transport and safety regulations to be aligned, which has substantial lead times
- Investment is to be aligned with the Magnetic Island Low Emission Marine Transport project (#16, Low emission marine transport)

Next steps

- Consultation needs to take place with current operators and the Palm Island Council to determine owner/operator structures
- Analysis of the proposed route, refuelling / charging options and infrastructure
- Engagement with potential technology providers

Considerations for implementation

- Route distances and charging requirements
- Refuelling time and strategic location of changing infrastructure
- Appropriate training of captains for new ferries may be required
- Publication and promotion of routes and operating time
- Consultation with Maritime Safety Queensland, Department of Transport and Main Roads (TMR) and the Australian Maritime Safety Authority (AMSA)

Timeframes to deliver solutions

- Assessment could be delivered within 6 months
- Dependent on the selected alternate energy fuel source and the implementation of the relevant refuelling infrastructure
- Lead times of novel ferry technology and any update to regulations for implementation could be substantial (2yrs+)

[1] Blake Matich, 2020, 'Southern Hemisphere's first electric commuter ferry', https://www.pv-magazine-australia.com/2020/01/22/southern-hemispheres-first-electric-commuter-ferry/
[2] Fred Lambert, 2018, 'All-electric ferry cuts emission by 95% and costs by 80%, brings in 53 additional orders', https://electrek.co/2018/02/03/all-electric-ferry-cuts-emission-cost/

Palm Island | Waste

14 Improving the Waste Management Site

Improving the rubbish site so waste can be better separated into different kinds of waste and stored properly for transport and recycling off island.

Description and overview

This project proposes an upgrade of the current Palm Island Aboriginal Shire Council (PIASC) waste management facility to improve recovery of recyclable materials and green waste for reuse on the island and decrease waste volumes and off-island transport costs. A plan will be developed for ongoing management of stockpiled recyclables to align with the Queensland Indigenous Waste Strategy (Department of Environment and Science (DES), under development).

PIASC provides waste management services on the island which are very costly and has relied on sporadic government grant schemes and investment for upgraded capital infrastructure works. There are currently no landfilling or municipal waste separation or recycling facilities on-island, and all collected waste is transported to the mainland.

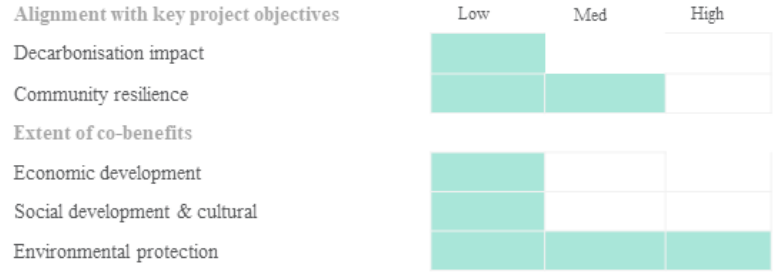
Two landfills were previously operated on the island, the Wallaby Point Road landfill which was authorised by an environmental authority and the informal Manbarra Road landfill. In 2017, following discussions with the DES, PIASC made the decision that both landfills would be rehabilitated, and a waste transfer station would be commissioned to send all waste off the island for disposal at Hinchinbrook Shire Council. PIASC rehabilitated the landfill sites and established a waste transfer station adjacent to the rehabilitated Manbarra Road landfill.

The existing waste transfer station is a relatively small concrete pad with one semi enclosed shed and an additional open concrete bay. There is also a concrete plant located at the site which was operational as of September 2019.
Current waste management practices on island include:

- Municipal solid waste collected weekly from households and taken to the transfer station site
- Consolidation into shipping containers for transport via barge to the mainland at Hinchinbrook Shire Council
- No segregated household collection or on-island separation services e.g., recycling or green waste
- Stockpiling of construction and demolition (C&D) waste, hydrocarbons, intermediate bulk containers of chemicals (sodium hydroxide), tyres and scrap metal at the adjacent closed Manbarra Road landfill, and green waste and used car bodies on the adjacent lot. Sporadic bulk transport of stockpiled waste/recyclables to mainland.

The upgrade proposes including a new compactor and waste sorting facilities as well as an enlarged waste transfer station to allow for better stockpiling. The upgrade will address securing the site to prevent illegal dumping activities (including asbestos etc) and animal control (e.g., horses and pigs) which have been reported to be problematic for council to manage.

Project summary



Item	Units	Total
Estimated annual emissions reduction	t-CO_2-e	0 - 5
Estimated payback period	Years	>10
Estimated annual cost savings	$ mil	.06
Estimated capital costs	$ mil	2
Timeframe to deliver project	Years	1 - 2
Estimated FTE	No.	2

Key project objectives

Carbon assessment
Degradation of organic waste within a landfill produces landfill gas which contains 40-60% methane, a greenhouse gas approximately 30 times more potent than carbon dioxide. Removal of recyclable materials from the general waste stream (particularly degradable material) would reduce the overall quantity of waste landfilled and a reduction in landfill gas and legacy environmental issues. It is noted that removal of these materials from the general waste stream, if not reused on the island, would require transport to the mainland for recycling. Whilst not necessarily providing a positive assessment with respect to carbon, this would result in higher order use for the waste materials in line with the waste hierarchy.

Currently green waste is stockpiled at the transfer station, the process of which does not achieve higher order use for the material. Appropriate collection and stockpiling of this material at the transfer station could allow for composting at the community gardens, allowing for recovery of green waste material, improvement of soil nutrients and provide an overall reduction in carbon emissions for the island. Large green waste material, such as trees and branches may need to be mulched for use in community gardens or prior to adding to the composting process.

Separation and recycling of other material streams such as white goods, wrecked vehicles, C&D waste, e-waste and solar panels provides an opportunity for reuse of materials and reduces a reliance on virgin material. Whilst this may not have an overall carbon reduction, recycling and reuse creates an improvement in overall environmental impact for the materials.

Community resilience
This project would aim to provide essential infrastructure and management strategies to prevent legacy waste stockpiling being ongoing issues for the island environment and public health.
This project should also consider the impact on community members of waste debris which may have a negative impact on the health and safety of nearby residents.

Co-benefits

Economic
Improved waste management measures will increase the island amenity and contribute towards tourism incentives. Increased reuse and recycling of materials, including potentially operation of a buyback shop at the transfer station or repurposing of waste materials through community groups such as the men's shed can provide livelihood or affordable materials for community.
Upgrading the transfer station has the potential for job creation with an additional full time equilalents to collect household recyclables, waste sorting and storage and managing the buyback shop. The addition of a functional compactor would significantly reduce the volume of general waste to be transported to the mainland for disposal, and therefore significantly reducing transport costs per cubic metre which was identified as a high risk in the project risk assessment.

In addition, a waste disposal levy currently applies to disposal of C&D and commercial and industrial (C&I) waste. Currently the government offers a levy rebate to councils for municipal solid waste (MSW) disposal. In addition to compaction, reducing the tonnages of MSW disposed to landfill, either by waste reduction measures or an increase in recycling, will result in cost savings should the rebate be revoked. The transfer station upgrade will allow materials to be stockpiled and consolidated until sufficient quantity for a full shipping container/ barge load. This will allow barge space to be utilised opportunistically or via backloading in order to reduce barging costs.

Social and cultural
The transfer site is located within 250m of local residences and improved management at this facility would minimise air quality issues with odour and dust. If green waste was composted rather than burnt this would also decrease impacts on nearby receptors. Providing a managed facility that was lockable out of hours would reduce the risk of vermin and illegal dumping, particularly of hazardous wastes such as asbestos that should be the responsibility of the construction contractor to manage and disposal of correctly. This would improve operational health and safety of the transfer station facility.

Environmental (impacts to Great Barrier Reef)
The transfer station site is located within close vicinity of the coastline, marine ecosystems, Great Barrier Reef and within 1km of a waterway leading into Coolgaree Bay. Appropriate upgrade of the transfer station and implementation of appropriate management measures would significantly reduce the risk of exposed and stockpiled waste contaminating of soils, surface and ground waters. Severe weather events such as cyclones and flooding could result in a mobilisation of stockpiled waste materials into the ocean and localised contamination of the Great Barrier Reef marine park.

Risks and opportunities

Barriers/Risks
- Ongoing availability of the levy rebate for MSW
- Support from PIASC to drive funding opportunities and improvements implementation
- Collaboration from community in the uptake of recycling and reuse of materials
- Corporation of the barge company to negotiate rates for transportation of recyclables
- Logistics for pickup of materials on the mainland and transport to processing facilities
- Any existing contract terms for collection, transport and disposal

Opportunity
The upgrade of the transfer station would provide a core environmental service to the community. Currently there is an Indigenous Waste Strategy under development (commissioned by the Local Government Association Queensland and the Department of Environment and Science), that seeks to align with the Queensland Waste Management and Resource Recovery Strategy and highlight priorities with respect to management of waste to ensure these areas are given priority in funding opportunities.

Alignment with other initiatives

Alignment with other project options
- 1. Community Market Garden
- 17. Help community to stop using plastic items commonly found in rubbish

Alignment with external initiatives or investments
- Wreck vehicle clean up as part of North Queensland Regional Organisation of Councils (NQROC) initiative
- Part 2 of the Indigenous waste strategy, development of infrastructure plans (DES)

Assumptions

- There is a lack of publicly available information regarding the current state of the closed landfills on Palm Island. It is assumed they have been rehabilitated in accordance with relevant guidelines and capex costs for capping works will not be included in the high-level cost estimates.
- It is assumed that the upgraded transfer station will be situated on council owned land
- Labour is included in the capex estimate
- Freight costs are assumed to increase costs of items purchased from the mainland by 50%
- Rawlinson's construction handbook indicates that construction costs (materials and labour) on Magnetic Island (in close proximity to Palm Island) is 30% higher than mainland cities such as Brisbane which has been accounted for in the capex estimate
- Timing assumes that there is no need to negotiate current waste collection, transport or disposal contracts

Costs and funding considerations

Capital costs

Transfer station upgrade:

- Weighbridge
- Fencing and security
- Hardstand and storage shed
- Skip bins for material separation (bulky waste)
- Sealed shipping containers and fit for purpose compactor for general waste
- Buy back shop/repurposing facility
- Plant/machinery (such as a mulcher for green waste)
- Plan for stockpiled recyclables in consultation with Queensland Indigenous Waste Strategy (DES, under development).

Future: Purchase of an additional waste collection vehicle and bins for recycling collection

Approximate total capital cost: $2M (excluding future recycling collection infrastructure)

Ongoing costs

- Operation of the transfer station facility and buy back shop, including ongoing upskilling of staff
- Sorting and transport of waste via barge to the mainland
- Education and community engagement regarding waste sorting and waste reduction
- Optional: Collection of comingled recycling including equipment maintenance, staff and management

Potential cost savings

The core purpose of upgrading the transfer station is to provide a sustainable and compliant facility that aims to protect the environment and the community. Some cost savings will be achieved through this project implementation however this is noted as not the key driver for the project. The current barge costs are approximately $700K per year (including freight, levy and gate fee). Potential cost savings as part of this project include:

- Volume reduction of general waste, reducing the number of barge trips required through implementation of a fit for purpose compactor = $60K per year
- Employment opportunities through increased collection and management of recyclable materials on the island
- Landfill disposal avoidance and therefore no need to pay a disposal levy charge on recyclables

Funding opportunities

- State Development, Manufacturing, Infrastructure and Planning - Resource recovery industry development program
- Department of Agriculture, Water and the Environment – Reef Trust – Great Barrier Reef Foundation Partnership Grant

Additional information

Some barge companies servicing Indigenous island communities offer a $0/tonne rate for recyclable goods. Given this material would be backloaded it is suggested that this type of contract rate be negotiated to make higher waste management solutions more affordable.

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
PIASC	■	■		■
Hinchinbrook Shire Council		■	■	■
Townsville City Council	■	■	■	
Palm Island Barge Company			■	
Community groups (e.g., Men's Shed)			■	■
DES– Environmental Services and Regulation			■	

Implementation and timeframes

Investment readiness

This project could go ahead immediately if the funding could be secured.

Next steps

1. A concept and detailed design for transfer station and detailed cost estimate
2. Investigation into local recycling operators to receive and process recyclable materials
3. Enforce contractual requirement for contractors to remove waste from island
4. Gating/controlled access and surveillance at site and locked gate so dumping can't occur outside of manned hours to manage occupational health and safety risks from hazardous materials
5. Job opportunities and training/upskilling for community, potential business opportunities once system is mature and expansion of waste management

Additional activities

1. Inspection of the capping and rehabilitation works at the closed landfill sites and development of a closure plan for ongoing management and risk mitigation
2. Purchase of household recycling collection vehicle, additional bins and other required equipment to ensure collection aligns with current general waste collection system
3. An education campaign to introduce the recycling bin and communicate the importance of reducing contamination rates

Considerations for implementation

- Early community engagement and education
- Early engagement with other stakeholders and councils

Timeframes to deliver solutions

- Detailed design of transfer station layout (3 months)
- Construction (4 months) / Implementation roll out and start up (2 months)

Palm Island | Water

15 Water and Wastewater Plan

A plan to highlight opportunities to improve long term water quality, community self-sufficiency, as well as ongoing wastewater management for the island.

Description and overview

Sustainable, reliable and accessible potable water supply and wastewater management are key to Palm Island community health, liveability and resilience. The island is not connected to mainland water supplies and Palm Island Aboriginal Shire Council (PIASC) is responsible for delivering water and wastewater services to the community.

PIASC have recently faced a number of challenges in delivering reliable water and wastewater services and this project proposes to develop a long-term management strategy to set direction and prioritise future efforts and resource investment.

Water security on Palm Island is highly dependent on seasonal rainfall, and in the recent past the community has experienced critical water shortages (e.g., emergency drought responses, severe water restrictions, banning non-essential visitors, importing water from mainland, and investigating groundwater and desalination options) and potable water quality supply incidents (e.g., discolouration of water and boil water notices).

The need for infrastructure upgrades and management and capacity improvements for both water and wastewater systems have been identified by PIASC, Queensland Department of Health and Department of Local Government, Racing and Multi-Cultural Affairs (DLGRMA) and other key stakeholders. Some priority infrastructure issues are being addressed through the Queensland Government's Indigenous Councils Critical Infrastructure Program (ICCIP)[1] and other capacity building programs are also being delivered by Queensland Health and DLGRMA*.

This project, delivered in collaboration with PIASC and other stakeholders, seeks to provide an overarching strategy to guide the transition toward a more sustainable model of water and wastewater service provision. This will include a detailed review of:

- Existing water consumption behaviours and opportunities for improved demand management to reduce the strain on existing assets;
- Existing water security, and identification of optimal water resource and storage requirements to address critical water shortages and increase water security and resilience in the long-term;
- Existing asset condition and performance and the development a prioritised program of infrastructure improvement works; and
- Existing infrastructure management, operation, maintenance and forward works planning procedures and the identification of staff capability and capacity, and asset management improvements to facilitate more effective and resilient water and wastewater service provision into the future.

To deliver the intended outcomes, this project must be delivered in conjunction with other initiatives to 1) address critical water and wastewater infrastructure deficiencies; 2) build further capacity within PIASC; and 3) better engage the community in the water planning and service provision process and re-build community trust in the safety and reliability of the water supply (see project #7, Building confidence in community's water supply).

Project summary

Item	Units	Total
Estimated annual emissions reduction	t-CO_2-e	N/A
Estimated payback period	Years	N/A
Estimated annual cost savings	$	N/A
Estimated capital costs	$ mil	0.25 – 0.5
Timeframe to deliver project	Years	1 - 2
Estimated FTE	No.	N/A

[1] Queensland Government, 2020, 'Indigenous Councils Critical Infrastructure Program (ICCIP)', https://www.dlgrma.qld.gov.au/local-government/grants/current-programs/indigenous-councils-critical-infrastructure-program

* It should be noted that the ICCIP funding and associated water infrastructure upgrade projects have been delayed due to a PIASC budgetary restructure.

Key project objectives

This project will develop a long-term strategy to deliver more sustainable, cost-effective and resilient water service provision, and ultimately deliver improved health, economic and social outcomes in the community. Implementation of the strategy will achieve the key project objectives in the following ways (directly and indirectly).

Carbon assessment

- Reduced per capita water consumption/ production;
- Increased efficiency in extraction, treatment, storage and distribution of water;
- Increased asset lifespans; and
- Identification of opportunities for incorporation of renewable energy within water and wastewater assets.

Community and climate resilience:

It is understood that when the treated water reservoir is at full capacity that the island has approximately 3 days' supply of potable water (i.e., running in island mode of self-sufficiency) which can supply the community, providing limited resilience during shock events (e.g., extreme weather, pandemic etc).

The strategy aims to provide for:

- More sustainable and resilient water infrastructure;
- Increased water security and self-sufficiency;
- Better management of water demand;
- Increased redundancy;
- Increased technical capacity within operational team; and
- Improved asset management, operation, maintenance.

Co-benefits

Economic

- Reduced overall cost of service provision
- Extended asset lifespans
- Opportunities for economic development (e.g., additional housing, tourism development)

Social and cultural

- Increased level of service delivered to community in terms of water security, reliability, quality and wastewater compliance. Wastewater treatment plant capacity was identified as a severe risk in the project risk assessment
- Increased community trust in water supply and wastewater services
- Better understanding within community of the challenges and costs associated with water and wastewater service provision, may improve community water management
- Note: social and cultural benefits will only be realised if the project is delivered in conjunction with other opportunities to address infrastructure issues, build PIASC capacity, and improve engagement with community

Environmental (General)

- Reduced overflows from wastewater network
- Increased compliance of wastewater treatment plant effluent discharge as sludge storage onsite has been identified as a severe risk to ecosystems in the project risk assessment

Environmental (impacts to Great Barrier Reef)

- Reduced risk of requirement to mobilise emergency mobile desalination
- Reduced wastewater nutrient export to the Great Barrier Reef
- A reduction of greenhouse gas emissions from reduced water treatment energy could contribute to the global effort to reduce emissions which are impacting the reef through increased temperatures and ocean acidification

Risks and opportunities

Barriers

- Previous projects have not successfully addressed the water issues on Palm Island highlighting the complexity and barriers
- Requires collaboration between multiple stakeholders including PIASC, Department of Local Government, Racing and Multicultural Affairs (DLGRMA), Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP), Department of Environment and Science (DES), Queensland Health (QH), QldWater – there are already established platforms for such collaboration which can be utilised and strengthened for the benefit of this project

Risks

- Relatively small issues (e.g., minor or perceived water quality incidents) can impact level of trust in community
- Large, complex and diverse project (may need to be broken into smaller components with staged delivery to enable funding)
- Strategy may identify significant ongoing costs to achieve target level of service which may exceed available funding

Opportunity

- Engagement with the community is recommended to gain stronger understanding of community values and attitudes toward water, and assist in tailoring solutions and strategy toward community priorities (refer to project #7, Building confidence in community's water supply)
- Opportunity to develop and leverage partnerships with neighbouring Townsville City Council (TCC) to provide strategic and technical support to PIASC (e.g., asset management, project delivery, strategic planning, laboratory services, etc.). It is understood QH and Qldwater are investigating opportunities for such collaboration across Queensland and should be involved in such discussions.
- Opportunity to align with and leverage outcomes from the QH Safe and Healthy Drinking Water in Indigenous Local Government Areas Program, which has reportedly been very successful

Alignment with other initiatives

Alignment with other project options

- 2. Living better at home and saving money
- 7. Building confidence in the community's water supply

Alignment with external initiatives or investments

- Indigenous Councils Critical Infrastructure Program – Palm Island Water and Sewerage Infrastructure Works
- Other water and wastewater infrastructure programs
- Queensland Health Safe and Healthy Drinking Water in Indigenous Local Government Areas Program
- Department of Local Government, Racing and Multi-Cultural Affairs Capacity Building Programs

Assumptions

- Detailed scope would need to be developed and refined in consultation with key project stakeholders
- Project anticipated to be consultant led, in collaboration with PIASC and key stakeholders
- To deliver the intended outcomes, this project must be delivered in conjunction with other initiatives to 1) address critical water and wastewater infrastructure deficiencies; 2) build further capacity within PIASC; and 3) better engage the community in the water planning and service provision process and re-build community trust in the safety and reliability of the water supply (see project #7, Building confidence in the community's water supply).

Costs and funding considerations

Capital costs
- A nominal budget of ~$250-500k is proposed subject to confirmation of project priorities and scope

Ongoing costs
- The strategy will develop and prioritise opportunities for long term investment
- It should be noted that there will be costs associated with the implementation of the strategy including potentially significant costs associated with additional infrastructure, capacity building, asset management systems, and ongoing community engagement which are not included here and need to be considered separately
- In the long-term however, implementation of the strategy is expected to deliver economic benefits and reduced overall investment

Potential cost savings or return on investment
- Implementation of the strategy is expected to reduce the cost of water and wastewater service provision through:
  - Improved operational efficiency;
  - Proactive asset management (reducing frequency of asset failures and extending service lives); and
  - Coordinated, strategic and long-term capital works planning.

Funding opportunities
- No specific funding opportunities have been identified for this project
- The project is aligned at some level to several existing funding programs including Building our Regions Program (Department of State Development, Tourism and Innovation), Queensland Disaster Resilience Fund (Queensland Reconstruction Authority), and Remote Area Boards Program, and the Indigenous Councils Critical Infrastructure Program (Department of Local Government, Racing and Multicultural Affairs (DLGRMA))
- Given the criticality of the work and alignment to multiple Departmental priorities, it is recommended that key stakeholders including PIASC, DLGRMA, DATSIP and DES to collaboratively review funding opportunities
- There may be an opportunity combine this project with project #7 (Building confidence in the community's water supply) for funding application purposes

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Palm Island Community				
Palm Island Aboriginal Shire Council (PIASC)				
Department of Local Government, Racing and Multicultural Affairs (DLGRMA)				
Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP)				
Department of Environment and Science (DES)				
Queensland Health (QH)				

Implementation and timeframes

Investment readiness
- Could be commenced within 3 months
- Works in community may be impacted by COVID-19 restrictions (planning/ scoping could commence ahead of restrictions being lifted)

Next steps
- Consultation with key stakeholders to confirm scope
- Development of consultant brief
- Consultant procurement

Considerations for implementation
- Refer previous pages

Timeframes to deliver solutions
- Delivery within 12 months
- Timing of delivery of this project may be reliant on delivery of other projects
- This project needs to be considered in context of other related projects to maximise impact

Palm Island | Resilience

16 A Tourism Plan for Palm Island

A plan to support the community to benefit from the opportunities that tourism can provide in a cultural, ethical, social and economical way.

Description and overview

Tourism has been identified as a catalyst for economic development and social improvement on the island. Whilst tourism is an emerging rather than mature sector, a management plan is required to strategically guide sustainable development in a manner which is environmentally, socially, culturally, and economically resilient. A management framework would embed community objectives and effectively consider growing infrastructure and service needs (including climate resilience and local disaster management planning systems). Leisure tourism to Palm Island is currently limited, as most activity involves fly-in fly-out business visitation or visitation of relatives. However, the development of the new Museum of Underwater Art (MOUA) will provide a compelling reason for visitation. Projections from the MOUA[1] project estimate 5,000 annual day visitors to Palm Island, a figure which has potential for considerable growth but requires management of visitor flows and infrastructure enhancements.

As a first step in the development of tourism on Palm Island, this project will deliver:

- An action and community-focused tourism destination management plan that provides a framework and roadmap for an environmentally sustainable, resilient and vibrant tourism industry that delivers outcomes aligned with community objectives. MOUA will be delivered by 2021 and provides an opportunity for a step change in the visitor economy. Accordingly, the plan will also consider the need to ensure physical resilience and disaster-preparedness and likely infrastructure and services requirements.
- A clear understanding of what 'sustainable' tourism growth on Palm Island will look like: understanding the type and quantity of tourism that is right for the island, a consideration of peak visitor flows and seasonality, understanding both social and ecological limits, how to protect and enhance the community's quality of life and the island's environmental protection, and a clear assessment of both local resident and visitor expectations, needs and desired experiences. The health and safety of the Indigenous population to disease exposure from increased visitor numbers, particularly overseas visitors needs to be considered, assimilating learnings from COVID-19. A dedicated project implementation manager will be engaged by Palm Island Aboriginal Shire Council for a 6-month period to lead on-island engagement and plan implementation.
- A clear governance framework, ensuring the community can have ongoing input and ensuring intellectual property and Indigenous knowledge is protected, and that cultural integrity is preserved and promoted. Environmental, Traditional Owner and those with Historical Associations input will be included to identify risks, negative impacts and issues for the community from tourism and tourists.

Project summary

Alignment with key project objectives	Low	Med	High
Decarbonisation impact	■		
Community resilience	■	■	■
Extent of co-benefits			
Economic development	■	■	■
Social development & cultural	■	■	
Environmental protection	■	■	

Item	Units	Total
Estimated annual emissions reduction	t-CO_2-e	N/A
Estimated payback period	Years	N/A
Estimated annual cost savings	$	N/A
Estimated capital costs	$ mil	0.1 – 0.2
Timeframe to deliver project	Years	1
Estimated FTE	No.	1

[1] AEX Group, 2018, 'Museum of Underwater Art Cost Benefit Analysis'

Key project objectives

Carbon assessment
- Potential for an increase in carbon emissions due to increased tourism activity and community development. However, this should be recognised and appropriately managed and/or mitigated where possible through the plan and through the type of tourism developed.
- Potential for avoided greenhouse gas emissions through the sustainable use of energy and water by tourism operators and visitors
- Sustainable and reduced consumption of resources by tourism operators will avoid the associated embodied energy and emissions associated with those goods
- Reduced and sustainable consumption of resources by the tourism industry on the island will reduce the transportation of goods and therefore avoid transportation emissions
- Increased tourist visitation may increase carbon emissions from transportation which would need to be appropriately managed by the Plan

Community and climate resilience
- An understanding of island essential services capacity will inform the Plan to ensure that the island has the capacity to support both the existing local community and visitors with food, water, energy and services. This will increase the resilience of both stakeholders to potential shortages or supply disruptions and not overwhelm current services such as health and crime prevention.
- Tourism ventures are to be facilitated and set up by the community and First Nation people
- Managing the growth of tourism businesses on Palm Island will ensure that they are long-term to ensure stable employment for the local community
- The Plan should incorporate existing community ideas and business ventures that could support the development of tourism products and experiences

Co-benefits

Economic
- Through the development of MOUA, due to launch in 2021, significant additional annual visitors are expected which will provide significant economic stimulus but will also impact on limited infrastructure

Co-benefits cont.

- Tourism activities and community owned and operated businesses will provide business development and employment opportunities for the community as well as training/upskilling opportunities for the community at large
- Tourism infrastructure will also support and service the community i.e., increased investment in public transport or active transport corridors will have shared benefits for the community

Social and cultural
- Community acceptance and preparedness for the industry on Palm Island to ensure longevity
- Appropriate engagement of Traditional Owners and those with Historical Associations to share and celebrate culture and traditions
- Establishment of a corporate social responsibility for tourism business operators
- Alignment of tourism development needs with infrastructure planning and investment focusing on visitor flows around key developments
- An effective and vibrant tourism management plan can promote a sense of community pride

Environmental (General)
- The tourism plan will consider reducing environmental impacts of tourism which was identified as a severe risk in the project risk assessment
- Improved waste management may reduce some forms of environmental contamination
- Reduced local air pollution where the plan required improved transportation practices and electricity use
- Sustainable product use across supply chains
- Sustainable transportation use i.e., public and active transport

Environmental (impacts to Great Barrier Reef)
- The Plan will manage the number of tourists to within the ecological limits, promoting conservation of the significant ecosystems
- Reduce litter pollution in the ocean through better visitor behaviour

Other
- Development of accommodation on Palm Island is to be considered after the completion of the Tourism Management Plan, when a clear understanding of the industry's needs, issues and demand are established

Risks and opportunities

Barriers
- Long-term funding and resource availability to successfully implement this plan
- Significant capital investment required to establish tourism infrastructure
- Existing infrastructure, community capacity and skilled workforce on the island
- No current experience of tourism industry or level of readiness
- Tourism is likely a seasonal business with impacts on business and employment in off-season
- It is likely that tourism will increase carbon emission, particularly through increased air/sea travel to the island unless sustainable transportation options are adopted

Risks
- Lack of community support or engagement
- Exploitation of Indigenous intellectual property
- Safety and public health implications of a highly transient population being accommodated on the island
- Future tourism businesses and growth not complying with the Plan
- Impacts of introduced species and environmental damage due to increased visitation
- Negative impacts of visitation on vulnerable Indigenous community (health, safety, wellbeing, culture, community cohesiveness)
- Economic leakage - community does not benefit from the tourism, but outsiders do

Opportunity
- Attain funding and investment from future tourism operators as part of their corporate social responsibility
- Attract a nature-based tourism market that aligns to the Tourism and Events Queensland (TEQ) Tourism for Good brand
- Develop a highly immersive environmental and cultural experience that will encourage visitors to spend more and stay longer
- Prior to the COVID-19 pandemic, there was strong tourism industry growth in Queensland with forecasts indicating fast growth over the next five years. This provides the opportunity to examine how this destination is perceived by visitors and to reposition as required.
- The Year of Indigenous Tourism is part of the Queensland Government's commitment to supporting Aboriginal and Torres Strait Islander Queenslanders to take charge of their economic futures. Due to the COVID-19 pandemic, the Year of Indigenous Tourism is being extended until 2021, with 2020 and 2021 focussing on the future direction of the market offering
- State Government funding opportunities for Indigenous Tourism
- Potential employment generation for Palm Island residents

Assumptions

- The community and council will develop the Tourism Management Plan in partnership with an external consultant/consortium (with community experience, knowledge, and relationships)
- The plan will be focused on sustainably managing and growing the tourism industry in line with the carrying capacity of the island
- The Tourism Management Plan is not a development plan and will not consider pathways to eco-certification
- Due to the COVID-19 pandemic, the Year of Indigenous Tourism is being extended until 2021, with 2020 and 2021 focussing on the future direction of the market offering
- The Museum of Underwater Art to install exhibitions on Palm Island by 2021 with the aim of increasing tourism to help bring an economic boost to the area

Alignment with other initiatives

Alignment with other project options

- 2. Living better at home and saving money
- 4. Community bus service
- 5. Solar Power on the ground with batteries
- 6. Put Solar Power on the roof
- 7. Building confidence in the community's water supply
- 10. Improving walkways around Palm Island
- 15. Water and wastewater plan
- 17. Help community to stop using plastic items commonly found in rubbish
- Masig Island 2. Blue Carbon Sequestration

Alignment with external initiatives or investments

- Attain investment from tourism operators (present and future)
- Queensland Year of Indigenous Tourism 2021 *(refer to Assumptions)*
- Queensland Recovery Plan, Queensland Reconstruction Authority
- Queensland Strategy for Disaster Resilience 2017, Queensland Reconstruction Authority.
- Queensland Tourism, Small Business and Built Environment Climate Change Response Plans
- Queensland's Ecotourism Plan
- Townsville Enterprise's Product and Experience Development Plan
- QTIC First Nations Tourism Plan
- Ecotourism certification requirement for tourism operators
- Tourism and Events Queensland's – Tourism for Good brand platform

Costs and funding considerations

Capital costs

- Engagement of a consultant to develop the Tourism Management Plan. This plan will contain a strategic framework, providing a pathway for developing an environmentally sustainable tourism industry on the island. The plan will be developed using a bottom-up approach, engaging communities to inform the pathway and key steps. There will be a focus on developing signature projects.
- Resources required by Townsville City Council or a consultant to implement the Tourism Management Plan
- Implementation of the plan (6 months) ~$95,000 (estimated to be a split of $55,000 for implementation manager and $40,000 for project implementation support)

Approximate total capital cost: ~$60,000 for the Tourism Management Plan, including extensive consultation. $95,000 for resources to implement the plan. Total of approximately $155,000.

Ongoing costs

- Annual monitoring and auditing costs to ensure tourism businesses are complying with the plan
- Community capacity building to provide capability to review and monitor compliance with the plan

Potential cost savings or return on investment

- Managing waste production from tourism operations will reduce transportation costs associated with waste produced
- Ongoing savings from reduced water and energy costs

Funding opportunities

- Round 3 - Community Sustainability Actions Grants, Queensland Department of Environment and Science
- Social Reinvestment Grant, Department of Aboriginal and Torres Strait Islander Partnerships
- Community Led Grants, Department of the Prime Minister and Cabinet
- Growing Indigenous Tourism Fund, Queensland Department of Innovation and Tourism Industry Development

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Local community	■	■		
Traditional owners			■	■
Tourism businesses	■	■	■	■
Townsville Enterprise		■	■	
Palm Island Aboriginal Shire Council	■	■	■	■

Implementation and timeframes

Investment readiness

- There are mixed responses from the community regarding the optimal growth of tourism on the island
- Community members have not all experienced the benefits that tourism opportunities could bring onto the island, contributing to mixed responses
- There is existing investment in new tourism businesses which will start to operate on Palm Island in the next year

Next steps

- Identify funding to engage a consultant/consortium (with community experience, knowledge, and relationships) to scope out the costs of developing and implementing the Tourism Management Plan

Considerations for implementation

- The island's current capacity to maximise economic opportunities without compromising the environmental and social sustainability of the industry
- Consultation with the local community to ensure their ideas, opportunities and concerns about development are addressed and managed by the plan
- Engagement with tourism operators to ensure that any requirements flowing from this plan are effectively communicated, mitigating the risk
- Sustainable employment growth that allows sufficient time for training and mobilising the local community
- Allocating adequate resources to implement the plan
- Monitoring to ensure compliance with the Tourism Management Plan
- Ensuring that the local community benefit from tourism, not outsiders
- Deliver additional benefits for the community through tourism, including a women's healing centre, a men's shed, nature walks from restored habitat (in collaboration with the ranger program), and active transport (project #10, Improving walkways around Palm Island)
- Leverage from traditional foods grown in the market garden

Timeframes to deliver solutions

The plan will be completed over 6 to 12 months, providing guidance on the carrying capacity and sustainable growth limits of Palm Island over the next three years.

Palm Island | Waste

17 Help Community to Stop Using Plastic Items Commonly Found in Rubbish

Finding better alternatives for shops to switch away from plastic items commonly found in rubbish – straws, coffee cups/lids, takeaway containers, food ware (cups, plates, cutlery etc.), bags and water bottles.

Description and overview

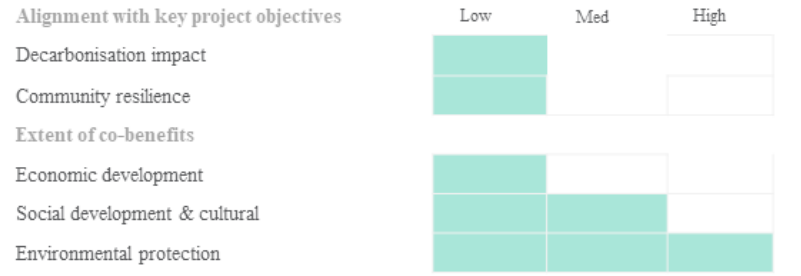
Palm Island Aboriginal Shire Council (PIASC) provides waste management services on the island which are very costly in terms of managing on-island collection and handling facilities, shipping waste to the mainland and cleaning up litter. There are currently no landfilling or municipal waste separation or recycling facilities on-island, and all collected waste is transported to the mainland, at Hinchinbrook Shire Council.

The Queensland Government plans to introduce a single-use plastic products ban commencing after 1 July 2021[1]. This project proposes to support the Palm Island community to reduce single use plastic waste on-island through implementation of 'Plastic Free Places[2]' initiative and increase container recycling rates through supporting further on-island uptake of the existing Queensland container refund scheme (CRS)[3].

Continuous improvement in waste management outcomes on Palm Island provides benefits for the health and liveability of the community, protection of the island and reef ecosystems and for a clean environment to support tourism and other economic enterprises (e.g., aquaculture). "It is estimated that approximately 95% of all plastic packaging in Australia is used once and then discarded, often as litter"[2]. "In its 2014 report on Marine Debris in Australia, the CSIRO found that three quarters of the marine debris found along our Australian coastline is plastic, most from local sources", with beverage containers being the dominant plastic item in the marine environment[4].

The Plastic Free Places program will be delivered by the Boomerang Alliance, and has been implemented in Noosa, Byron, Perth, Adelaide and more recently is being rolled out in North Queensland - Cairns, Townsville and Magnetic Island. The proposed program is to be a partnership with the Palm Island community, PIASC and voluntary local stakeholders and businesses; to reduce use of single-use plastic items: water bottles, straws, coffee cups/lids, takeaway containers, food ware (cutlery, plates, cups etc) and bags etc replacing with reusable or compostable alternatives; and/or encourage recycling of containers using the container refund scheme (CRS). The Queensland Government CRS offers a 10c refund for return of eligible beverage containers, such as glass, plastic, aluminium, steel and liquid paperboard containers between 150ml and 3L. This scheme was introduced in 2018 as in incentive to increase recycling rates and reduce litter throughout the state. Container recycling is voluntarily undertaken with collection points currently offered by the Palm Island Community Development Program, St Michael's School and Coolgaree Bay Sports Bar and Bistro as part of the CRS, but this service is not widely utilised in the community used due to lack of accessibility which will be improved.

Project summary



Item	Units	Total
Estimated annual emissions reduction	t-CO_2-e	N/A
Estimated payback period	Years	N/A
Estimated annual cost savings	$	N/A
Estimated capital costs	$ mil	0.4
Timeframe to deliver project	Years	2
Estimated FTE	No.	1

[1] Queensland Government, 2020, 'Single-use plastic products ban', https://www.qld.gov.au/environment/pollution/management/waste/recovery/reduction/plastic-pollution/single-use-plastic-products-ban
[2] Boomerange Alliance, 2020, 'Plastic Free Places', https://www.plasticfreeplaces.org/
[3] Queensland Government, n.d., 'Containers for Change', https://www.qld.gov.au/environment/pollution/management/waste/recovery/reduction/container-refund
[4] CSIRO, 2020, 'Sources, distribution and fate of marine pollution', https://www.csiro.au/en/Research/OandA/Areas/Marine-resources-and-industries/Marine-debris

Key project objectives

Environmental
Roll out of the Queensland CRS and uptake of the Plastic Free Places initiative on Palm Island would increase recycling or reuse of single use items and reduce the volume of litter in the environment, blocking up drainage channels and entering the island waterways and coastline. According to the Boomerang Alliance "95% of all plastic packaging is used once and then discarded, often as litter… three quarters of the marine debris found along our coastline is plastic, most from local sources"[5]. Plastic packaging poses a risk to the surrounding Great Barrier Reef and marine life.

Under the Plastic Free Places initiative the Boomerang Alliance would work with food retailers, events, markets and organisation to assist in the switch from single-use plastics, to reusable or compostable items. The focus for the Plastic Free Places Initiative is reducing six problematic single-use plastic items; water bottles, straws, coffee cups/lids, takeaway containers, food ware (cutlery, plates, cups etc) and bags. Once a business has eliminated these, they are awarded the status of Plastic Free Champion.

Due to the lack of recycling options on the island, product packaging of consumables transported to Palm Island ultimately end up as general waste and are disposed to landfill. The environmental benefits of this project include increasing recycling rates for single use items or replacement of single use items with a more sustainable material such as cardboard or compostable products, which could be shredded and composted on the island.

Minimisation of plastic and replacement with a more sustainable material such as cardboard, bioplastics or compostable products is the best option for carbon reduction. This would not only reduce reliance on virgin materials for plastic production but would reduce overall waste to landfill and barge movements of transport of recyclables including associated costs. It would also reduce soil contamination and pollution which was identified as an extreme risk in the project risk assessment. This material could be recycled on the island and used as a feedstock for compost production, with the output supporting local gardens.

Co-benefits

Carbon assessment
Whilst not creating any net change in barge movements for waste management, uptake of the Queensland CRS and Plastic Free Places supports recycling of plastic containers or replacement of plastic with other products where possible and therefore reducing overall reliance on virgin materials. Recycling or reduction in plastic packaging also reduces the volume of plastic waste to landfill and therefore overall landfill gas and emissions produced which was identified as a high risk.

Community resilience
Reduction of plastic waste on the island would reduce pollution in the environment and replacement of plastic items where possible with compostable alternatives would enable the community to utilise these products on island. These environmental stewardship practices tie into cultural rights and responsibilities and can link into the tourism narratives for the island.

Economic
Identification of single use item alternatives that are not cost prohibitive would be the first step to implementation of this project. If non-plastic options are too expensive these will not be attractive to businesses or the community.

Expansion of the Queensland CRS provides an opportunity for the community to reduce litter, recycle and make a small amount of money on containers returned.

Uptake of either of these initiatives would reduce the waste shipped to the mainland for disposal, potentially reducing barge, gate fee and associated waste disposal levy costs in the future.

Social
All aspects of this project aim to promote awareness of litter, waste management and sustainable practices with the community. These practices would improve the aesthetics of the island and enhance the environment for local residents.

Risks and opportunities

Barriers
- Increased cost for businesses in replacement of single use plastic items
- Community behavioural change

Risks
- Program management capacity given PIASC has limited resources
- Replacement of plastic items with compostable items would only result in a beneficial outcome if a composting facility was established on the island. Should a composting facility not be established these items would end up in landfill, which would not reduce the volume of waste shipped off the island for disposal and therefore would not result in a higher order outcome for the materials.
- Cooperation of local businesses to adopt new procurement practices or host a reverse vending machine for eligible Queensland CRS containers.
- Discussion with Container Exchange (COEX) and the Palm Island Barge Company regarding transport of the collected containers to the mainland for recycling.
- Unsafe drinking water leading to increase in bottle water use.

Opportunity
- The Queensland government is proposing to ban single use plastics through their Plastic Pollution Reduction Plan.
- Replacement of single use items, particularly for bottled water coupled with project #7 (Building confidence in the community's water supply), development of drinking fountains to enable access to fresh water without buying plastic water bottles

Alignment with other initiatives

Alignment with other project options
1. Community Market Garden
2. Living better at home and saving money
3. Caring for Our Sea Countries
7. Building confidence in the community's water supply
8. Indigenous Ranger Program
14. Improving the Waste Management Site
16. A tourism plan for Palm Island

Alignment with the following
- Queensland Waste Management and Resources Recovery Strategy
- Queensland's Plastic Pollution Reduction Plan
- Indigenous Waste Management Strategy

[5] Boomerang Alliance, 2020, 'WHAT IS PLASTIC FREE PLACES?', https://www.plasticfreeplaces.org/overview

Assumptions

The Department of Environment and Science (DES) have indicated that roll out of plastic free places in Cairns and Townsville was ~$180,000 per year for two years. It has been assumed that given the remote location of Palm Island this cost would be greater than on the mainland.

Additional information

PIASC is responsible for waste management services on the island which are very costly in terms of managing on-island collection and handling facilities, shipping waste to the mainland and cleaning up litter. Currently municipal solid waste is collected weekly from households by PIASC and transported to the on-island transfer station site for consolidation into shipping containers for transport to the mainland (Hinchinbrook Shire Council landfill). The previous Palm Island landfill facilities have been closed. There are no municipal waste separation and recycling facilities on-island.

The Boomerang Alliance work directly with communities through the Plastic Free Places initiative to reduce single use plastic items. The Boomerang Alliance enter a partnership with the community and local stakeholders, such as council to help manage the project. Collaboration with the Boomerang alliance to provide assistance for the phase out of single use plastics would help to achieve practical and sustainable results for Palm Island businesses and the community.

COEX is the not-for-profit organisation created to establish and run the Queensland CRS containers for change scheme. COEX focuses on reducing beverage container litter, increasing recycling efforts and helping the community to benefit through charities, community groups and not-for-profit organisations.

Costs and funding considerations

Capital costs
Capital costs of this project estimated at $400,000 however would need to be established through discussions with COEX and the Boomerang Alliance.

Ongoing costs
Once established the ongoing costs of this project are suspected to be minimal and plastic reduction practices will become business as usual for the island community. Establishment of an organisation to manage and implement the scheme is highly recommended and therefore would require a part role for a scheme champion, at approximately $30,000 per year.

Potential cost savings
This initiative, although not driven as a cost saving exercise, is critical from an environmental, social, tourism and clean drinking water perspective. This project is in line with state targets and objectives for waste management and will help to build resilience for the Palm Island community.

Potential funding opportunities
Application for funding through DES for support of the Plastic Free Places initiative on Palm Island. DES are currently undertaking an Indigenous Waste Strategy and associated infrastructure planning, in line with the Queensland Waste and Resource Management Strategy. The development of this Indigenous Waste Strategy and infrastructure plans may provide opportunity for funding for remote communities such as Palm Island for CRS and plastic free places initiative.

This project should form part of the Regional Action Plan to be developed under the Indigenous Waste Management Strategy so that project identification and development can be undertaken in a coordinated way.

Key Stakeholders

Stakeholder	Asset / initiative owner	Operator	Potential partner	End user
Palm Island Aboriginal Shire Council	■	■	■	■
Palm Island Barge Company			■	
Local businesses (grocery stores, clubs and cafes)		■	■	
COEX- Container Exchange		■	■	■
Boomerang Alliance	■		■	
Department of Environment and Science			■	

Implementation and timeframes

Investment readiness
This project could go ahead immediately if the funding could be sought.

Next steps
1. Identify community champion or PIASC representative to drive initiative forward
2. Discussions with COEX and Palm Island Barge Company to establish container collection point on the island and methods for transport of containers back to the mainland
3. Application for government funding through Plastic Free Places in collaboration with Boomerang Alliance
4. Implementation of CRS collection point, accessible to whole of island and including community awareness campaign
5. Establish part time roll for plastic free champion
6. Roll out of plastic free places initiative (dependent on funding from DES)

Considerations for implementation
This project would require an organisation to drive the plastic packaging reduction strategy and take ownership of its implementation. Ideally this would be PIASC however given this council is often under resourced and securing funding would be of critical importance, support from identified parties on the island or within the community, overseen by PIASC, would be beneficial.

Timeframes to deliver solutions
- Identify champion and gather support of COEX and Boomerang Alliance (6 months)
- Funding application (6 months)
- Roll out of equipment and educational materials (12 months)

Appendix 2: Option Recommendations

The project recommendations are options that have not progressed through to the options shortlist, but which have merit and potentially represent areas for future consideration. These exclude options which were not supported by the community or were found to be infeasible.

For further information and descriptions of these Option Recommendations, please refer to Technical Appendix: Options Report

Appendix 2: Option Recommendations

ID	Title	Explanation
E3	Palm Island sustainable building design code for new buildings	Local housing plans is one of the actions to be progressed by the DHPW as part of the Aboriginal and Torres Strait Islander Housing Action Plan 2019-2023. Progressing this option was considered to be a policy decision outside of the scope of this project.
E9	Current or tidal generation/water turbine	This technology is considered to be costly to install and maintain, and may impact the Great Barrier Reef marine park and its marine life. The effectiveness of the technology in this location is also not proven. The extent of community support for this option was not clear with some concerns around safety. However, if other developments (e.g. desalination plant) were constructed in future, this technology could be complementary and should be re-evaluated at that time.
E10	Wind turbines	It is recommended that alternative renewable energy such as wind turbines could be assessed in the future. Initially the provision of solar PV generation on roofs and existing cleared land close to demand was considered the most economically feasible renewable energy opportunity for Palm Island to be put forward to final project options at this time. Any future feasibility assessment of wind turbines should consider community views, aesthetic, cultural and environmental impacts as well as economic feasibility.
E13	Power generation from sewage treatment plant gas supplemented with solar	This option is not currently considered to be a practical or cost-effective solution to energy generation on Palm Island. Of the alternative energy solutions available, solar photovoltaic is being progressed at this time. This option could be re-evaluated in the future if the capacity to operate and maintain the system is developed.
E14	Pumped hydro storage	Significant capital expenditure is required to establish pumped hydro energy storage. Should the 'Sustainable water and wastewater management strategy' option identify the need for augmentation to water supply dams, hydroelectric generation could be investigated further at that time.
R7	Upgrade of emergency facilities	This is considered to be out of the scope of the project, and should form part of State or council-level disaster preparedness and mitigation activities.
R8	Upgrade river rock walls	It was determined that a range of component activities and plans would come together to form an overarching resilience plan, many of which are being led by other agencies. Considered to be outside of the scope of this project.
R10	Design and construct a cyclone shelter or identify upgrades to an existing building	This is considered to be out of the scope of the project, and should form part of State or council-level disaster preparedness and mitigation activities.
R11	Whole of island resilience and self-sufficiency plan	It was determined that a range of component activities and plans would come together to form an overarching resilience plan, many of which are being led by other agencies. Considered to be outside of the scope of this project (see Recommendation 5: On-island Resilience Plan).
R13	Community upskilling	It is recognised that programs to provide training and education to upskill residents would be advantageous for the Island community, however this is beyond the scope of this project. It should be noted however that a project option will be developed for community led sustainability and environmental traditional knowledge sharing and education.

Appendix 2: Option Recommendations

ID	Title	Explanation
R14	Creation of activities for youth and community fitness programs	It is recognised that programs to promote community health and wellbeing would be advantageous for the Island community, however this is beyond the scope of this project. It should be noted however that final project options for active transport facilities do contribute and support community health and wellbeing.
R16	Additional communication systems	This option is an enabler to others, as digital connectivity can remove barriers to community resilience. However, this is considered outside of project scope.
T1	Pilot research trial for production of diesel from recycled cooking oil and biomass (coconut oil) for local transport use	There is not sufficient feedstock available to support a commercial-scale operation. However, small-scale production by an individual may still be viable to replace commercial fuels for their own use. Appropriate safeguards in line with fuel handling regulations must be in place, including consideration of potential impacts on vehicle running and maintenance must be considered.
T4	Electric car hire and charge point program	There are currently no car hire facilities on the island. It was concluded that the option for a shuttle bus should be prioritised ahead of car hire for community employment/business. Should car hire facilities be needed / implemented on the island, there is an opportunity to use electric vehicle technology. It should be noted that emissions reductions would be dependent on the penetration of low carbon renewable technologies in the electricity supply for the vehicles.
T8	Transport infrastructure upgrade	Road upgrades are considered outside of the scope of this project, and belong under the jurisdiction of council and the Department of Transport and Main Roads. The extent of any potential decarbonisation benefits are not clear.
T11	Increase size and capacity of planes to island to reduce trip frequency	Commercial aviation operators run the commercial transport service to/from the Island. Aircraft types are currently restricted by runway length on the island. Vertical flight technology, electric and/or low emission fuels may be available in the future to enable decarbonisation opportunities in the aviation sector.
T12	Community-run barge	There is no identified need for an additional barge service and an existing commercial service would be displaced. It is unclear if there is sufficient demand or capacity to maintain an additional service. There is anecdotal information that a previous second barge service for the Island was not commercially viable. The addition of a new service would also potentially increase carbon emissions. However, it is recognised that community owned enterprises could bring economic opportunity in the region. In future, there may be opportunity for a community business to tender for this service.
WS9	Waste reduction and management strategy	Waste management optimisation requires immediate action on the island and therefore investment in infrastructure and equipment is of top priority. The Department of Environment and Science are currently completing an Indigenous Waste Strategy and Palm Island will be included under this strategy, therefore development of an individual strategy is not considered an immediate priority or barrier to improving waste management practices on the island.
WS10	Use sewage plant effluent to create compost and fertiliser for use on the island	This option is a complex and an expensive initiative to establish. It would require a high level of skill to operate and maintain in line with strict regulatory controls and testing requirements, to manage health and safety concerns, particularly if the outputs are to be used for agricultural purposes. Run-off is of particular concern being in the Great Barrier Reef catchment. This option could be considered as a secondary stage for integration if an effective composting process is established on the island.

Appendix 3: Discounted Options

The discounted options are other options put forward by the community and stakeholders that were assessed, but ultimately not determined to constitute a viable project option or option recommendation.

For further information and descriptions of these Discounted Options, please refer to Technical Appendix: Options Report

Appendix 3: Discounted Options

ID	Title	Explanation
WS6	Small scale incineration for waste destruction	The Queensland Energy from Waste Policy framework is unlikely to support this development as this is not in line with higher order management solutions of the waste hierarchy. The sensitive environment of the Great Barrier Reef is also a key consideration for any potential air or water quality impacts. In addition the establishment of small scale incineration infrastructure on Palm Island would require skilled technical staff to operate and currently these type of skills would not be available locally. Due to the low volume of waste produced, incineration as means of disposal would be a high cost per tonne to process. Consideration would need to be given to the outputs, ash production at typically 20% of input the material volume and would need disposal of in an appropriate facility i.e. shipping to the mainland for landfill disposal, incurring barge rates and potentially a landfill levy. To manage environmental and health risks incinerators need a treatment process for the flue gas which is expensive infrastructure. Regular maintenance is also critical, particularly given the marine environment and failure to do so would add to the waste problems on the island.
WT8	Installation of water filters at end user taps	This option provides additional maintenance requirements on end users (residents) and does not adequately address concerns over water quality and appearance. An investment in improvement of town water supply quality is better long term option to achieve better outcomes for the community. Under bench filters increase capital and maintenance burden on residents, are at risk of failure without adequate maintenance. They may mask problems with town water supply which would otherwise be identified and reported.

Appendix 4: Stakeholder Register

The Stakeholder Register lists project stakeholders. Names and contact information are not included in this report for privacy considerations.

Appendix 4: Stakeholder Register

Position	Business/Organisation	Category
Store manager	Palm Island Supermarket	Business and the business community
Owner/Manager	Coolgaree Bay Sports Bar And Bistro	Business and the business community
	Sandy Boyd Aged Care Hostel	Business and the business community
	Sibley Petrol Station	Business and the business community
CEO	Blue Water Aviation	Business and the business community
Administration Manager	Palm Island Barge Company	Business and the business community
Coordinator	Beryl Castors Home Care Service	Business and the business community
CEO	Townsville Enterprise	Business and the business community
Business Development Manager	Container Exchange	Business and the business community
	Sunset Snack Bar	Business and the business community
	Palm Island Sustainability Hub – Jina Gunduy	Business and the business community
	Bwgcolman Supermarket - Palm Island	Business and the business community
	Goodoo Day Care Centre	Business and the business community
	Klub Kuda	Business and the business community
	Palm Island Pharmacy	Business and the business community
	Palm Island Shuttle Service	Business and the business community
	Palm Island Technologies	Business and the business community
	Townsville Enterprise	Business and the business community
	Palm Island Motel	Business and the business community
	Seventh Day Adventist Community Church	Community Providers
	Palm Island Voice	Community Providers
	Community Development Program	Community Providers

Appendix 4: Stakeholder Register

Position	Business/Organisation	Category
Domestic Violence Specialist Service	Palm Island Community Company	Community Providers
Director of Nursing	Joyce Palmer Health Service	Community Providers
Back to work youth training officer	Back to work, regional employment package	Community Providers
Executive Manager, Youth and Accommodation	Townsville Aboriginal and Island Health Services	Community Providers
Chairman	Palm Island Community Company	Community Providers
	Palm Island Community Company	Community Providers
	Community Development Program	Community Providers
Operations Manager	Joyce Palmer Health Service	Community Providers
IKC Coordinator	Palm Island Aboriginal Shire Council library services	Community Providers
Principal	St Michael's Catholic Primary School	Community Providers
	Australia Post - Palm Island LPO	Community Providers
	Campbell Page Community Center	Community Providers
	Bwgcolman Community School	Community Providers
Officer in Charge	Queensland Police Service - Palm Island Station	Government (State)
Senior Sergeant	Queensland Police Service - Palm Island Station	Government (State)
Key contact for QPWS	Queensland Parks and Wildlife Service	Government (State)
Principal Engineer	Department of Local Government, Racing and Multicultural Affairs	Government (State)
Principal Engineer	Department of Local Government Racing and Multi Cultural Affairs	Government (State)
Officer in Charge	Queensland Ambulance Service	Government (State)
	State Energency Services	Government (State)
	Housing and Public Works	Government (State)
Senior Project Officer | Remote Service Delivery	Department of Aboriginal and Torres Strait Islander Partnerships	Government (State)

Appendix 4: Stakeholder Register

Position	Business/Organisation	Category
	Palm Island Rural Fire Brigade	Government (State)
Mayor	Palm Island Aboriginal Shire Council	Local Council
Economic development and grants	Palm Island Aboriginal Shire Council	Local Council
Councillor	Palm Island Aboriginal Shire Council	Local Council
Councillor	Palm Island Aboriginal Shire Council	Local Council
Manager STP/WTP	Palm Island Aboriginal Shire Council	Local Council
Councillor	Palm Island Aboriginal Shire Council	Local Council
CEO	Palm Island Aboriginal Shire Council	Local Council
Deputy Mayor	Palm Island Aboriginal Shire Council	Local Council
Director of Works and Facilities	Palm Island Aboriginal Shire Council	Local Council
Personal Assistant	Palm Island Aboriginal Shire Council	Local Council
	Traditional Owner	Traditional owner representatives
Administration/contact officer	Manbarra Nanggarra Wanggarra Aboriginal Corporation	Traditional owner representatives
Connections Manager Northern	ERGON	Utility providers
Renewable and Strategy Engineer Ergon Energy	Energy Q	Utility providers
Assessment Coordinator Ergon Energy	EnergyQ	Utility providers
	Key contact/project champion for Farm	Resident
	Key contact/project champion for Farm	Resident
	Palm Island CDP	Resident
	Key contact for Farm project	Resident
	Key contact/project champion for Farm	Resident
	Jiggas Agora	Resident