

Decarbonisation of the Great Barrier Reef Islands Whole of Island Community Pilot

Palm Island

Technical Appendix 2: Options Report

Prepared for the Queensland Department of Environment and Science & EarthCheck
January 2021



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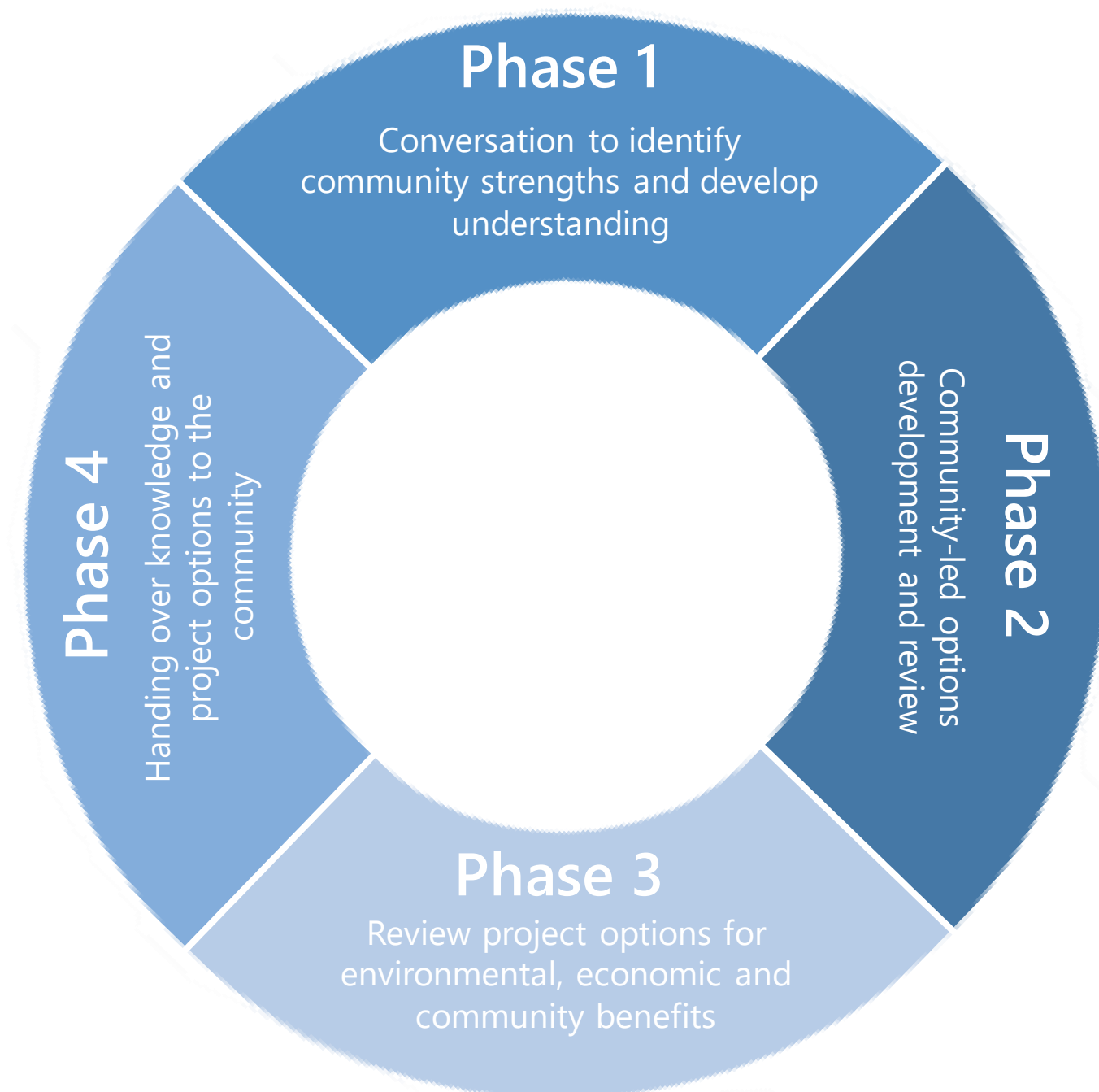
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Executive summary

Arup have partnered with EarthCheck, Queensland Tourism Industry Council (QTIC) and Regional Economic Solutions (RES) to assist the Department of Environment and Science (DES) to identify genuine decarbonisation and resilience (i.e. self-sufficiency) opportunities as part of Whole of Island Community Pilot for Palm Island. These project objectives are in alignment and support of the wider Queensland Climate Change Response (2017).

The project is comprised of four distinct phases. This interim report focuses on **Phase 2: Dreaming Big- Options shortlisting**, specifically the methodology employed to arrive at a shortlist of options to take to **Phase 3: Which way now? – Final Project Option development**.



PHASE 2 - OPTION ASSESSMENT APPROACH

A longlist of (66) options was developed for Palm Island through a process of community consultation and engagement with stakeholder organisations (Project Phase 1). This process was led by EarthCheck, with support from the project team.

The longlist options were appraised through the options assessment process (Project Phase 2), which was led by Arup with input from the wider project team. The options assessment has been informed by community and stakeholder consultations, technical workshops, desktop review and the Sustainability Assessment.

The intent of the Phase 2 assessment was to arrive at a shortlist of credible, community and stakeholder-led options to reduce carbon emissions and promote island community resilience (self-sufficiency), in line with the project objectives. Shortlisted options were required to be considered achievable for implementation within the next 5-10 years and to perform well against a weighted set of social, economic and environmental criteria (multi-criteria assessment).

PHASE 2 - OUTCOMES AND NEXT STEPS

The final shortlisted options (18 for Palm Island) progress to Phase 3 – final project option development phase.

Options that did not progress to Phase 3 will be recorded in the final report prepared by EarthCheck.

1.0 Project overview

1.0 Project overview

1.1 SCOPE

Arup have partnered with EarthCheck, Regional Economic Solutions (RES) and Queensland Tourism Industry Council (QTIC) to assist the Department of Environment and Science (DES) to identify genuine decarbonisation and resilience (i.e. self-sufficiency) opportunities as part of Whole of Island Community Pilot for Palm Island.

The project is comprised of four distinct phases. This interim report focuses on **Phase 2: Dreaming Big- Options shortlisting**, specifically the methodology employed to arrive at a shortlist of options to take to final project option.

Community and stakeholder engagement was undertaken during each of the four phases, and consisted of both on-island consultations, community operations group meetings and individual phone and videoconference conversations with stakeholders.

1.2 PROJECT PHASES

The project can be divided into **four phases** of engagement and works. These are:

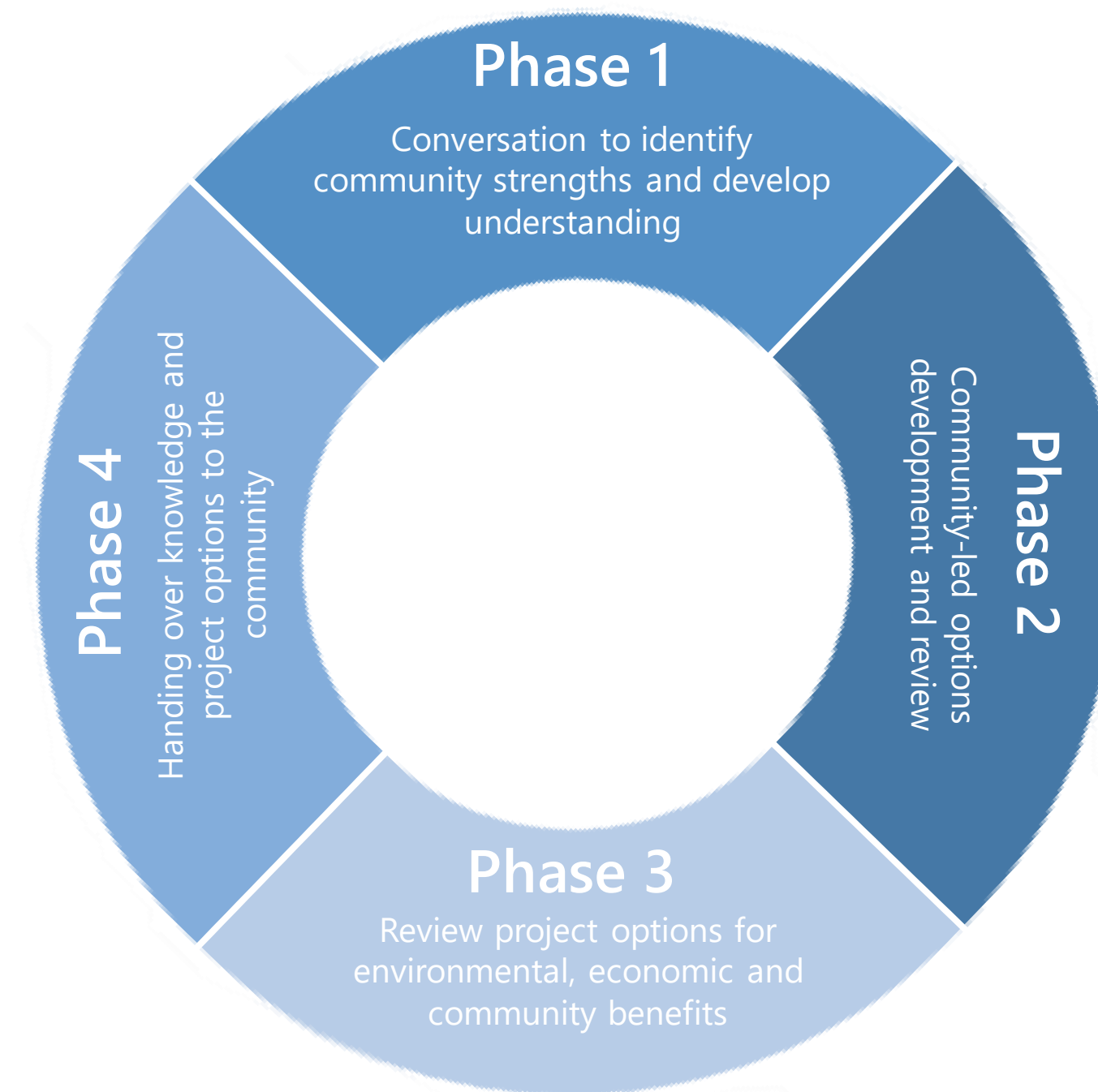
Phase 1: Sustainability assessment and option longlist

Phase 2: Option shortlisting (*focus of this report*)

Phase 3: Final project option development

Phase 4: Final project option handover to community

The diagram to the right presents the overarching project phases. The approach underpinning the options assessment (Phase 2) is subsequently discussed in detail in this report.



1.0 Project overview *cont.*

Phase 1: The first phase of work involved community and stakeholder consultation, data gathering and the development of Sustainability Assessment Reports, a process led by EarthCheck. This process resulted in a longlist of options sourced from the community and key stakeholders supplemented with input from the project team where appropriate. Options were categorised according to theme:

1. Energy (Generation & Efficiency)
2. Water
3. Waste
4. Transport
5. Resilience

Second-round community consultation was undertaken to present the findings of the baseline Sustainability Assessment to test and further scope the longlist options with the community by the project team. From this, additional options were identified and included within the longlist. Feedback from community members was received via face-to-face discussion through workshops and drop-in sessions, as well as via an online survey (for Palm Island). In addition, technical workshops were held with core State Government agencies to further scope and test the feasibility of options, and align with other government funded initiatives where relevant.

The feedback from community, key stakeholders and government agency consultations was documented by the project team, collated and analysed in a process led by EarthCheck. This information was used to update the final options longlist. The longlist for Palm Island comprised 45 options. Refer to Appendix A.

Phase 2: (*focus of this report*) The second phase of work involved the option shortlisting whereby an options assessment methodology was applied to filter down the Phase 1 longlist to a shortlist of options (maximum of 30) for progression to final project option.

The options assessment undertaken by the project team has been informed by community consultations, technical workshops, desktop review and the Sustainability Assessment.

The final shortlist of options to be taken forward for final project option are those options which:

- Have potential to lower carbon emissions and/or promote island resilience/self-sufficiency; and
- Have the support of community and key stakeholders; and
- Have a positive potential impact upon economic, social and environmental outcomes; and
- Do not replicate or detract from other initiatives already underway on the Islands

The outcome of the assessment is that 18 options will progress to final project option for Palm Island.

NEXT STEPS

Phase 3: In this phase final project option are to be developed by Arup with input from the project team and community/stakeholder engagement for up to 30 of the highest scoring options. For Palm Island 18 options will progress to final project option.

Phase 4: In the final phase of works, reporting will be finalised and the final project option handed over to the community / key stakeholders. This phase will be led by EarthCheck.

2.0 Options assessment methodology

2.0 Options assessment

2.1 Overview

DEVELOPMENT OF APPROACH

The development of the options assessment approach was undertaken by Arup in an iterative 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.

The intent of the Phase 2 assessment was to provide a consistent and robust approach to appraising the longlist of options to arrive at a shortlist of options to proceed to Phase 3.

The longlist options generated by the Phase 1 engagement process were highly variable in scope, function, outcome, complexity and topic, recognising the wide range of sustainability opportunities on the Island.

It was agreed that shortlisted options for final project option are to be credible, community and stakeholder-led options to reduce carbon emissions and promote island community resilience (self-sufficiency), in line with the project objectives.

It is recognised that for the Community Pilot Project, the support the community and key stakeholders is critical for an option to be considered and to potentially progress to final project option.

It was also agreed that shortlisted options be required to be considered achievable for implementation within the next 5-10 years; not duplicate or negatively impact other initiatives already underway on the Island; and consider impacts (positive and negative) from a social/cultural, economic and/or environmental perspective.

To capture these requirements, a ‘gateway’ approach to options filtering was developed as the basis of the assessment. This integrates three discrete appraisal processes (or ‘gates’).

Gate 1. Alignment with project objectives

Gate 2. Achievability

Gate 3. Multi-criteria analysis

Each gate is described in detail in the following section.

2.0 Options assessment

2.1 Overview

DETAILED METHODOLOGY

The options assessment process employs a ‘gateway’ approach to arrive at an options shortlist. This approach is as follows:

1. **Gate 1: Project objectives** considers the alignment of options with key project objectives, resulting in a pass/fail score for each option:
 - a) Decarbonisation potential; and/or
 - b) Contribution to community resilience /self-sufficiency; and
 - c) Community and key stakeholder support

Firstly, options are appraised to determine if they have carbon abatement potential and/or the ability to contribute to island resilience and self-sufficiency. (*Note: the definition for community resilience / self-sufficiency is provided in the next section*).

Options were then assessed by whether or not they were generally supported by the community.. The views of the community and key stakeholders were also sought to better understand the potential viability of the options, and other pertinent contextual information. Key stakeholders included Council, Ergon Energy, Project

Operational Working Group, Community Groups and similar groups with a direct interest. This process was informed by desktop research, and the stakeholder and community consultation sessions both on-island and in meetings with the project team.

Options not meeting these requirements were not progressed to Gate 2.

2. **Gate 2: Achievability** introduces an intuitive logic test. Each option is considered according to whether or not there may exist prohibitive constraints to its successful implementation. Such issues include consideration of physical availability of space, supply chain maturity, or technological feasibility/market readiness of key technologies.

In addition, it considers the alignment of options with other existing or planned initiatives known to be implemented on an island. Where an option contradicts, negates or otherwise does not support these initiatives, professional judgement is employed to determine if the option should be progressed.

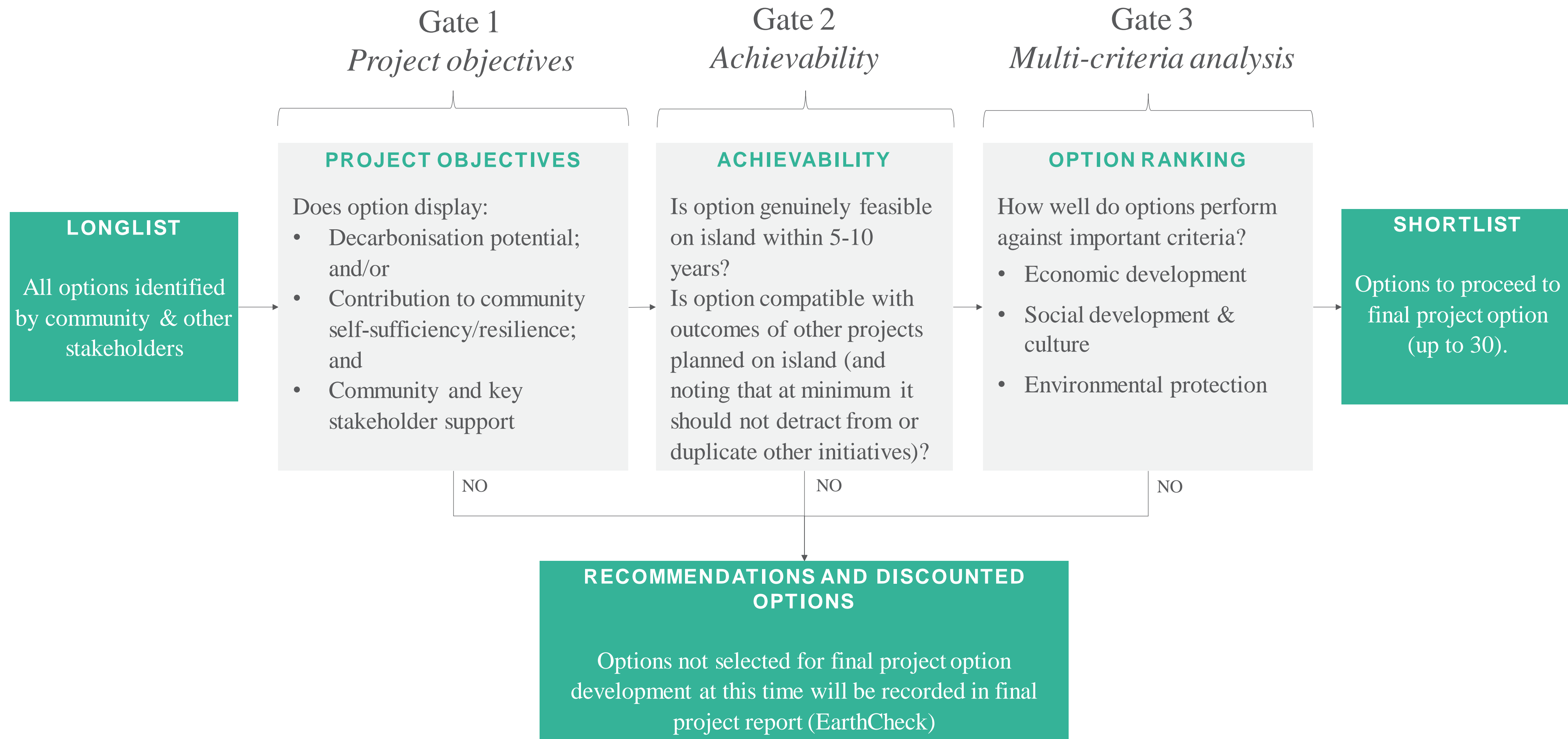
3. **Gate 3: Multi-criteria analysis (MCA)** enables the relative comparison of option performance against key environmental, social and economic criteria. Options were scored against weighted criteria relating to economic opportunity, livability and wellbeing, protection of cultural and natural heritage, and environmental protection. The top scored options were to progress through to the shortlist for final project options (up to maximum of 30 options). Option criteria and weightings were developed by Arup, and reviewed by the wider project team. Final MCA criteria and weightings are provided in Appendix B. Options were also considered where relevant against their potential to align with the National Indigenous Reform Agreement (NIRA) building blocks as endorsed by COAG. Detail on NIRA building blocks considered in MCA are included in Appendix F.

Recommendations and Discounted Options: Options which did not progress to the shortlist were collated, summarised and documented for reference purposes within the final report. Those identified through consultation with strong merit, but did otherwise not fit within the scope and bounds of the project were documented as ‘recommendations’.

The options assessment gateway process is presented in the figure overleaf.

2.0 Options assessment

2.1 Overview



2.0 Options assessment

2.2 Gateway approach: Gate 1

Gate 1 provides an initial, high-level screening to ensure options align with the project objectives and intended outcomes.

GATE 1A: PROJECT OBJECTIVE – DECARBONISATION & RESILIENCE

The ability of the option to reduce baseline carbon and other greenhouse gas emissions was determined qualitatively at a high level (*yes/no*). This assessment was made through consideration of both direct and indirect emissions. This includes: opportunities where the emission sources were generated on-island; where emission sources were not owned or controlled directly by the Island’s businesses or residents (e.g. commercial transport to/from island); or where emissions were generated off-site such as connected mainland electricity¹.

In addition, options were assessed according to their potential to improve Island self-sufficiency and community resilience to severe weather and the effects of climate change.

For the purpose of this project, self-sufficiency has been defined as: *A form of resilience which enables the community to reduce reliance on the mainland for important goods and services, particularly in the context of severe weather events, pandemic and climate change (includes stand-alone systems)*

The ability of the option to contribute to self-sufficiency in this respect was determined qualitatively at a high level (*yes/no*).

1. This approach broadly aligns with NGER Framework emission scope classifications.

GATE 1B: COMMUNITY AND KEY STAKEHOLDER SUPPORT

As finalised final project options will be handed back to the community and/or key stakeholders (such as Councils, business and utility providers) to champion next steps, support is vital for the successful outcomes of the project.

The community and key stakeholders were consulted in the development of longlisted options during the first project team site visits. An additional round of community input and feedback was sought on options through the second site visits. Here, the community and stakeholders were able to indicate their level of support for options through conversations with the project team and via surveys.

The project team also engaged with Operational Working Groups throughout the duration of the project². Views and feedback received by these group members was also documented and will be considered throughout the options assessment process.

Where there is deemed to be insufficient or inconclusive information regarding the extent of community and stakeholder support, professional judgement was employed by the project team.

GATE 1 SUMMARY

Options which were deemed to have either a decarbonisation and/or self-sufficiency benefit and community and stakeholder support were progressed to Gate 2.

2. Engagement with the Palm Island Operational Working Group was more limited, being established towards the end of Phase 2

2.0 Options assessment

2.3 Gateway approach: Gate 2

GATE 2: ACHIEVABILITY

Options progressing through the Gate 1 assessment were then tested against key viability constraints. This approach recognised that whilst an option has merit, there may exist significant constraints which ultimately make it untenable. Considerations included:

1. Compatibility with other initiatives/programs occurring on or planned for the island

It is acknowledged that a range of existing and planned initiatives are, or will be implemented on island through programs led by other organisations or government agencies. Such initiatives may include changes to policy, infrastructure development projects, service changes and other investments. It is critical that the options taken to final project option do not:

- a) Unnecessarily duplicate efforts; or
- b) Conflict with the objectives of, or negate the

intended outcomes of other initiatives. However, it should be noted that where an initiative may have improved the sustainability outcomes of an existing or planned project, this was investigated.

Each longlisted option was therefore considered within this context. This process was informed by desktop research and stakeholder and community consultation sessions, both on-island and in meetings with the project team. The professional knowledge held by the project team regarding existing and planned State Government initiatives also informed this process.

2. Timeframes

It is preferable that shortlisted options are those which can be effectively implemented within up to a maximum 5 – 10 year timeframe. This may occur where, for instance, the option incorporates untested technology which is not market-ready, or where critical supply chains are underdeveloped or non-existent.

3. Feasibility

Where the successful implementation of an option requires excessive and unacceptable physical resource use it is not considered feasible. For instance, an option which requires more land than is physically or practically available on the island would not be feasible.

Similarly, an option will not be feasible where the conditions or resources required to successfully build, implement, or operate it are unavailable or non-existent. However, the absence of required local expertise was not necessarily considered a barrier, as the project also seeks to build capacity and capability.

GATE 2 SUMMARY

Options for which a significant constraint as outlined above was identified did not progress through Gate 2. The outputs of the Gate 2 assessment can be seen in Appendix C.

2.0 Options assessment

2.4 Gateway approach Gate 3

GATE 3: MULTI-CRITERIA ANALYSIS

Options which progressed through Gate 2 were then analysed through a MCA. Here, the relative performance of options were compared, according to weighted economic, social and environmental criteria. Criteria were developed to reflect core project objectives which fell into the three broad objective categories of:

- Economic development
- Social development & culture
- Environmental protection

The intention of an MCA is to objectively assess each option's merit in achieving positive outcomes in line with these criteria, and with community expectations.

It was recognised that there are numerous criteria of importance to the community. However, the number of criteria considered in the MCA needs to be carefully considered. As more criteria are included in an MCA,

their respective weightings become lower, diluting the value of the assessment.

The economic development criteria reflected the importance of enhancing economic opportunity and associated issues such as job creation and capacity building.

It was also acknowledged that the objectives of economic growth, for instance, can at times be in conflict with social and environmental outcomes. In line with project objectives, criteria were included to recognise the imperative the ongoing protection, celebration and empowerment of the community, as well as acknowledging their environmentally sensitive location.

Each criterion was assigned a weighting with the intention of reflecting a balanced and sustainable basis for development.

Each option was then assigned a score on a linear scale (1 to 5) to indicate its relative performance against a criterion. 5 represented the highest attainable positive score against a given criterion, whilst 1 represented a strong negative score. Refer to Appendix B.

The weighted average score for each option was then calculated, enabling options to be ranked. As previously outlined, if there were in excess of 30 options, only the 30 which had the highest rankings would progress to the shortlist for final project option.

Please refer to Appendix B for the MCA assessment criteria and weightings.

2.0 Options assessment

2.5 Final Shortlist

FINAL OPTIONS SHORTLIST

The output of the options assessment was the final shortlist of options to be taken forward to final project option.

As noted previously, care was taken where possible to promote a balanced representation of top-performing options in each of the six key themes of Energy Generation, Energy Efficiency, Water, Waste, Transport and Resilience.

The final options shortlist can be found in Appendix D.

3.0 Assumptions and drivers

3.0 Assumptions and drivers

OPTIONS ASSESSMENT METHODOLOGY

A bespoke approach was taken in the development of the options assessment methodology. It was developed collaboratively and in consideration of a range of key drivers and desired outcomes of DES and the community.

- The project is underpinned by a desire for stakeholder /community-led, and community-supported outcomes. The longlist and the options assessment process have endeavored to reflect this value.
- The options longlisting process was led by EarthCheck, in consultation with DES, RES, QTIC and Arup, based primarily upon community and stakeholder consultation findings and the outputs of the Sustainability Assessment from project Phase 1.
- The options assessment methodology is a bespoke process reflecting the value of community involvement, and reflecting the diverse nature of

longlisted options. The methodology was developed iteratively, and in collaboration with the project team - DES, RES, QTIC and EarthCheck, as well as with feedback from the stakeholders and community during the second round of Island visits and engagement.

- The methodology was developed in recognition of the project objectives of decarbonisation, self-sufficiency and for community and stakeholder support. It also recognised the importance of options not replicating or detracting from other initiatives already underway including the NIRA Building Blocks for closing the gap.

CONTEXT AND LIMITATIONS

It must be noted that there exist limitations to this analysis of strategic options.

Imperfect information is a key limitation; at the strategic level there are always many unknowns and reasonable assumptions must be developed.

Examples of unknowns include the expected demand for a service; size and scalability of an initiative; maturity of supply chains; site conditions and technical feasibility; and cost.

Options were assessed robustly according to the outlined methodology, however, this must be understood within the context of unknowns and uncertainties.

Reasonable assumptions were developed as a basis for assessing the potential scope, impact and merits of each option and best professional judgement was employed in drawing conclusions.

4.0 Next steps

4.0 Next steps

4.1 FINAL PROJECT OPTION DEVELOPMENT

The output of the options assessment process is a shortlist of options to be taken forward to final project option.

It should be noted that for the purposes of this project, 'final project options' are:

- short summary documents to describe the potential scope, benefits (carbon and/or resilience/self sufficiency), co-benefits such as job creation, as well as challenges and risks associated with the identified opportunities. The final project options are based on high level qualitative assessments and assumptions using information available to the project team at the time. Where feasible and robust, quantified benefits are included.
- intended to support stakeholders and community in applications for grant funding to progress next steps in project development, such as undertaking feasibility studies. Consideration of potential funding sources is also included in the final project options.

- it should be noted these are not detailed final project options, and are not suitable for investment decisions to be made upon. Further assessment of feasibility, design, planning, cost and benefits etc. is required before progressing. It is envisaged that grant funding will support the progression of options from opportunities to an investment ready project.

Final project options are developed for the purpose of being handed over to the stakeholder and/or community to champion and progress next steps.

4.2 COMMUNITY CONSULTATION AND FINALISATION

The project team will return to the island to engage with the community and key stakeholders on the draft final project options.

Feedback will be sought to confirm any gaps in the project team's understanding. Feedback will be documented and used to inform final project option finalisation.

The final reporting for the project will be led by EarthCheck with support from the project team.

Appendices

Appendix A

Options longlist

Appendix A | Palm Island options longlist

LONGLIST

The longlist options identified by the community, key stakeholders and the project team are outlined in the table below (as provided to Arup by EarthCheck). These are grouped according to theme.

Theme	ID	Title	Description
Energy	E1	Efficient energy use in buildings	Implementation of efficient energy use in residential and commercial buildings, including energy efficiency audits, energy control systems, LED lights installation and high efficiency appliances, to decrease electricity use and reduce bills for community members and businesses.
Energy	E2	Energy efficiency and solar panel education	Introduction of community-led energy efficiency and solar panel education, including upskilling as applicable about how to efficiently manage energy consumption, and install and maintain solar panel systems, to contribute to cost saving and potential job opportunities.
Energy	E3	Palm Island sustainable building design code for new buildings	Creation of community-led sustainable building design code for new buildings on the Island to adhere to, to ensure energy efficiency and appropriateness of buildings.
Energy	E4	Solar air conditioning with high efficiency air conditioning units	Installation of residential solar, high efficiency air conditioning to replace traditional systems, to reduce electricity consumption and environmental impact.
Energy	E5	Installation of additional new smart solar and/or LED lighting	Installation of new smart solar and/or LED streetlights across the community and/or retrofitting lighting with LED where applicable, to reduce energy consumption and environmental impact.
Energy	E6	Cooling improvements for existing buildings	An audit of all existing commercial and residential buildings to understand current energy efficiencies and provide recommendations on installation of cooling improvements, such as air flow/ventilation, insulation and/or heat reflective roof paint, to reduce consumption and cool buildings.
Energy	E7	Upgrade to high efficiency appliances and refrigeration units	Upgrade to high efficiency appliances and refrigeration units for residents and organisations including a related subsidy, to decrease electricity use and reduce related bills.
Energy	E8	Solar hot water system upgrade	Upgrade of residential hot water systems to solar, which may also include the installation of larger or supplementary systems to meet the needs of overcrowding in homes, to reduce the demand on the current electricity supply.
Energy	E9	Current or tidal generation/water turbine	Installation of ocean current, tidal or wave generated renewable energy turbine on-island, to supplement current energy supply, provide behind the meter energy and reduce reliance on non-renewable energy.
Energy	E10	Wind turbines	Installation of wind turbines on the island, to supplement current energy supply, provide behind the meter energy and reduce reliance on non-renewable energy.

Appendix A | Palm Island options longlist

LONGLIST

Theme	ID	Title	Description
Energy	E11	Floating solar array to power wastewater treatment plant	Installation of floating solar panels on larger dams, with the potential benefit of reducing the land footprint of solar installations, while reducing evaporation and increasing effective water reserves. The intent is to provide a source of renewable power for the wastewater treatment plant.
Energy	E12	Rooftop solar for household use	Installation or repair of rooftop solar systems for residents including behind the meter solar energy which is a direct supply not provided by the main supply and has the potential to reduce electricity bills.
Energy	E13	Power generation from sewage treatment plant gas supplemented with solar	Installation of a methane capturing and energy producing system at the sewage treatment plant, to be used for generation of electricity and supplemented with solar to reduce total energy consumption from the diesel generators.
Energy	E14	Pumped hydro storage	Installation of hydroelectricity generation systems and storage from pumped hydro stations, as a closed circuit connecting to existing dams, to store other renewable energy sources and reduce overall reliance on non-renewable energy resources.
Energy	E15	Solar PV generation	Installation of solar PV generation including a rooftop on homes and other buildings, and the feasibility exploration of a ground mounted solar farm, to displace diesel generation. This may also include a future battery storage system.
Energy	E16	Connect and upgrade unconnected or non-functional rooftop solar	Re-connection, repair or upgrade of unconnected or non-functional rooftop solar installation that are Council-owned, to reduce demand from the diesel generators.
Resilience	R1	Community driven feral/invasive species management plan	Development of a community-led feral/invasive species management plan, to reduce the populations of these species to improve the Island's environmental health and community wellbeing.
Resilience	R2	Community tourism preparedness, wellbeing and economic growth roadmap	Creation of a tourism development and management plan for the Island, including funding to implement the plan and considering social, cultural, environmental and economic factors to prepare the community for tourism and economic growth.
Resilience	R3	Community driven bush fire management plan	Development of a community-driven bush fire management plan, utilising Indigenous cultural knowledge of the land.
Resilience	R4	Sustainability and environmental training and Traditional Knowledge sharing	Development and delivery of community-led traditional knowledge sharing, to celebrate and share cultural knowledge, and support and upskill the community in sustainability to contribute to community, culture and economic development.
Resilience	R5	Revegetation and blue carbon sequestration	Develop and implement carbon sequestration on land and sea including revegetation with native species, such as with coral, dune, grass, terrestrial, mangrove and seagrass, to increase resilience by reducing erosion.
Resilience	R6	Market garden	Development of a farm or market garden pilot for the community to grow and sell food produced on-island, to increase self-sufficiency and food safety.

Appendix A | Palm Island options longlist

LONGLIST

Theme	ID	Title	Description
Resilience	R7	Upgrade of emergency facilities	Purchase of new equipment for the emergency facility to bolster the Island's capacity to respond to environmental emergencies, such as chemical spills, fires and other hazards.
Resilience	R8	Upgrade river rock walls	Upgrade river rock walls at Francis Creek, to reduce erosion and sediment accumulation on the reef near the jetty terminal during monsoon events.
Resilience	R9	Increase accommodation capacity or add accommodation facilities for tourists	Promotion of sustainable tourism growth by increasing accommodation capacity on the Island or by adding accommodation facilities for tourists such as glamping, off-grid accommodation and eco-accommodation at key sites across the island.
Resilience	R10	Design and construct a cyclone shelter or identify upgrades to an existing building	Feasibility assessment for the design and construction of a community cyclone shelter on the Island which can be used for multiple purposes such as a women's centre or community hall, or identify an existing building that could be upgrade to be utilised for a cyclone shelter, to increase community resilience during severe weather events.
Resilience	R11	Whole of island resilience and self-sufficiency plan	Development of a whole-of-island resilience and self-sufficiency plan in consultation with the community, to identify ways of improving resilience for the community and environmental management.
Resilience	R12	Drought proofing plan	Development of a drought proofing plan for the Island, in order to increase resilience during droughts and identify/develop a range of alternative water supplies.
Resilience	R13	Community upskilling	Development of a community upskilling program based on identification of skill gaps on Island and development of a capacity building framework, including mechanical education and upskilling, leading to employment.
Resilience	R14	Creation of activities for youth and community fitness programs	Creating and supporting activities for youth and community fitness programs, such as environmental management, bike maintenance, and tourism opportunities, to improve community health and wellbeing.
Resilience	R15	Native plant nursery	Creation and development of a native plant nursery on-island that is owned and operated by Historical Owners as well as Traditional Owners to service the local community, other neighbouring islands and other local markets including the mainland.
Resilience	R16	Additional communication systems	Feasibility study for the installation of additional communications systems or retrofit of existing systems such as emergency, internet, GPS and mobile communication, to improve coverage and increase resilience.
Resilience	R17	Community arts and crafts centre	Development of a community arts and crafts centre to provide art healing and CDP, specifically addressing feedback that women want their own workshop space.

Appendix A | Palm Island options longlist

LONGLIST

Theme	ID	Title	Description
Transport	T1	Production of diesel from recycled cooking oil and biomass	Development and production of biodiesel from recycled cooking oil and biomass such as coconut oil, for local transport use to reduce the cost of fuel and decrease dependence on fossil fuels.
Transport	T2	Active transport plan and infrastructure	Infrastructure and transport practices assessment to identify key infrastructure upgrades and increase community safety, development as well as access to services across the island, which could include the encouragement of current active transport, such as walking and cycling, and the implementation of future options such as e-bikes, scooters or tuk-tuks.
Transport	T3	Education on vehicle efficiency and use	Educational programs and materials to promote efficient and responsible land and marine vehicle use.
Transport	T4	Electric car hire and charge point program	Creation and development of an electric car hire platform including a program for installing charging points where needed, to reduce reliance of fossil fuels for transport.
Transport	T5	Alternative energy or fuels for commercial watercraft	Undertaking feasibility assessment of alternative energy options including electric, hydrogen or solar or alternative fuels such as biodiesel for commercial watercrafts (water taxis and barge) connecting between islands and the mainland, to reduce emissions associated with transportation.
Transport	T6	On-island shuttle bus	Implementation of on-island shuttle bus (or other vehicle) public transport services with low emissions vehicles such as electric, hybrid or biodiesel to promote sustainable community development as well as reduce fossil fuel consumption.
Transport	T7	Provide business support and assist in developing the Palm Island Shuttle service	Investigation and implement on-island public transport services as well as providing management, budgetary and mechanical business support which is needed to ensure financial viability for long-term operation and to operate independently.
Transport	T8	Road infrastructure upgrade	Investigation the need for transport road infrastructure upgrades and maintenance across the island based on community needs.
Transport	T9	Hydrogen fuel cell upgrades	Feasibility assessment for hydrogen fuel cells for commercial marine watercraft.
Transport	T10	Hydrogen combustion upgrades	Feasibility assessment for hydrogen combustion upgrades for commercial marine watercraft, to reduce emissions and dependence on fossil fuels.
Transport	T11	Increase size and capacity of planes to the island	Increasing the size and therefore capacity of planes connecting the Island to the mainland to reduce total trips and emissions.
Transport	T12	Community-run barge	Acquisition and operation of a community-run barge, to compete with or replace current barge operator and reduce the cost high associated with freight to the Island.
Transport	T13	Alternative fuels for private boats	Feasibility assessment of alternative energy options including electric and hydrogen or alternative fuels such as biodiesel for private watercraft, to reduce emissions associated with residential marine transportation and reduce reliance on fossil fuels.

Appendix A | Palm Island options longlist

LONGLIST

Theme	ID	Title	Description
Waste	WS1	Waste management program	Encouragement of businesses, locals and visitors to reduce the amount of single-use plastics brought onto or used on the Island, will not only reduce the total waste generated, but also reduce the associated carbon emissions with transportation of waste to the mainland. This also includes education and awareness campaigns, such as the Plastic Free Places initiative.
Waste	WS2	Increase sorting and recycling items stockpiles at landfill	Increase the sorting and recycling of item stockpiles at the landfill site, to help better manage waste, facilitate materials reuse and contribute to economic activity.
Waste	WS3	Modify procurement practices to reduce shipping off island	Encouragement of businesses and other organisations to reduce the amount of packaging brought onto or used on the island, to reduce the total waste generated and the associated carbon emissions with the transportation of waste off-island. This could be achieved by adhering to the Plastic Free Places initiative.
Waste	WS4	Upgrade waste transfer station	Upgrade the waste transfer station including the optimisation of recycling to increase separation of metals, cardboard, glass and plastics, then the removal of waste off the island for recycling on the mainland. This also includes connecting Council with funding for a waste compactor.
Waste	WS5	Pilot composting scheme	Implementation of a composting system for green waste combined with a market garden, to increase self-sufficiency and reduce waste barged off the island.
Waste	WS6	Small- scale incineration for waste destruction	Investigation of the possibility of high-efficiency incinerators on the island, to reduce the amount of waste barged off the island.
Waste	WS7	Waste management education and capacity building	Implementation of educational programs and communications on waste management, including separation of waste and reduction of waste materials to reduce pollution and waste sent to landfill.
Waste	WS8	Container collection program	Promotion of current container refund scheme – as applicable, to increase access and use by the community for recycling of containers to reduce waste sent to landfill.
Waste	WS9	Waste reduction and management strategy	Development of a waste reduction and management strategy in collaboration with the community, to phase out single use items, remove metal waste from the island, implement recycling and comingled waste opportunities to reduce pollution and waste sent to landfill.
Waste	WS10	Use sewage plant effluent to create compost and fertiliser for use on the island	Utilisation of sewage plant effluent outputs for composting and fertiliser to be used on the island where possible.

Appendix A | Palm Island options longlist

LONGLIST

Theme	ID	Title	Description
Water	WT1	Consistent high-quality water supply	Feasibility assessment of options that would ensure consistent high-quality water supply for residents and organisations, to rebuild trust in the water supply.
Water	WT2	Upgrade stormwater drainage systems	Assessment of the current stormwater drainage systems to identify and address system weaknesses and erosion prone areas.
Water	WT3	Wastewater recycling for non-potable reuse	Utilisation effluent from the wastewater treatment plant, to irrigate specific zones on the island, such as the rugby field.
Water	WT4	Increase rainwater harvesting for homes and water efficiency education	Installation of rainwater harvesting methods such as water tanks on homes and buildings to supplement the mains water supply, which includes education on the maintenance of these systems as well as water efficiency measures for residents.
Water	WT5	High efficiency water pumps throughout mains system	Installation of high efficiency water pumps throughout the mains water system, to reduce energy usage associated with water consumption.
Water	WT6	Solar desalination plant	Commission a solar desalination plant to improve quality and reliability of water supply for community, to complement the current water supply in times of drought.
Water	WT7	Install non-return valves on sewerage outlets	Install non-return valves in the sewerage system, to reduce sewage spills during heavy rainfall events.
Water	WT8	Installation of water filters at end user taps	Installation of water filters on residential taps, to ensure high quality drinking water for the community.
Water	WT9	Identification of water and wastewater upgrades not covered by ICCIP funding	Investigate other gaps in funding for the water and wastewater system, not covered by ICCIP funding. This may include: review of raw water intakes; water and wastewater reticulation networks, reservoirs and pump stations; water and wastewater treatment plant to address existing condition, operational and health and safety issues; instrumentation and control systems.
Water	WT10	Installation of new water stations	Installation of solar chilled water fountains and bottle filling taps at convenient locations around the island, such as at the airport, town centre and near the water treatment plant, to provide a consistent source of clean drinking water to the community, reducing the need for bottled water.

Appendix B

Gate 3: Multi-criteria analysis criteria and weightings

Appendix B | Multi-criteria analysis overview

PURPOSE

A Multi-Criteria Analysis (MCA) is a decision-making tool which can be used to compare options that differ across several dimensions. It is typically used to assess aspects of options which cannot (or cannot easily) be quantified or monetised for conclusive comparison. It can be used as a filter to identify which options likely have the most merit (according to the defined criteria). This removes the need for time-consuming and in-depth analysis which is not feasible at the strategic level. An MCA was selected as the Gate 3 sifting mechanism for these reasons.

However, the nature of this project resulted in a longlist of options which are very different to each other, making direct comparisons of merit more challenging. For instance, a water resilience project differs in intent and function to an energy generation project. To ensure the MCA is meaningful in this context, criteria were developed to enable the assessment to focus on how well each option aligned with the core project objectives. The selected criteria are outlined on the next page.

SCORING

The logic behind the scoring mechanism is demonstrated in the table below. However, it must be noted that there exist limitations to this (and any other) analysis. Imperfect information is one; at the strategic level there are always many unknowns and reasonable assumptions must be developed. Examples of unknowns include the expected demand for a service; size and scalability of an initiative; maturity of supply chains; site conditions and technical feasibility; and cost. Scoring was undertaken within this context of uncertainty, using reasonable assumptions and best professional judgement.

Performance against each criterion was assessed on a scale of 1 to 5, as outlined in the table below.

The scoring descriptions provided are necessarily at a high level to manage the subjectivity of the scoring process. This is because an option could, in practice, support a criterion in many different ways; too many possibilities exist to warrant excessive specificity. Subjectivity was sought to be minimised by the review and challenge of the wider project team. For example, an option may ‘support economic opportunity’ in a variety of ways (i.e. through job creation; enabling the development of new services or creation of a new business; by increasing consumer or investor confidence; by promoting tourism opportunities; by removing barriers to individuals’ economic progression or wellbeing).

Arup’s team delivered an individual score against each criterion for each project option, along with a statement of underlying rationale. These outputs were presented to the wider project team.

Performance	Score
Option likely to generate a strong positive impact	5
Option likely to generate a positive impact	4
Option likely to generate a neutral or no impact	3
Option likely to generate a negative impact	2
Option likely to generate a strong negative impact	1

The following slide outlines the weightings applied to each criterion.

Appendix B | Multi-criteria analysis criteria

MULTI-CRITERIA ANALYSIS CRITERIA

The multi-criteria analysis criteria and weightings for Palm Island are presented in the table below.

Objective category	#	Draft 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%
	<i>Total (economic development)</i>		<i>30%</i>
Social development & culture	3	Promotion of community self-sufficiency and/or resilience (including consideration of NIRA objectives)	15%
	4	Protection of cultural heritage and assets	15%
	<i>Total (social development & culture)</i>		<i>30%</i>
Environmental protection	5	Extent of decarbonisation potential	25%
	6	Preservation of environmental, ecological and/or natural resources	15%
	<i>Total (environmental protection)</i>		<i>40%</i>
TOTAL			100%

Appendix C

Gateway assessment outputs

Gate 1: Project objectives

Gate 2: Achievability

Gate 3: Multi-criteria analysis

Appendix C | Gateway assessment outputs

SIMILAR AND COMPLEMENTARY OPTIONS

In early stages of project development, it was identified that some of the longlist options contained similarities or other complementary aspects that may enable them to be ‘bundled’ together for final project option development purposes.

As the longlist development process continued, some of these options were consolidated into a single (but broader) option where this was considered the most appropriate and logical approach. Other complementary options were kept separate. This process was led by EarthCheck and the intent was to enable more effective and targeted stakeholder engagement on key aspects of these options.

As part of the options assessment process (led by Arup), options were assessed individually through each of the Gateways. This enabled the individual merits of these options to be assessed, and a separate weighted ranking to be returned.

After options passed through Gate 3, Arup consolidated those remaining shortlisted options which were considered to be complementary, and which would benefit from being packaged together into a single final project option. Where this has occurred, it is noted in the Gate 3 assessment outputs in the following pages. Options that failed to progress are discussed further in Appendix E.

PROGRESSION TO FINAL PROJECT OPTION

A maximum of 30 final project options were to be delivered. The output of the Gate 3 assessment was a ranked listing of the options which had progressed through Gate 2.

If, after consolidation, there were in excess of 30 options, only the 30 which had the highest ranking would progress to the shortlist for final project option development. As the number of final consolidated options was less than 30, all of these options were deemed to have merit and were progressed to final project option.

Appendix C | Gateway assessment outputs

GATEWAY ASSESSMENT

Theme	ID	Title	Gate 1	Gate 2	Gate 3	Outcome
Energy	E1	Efficient energy use in buildings	Pass	Pass	Pass (consolidated)	Shortlist: BC6 “Efficient energy used in buildings”
Energy	E2	Energy efficiency and solar panel education	Pass	Pass	Pass (consolidated)	Shortlist: “Community-led sustainability and environmental traditional knowledge sharing and education”
Energy	E3	Palm Island sustainable building design code for new buildings	Fail			Recommendation
Energy	E4	Solar air conditioning with high efficiency air conditioning units	Pass	Pass	Pass (consolidated)	Shortlist: “Cooling improvements for existing buildings”
Energy	E5	Installation of additional new smart solar and/or LED lighting	Pass	Pass	Pass (consolidated)	Shortlist: “Efficient energy used in buildings”
Energy	E6	Cooling improvements for existing buildings	Pass	Pass	Pass (consolidated)	Shortlist: “Cooling improvements for existing buildings”
Energy	E7	Upgrade to high efficiency appliances and refrigeration units	Pass	Pass	Pass (consolidated)	Shortlist: “Efficient energy used in buildings”
Energy	E8	Solar hot water system upgrade	Pass	Pass	Pass	Shortlist: “Upgrade of solar hot water systems”
Energy	E9	Current or tidal generation/water turbine	Fail			Recommendation
Energy	E10	Wind turbines	Pass	Fail		Recommendation
Energy	E11	Floating solar array to power wastewater treatment plant	Pass	Pass	Pass (consolidated)	Shortlist: “Solar PV to power wastewater treatment plant”
Energy	E12	Rooftop solar for household use	Pass	Pass	Pass (consolidated)	Shortlist: “Rooftop solar”

Appendix C | Gateway assessment outputs

GATEWAY ASSESSMENT

Theme	ID	Title	Gate 1	Gate 2	Gate 3	Outcome
Energy	E13	Power generation from sewage treatment plant gas supplemented with solar	Pass	Fail		Recommendation
Energy	E14	Pumped hydro storage	Pass	Fail		Recommendation
Energy	E15	Solar PV generation	Pass	Pass	Pass (consolidated)	Shortlist: “Rooftop solar” and “Ground mounted solar farm” and “Solar PV to power wastewater treatment plant”
Energy	E16	Connect and upgrade unconnected or non-functional rooftop solar	Pass	Pass	Pass (consolidated)	Shortlist: “Rooftop solar”
Resilience	R1	Community driven feral/invasive species management plan	Pass	Pass	Pass (consolidated)	Shortlist: “Community driven feral/invasive species and bush fire management plans”
Resilience	R2	Community preparedness, wellbeing and economic growth roadmap	Pass	Pass	Pass (consolidated)	Shortlist: “Tourism Management Plan”
Resilience	R3	Community driven bush fire management plan	Pass	Pass	Pass (consolidated)	Shortlist: “Community driven feral/invasive species and bush fire management plans”
Resilience	R4	Sustainability and environmental training and Traditional Knowledge sharing	Pass	Pass	Pass (consolidated)	Shortlist: “Community-led sustainability and environmental traditional knowledge sharing and education”
Resilience	R5	Revegetation and blue carbon sequestration	Pass	Pass	Pass (consolidated)	Shortlist: “Land restoration and blue carbon sequestration projects”
Resilience	R6	Market garden	Pass	Pass	Pass (consolidated)	Shortlist: “Development of a community-led pilot on-island farm/market garden”

Appendix C | Gateway assessment outputs

GATEWAY ASSESSMENT

Theme	ID	Title	Gate 1	Gate 2	Gate 3	Outcome
Resilience	R7	Upgrade of emergency facilities	Fail			Recommendation
Resilience	R8	Upgrade river rock walls	Pass	Fail		Recommendation
Resilience	R9	Increase accommodation capacity or add accommodation facilities for tourists	Pass	Pass	Pass (consolidated)	Shortlist: “Tourism Management Plan”
Resilience	R10	Design and construct a cyclone shelter or identify upgrades to an existing building	Pass	Fail		Recommendation
Resilience	R11	Whole of island resilience and self-sufficiency plan	Pass	Fail		Recommendation
Resilience	R12	Drought proofing plan	Pass	Pass	Pass (consolidated)	Shortlist: “Sustainable water and wastewater management strategy”
Resilience	R13	Community upskilling	Fail			Recommendation
Resilience	R14	Creation of activities for youth and community fitness programs	Fail			Recommendation
Resilience	R15	Native plant nursery	Pass	Pass	Pass (consolidated)	Shortlist: “Land restoration and blue carbon sequestration projects”
Resilience	R16	Additional communication systems	Fail			Recommendation
Resilience	R17	Community arts and crafts healing centre & shop	Pass	Pass	Pass (consolidated)	Shortlist: “Tourism Management Plan”
Transport	T1	Production of diesel from recycled cooking oil and biomass	Pass	Fail		Recommendation
Transport	T2	Active transport plan and infrastructure	Pass	Pass	Pass	Shortlist: “Active transport plan and infrastructure”

Appendix C | Gateway assessment outputs

GATEWAY ASSESSMENT

Theme	ID	Title	Gate 1	Gate 2	Gate 3	Outcome
Transport	T3	Education on vehicle efficiency and use	Pass	Pass	Pass (consolidated)	Shortlist: “Community-led sustainability and environmental traditional knowledge sharing and education”
Transport	T4	Electric car hire and charge point program	Pass	Fail		Recommendation
Transport	T5	Alternative energy or fuels for commercial watercraft	Pass	Pass	Pass (consolidated)	Shortlist: “Feasibility assessment of alternative energy solutions for commercial watercraft”
Transport	T6	On-island shuttle bus	Pass	Pass	Pass (consolidated)	Shortlist: “On island shuttle bus for public transport”
Transport	T7	Provide business support and assist in developing the Palm Island Shuttle service	Pass	Pass	Pass (consolidated)	Shortlist: “On island shuttle bus for public transport”
Transport	T8	Infrastructure upgrade	Pass	Fail		Recommendation
Transport	T9	Hydrogen fuel cell upgrades	Pass	Pass	Pass (consolidated)	Shortlist: “Feasibility assessment of alternative energy solutions for commercial watercraft”
Transport	T10	Hydrogen combustion upgrades	Pass	Pass	Pass (consolidated)	Shortlist: “Feasibility assessment of alternative energy solutions for commercial watercraft”
Transport	T11	Increase size and capacity of planes to the island	Pass	Fail		Recommendation
Transport	T12	Community-run barge	Pass	Fail		Recommendation
Transport	T13	Alternative fuels for private boats	Pass	Pass	Pass (consolidated)	Shortlist: “Feasibility assessment of alternative energy solutions for commercial watercraft”

Appendix C | Gateway assessment outputs

GATEWAY ASSESSMENT

Theme	ID	Title	Gate 1	Gate 2	Gate 3	Outcome
Waste	WS1	Waste management program	Pass	Pass	Pass (consolidated)	Shortlist: “Include Palm Island in the Plastic Free Places Initiative being undertaken in the Townsville region”
Waste	WS2	Increase sorting and recycling items stockpiles at landfill	Pass	Pass	Pass (consolidated)	Shortlist: “Upgrade waste transfer station”
Waste	WS3	Modify procurement practices to reduce shipping off island	Pass	Pass	Pass (consolidated)	Shortlist: “Include Palm Island in the Plastic Free Places Initiative being undertaken in the Townsville region”
Waste	WS4	Upgrade waste transfer station	Pass	Pass	Pass (consolidated)	Shortlist: “Upgrade waste transfer station”
Waste	WS5	Pilot composting scheme	Pass	Pass	Pass (consolidated)	Shortlist: “Development of a community-led pilot on-island farm/market garden”
Waste	WS6	Small- scale incineration for waste destruction	Pass	Fail		Discounted
Waste	WS7	Waste management education and capacity building	Pass	Pass	Pass (consolidated)	Shortlist: “Community-led sustainability and environmental traditional knowledge sharing and education”
Waste	WS8	Container collection program	Pass	Pass	Pass (consolidated)	Shortlist: “Include Palm Island in the Plastic Free Places Initiative being undertaken in the Townsville region”
Waste	WS9	Waste reduction and management strategy	Pass	Fail		Recommendation
Waste	WS10	Use sewage plant effluent to create compost and fertiliser for use on the island	Pass	Fail		Recommendation

Appendix C | Gateway assessment outputs

GATEWAY ASSESSMENT

Theme	ID	Title	Gate 1	Gate 2	Gate 3	Outcome
Water	WT1	Consistent high-quality water supply	Pass	Pass	Pass (consolidated)	Shortlist: “Sustainable water and wastewater management strategy” and “Community water engagement program”
Water	WT2	Upgrade stormwater drainage systems	Pass	Pass	Pass (consolidated)	Shortlist: “Sustainable water and wastewater management strategy”
Water	WT3	Wastewater recycling for non-potable reuse	Pass	Pass	Pass (consolidated)	Shortlist: “Sustainable water and wastewater management strategy”
Water	WT4	Increase rainwater harvesting for homes and water efficiency education	Pass	Pass	Pass (consolidated)	Shortlist: “Sustainable water and wastewater management strategy” and “Community water engagement program”
Water	WT5	High efficiency water pumps throughout mains system	Pass	Pass	Pass (consolidated)	Shortlist: “Sustainable water and wastewater management strategy”
Water	WT6	Solar desalination plant	Pass	Pass	Pass (consolidated)	Shortlist: “Sustainable water and wastewater management strategy”
Water	WT7	Install non-return valves on sewerage outlets	Pass	Pass	Pass (consolidated)	Shortlist: “Sustainable water and wastewater management strategy”
Water	WT8	Installation of water filters at end user taps	Pass	Fail		Discounted
Water	WT9	Identification of water and wastewater upgrades not covered by ICCIP funding	Pass	Pass	Pass (consolidated)	Shortlist: “Sustainable water and wastewater management strategy”
Water	WT10	Installation of new water stations	Pass	Pass	Pass (consolidated)	Shortlist: “Community water engagement program”

Appendix D

Options shortlist

Appendix D | Palm Island options shortlist

SHORTLIST

The options which progressed through the Gate 3 assessment and will progress to final project option are outlined in the table below. These are grouped according to theme.

Theme	ID	Component ID	Title	Description
Energy	1	E15	Ground mounted solar farm	This option is to increase the solar PV generation on the island to primarily replace diesel generation in consultation with Ergon. This would also allow Council's unconnected solar to be hooked in. May include future battery storage energy system. Back up diesel generation is likely still required for energy resilience, and could be powered by an alternative low carbon fuel when available in the future e.g renewable/ biodiesel.
Energy	2	E12, E15, E16	Rooftop solar for residents	This option involves the installation of new rooftop solar PV systems for residential buildings in consultation with DHPW to provide behind-the-meter renewable power 'free of charge' to residents. Where applicable, this may also include ensuring existing rooftop systems are properly connected and operational.
Energy	3	E11, E15	Solar PV to power wastewater treatment plant	This option involves the installation of solar panels at or nearby the wastewater treatment plant. The intent is to provide a source of renewable power for the wastewater treatment plant.
Energy	4	E8	Upgrade of solar hot water systems	Upgrade of solar hot water systems on residential dwellings to improve access to hot water in consultation with DHPW. This final project option is to provide new larger solar hot water systems to accommodate average household size. Final project option would consider options to maximise efficient use through a community and resident education program. Larger solar hot water systems may also reduce reliance on mains grid power for hot water, providing cheaper hot water with decarbonisation benefit but also reducing reliance on grid during peak times (demand management).
Energy	5	E4, E6	Cooling improvements for existing buildings	This final project option would include an audit/review of existing building conditions (commercial and residential) and recommendation for what options may be appropriate to improve comfort such as air flow/ventilation, insulation and/or heat reflective roof paint, to improve comfort and reduce reliance and/or increase efficiency of air conditioning units. Air-conditioning is a high electricity use for households and the electricity grid is currently the highest direct carbon emissions source on the Island.
Energy	6	E1, E5, E7	Efficient energy use in buildings	This option includes community co-designed audit, education and recommendations for implementation of some likely energy efficiency/demand management options. Improvements in energy efficiency and demand side management (e.g. LED lighting, higher efficiency appliances, energy management systems) has the potential to decrease electricity use. The electricity grid is currently the highest direct carbon emissions source on the Island. Residents are currently required to buy own light bulbs and appliances, so this option also needs to look at subsidy and availability of higher efficiency appliances on-island.

Appendix D | Palm Island options shortlist

SHORTLIST

Theme	ID	Component ID	Title	Description
Water	7	WT1, WT2, WT3, WT4, WT5, WT6, WT7, WT9, R12	Sustainable water and wastewater management strategy	It is recognised that a overarching, strategic and coordinated plan for the effective management and upgrades of Palm Island’s water and wastewater network and assets is required. This final project option would involve a holistic review of all assets, their functionality and performance relative to the needs of the Palm Island community. As part of this, requirements for future-proofing the system in the face of increasing demand will also be considered.
Water	8	WT1, WT4, WT10	Community water engagement program	This final project option would involve a community-driven, culturally appropriate campaign to engage Palm Island residents in the effective use and management of water resources, particularly needed to rebuild trust in water quality.
Waste	9	WS2, WS4	Upgrade waste transfer station	This would involve an upgrade of the waste transfer station to optimise recycling and increase separation of metals, cardboard, glass and plastics. This would enhance resource recovery, and would enable removal of waste streams from the island for recycling on the mainland.
Waste	10	WS1, WS3, WS8	Include Palm Island in the Plastic Free Places Initiative being undertaken in the Townsville region	The ‘Plastic Free Places’ initiative is a collection of strategies to reduce use of and waste from single-use plastics in a given area. The program works with communities to directly achieve these outcomes, and to empower the community to make lasting changes towards a circular economy. As Townsville City Council are already progressing with the ‘Plastic Free Places’ initiative for the region, there is opportunity for Palm Island to be included in this process.
Transport	11	T6, T7	On island shuttle bus for public transport	This option is primarily to meet a community need to have on-island public transport services re-instated. To reduce carbon emissions it is suggested that this option could be an electric vehicle (EV) or EV hybrid which would also need to consider charging infrastructure (preferable renewable charging infrastructure) or use alternative low emission fuels. This option would need to include secure storage for vehicles and appropriate charging infrastructure. Business administrative support (funding already approved and available on island) is needed to support the business to ensure it is financially viable for long-term operation and to operate independently.
Transport	12	T2	Active transport plan and infrastructure	This final project option will encourage active transport for now such as walking or cycling, and into the future (e.g. electric bikes, scooters or tuk tuks). This will also support longer-term tourism for the community.
Transport	13	T5, T9, T10, T13	Feasibility assessment of alternative energy solutions for commercial watercraft	This final project option would recommend a feasibility assessment is developed to investigate current low emission marine vehicle options and support decisions on the future procurement of low emission ferry and barge service routes. It will assess alternative energy solution such as electric, hydrogen or solar power, or fuels such as biodiesel, for commercial watercraft.

Appendix D | Palm Island options shortlist

SHORTLIST

Theme	ID	Component ID	Title	Description
Resilience	14	R5, R15	Land restoration and blue carbon sequestration projects	This final project option will seek funding to develop and implement pilot projects for carbon sequestration in terrestrial, estuarine and marine environments of the island. Opportunities may include revegetation of terrestrial habitat with native species including aligning with existing tourism bush tucker trail initiatives and potential native plant nursery, revegetation in erosion prone areas including intertidal and waterways (e.g. mangroves etc.), and coral, seagrass, other marine species blue carbon sequestration.
Resilience	15	R1, R3	Community driven feral/invasive species and bush fire management plans	This final project option is for: 1. Development of a feral/invasive species management plan with community to improve environmental health for the community 2. Seeking funding to implement an indigenous ranger program. This would include management of horses, pigs and other pests/weeds 3. Development of a community driven bush fire management plan using indigenous knowledge
Resilience	16	R6, WS5	Development of a community-led pilot on-island farm/market garden	This final project option includes development of a pilot on-island for a farm or market garden for the sale of produce to the local community. It is proposed to incorporate a pilot composting system of green waste from the pilot farm scheme. If successful, the pilot could be built upon further and extended to produce other farming options.
Resilience	17	E2, R4, T3, WS7	Community-led sustainability and environmental traditional knowledge sharing and education	This final project option would develop and deliver community-led sustainability and environmental traditional knowledge sharing and education. The purpose of this option is to celebrate and share cultural knowledge, engage community, support and upskill the community in sustainable and resilient transport and household management options, and complement other island community initiatives.
Resilience	18	R2, R9, R17	Tourism Management Plan	This final project option will outline the strong need for a coordinated Tourism Management Plan to support the future rise of tourism on Palm Island. It is vitally important that development be approached in a culturally, socially, environmentally and economically sustainable manner, and that the needs and views of Palm Island residents are embedded within the strategy. The plan will address the need for tourism accommodation on the island and the establishment of facilities / business opportunities such as a arts and crafts healing centre & shop; fishing charters; bush tucker walking trails; cultural historical tours etc

Appendix E

Recommendations and discounted options

Appendix E | Palm Island option recommendations

RECOMMENDATIONS

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. Recommendations may not progress for a variety of reasons, including:

- Where work is already planned through initiatives external to the project
- Where it is 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

Theme	ID	Title	Rationale
Energy	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.
Energy	E9	Current of tidal generation/water turbine	The effectiveness of this renewable technology in this location is not proven, and there are other technologies such as solar which can be initially employed in preference. 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 extent of community support for this option was not clear with some concerns around safety. However, if other developments involving significant maritime infrastructure (e.g. desalination plant) were constructed in future, this technology could be complementary and should be reevaluated at that time.
Energy	E10	Wind turbines	Initially the provision of solar PV generation on roofs and existing cleared land close to demand (such as identified in the Palm Island Masterplan 2019) was considered the most economically and technically feasible renewable energy opportunity for Palm Island to be put forward to final project option at this time. It is recommended that alternative renewable energy such as wind turbines could be assessed in the future. Any future feasibility assessment of wind turbines should consider potential impacts to GBR world heritage area, aesthetics and community views, cultural and environmental impacts as well as economic feasibility.

Appendix E | Palm Island option recommendations

RECOMMENDATIONS

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. Recommendations may not progress for a variety of reasons, including:

- Where work is already planned through initiatives external to the project
- Where it is 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

Theme	ID	Title	Rationale
Energy	E13	Power generation from sewage treatment plant gas supplemented with solar	Initially the provision of solar PV generation on roofs and existing cleared land close to the STP (such as identified in the Palm Island Masterplan 2019) was considered the most economically and technically feasible renewable energy opportunity for Palm Island to be put forward to final project option at this time. This option is not currently considered to be a practical or cost-effective solution to energy generation on Palm Island. This option could be reevaluated in the future if the capacity to operate and maintain the system is developed.
Energy	E14	Pumped hydro storage	Initially the provision of solar PV generation on roofs and existing cleared land close to the STP (such as identified in the Palm Island Masterplan 2019) was considered the most economically and technically feasible renewable energy opportunity for Palm Island to be put forward to final project option at this time. In future battery energy storage systems are expected to be considered to complement this intermittent renewable energy. 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.
Resilience	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.
Resilience	R8	Upgrade river rock walls	It was advised by DES that a range of component activities and plans proposed would come together to form an overarching climate resilience approach for the islands, many of which are being led by Government agencies together with research and not for profit sector. Considered to be outside of the scope of this project.

Appendix E | Palm Island option recommendations

RECOMMENDATIONS

Theme	ID	Title	Rationale
Energy	E14	Pumped hydro storage	Initially the provision of solar PV generation on roofs and existing cleared land close to the STP (such as identified in the Palm Island Masterplan 2019) was considered the most economically and technically feasible renewable energy opportunity for Palm Island to be put forward to final project option at this time. In future battery energy storage systems are expected to be considered to complement this intermittent renewable energy. 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.
Resilience	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.
Resilience	R8	Upgrade river rock walls	It was advised by DES that a range of component activities and plans proposed would come together to form an overarching climate resilience approach for the islands, many of which are being led by Government agencies together with research and not for profit sector. Considered to be outside of the scope of this project.
Resilience	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.
Resilience	R11	Whole of island resilience and self-sufficiency plan	It was advised by DES that a range of component activities and plans proposed would come together to form an overarching climate resilience approach for the islands, many of which are being led by Government agencies together with research and not for profit sector. The development of a resilience plan, was advised to be outside of the scope of this project however the absence of such a plan should not prevent these measures being implemented..
Resilience	R13	Community upskilling	It is recognised that programs to provide training and education to upskill residents would be advantageous for the Island community, and have been included within individual final project options where relevant. Community upskilling as a whole however this is beyond the scope of this project.

Appendix E | Palm Island option recommendations

RECOMMENDATIONS

Theme	ID	Title	Rationale
Resilience	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 and could be used to leverage additional community and youth fitness programs through other funding mechanisms.
Resilience	R16	Additional communication systems	Whilst it is recognised that improvement in digital connectivity is an enabler to improved sustainability and community resilience, it is considered outside of project scope.
Energy	T1	Pilot research trial for production of diesel from recycled cooking oil (e.g from takeaway store) and biomass (e.g 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.
Transport	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 community transport e.g 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.
Transport	T8	Road Infrastructure upgrade	Road infrastructure improvements are being progressed by PIASC and Transport and Main Roads and are considered outside of the scope of this project. Upgrade of active transport infrastructure will be progressed as part of this project, and provide a more direct decarbonisation benefit.
Transport	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.

Appendix E | Palm Island option recommendations

RECOMMENDATIONS

Theme	ID	Title	Rationale
Transport	T12	Community-run barge	There is no identified need for an additional barge service from community consultation 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 unless run on low-emission technology. It is however 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, and for procurement to encourage low-emission options.
Waste	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 document, therefore development of an individual strategy is not considered an immediate priority or barrier to improve waste management practices on the island.
Waste	WS10	Use sewage plant effluent to create compost and fertiliser for use on the island	This option is a complex and relatively expensive initiative to establish. It would require a moderate to 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 composting outputs are to be used for agricultural purposes. Run-off is of particular concern being in the Great Barrier Reef catchment. This option may be considered in the future once municipal and green waste management practice improvements are achieved. This option could better be considered as a secondary stage for integration if an effective composting process is established on the island.

Appendix E | Palm Island discounted options

DISCOUNTED OPTIONS

Other options put forward by the community and stakeholders were assessed, but ultimately not determined to constitute a viable final project option or recommendation. These discounted options are presented in the table below. An option may have been discounted for reasons including:

- Low levels of community support for the option
- The strong likelihood that an option would be infeasible in a technological, technical or physical sense
- The strong likelihood that an option would consume or divert significant resources from other critical uses

Theme	ID	Title	Rationale
Waste	WS6	Small- scale incineration for waste destruction	<p>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.</p> <p>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.</p>
Water	WT8	Installation of water filters at end user taps	<p>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.</p>

Appendix F

Gate 3 Multi-Criteria Analysis: Summary of interpretation of NIRA Building Blocks for project

NIRA Building Blocks

Considerations for Gate 3 Multi-criteria analysis

ARUP

THE NATIONAL INDIGENOUS REFORM AGREEMENT

The National Indigenous Reform Agreement (NIRA) implements intergovernmental reforms to close the gap in Indigenous disadvantage. In December 2007, the Council of Australian Governments (COAG) agreed to a partnership between all levels of government to work toward this goal.

Given the high populations of Indigenous persons on Palm Island (which is operated by an Indigenous Council), it was considered vital that all longlisted options be considered in the context of compatibility with the NIRA Building Blocks framework. These Building Blocks represent strategic platforms across which major reforms must be directed in order to meet the specific targets to close the gap, as outlined in the NIRA. These Building Blocks are:

1. Early Childhood
2. Schooling
3. Health
4. Economic Participation
5. Healthy Homes
6. Safe Communities
7. Governance and Leadership

COAG acknowledge that strategies aimed at achieving improvements in any area will not work in isolation and that the integration of policy and considerations for strategic implementation must occur together.

INCORPORATING NIRA INTO OPTIONS ASSESSMENT

A range of key terms and definitions were developed to guide the scoring of options within the Gate 3 multi-criteria analysis (MCA) in a consistent manner.

The interpretation of the NIRA Building Blocks for the purpose of the MCA is presented in the following section.

NIRA Building Blocks

Building Blocks outlined in NIRA

The following paragraphs are taken directly from the NIRA, and outline the seven key Building Blocks deemed critical to improving outcomes for Indigenous people in Australia.

EARLY CHILDHOOD

For an equal start in life, Indigenous children need early learning, development and socialisation opportunities. Access to quality early childhood education and care services, including pre-school, child care and family support services such as parenting programs and supports, is critical. Appropriate facilities and physical infrastructure, a sustainable early childhood education and health workforce, learning frameworks and opportunities for parental engagement are also important and require attention. Action in the areas of maternal, antenatal and early childhood health is relevant to addressing the child mortality gap and to early childhood development.

SCHOOLING

Human capital development through education is key to future opportunity. Responsive schooling requires attention to infrastructure, workforce (including teacher and school leader supply and quality), curriculum, student literacy and numeracy achievement and opportunities for parental engagement and school/community partnerships. Transition pathways into schooling and into work, post school education and training are also important.

HEALTH

Indigenous Australians' access to effective, comprehensive primary and preventative health care is essential to improving their health and life expectancy, and reducing excess mortality caused by chronic disease. All health services play an important role in providing Indigenous people with access to effective health care, and being responsive to and accountable for achieving government and community health priorities. Closing the Indigenous health gap requires a concerted effort in the prevention, management and treatment of chronic disease. Indigenous children and their parents need to access programs and services that promote healthy lifestyles.

NIRA Building Blocks

Building Blocks outlined in NIRA

ARUP

ECONOMIC PARTICIPATION

Individuals and communities should have the opportunity to benefit from the mainstream economy – real jobs, business opportunities, economic independence and wealth creation. Economic participation needs to extend to disadvantaged job seekers and those outside of the labour market. Access to land and native title assets, rights and interests can be leveraged to secure real and practical benefits for Indigenous people. Other financial assets, capacity building, employment and training programs, incentive structures and social and physical infrastructure, including communications and transport, are needed to foster economic participation and community engagement. Through this participation, parents and other adults can become effective role models for their families and community. The design and delivery of welfare (both transfer payments and services) needs to promote active engagement, enhanced capability and positive social norms. Ensuring that communities have support to address factors that are a barrier to engagement such as problem gambling is critical. Life-long learning is important and attention is also needed regarding adult literacy and numeracy skills.

HEALTHY HOMES

A healthy home is a fundamental precondition of a healthy population. Important contributors to the current unsatisfactory living conditions include inadequate water and sewerage systems, waste collection, electricity and housing infrastructure (design, stock and maintenance).

Children need to live in accommodation with adequate infrastructure conducive to good hygiene and study and free of overcrowding.

SAFE COMMUNITIES

Indigenous people (men, women and children) need to be safe from violence, abuse and neglect. Fulfilling this need involves improving family and community safety through law and justice responses (including accessible and effective policing and an accessible justice system), victim support (including safe houses and counselling), child protection and also preventative approaches. Addressing related factors such as alcohol and substance abuse will be critical to improving community safety, along with the improved health benefits to be obtained.

GOVERNANCE AND LEADERSHIP

Strong leadership is needed to champion and demonstrate ownership of reform. Effective governance arrangements in communities and organisations as well as strong engagement by governments at all levels are essential to long term sustainable outcomes. Indigenous people need to be engaged in the development of reforms that will impact on them. Improved access to capacity building in governance and leadership is needed in order for Indigenous people to play a greater role in exercising their rights and responsibilities as citizens.

NIRA Building Blocks

Considerations for Gate 3 Multi-criteria analysis

CONSIDERATIONS FOR MULTI-CRITERIA ANALYSIS

The MCA's intent is to assess option alignment or non-conflict with the intended outcomes of the NIRA (in reference to the seven building blocks). The points outlined below are intended to guide this assessment.

1. Early Childhood

- a. Access to existing early childhood education and care services for anyone in the community.
- b. Development of new facilities and infrastructure for early childhood education and care.
- c. Opportunities for employment in early childhood education and health.
- d. Early childhood education and health workforce from providing sustainable and quality service to community.
- e. Parental engagement with early childhood education and health issues.

2. Schooling

- a. Development of new schooling facilities and infrastructure.
- b. Opportunities for employment in schooling.
- c. The schooling workforce (including teachers and school leaders) providing sustainable and quality service to the community.
- d. Parental and community engagement with schooling.
- e. Opportunities for school/community partnerships
- f. Transition pathways into school
- g. Transition pathways from school into work and post-school education/training

NIRA Building Blocks

Considerations for Gate 3 Multi-criteria analysis

ARUP

CONSIDERATIONS FOR MULTI-CRITERIA ANALYSIS

Options which do not comply with the following statements will not be progressed to Gate 3 of the short-listing process:

3. Health

- a. Access to effective, comprehensive primary and preventative health care.
- b. Development of new facilities and infrastructure for primary and preventative health care.
- c. Children and parents accessing programs and services that promote healthy lifestyles.

4. Economic Participation

- a. Opportunities for individuals and the community to benefit from the mainstream economy
- b. Access to jobs, including for disadvantaged job seekers and those outside the labour market.
- c. Business opportunities in the community.
- d. Economic independence of individuals and the community.
- e. Access to land and native title assets, rights and interests.
- f. Access to employment and training programs.
- g. Promotion of active engagement, enhanced capability and positive social norms.
- h. Addressing factors that are a barrier to engagement such as problem gambling.
- i. Opportunities for life-long learning and adult literacy and numeracy.

NIRA Building Blocks

Considerations for Gate 3 Multi-criteria analysis

ARUP

CONSIDERATIONS FOR MULTI-CRITERIA ANALYSIS

Options which do not comply with the following statements will not be progressed to Gate 3 of the short-listing process:

5. Healthy Homes
 - a. Access to adequate water and sewerage systems, waste collection, electricity and housing infrastructure
 - b. Development of new water and sewerage systems, waste collection, electricity and housing infrastructure
 - c. Children's permanent access to accommodation which is conducive to good hygiene and study, and which is free of overcrowding.
6. Safe Communities
 - a. Members of the community being safe from violence, abuse and neglect.
 - b. Law and justice responses to community safety issues across policing and the justice system.
 - c. Members of the community from accessing victim support services such as safe houses, counselling and child protection.
7. Governance and Leadership
 - a. Development of effective governance arrangements in the community and organisations.
 - b. Indigenous people in the community being engaged in the development of reforms which affect them.
 - c. Access for Indigenous people in the community to capacity building programs in governance and leadership.

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