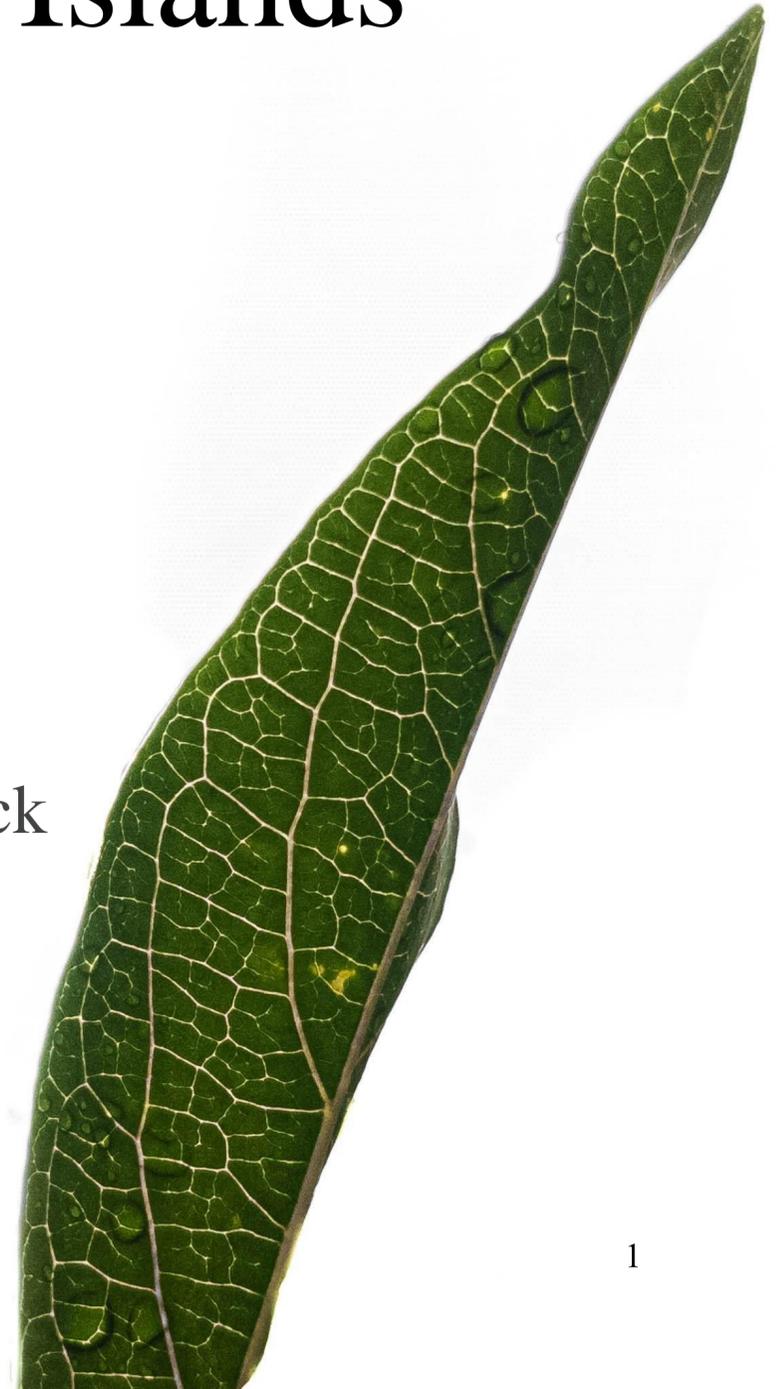


Decarbonisation of the Great Barrier Reef Islands Whole of Island Community Pilot

Magnetic Island

Technical Appendix 2: Options Report

Prepared for the Queensland Department of Environment and Science & EarthCheck
December 2020



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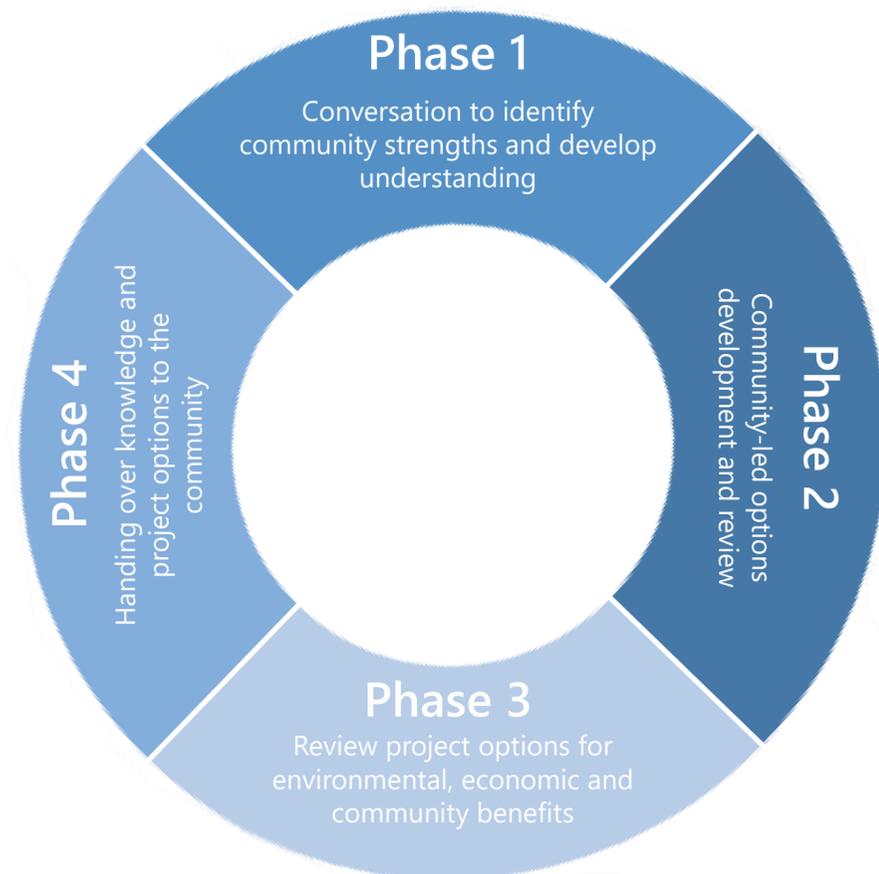
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Executive summary

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 which includes Magnetic 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 Longlist**, 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 (87) options was developed for Magnetic 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 Magnetic 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. the promotion of self-sufficiency) opportunities as part of Whole of Island Community Pilot for Magnetic 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 led by Earthcheck and RES for each of the four phases, and consisted of both in-person engagement on-island, 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:

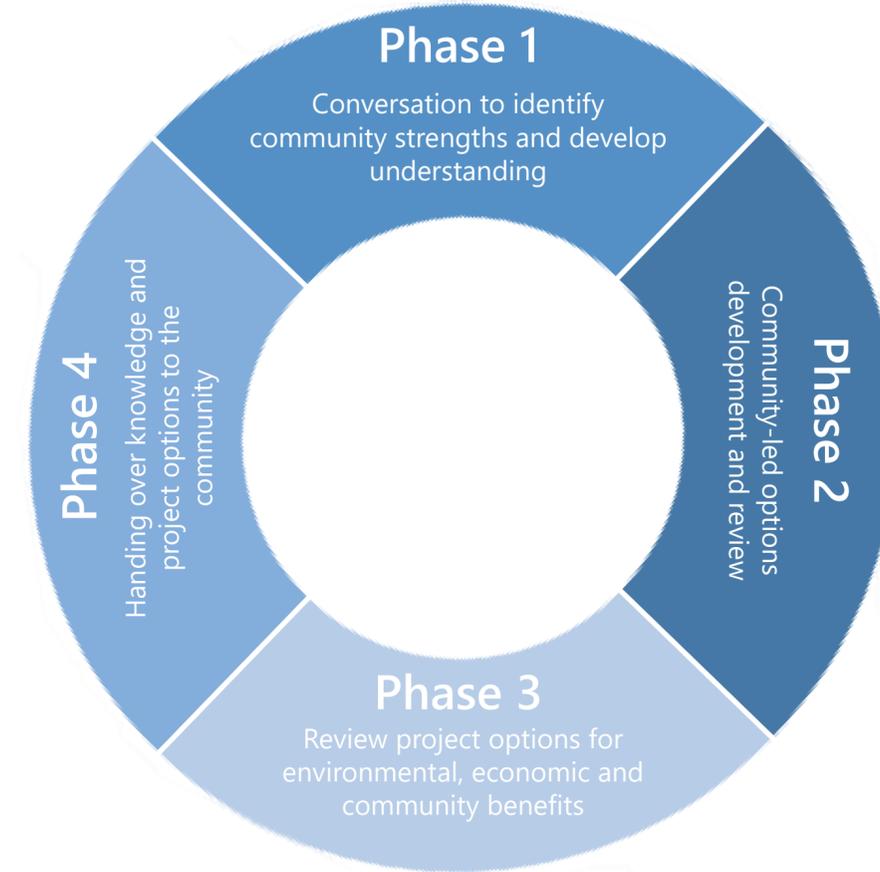
Phase 1: Sustainability assessment and option longlist

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

Phase 3: Final project option development

Phase 4: Final project option handover to community (*all phases and includes final project options*)

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 Magnetic 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 Magnetic Island comprised 87 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 Assessments.

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 20 options will progress to final project option for Magnetic Island.

NEXT STEPS

Phase 3: In this phase final project options 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 Magnetic Island- 20 options will progress to final project option.

Phase 4: In the final phase of works, reporting will be finalised and the final project options 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 Assessments.

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 of 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.

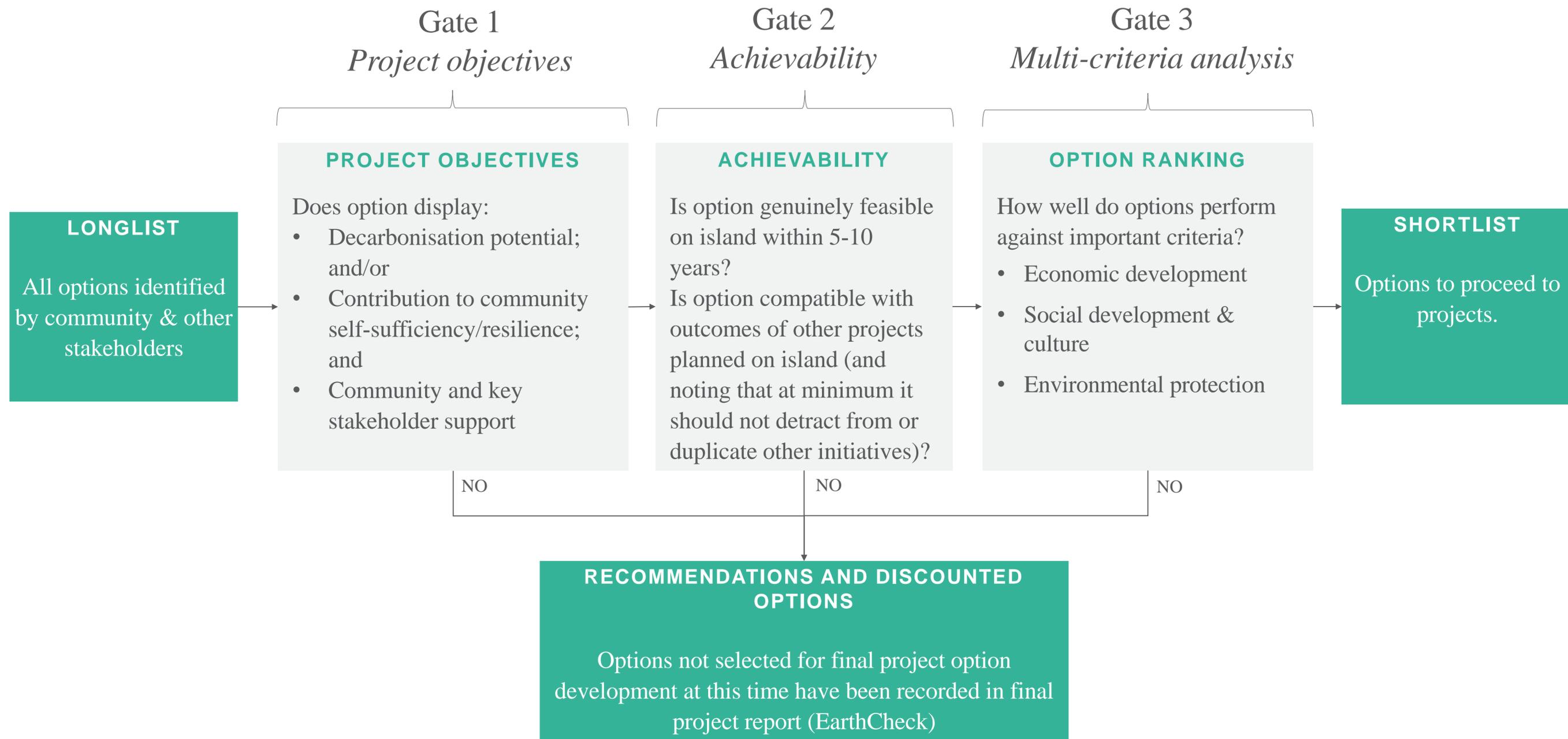
3. **Gate 3: Multi-criteria analysis (MCA)** enables the relative comparison of option performance against key environmental, social and economic criteria. Options were scored against weighted criteria relating to economic opportunity, livability and wellbeing, protection of cultural and natural heritage, 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.

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 electricity².

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*).

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 project. 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.

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

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 of ensuring 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 3 was neutral and 1 was poor. 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 Assessments 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.

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.

Appendix A

Options longlist

Appendix A | Magnetic 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	LED cells in Council-owned streetlights	Replacement of all bulbs from Council-owned streetlights with LED bulbs, to reduce energy consumption.
Energy	E2	Pilot research trial for renewable fuels from cooking oil or biomass	Research into understanding the application of using cooking oil, biomass or alternative renewable fuels, to generate energy on-island.
Energy	E3	Fuel cells using natural gas for energy generation	Investigation to understand if the application of fuel cells using natural gas to generate energy on-island is feasible, reducing reliance on grid electricity.
Energy	E4	Heat recovery from compost at waste transfer station	Feasibility study to understand if capturing heat from compost at the waste transfer station on-island would generate enough electricity to offset the installation of the technology.
Energy	E5	Methane capture from upgraded STP to flare	Understanding how much methane could be captured from the sewage treatment plants on-island and flaring the gas to generate electricity using anaerobic digester or a covered anaerobic lagoon, offsetting usage from the grid.
Energy	E6	Install rooftop solar PV with battery support	Investigating the feasible roof-space on-island for installation of solar panels supporting by battery systems for residents, to off-set the reliance and reduce the demand on grid electricity.
Energy	E7	Solar powered A/C with no grid return for commercial systems	Investigating the feasibility of replacing commercial air conditioning systems on-island with solar powered air conditioning systems, to offset the usage of electricity from the grid.
Energy	E8	Tidal or wave generators	Investigating the feasibility for installation of tidal or wave generated renewable energy on-island and the potential of generated energy from these systems, to reduce the demand on grid electricity.
Energy	E9	Waste to energy plant with gas boost	Investigation the feasibility of using waste to energy plant to generate renewable energy, with a boost of natural gas to supplement the processing of the waste
Energy	E10	Wind turbines offshore	Investigating the feasibility for installation of large or small wind turbine off-shore of the island, and the potential of generated energy from these systems, to reduce the demand on grid electricity.
Energy	E11	Increase solar panels installed on sea-going vessels	Installation of solar panels on sea-going vessels to the island, such as SeaLink ferries and Magnetic Island Ferries, to offset the amount of fuel used for transportation to the island.
Energy	E12	Community owned or partially owned microgrid	Feasibility study investigating what a community owned or partially owned microgrid would look like on the Island and how much energy would be offset through generating hydrogen energy.

Appendix A | Magnetic Island options longlist

LONGLIST

Theme	ID	Title	Description
Energy	E13	Adopt best practice building code for island	Creation of a best practice building code, specific to the Island for all new builds to adhere to, in order to ensure the most energy efficient buildings.
Energy	E14	Cluster purchase of small-scale energy control systems	Implementation of a cost-effective buying method, of small-scale energy control systems to monitor energy usage and demand
Energy	E15	Energy data loggers for energy efficiency education	Implementation of energy data loggers at large commercial sites on the Island to better understand energy consumption at premises. An education element would be included to provide advice to businesses how to effectively reduce their consumption.
Energy	E16	Energy efficiency education for locals and visitors	Educational programs for visitors and residents on-island on how to efficiently manage their energy consumption and simple ways to reduce consumption/bills, such as encouraging visitors to take longer stays to reduce their footprint.
Energy	E17	Existing building improvements	Audit of all existing residential and commercial properties on-island to understand current energy efficiencies and recommendations on the retrofit actions required to reduce consumption, such as air flow, insulation, glazing, heat reflective paint and gutter guards.
Energy	E18	LED uptake enhancing incentive scheme	Incentive scheme for residential and commercial properties to retrofit all lights on the island to LEDs, to reduce energy consumption.
Energy	E19	Central control system for accommodation providers on-island	All accommodation providers, where applicable, would retrofit buildings to use Central Control Systems, to effectively manage energy consumption and demand across the property remotely.
Energy	E20	Ground source heat pumps	Installation of business and residential ground source heat pumps to pump water from the water table in a renewable and energy efficient way, using the temperature of the ground
Energy	E21	Upgrade to high efficiency AC units and refrigeration units	Undertake an audit of all residential and commercial air conditioning units on-island and commercial refrigeration to perform a cost benefit analysis for upgrading systems to more efficient systems, to reduce energy consumption.
Energy	E22	Upgrades to solar hot water system	Feasibility study to investigate the upgrading of residential electric hot water systems to solar, to reduce the demand on the grid.
Energy	E23	New rooftop solar systems with battery storage	Uptake of new solar rooftop systems with integrated battery storage for any residential or commercial properties currently without solar that meet requirements and the energy is shared to peers within close proximity, rather than fed into the grid on-island.
Energy	E24	Magnetic Island Hydrogen Economy Pilot	Small scale feasibility study for the development of a hydrogen economy pilot including a demonstration size electrolyser to produce green hydrogen from a local water supply and refuelling stations, to reduce reliance on fossil fuels.

Appendix A | Magnetic Island options longlist

LONGLIST

Theme	ID	Title	Description
Water	WT1	Ground water extraction via windmill	Feasibility study to investigate the plausibility of ground water extraction via windmill, to provide potable water to the island and how much the extraction could offset reliance on the mains water supply to the island from Townsville.
Water	WT2	Water efficiency education	Educational programs for residents and visitors, including how to recycle grey water at the residential level and increasing communications at community meetings.
Water	WT3	Planting climate adapted plant and grass varieties	Planting of climate adapted plant and grass species for Council gardens or as a requirement of new builds, to increase island resilience.
Water	WT4	Stormwater management	Feasibility study to understand storm water run-off and establish a catchment management plan for the island, to prevent stormwater run-off which currently goes directly into the ocean without filtration or catchment integrity.
Water	WT5	Variable Speed Drivers for water pumps	Variable Speed Drives for water pumps to distribute water around the island, thus reducing energy demand on the island.
Water	WT6	Water Tanks / Water smart package	Encourage the update of more water efficient devices or installation of water tanks on-island, to reduce demand on potable water supplied to the island from Townsville.
Water	WT7	Water storage dam	Installation of a dam on-island to capture rainwater or run-off which could be treated on-island for potable water, or used for irrigation on-island.
Waste	WS1	Increase buying of Bioplastic/paper disposable items	Encouraging businesses, locals and visitors to reduce the amount of single-use plastics used on the island through Cluster Purchasing or Plastic Free Places schemes, to reduce the total waste generated, but also reduce the associated carbon emissions with transportation of the waste off island.
Waste	WS2	Glass crusher	Installation of whole-of-island glass crusher on-island, which could take the majority of glasses disposed of on-island and use the crushed glass in cement, gardens or sand bank rehabilitation. It would reduce the amount of waste sent for recycling or landfill, and the costs and emissions associated with removal of this heavy and space intensive material.
Waste	WS3	Green waste collection bins	Addition of a green waste bin and collection every fortnight, removing residents' green waste and storing at the waste transfer station on-island, to increase existing scheme capacity, reduce the size of current roadside bins and reduce emissions by using enzymes for mulch production rather than the usual aerobic decomposition process.
Waste	WS4	Phase out single use items	Encouraging businesses, locals and visitors to reduce the amount of single-use plastics, such as straws and cups, to reduce total waste generated and associated carbon emissions with transportation of the goods on to the island and off Island as waste, through schemes such as Plastic Free Places.
Waste	WS5	Reduce packaging for shipments to Island	Encouraging businesses to reduce the amount of packaging brought onto or used on the island, to reduce total waste generated and associated carbon emissions with transportation of the goods on to the island and off Island as waste.

Appendix A | Magnetic Island options longlist

LONGLIST

Theme	ID	Title	Description
Waste	WS6	Waste reduction education	Educational programs and materials on waste management for residents and visitors, including how to reduce amount of waste sent to landfill.
Waste	WS7	Biosolids reuse as compost or fertiliser	Utilisation of biosolids as compost or fertiliser to be used on gardens and landscaping, to promote environmental health.
Waste	WS8	Motor home sewage dump facilities	Installation of motor home sewage dump facilities on-island, such as bio-cycle systems to reduce dumping of waste.
Waste	WS9	Rotary table for sorting recycling materials	Installation of a rotary table at the waste transfer facility to enable more effective and efficient sorting of recyclables, leading to a higher recovery rate and resulting in less pollution on the island.
Waste	WS10	Upgrade of sewage treatment plant, offset with solar	Upgrade of the sewage treatment plant at Picnic Bay as it is at capacity would be required to cater to a growing population, in addition to offsetting the additional energy usage with solar panels (and possible battery integration) would provide a carbon neutral solution.
Waste	WS11	Ban plastic bottle sales at cafes/ bars/ restaurants	Reduction or a complete ban of single-use plastic items, specifically plastic bottles, at hospitality businesses by switching to alternatives and to empower the community to make lasting changes towards sustainability.
Waste	WS12	Surcharge for using takeaway coffee cups	To eliminate or discourage use of takeaway coffee cups, a surcharge for using these cups, a reverse discount for those who bring their own cups or biodegradable options would be implemented in restaurants and cafes.
Waste	WS13	Sewage facilities for yachts/boats	Development of sewage disposal facilities for watercraft such as yachts and boats, to reduce marine pollution.
Waste	WS14	Plastic repurposing	Plastic collection and repurposing by small industry island business to make products from recycled outputs, including waste segmentation to reduce plastic pollution.
Transport	T1	Alternative fuels for boats	Feasibility assessment of alternative fuels for marine operators, to reduce emissions from transportation and reliance on fossil fuels.
Transport	T2	Education on vehicle efficiency and marine use	Educational programs for community and businesses on personal and commercial, land and sea vehicle efficiency and use, including interpretation materials for alternative transport modes.
Transport	T3	Efficient boat propellers upgrades	Upgrade of commercial watercraft propellers for fuel efficiency and to reduce emissions associated with marine transport.
Transport	T4	Efficient boat coatings	Implementation of boat coatings for fuel efficiency on commercial watercraft.
Transport	T5	Electric bicycle rental/purchasing scheme	Development of an electric bicycle rental or purchasing scheme for residents and visitors including charging point infrastructure, to provide a reduced emissions transport solution while increasing connectivity between hubs.
Transport	T6	Reducing speed limit from 60km/h to 50km/h or 40km/hr	Strategy development and enforcement of reduced island speed limits from 60km/hr to 50km/hr or 40km/hr for community safety and protection of the Island's wildlife.

Appendix A | Magnetic Island options longlist

LONGLIST

Theme	ID	Title	Description
Transport	T7	Solar powered speeding signs	Installation of speeding signs including identification of speed-prone areas supplemented with solar power, to reduce energy consumption and address safety concerns.
Transport	T8	Driverless vehicles	Implementation of driverless vehicles that would act as a taxi/shuttle service on the Island, would reduce the need for visitors to hire a car or take public transport, thus lowering the overall footprint of the island.
Transport	T9	Alternative energy for marine vehicles	Feasibility assessment of alternative energy commercial watercrafts such as solar ferries, electric boats or solar powered components, for marine operators to reduce emissions from transportation and reliance on fossil fuels.
Transport	T10	Electric island shuttle buses	Replacing large buses currently on the island with a low emission alternative such as electric island shuttle buses including installation of electric charging stations and infrastructure, under a direct rapid transport scheme.
Transport	T11	Construction of continuous path networks	Construction of continuous path networks such as footpaths and cycling lanes, to support active travel including any infrastructure needed and to promote a healthier lifestyle while reducing the Island's carbon footprint.
Transport	T12	Infrastructure to support fuel efficient vehicles	Upgrade and installation of infrastructure to support fuel efficient vehicles such as electric charging stations and biodiesel or hydrogen power including promotion of finance sources or existing subsidies.
Transport	T13	Infrastructure upgrade (roads)	Upgrading the current road infrastructure on-island to address road quality and surface roughness issues, with the aim of reducing fuel consumption.
Transport	T14	Solar powered A/C on boats as a standalone upgrade	Upgrade of air-conditioning units to solar power on commercial watercrafts, to reduce reliance on energy and fossil fuels.
Transport	T15	Bridge from mainland	Feasibility assessment for the construction of a bridge from the Island to mainland, to support local and visitor traffic and to reduce marine transport emissions.
Transport	T16	Ban motor homes on island	Feasibility assessment and strategy to reduce the number or ban motor homes accessing the Island, to reduce transport emissions.
Transport	T17	Reduce number of car hire businesses	Feasibility study for the reduction of car hire businesses on-island, to consequently reduce the number of cars and therefore the emissions associated with car use.
Transport	T18	Car share scheme for local community	Community-led scheme for residents to reduce vehicles on the road by carpooling by bay or sharing barge transfers/costs which aims to reduce costs and emissions.
Transport	T19	Incentive schemes to reduce number of vehicles used on-island	Potential implementation of congestion charges, specific island fuel tax or entrance fees with all revenues redirected to emission free public transport.

Appendix A | Magnetic Island options longlist

LONGLIST

Theme	ID	Title	Description
Transport	T20	Electric tram/train tunnel	Feasibility investigation of electric tram or trains efficiency compared to a diesel or petrol powered bus, as a form of Island transportation. Tunnel would be from Nelly Bay Terminal to HSB with a stop at Arcadia, with services running every 15 minutes and potential to also be used as a cyclone shelter.
Transport	T21	Change bus fuel to natural gas	Replacement of existing public transport services on the Island to be fuelled by natural gas, rather than diesel, to reduce reliance on fossil fuels.
Transport	T22	Courier service for luggage for visitors	Implementation of a courier service that greets the passenger and vehicle ferries, to collect the visitor's luggage, which will deliver it to the accommodation of the visitor, aiming to reduce the number of hire cars on island.
Resilience	R1	Support for tourism businesses to achieve eco-accreditation	Development of appropriate programs and materials to support funding and guidance for local tourism businesses in achieving eco-accreditation, which will support the Island's tourism "green image" and encourage more responsible and sustainable tourism of the island.
Resilience	R2	Creek clean up	Frequent community-led events for cleaning up and picking up waste from the creek system, to reduce pollution entering waterways.
Resilience	R3	Plant Cyclone rated plant species	Wide-spread planting of cyclone rated plant species to improve environmental health when faced with severe wind events such as cyclones.
Resilience	R4	Cyclone rating assessment	Assessments conducted by an authorised business to develop cyclone ratings for residential and commercial buildings, to help identify buildings that may need to be upgraded to suit climate conditions.
Resilience	R5	Feral/invasive animal management plan	Community-led development of a feral/invasive animals management plan to reduce the populations of species such as cats, cane toads, pigs and goats, or banning domestic cats, which will improve environmental health on the island.
Resilience	R6	Gutter guards	Installation of gutter guards on residential and commercial roof space to reduce the risk during bushfire season.
Resilience	R7	Mosquito screens	Installation of mosquito screens on residential properties to encourage residents to leave doors and windows open for natural ventilation, reducing reliance on air-conditioning systems and reducing energy consumption.
Resilience	R8	Nature walking tracks	Construction and maintenance of nature walking tracks to support a healthy and active lifestyle for residents and to promote environmental care to visitors.
Resilience	R9	Ongoing management of islander wellbeing	A study to look at ways to encourage ongoing mental and physical wellbeing of island residents to ensure a happy, healthy and resilient community.
Resilience	R10	Overall beach erosion plan	Development of a overall beach and erosion plan, to create a more resilience coastline to storm surges.

Appendix A | Magnetic Island options longlist

LONGLIST

Theme	ID	Title	Description
Resilience	R11	Revegetation	A study to investigate the most effective way to encourage revegetation on-island with respect to coral, dune grass, terrestrial environment, mangrove and seagrasses, to ensure a resilience ecosystem on-island, including the potential for carbon sequestration.
Resilience	R12	Visitor number restrictions and ongoing management	Research for a feasible carrying capacity for the island including appropriate visitor number restrictions and strategies for ongoing management.
Resilience	R13	Whole of Island resilience plan	Resilience plan developed with the community to be applied across whole of Island, including ways to improve resilience for the community and the environment.
Resilience	R14	Aquaculture or oyster farm	Establishment of an aquaculture or oyster farm on-island, to encourage the local production of food, increasing resilience of the island.
Resilience	R15	On-island food production	Feasibility assessment of the potential for an ecologically sensitive and sustainable food production industry on the island including a community garden, clams, seaweed, crayfish, oyster farm and trial aquaponic farm to promote food self-sufficiency.
Resilience	R16	Cyclone shelter	Feasibility assessment for the design and construction of a building suitable to be a cyclone shelter at Kelly Street, which can also be used as a community centre for events and shows, while increasing Island resilience.
Resilience	R17	Aged care facility	Investigation of the construction of an aged-care facility on the Island, as currently residents need to leave the island to be cared for in a facility, therefore this would create greater self-sufficiency.
Resilience	R18	Ongoing coastal clean-ups	Frequent community-led events for cleaning up and picking up waste from coastal ecosystems, to reduce pollution entering waterways.
Resilience	R19	Permanent Indigenous rangers for the establishment of traditional environmental	Development of permanent Indigenous ranger roles in collaboration with community for the establishment of traditional fire management systems including weed and feral animal management.
Resilience	R20	Traditional owner native nursery	Establishment of a native plant nursery including infrastructure owned by Traditional Owners and supported by a Townsville City Council supplier contract to also be planted on the island, to benefit environmental health while celebrating and sharing Traditional Owner knowledge.

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 limitations exist 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 Magnetic Island are presented in the table below.

Objective category	#	Draft criteria	Proposed weighting
Economic development	1	Potential to support sustainable economic development opportunities	15%
	2	Potential to support local job creation, skills development and/or capacity building	15%
	<i>Total (economic development)</i>		<i>30%</i>
Social development & culture	3	Promotion of community self-sufficiency and/or resilience	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. The intent of this process was to enable more effective and targeted stakeholder engagement on key aspects of these options.

As part of the options assessment process options were then 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 progressed 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	LED cells in Council-owned streetlights	Pass	Fail		Recommendation
Energy	E2	Pilot research trial for renewable fuels from cooking oil or biomass	Pass	Fail		Recommendation
Energy	E3	Fuel cells using natural gas for energy generation	Pass	Fail		Discounted
Energy	E4	Heat recovery from compost at waste transfer station	Pass	Fail		Discounted
Energy	E5	Methane capture from upgraded Sewage Treatment Plant to flare	Fail			Discounted
Energy	E6	Install rooftop solar PV with battery support	Pass	Pass	Pass (consolidated)	Shortlist: “New rooftop solar systems with battery storage”
Energy	E7	Solar powered A/C with no grid return for commercial systems	Pass	Fail		Recommendation
Energy	E8	Tidal or wave generators	Pass	Fail		Discounted
Energy	E9	Waste to energy plant with gas boost	Pass	Fail		Discounted
Energy	E10	Wind turbines offshore	Pass	Fail		Discounted
Energy	E11	Increase solar panels installed on sea-going vessels	Pass	Pass	Pass (consolidated)	Shortlist: “Alternative fuels for boats”
Energy	E12	Community owned or partially owned microgrid	Pass	Pass	Pass	Shortlist: “Feasibility study for microgrid (whole of island)”
Energy	E13	Adopt best practice building code for island	Fail			Recommendation
Energy	E14	Cluster purchase of small-scale energy control systems	Pass	Pass	Pass (consolidated)	Shortlist: “Energy efficiency and demand management incentive scheme”
Energy	E15	Energy data loggers for energy efficiency education	Pass	Pass	Pass (consolidated)	Shortlist: “Energy efficiency and demand management incentive scheme”

Appendix C | Gateway assessment outputs

GATEWAY ASSESSMENT

Theme	ID	Title	Gate 1	Gate 2	Gate 3	Outcome
Energy	E16	Energy efficiency education for locals and visitors	Pass	Pass	Pass (consolidated)	Shortlist: “Development and delivery of community sustainability and environmental education for residents and visitors”
Energy	E17	Existing building improvements	Pass	Pass	Pass	Shortlist: “Existing building improvements”
Energy	E18	LED uptake enhancing incentive scheme	Pass	Pass	Pass (consolidated)	Shortlist: “Energy efficiency and demand management incentive scheme”
Energy	E19	Central control system for accommodation providers on-island	Pass	Fail		Recommendation
Energy	E20	Ground source heat pumps	Pass	Pass	Pass (consolidated)	Shortlist: “Energy efficiency and demand management incentive scheme”
Energy	E21	Upgrade to high efficiency AC units and refrigeration units	Pass	Pass	Pass (consolidated)	Shortlist: “Energy efficiency and demand management incentive scheme”
Energy	E22	Upgrades to solar hot water system	Pass	Pass	Pass	Shortlist: “Upgrades from electric to solar hot water systems”
Energy	E23	New rooftop solar systems with battery storage	Pass	Pass	Pass (consolidated)	Shortlist: “New rooftop solar systems with battery storage”
Energy	E24	Magnetic Island Hydrogen Economy Pilot	Pass	Pass	Pass	Shortlist: “Magnetic Island Hydrogen Economy Pilot feasibility study”
Water	WT1	Ground water extraction via windmill	Pass	Pass	Pass	Shortlist: “Needs study for renewable energy alternative for groundwater extraction”

Appendix C | Gateway assessment outputs

GATEWAY ASSESSMENT

Theme	ID	Title	Gate 1	Gate 2	Gate 3	Outcome
Water	WT2	Water efficiency education	Pass	Pass	Pass (consolidated)	Shortlist: “Development and delivery of community sustainability and environmental education for residents and visitors”
Water	WT3	Planting climate adapted plant and grass varieties	Pass	Pass	Pass (consolidated)	Shortlist: “Traditional owner native nursery”
Water	WT4	Stormwater management	Pass	Fail		Recommendation
Water	WT5	Variable Speed Drives for water pumps	Pass	Fail		Recommendation
Water	WT6	Water Tanks / Water smart package	Pass	Pass	Pass	Shortlist: “Water sensitive Island initiatives”
Water	WT7	Water storage dam	Pass	Fail		Discounted
Waste	WS1	Increase buying of Bioplastic/paper disposable items	Pass	Fail		Recommendation
Waste	WS2	Glass crusher	Pass	Pass	Pass	Shortlist: “Glass crusher”
Waste	WS3	Green waste collection bins	Pass	Pass	Pass	Shortlist: “Feasibility assessment for green waste collection and re-use on island”
Waste	WS4	Phase out single use items	Pass	Fail		Recommendation
Waste	WS5	Reduce packaging for shipments to Island	Pass	Fail		Recommendation
Waste	WS6	Waste reduction education	Pass	Pass	Pass (consolidated)	Shortlist: “Development and delivery of community sustainability and environmental education for residents and visitors”
Waste	WS7	Biosolids reuse as compost or fertiliser	Pass	Fail		Discounted
Waste	WS8	Motor home sewage dump facilities	Fail			Discounted

Appendix C | Gateway assessment outputs

GATEWAY ASSESSMENT

Theme	ID	Title	Gate 1	Gate 2	Gate 3	Outcome
Waste	WS9	Rotary table for sorting recycling materials	Pass	Pass	Pass	Shortlist: “Rotary table for sorting recycling materials”
Waste	WS10	Upgrade of sewage treatment plant, offset with solar	Pass	Pass	Pass	Shortlist: “Solar panels with battery integration at Magnetic Island Water Recycling Facility”
Waste	WS11	Ban plastic bottle sales at cafes/ bars/ restaurants	Pass	Fail		Recommendation
Waste	WS12	Surcharge for using takeaway coffee cups	Pass	Fail		Recommendation
Waste	WS13	Sewage facilities for yachts/boats	Pass	Fail		Discounted
Waste	WS14	Plastic repurposing	Pass	Fail		Recommendation
Transport	T1	Alternative fuels for boats	Pass	Pass	Pass (consolidated)	Shortlist: “Alternative fuels for boats”
Transport	T2	Education on vehicle efficiency and marine use	Pass	Pass	Pass (consolidated)	Shortlist: “Development and delivery of community sustainability and environmental education for residents and visitors”
Transport	T3	Efficient boat propellers upgrades	Pass	Fail		Recommendation
Transport	T4	Efficient boat coatings	Pass	Fail		Recommendation
Transport	T5	Electric bicycle rental/purchasing scheme	Pass	Pass	Pass	Shortlist: “Electric bike rental scheme”
Transport	T6	Reducing speed limit from 60km/h to 50km/h or 40km/hr	Fail			Discounted
Transport	T7	Solar powered speeding signs	Pass	Fail		Discounted
Transport	T8	Driverless vehicles	Fail			Discounted

Appendix C | Gateway assessment outputs

GATEWAY ASSESSMENT

Theme	Title	Gate 1	Gate 2	Gate 3	Outcome
Transport T9	Alternative energy for marine vehicles	Pass	Pass	Pass (consolidated)	Shortlist: “Alternative fuels for boats”
Transport T10	Electric island shuttle buses	Pass	Pass	Pass (consolidated)	Shortlist: “Low emission shuttlebus”
Transport T11	Construction of continuous path networks	Pass	Pass	Pass	Shortlist: “Construction of continuous path networks”
Transport T12	Infrastructure to support fuel efficient vehicles	Pass	Pass	Pass (consolidated)	Shortlist: “Low emission shuttlebus”
Transport T13	Infrastructure upgrade (roads)	Pass	Fail		Recommendation
Transport T14	Solar powered A/C on boats as a standalone upgrade	Pass	Pass	Pass (consolidated)	Shortlist: “Alternative fuels and energy for marine vehicles”
Transport T15	Bridge from mainland	Fail			Discounted
Transport T16	Ban motor homes on island	Fail			Discounted
Transport T17	Reduce number of car hire businesses	Fail			Discounted
Transport T18	Car share scheme for local community	Pass	Fail		Recommendation
Transport T19	Incentive schemes to reduce number of vehicles used on-island	Pass	Fail		Discounted
Transport T20	Electric tram/train tunnel	Pass	Fail		Discounted
Transport T21	Change bus fuel to natural gas	Pass	Fail		Discounted
Transport T22	Courier service for luggage for visitors	Pass	Fail		Recommendation
Resilience R1	Support for tourism businesses to achieve eco-accreditation	Pass	Pass	Pass	Shortlist: “Support for tourism businesses to achieve eco-accreditation”
Resilience R2	Creek clean up	Pass	Fail		Recommendation

Appendix C | Gateway assessment outputs

GATEWAY ASSESSMENT

Theme	Title	Gate 1	Gate 2	Gate 3	Outcome
Resilience R3	Plant Cyclone rated plant species	Pass	Pass	Pass (consolidated)	Shortlist: “Traditional owner native nursery”
Resilience R4	Cyclone rating assessment	Pass	Fail		Recommendation
Resilience R5	Feral/invasive animal management plan	Pass	Fail		Recommendation
Resilience R6	Gutter guards	Pass	Pass	Pass (consolidated)	Shortlist: “Existing building improvements”
Resilience R7	Mosquito screens	Pass	Pass	Pass (consolidated)	Shortlist: “Existing building improvements”
Resilience R8	Nature walking tracks	Pass	Fail		Recommendation
Resilience R9	Ongoing management of islander wellbeing	Pass	Fail		Recommendation
Resilience R10	Overall beach erosion plan	Pass	Fail		Recommendation
Resilience R11	Revegetation	Pass	Fail		Recommendation
Resilience R12	Visitor number restrictions and ongoing management	Fail			Discounted
Resilience R13	Whole of Island resilience plan	Pass	Fail		Recommendation
Resilience R14	Aquaculture or oyster farm	Pass	Pass	Pass (consolidated)	Shortlist: “Feasibility study for sustainable on-island food production”
Resilience R15	On-island food production	Pass	Pass	Pass (consolidated)	Shortlist: “Feasibility study for sustainable on-island food production”
Resilience R16	Cyclone shelter	Fail			Recommendation
Resilience R17	Aged care facility	Fail			Recommendation
Resilience R18	Ongoing coastal clean-ups	Pass	Fail		Recommendation
Resilience R19	Permanent Indigenous rangers for the establishment of traditional environmental	Pass	Fail		Recommendation
Resilience R20	Traditional owner native nursery	Pass	Pass	Pass (consolidated)	Shortlist: “Traditional owner native nursery”

Appendix D

Options shortlist

Appendix D | Magnetic 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	E17, R6, R7	Existing building improvements	This final project option is for a scheme to provide financial assistance for a fixed amount to: 1. Fund building audits (including new-builds) to establish the need for building improvements with the intent of enhancing energy efficiency. 2. Fund the highest priority upgrade(s). Effective and feasible retrofitting measures would seek to improve thermal comfort through passive cooling (based on the findings of the audit). Existing building improvements could include air flow, insulation, glazing, heat reflective roof paint and gutter guards. The solution should allow the consumer to determine the best technology option to purchase based on the house design, orientation, etc.
Energy	2	E14, E15, E18, E20, E21	Energy efficiency and demand management incentive scheme	This final project option would recommend a scheme to provide low-cost energy efficient appliances and demand management devices to residents and businesses on the island. Efficient appliances and tools to enable residents /businesses to actively monitor and manage their energy use can have a significant impact on reducing the overall energy demand of the island. Businesses and residents are also incentivised to purchase reduced-cost devices to save on electricity bills. The intent is to reduce the overall carbon footprint of residents, visitors and businesses, of which electricity consumption is a significant contributor.
Energy	3	E22	Upgrades from electric to solar hot water systems	This final project option is to explore options for funding to subsidise residential households to switch their electric hot water systems over to solar hot water systems.
Energy	4	E6, E23	New rooftop solar systems with battery storage	Uptake of new solar rooftop systems with integrated battery storage for any residential or commercial properties currently without solar that meet requirements and the energy is shared to peers within close proximity, rather than fed into the grid on-island.
Energy	5	E12	Feasibility study for microgrid (whole of island)	A final project option for a study into the feasibility of converting Magnetic Island into a microgrid using renewable electricity generated on-island as opposed to being underwater cable fed from the mainland.
Energy	6	E24	Magnetic Island Hydrogen Economy Pilot feasibility study	This final project option is for a feasibility study for the development of a hydrogen economy pilot scheme on Magnetic Island. Initial pilot scheme would include demonstration size electrolyser to produce green hydrogen from local water supply; and refuelling station suitable to refuel local vehicles (buses, cars, forklift etc.).

Appendix D | Magnetic Island options shortlist

SHORTLIST

Theme	ID	Component ID	Title	Description
Water	7	WT1	Needs study for renewable energy alternative for groundwater extraction	This final project option would seek funding for an investigation of the need and options for renewable energy alternatives for groundwater extraction. The community have suggested that windmills could be installed. It would explore options to provide a technological best fit to achieve benefits in line with project objectives.
Water	8	WT6	Water sensitive Island initiatives	This project seeks to implement water sensitive initiatives and solutions on an integrated and community-wide scale on Magnetic Island, to improve the resilience of water supply and systems locally, and inform the broader roll-out of successful strategies across Townsville.
Waste	9	WS10	Solar panels with battery integration at Magnetic Island Water Recycling Facility	This option seeks funding for the addition of solar panels and battery storage at the Magnetic Island Water Recycling Facility. As a significant user of electricity in daily operations, this option has the potential to significantly reduce the island's carbon footprint through reduced reliance on mains electricity. This scheme would be one component of a wider vision to increase the island's self-sufficiency. Taken together, a key driver of this vision is the deferment (indefinitely) of the third underground mains electricity cable to Magnetic Island.
Waste	10	WS9	Rotary table for sorting recycling materials at waste facility	This final project option would set the case for and identify potential funding for the installation of a rotary sorting table at the waste transfer facility. Rotary tables enable more effective and efficient sorting of recyclables to enable better source separation, leading to a higher recovery rate.
Waste	11	WS3,	Feasibility assessment for green waste collection and re-use on island	This final project option would aim to seek funding for the investigation of ways to collect and reuse green waste on island. Collection options include green bins; periodic pick up services on nominated days (i.e. clean up before cyclone season events; or after significant weather events to collect debris etc.). Reuse options could be composting on or off-island for reuse (e.g. public realm, food production, plant nursery).
Waste	12	WS2	Glass crusher	A glass crusher would enable more effective on-island management of glass waste streams and reduce the need for barge trips to the mainland. Crushed glass would be reused on-island in cement or for sand bank rehabilitation
Transport	13	T5	Electric bike rental scheme	This final project option is for the development of a Magnetic Island solar electric bike rental scheme and charge point infrastructure for locals and visitors. This would provide a zero emission active transport solution (suited for hilly Magnetic Island) that would increase connectivity between hubs and potentially reduce the need for vehicle use and car hire alternatives.
Transport	14	T10, T12	Low emission shuttlebus	Existing public transport on the island could be decarbonised through replacement with a low-emissions option such as EV or EV hybrid. The community has raised safety concerns with the current bus service due to bus size relative to the constrained and winding roads. The need has been identified for more flexible, frequent services which could be accommodated by smaller 'mini'/shuttle buses.

Appendix D | Magnetic Island options shortlist

SHORTLIST

Theme	ID	Component ID	Title	Description
Transport	15	T11	Construction of continuous path networks	This final project option will include active transport infrastructure (such as footpaths and cycling lanes) needs identified but not already funded to support active travel.
Transport	16	E11, T1, T9, T14	Alternative fuels for boats	This final project option would focus around possibilities for SeaLink to look at alternate fuels for their marine operations such as solar, electric or solar powered component (such as air-conditioning).
Resilience	17	R14, R15	Feasibility study for sustainable on-island food production	This final project option would involve a feasibility assessment of the potential for an ecologically sensitive and sustainable food production industry on the island. It is understood that there was previously a commercial aquaculture industry on the island. Consideration would be given to issues including land availability and space requirements, policy restrictions, and technical and environmental suitability (most importantly given location on the Great Barrier Reef). Formal farming arrangements would be commercial in nature, with this final project option seeking support for a feasibility and market assessment. On-island production would enhance community self-sufficiency and has the potential to provide significant economic opportunity for the community through the development of new industries and employment.
Resilience	18	R1	Support for tourism businesses to achieve eco-accreditation	The final project option will seek funding for the development of appropriate programs and materials to support local tourism businesses in achieving eco-accreditation. This would facilitate businesses to be recognised for sustainability initiatives and potentially drive more sustainable outcomes from these businesses. Wider eco-accreditation of island businesses will support Magnetic Island's tourism "green image".
Resilience	19	WT3, R3, R20	Traditional owner native nursery	The final project option will set the basis for, and identify funding options for the establishment of the native plant nursery structure /infrastructure under an Indigenous Small Business grant (or similar). As a commercial venture, next steps will be for the proponent to undertake detailed business planning to support a grant application for subsequent project planning approval and infrastructure development. The viability of the operation could be supported by a supply contract with Townsville City Council.
Resilience	20	E16, WT2, WS6, T2	Development and delivery of community sustainability and environmental education for residents and visitors	This final project option is for the development and delivery of sustainability and environmental education, tailored separately to residents and to visitors. The purpose is to promote the sustainable use of resources, and also to celebrate and share traditional owner knowledge. The final project option will seek funding for the development of appropriate programs and materials to be developed in conjunction with the community and rolled out.

Appendix E

Recommendations and discounted options

Appendix E | Magnetic 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	E1	LED cells in council-owned streetlights	Through engagement with TCC it was established that a final project option had already been developed and put forward to transition to LED cells. This was moved to be a recommendation to avoid duplication of effort
Energy	E2	Pilot research trial for renewable fuels from cooking oil or biomass	Renewable fuel feedstocks are currently limited and would need to be transported to the island which may not have a direct decarbonisation impact, however could be explored in combination with final project option 16, Low Emission Marine Transport.
Energy	E7	Solar powered A/C with no grid return for commercial systems	There are a few large providers that this may be applicable to. This option would need to consider the varying operations and maintenance capability of business systems. Success would be dependent upon operational requirements and reliability needs.
Energy	E13	Adopt best practice building code for island	This was considered to be an external policy consideration outside the jurisdiction and scope of this project.
Energy	E19	Central control system for accommodation providers on-island	There are few providers large enough to warrant consideration and the decarbonisation impact is unclear. This is considered to be a commercial decision for consideration by these businesses.
Water	WT4	Stormwater management	There is currently no storm water management on-island. Stormwater management processes are under the jurisdiction of TCC, and therefore considered out of scope for this project. This recommendation could be considered in combination with final project option 17 Water Smart Demonstration Community
Water	WT5	Variable Speed Drives for water pumps	This option has already been advanced by TCC through a final project option.

Appendix E | Magnetic Island option recommendations

RECOMMENDATIONS

Theme	ID	Title	Rationale
Waste	WS1	Increase buying of bioplastic/paper disposable items	These options would form part of a 'Plastic Free Places' initiative, which is a collection of strategies to reduce use of and waste from single-use plastics in a given area. As TCC is already progressing with the 'Plastic Free Places' initiative for the region, these options are excluded from the shortlist.
Waste	WS4	Phase out single use items	
Waste	WS5	Reduce packaging for shipments to island	
Waste	WS11	Ban plastic bottle sales at cafes/ bars/ restaurants	
Waste	WS12	Surcharge for using takeaway coffee cups	
Waste	WS14	Plastic repurposing	
Transport	T3	Efficient boat propellers upgrades	This is considered to be a private commercial decision for relevant businesses to undertake. It is understood SeaLink recently upgraded propellers as a pilot for some marine craft.
Transport	T4	Efficient boat coatings	This is considered to be a private commercial decision for relevant businesses to undertake. It is understood SeaLink recently applied new coatings as a pilot trial for some marine craft.
Transport	T13	Infrastructure upgrade (roads)	Road upgrades are considered outside of the scope of this project, and belong under the jurisdiction of Council and the Department of Transport and Main Roads. The decarbonisation benefits of upgrades upon reduced road roughness (and therefore fuel consumption) were also not considered to be significant in this context.
Transport	T18	Car share scheme for local community	This is considered to be a voluntary, community-driven measure which does not suit the format of a final project option. Other existing services such as taxis and ride-share apps may already provide a suitable platform for this scheme.
Transport	T22	Courier service for luggage for visitors	This does not align with core project objectives. This is considered to be a private commercial decision for businesses to make.

Appendix E | Magnetic Island option recommendations

RECOMMENDATIONS

Theme	ID	Title	Rationale
Resilience	R2	Creek clean up	It is understood that creek and coastal clean-ups are undertaken on a semi-regular basis by volunteers and community groups.
Resilience	R4	Cyclone rating assessment	This is outside of the scope of this project.
Resilience	R5	Feral/invasive animal management plan	This is outside of the scope of this project.
Resilience	R8	Nature walking tracks	This is under the jurisdiction of Council, Transport and Main Roads and Queensland Parks and Wildlife Service. A program of works to review and progress walking tracks is currently underway.
Resilience	R9	Ongoing management of islander wellbeing	This is outside of the scope of this project.
Resilience	R10	Overall beach erosion plan	It was determined that this would form one part of an overarching resilience plan for the island (which has been identified as a policy recommendation). This is outside of the scope of this project.
Resilience	R11	Revegetation	It was determined that there is minimal land available to revegetate. The plant nursery option has progressed to final project option #3 (Establishment of a Native Plant Nursery) to support small scale plant requirements.
Resilience	R13	Whole of island resilience plan	It was determined that a range of component activities and plans would come together to form an overarching resilience plan, many of which are being led by other agencies. This has been elevated as an overarching policy recommendation.
Resilience	R16	Cyclone shelter	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	R17	Aged care facility	This is outside of the scope of this project.
Resilience	R18	Ongoing coastal clean-ups	It is understood that creek and coastal clean-ups are undertaken on a semi-regular basis by volunteers and community groups.
Resilience	R19	Permanent Indigenous rangers for the establishment of traditional environmental knowledge sharing.	Should additional Ranger or community education programs be considered needed by State or Local government, it is recommended that it include indigenous cultural ranger programs. This recommendation could link with final project options recommended on neighboring Palm Island., such as #8 Indigenous Ranger Program.

Appendix E | Magnetic 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
Energy	E3	Fuel cells using natural gas for energy generation	This option would not provide a significant decarbonisation benefit in comparison with renewable energy generation options such as solar or hydrogen.
Energy	E4	Heat recovery from compost at waste transfer station	Considered to be a technically complex approach to energy generation. The physical space requirements for such a system are also likely to be infeasible given the capacity of the transfer station.
Energy	E5	Methane capture from upgraded Sewage Treatment Plant to flare	Due to existing Townsville City Council processes, it was advised that further sludge digestion is unlikely to be viable.
Energy	E8	Tidal or wave generators	There was a low level of community and stakeholder support for this option, and other technologies (i.e. solar) are considered to provide greater value for money and reliability.
Energy	E9	Waste to energy plant with gas boost	This option is technically and legislatively complex. The location and feedstock availability do not make Magnetic Island a feasible location for this project.
Energy	E10	Wind turbines offshore	There was a low level of community and stakeholder support for this option, and other technologies (i.e. solar) are considered to provide greater value for money and reliability. Impacts to the Great Barrier Reef would need to be considered.
Water	WT7	Water storage dam	There was not strong community support for this option, and issues were raised regarding the potential for adverse environmental impacts.
Waste	WS7	Biosolids reuse as compost or fertiliser	Townsville City Council have previously progressed pilot projects reusing biosolids in the region but have no current plans for wider implementation of their strategy to Magnetic Island.
Waste	WS8	Motor home sewage dump facilities	Survey findings indicated a low level of community support for this option, and the total number of motorhomes on the island is generally quite low.
Waste	WS13	Sewage facilities for yachts/boats	Sufficient public pump out facilities exist for boats at Nelly Bay.

Appendix E | Magnetic Island discounted options

DISCOUNTED OPTIONS

Theme	ID	Title	Rationale
Transport	T6	Reducing speed limit from 60km/h to 50km/h or 40km/hr	This is in the jurisdiction of Council or Transport and Main Roads and outside of project scope.
Transport	T7	Solar powered speeding signs	Recommended for new signage in locations remote to mains power. This is in the jurisdiction of Council or Transport and Main Roads and outside of project scope.
Transport	T8	Driverless vehicles	This option did not align with core project objectives and did not have community support.
Transport	T15	Bridge from mainland	This option did not align with core project objectives and did not have community support.
Transport	T16	Ban motor homes on island	This option did not align with core project objectives and was not considered a feasible policy position.
Transport	T17	Reduce number of car hire businesses	This option did not align with core project objectives and was not considered a feasible policy position.
Transport	T19	Incentive schemes to reduce number of vehicles used on-island	This option did not align with core project objectives and was not considered a feasible policy position.
Transport	T20	Electric tram/train tunnel	This option was not considered to be viable nor represent value for money.
Transport	T21	Change bus fuel to natural gas	This is considered to be a commercial decision by the bus owner and/or operator as it relates to profitability after costs. It is not considered to provide a significant decarbonisation impact in comparison with conversion to EV or hydrogen.
Resilience	R12	Visitor number restrictions and ongoing management	This option did not align with core project objectives and was not considered a feasible policy position.

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